Level of Service Calculations

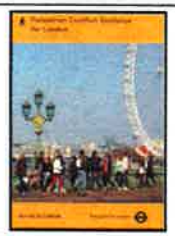
Traffix Group / UNSW

Appendix F

UNSW

TraffixGroup

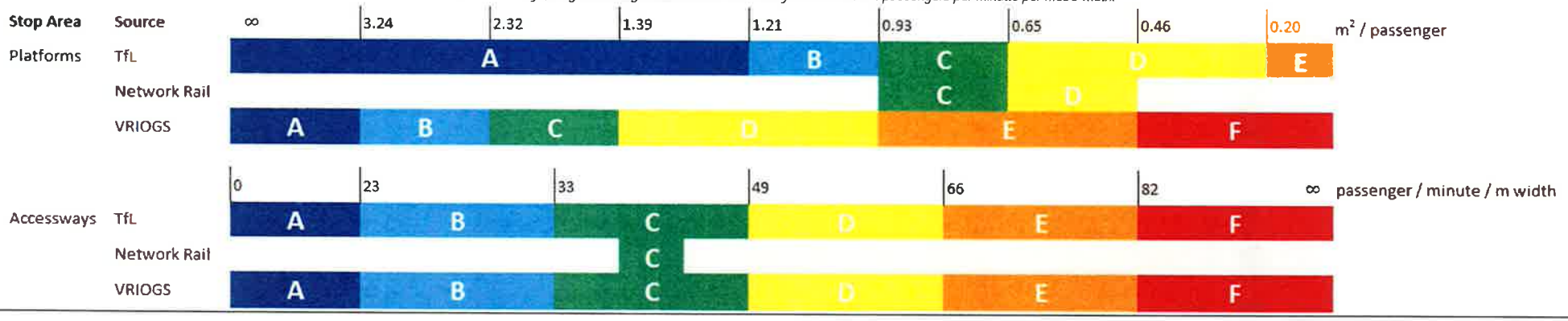
LEVEL OF SERVICE CALCULATIONS - COMPARISON

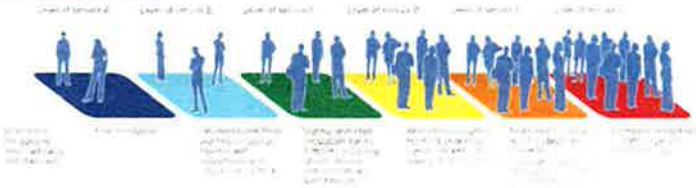
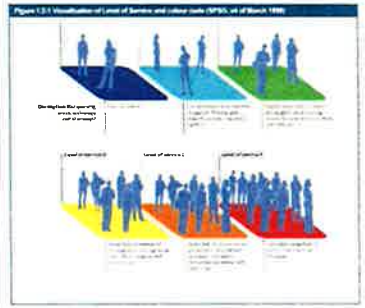
London Underground Station Planning Standards and Guidelines, Transport for London, 2012 Edition	Pedestrian Comfort Guidance for London – Guidance Documents, Transport for London, 2010	Victorian Rail Industry Operators Group Standards VRIOGS 002.1, Railway Station Design Standard and Guidelines. Revision A, 29/03/2011	Network Rail Station Capacity Assessment Guidance, May 2011
			
Recommends average flow per minute. *Two way accessway – LOS C (40 pax/min/m), edge effect of 0.3m due to walls.* *Platforms – 0.93 m²/pax at busiest parts of platform, edge effects of 0.5m at front and rear of platform.* *Island platforms – Calculated by treating them as two separate platforms and adding the two widths together.*	*Transport interchanges* *LOS B- acceptable* *LOS C+ acceptable* *LOS C- at risk* *LOC D unacceptable / uncomfortable* *LOC E unacceptable / uncomfortable*	*Platforms – LOS C (1.39 m² to 2.32 m²) during peak periods, with LOS E (0.46 m² to 0.93 m²) for short periods.* *Ramps – LOS C (33 to 49 pax/min/m).*	*Platform waiting zone – 0.65 m²/pax (LOS C).* *Localised queueing of LOS D or higher only for less than 5 minutes every 15 minutes.*

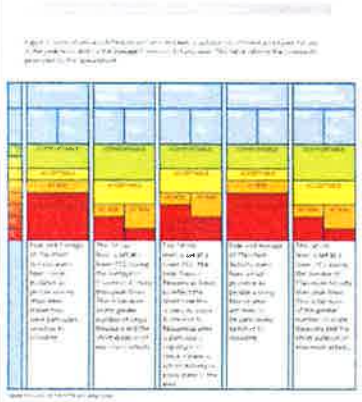
Comparison of the above guidelines (where available).

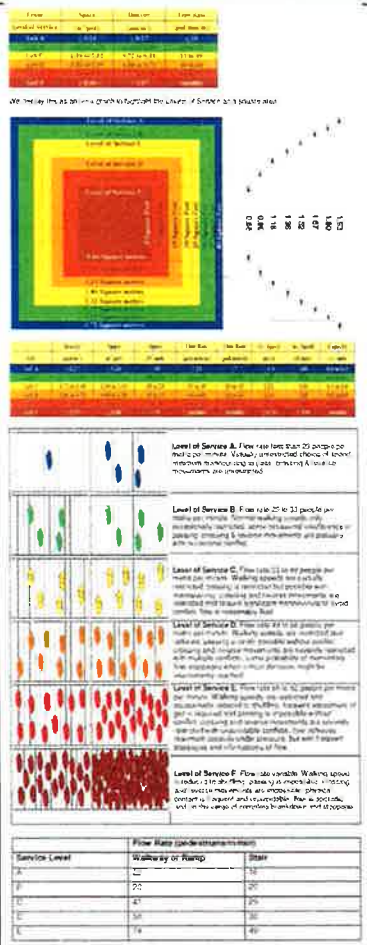
For platforms, the TfL and Network Rail guides will give better LOS for smaller areas per passenger. Therefore, the Victorian guide is more conservative than the UK guides, with the UK guides accepting significantly smaller areas per passenger for each LOS.

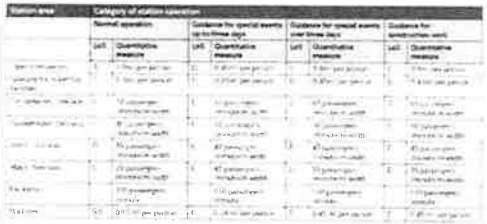
For accessways, all guidelines give the same LOS for varyous numbers of passengers per minutte per metre width.

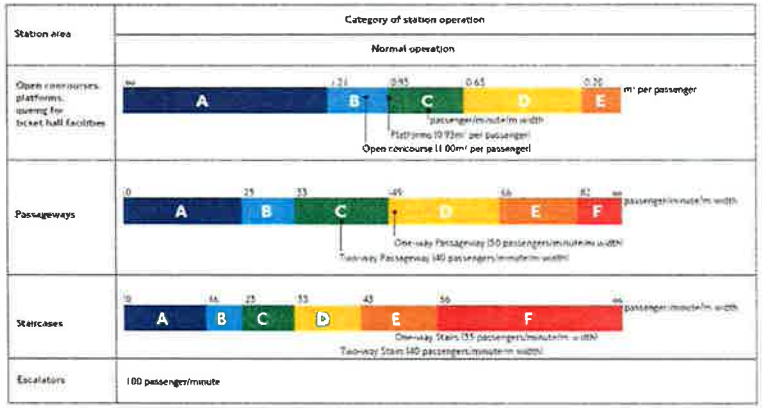


London Underground Station Planning Standards and Guidelines, Transport for London, 2012 Edition	Pedestrian Comfort Guidance for London – Guidance Documents, Transport for London, 2010	Victorian Rail Industry Operators Group Standards VRIOGS 002.1, Railway Station Design Standard and Guidelines. Revision A, 29/03/2011	*Network Rail Station Capacity Assessment* Guidance, May 2011
Level of service / **Description (for queuing areas, walkways and stairways)** A – Free circulation B – Uni-directional flows and free circulation. Reverse and cross-flows with only minor conflicts C – Slightly restricted circulation due to difficulty in passing others. Reverse and cross-flows with difficulty D – Restricted circulation for most pedestrians. Significant difficulty for reverse and cross-flows. E – Restricted circulation for all pedestrians. Intermittent stoppages and serious difficulties for reverse and cross-flows. F – Complete breakdown in traffic flow with many stoppages 	Going further than existing measures such • as Fruin Level of Service which simply assess crowding. This guidance is based on comfort and takes into account user perceptions as well as observed behaviours.	7.6.1 Access, Queuing and Circulation The entry configuration should be designed to: e) Provide sufficient space to allow queuing that doesn't conflict with passenger flows and which satisfies as a minimum a Fruin Level of Service C (see Appendix A).	Network Rail, however, also looks at other performance criteria to evaluate station designs such as station dwell and journey times as described below: ▯ clearance times at escalator landings and staircases off a platform ▯ clearance times at revenue protection barriers ▯ waiting times at ticket vending machines and ticket windows ▯ dwell times in accessing, reading and understand passenger information ▯ interchange times to access other modes of transport ▯ journey times from entrance to platforms ▯ journey times between interchanging trains ▯ journey times between other transport providers 

London Underground Station Planning Standards and Guidelines, Transport for London, 2012 Edition	Pedestrian Comfort Guidance for London – Guidance Documents, Transport for London, 2010	Victorian Rail Industry Operators Group Standards VRIOGS 002.1, Railway Station Design Standard and Guidelines. Revision A, 29/03/2011	*Network Rail Station Capacity Assessment* Guidance, May 2011
		8.4 DETAILED REQUIREMENTS The general requirements for all circulation elements are to include: i. Passenger circulation concourses including platforms should be designed to Level of Service C for Walkways (as defined by Fruin – see Appendix A). However, for short periods (up to 3 minutes within arrival of a train), up to Level of Service E is acceptable on platforms only; 8.5.1 General requirements for all vertical circulation elements are: b) Ramps and stairways should be designed to Level of Service C (as defined by Fruin – see Appendix A); 8.5.3 Stairs and Landings Stairs should be designed to the following requirements: a) The designer is to exercise their judgement in evaluating the traffic patterns and peaking characteristics to achieve a flow rate of 26 passengers per minute (Fruin level C). See Appendix A for more detail;	2.4.5.2 Platform widths – platforms as waiting areas The "waiting zone" should be sufficiently sized to accommodate all waiting passengers at a maximum average peak minute density of 0.65m² per person per carriage block of the platform. It is acknowledged that there will be pockets of density greater than this as passengers will congregate around train door areas, particularly when trains are in the platforms; however this is considered acceptable for short periods.
3.2 Passenger flow data Standard – Passenger flow data The calculations for station areas shall use the **average flow per minute** that shall be derived from the peak 15 minutes flow. Passenger areas derived from methodologies contained in this document shall be the net areas available after allowing for the requirements of amenities and facilities as specified in other relevant Category 1 Standards.		9.3.2 Platform Width Design considerations for new, or alterations to existing platforms shall be that the platform/s be designed so that the capacity at peak patronage allows for: b) A Fruin level of comfort C during disembarkation in peak periods.	Service perturbation is defined as a significant delay to the service leading to increased waiting in the station environment (either on the platforms or the concourses). The definition (and indeed the impact) of service perturbation varies on a station by station basis.
3.10 Access and interchange Passageways Two-way passageway sizing is based on Fruin level of service C, as defined in Section 2.1, which equates to 40 passengers per minute per metre width. One-way passageway sizing is based on Fruin level of service D, also as defined in Section 2.1, which equates to 50 passengers per minute per metre width. This is a higher passenger density than for two-way passageways as there is no opposing flow.		SECTION 22.0 APPENDIX APPENDIX A FRUIN LEVELS OF SERVICE	 Platform Waiting Area ▯ The average density within the waiting area for each carriage block of the platform should not exceed 0.65sqm/pax during the waiting period for the busiest

London Underground Station Planning Standards and Guidelines, Transport for London, 2012 Edition	Pedestrian Comfort Guidance for London – Guidance Documents, Transport for London, 2010	Victorian Rail Industry Operators Group Standards VRIOGS 002.1, Railway Station Design Standard and Guidelines. Revision A, 29/03/2011	*Network Rail Station Capacity Assessment* Guidance, May 2011
Note: an 'edge effect' of 0.3 metres at each sidewall has been incorporated into the above formulae to take account of the space passengers leave to avoid touching the walls. 3.11 Platforms Platforms should be designed to promote easy access, exit and circulation and have good sightlines by avoiding recesses and indentations which could offer hiding places and litter traps. *Platform sizing is one of the most important aspects of station design. Platform crowding is the most common reason for the implementation of station control, and it can have a major impact on the regularity of the train service by determining the length of dwell times. Platform sizing should also take into account the impact of train service disruption.* The shortest time period data available should be used in all formulas below. The factors from the table in Section 3.2 should then be applied, if necessary, to obtain the correct flow for the relevant formula. All station planning should allow for long- term future demand changes, according to the scenarios in the LU Corporate Planning Guidelines. This section covers the following areas: • Platform sizing • Headroom • Platform exits Platform sizing Platforms are sized to offer a minimum of 0.93m2 per passenger at the busiest part of the platform, which equates to the Fruin level of service B/C boundary, as defined in Section 2.1. The platform sizing methodology recognises that passengers are not evenly distributed along platforms, and at the busiest part of the platform it is assumed that 35% of the platform load occupies 25% of the platform. The formula requires the average platform load per headway (ie the average number of passengers waiting for a train at the height of the peak plus the number of passengers alighting from the train). 0.5m is added for each of the front and rear 'edge effects'. The front 'edge effect' is because passengers do not like to walk or stand too near the edge of the platform; the rear 'edge effect' takes into account the presence of platform furniture, such as seating. Standard – Platform width General principles The width of a platform shall be the same along its entire length except in the following circumstances: a) When space is restricted elsewhere within the station and there is a justifiable need to encroach into the platform area to accommodate equipment rooms and staff accommodation only b) For essential structural reasons c) To accommodate track geometry Any variation in platform width shall be subject to the following conditions: a) Width reductions shall be at the less busy parts of the platform as defined below for variable platform width b) All parts of the platform shall be visible from all of the entrance and exit points onto the platform The following minimum widths shall apply: a) Side platforms: 3m (where measurement is taken from platform nosing to wall finish at platform level) b) Island platforms: 6m (where measurement is taken from platform nosing to wall finish at platform level) Standard – Uniform platform width It is assumed that passengers are distributed along a platform such that 35% of a platform load occupies 25% of the platform at the busiest section. The platform is sized to give these passengers 0.93m2 per passenger with 2 x 0.5m (1m) added for edge effects. The formula for the width of a platform along its entire length is as follows:		 The following service levels are applicable to stairs and ramps: 1. Service level C is recommended for heavily used transportation terminals and links that have approximately equal flows in each direction 2. Service Level D represents some probability of intermittently reaching critical density on the walkway link, and is recommended for minor counter flows: and 3. Service Level E is recommended for short periods in the most crowded areas and where there are no counter flows.	train. This corresponds to the upper limit of LOS C service. ▯ Areas of localized queuing should not operate at LOS D or higher for more than 5 minutes during the peak 15 minute period ▯ Queuing should not prevent people from passing through to access the far ends of the platform (or from leaving the platform if alighting a train) ▯ Platform clearance time should not exceed the minimum gap between trains (dictated by signaling constraints, as opposed to be timetabling) for that particular platform.

London Underground Station Planning Standards and Guidelines, Transport for London, 2012 Edition	Pedestrian Comfort Guidance for London – Guidance Documents, Transport for London, 2010	Victorian Rail Industry Operators Group Standards VRIOGS 002.1, Railway Station Design Standard and Guidelines. Revision A, 29/03/2011	Network Rail Station Capacity Assessment Guidance, May 2011
platform width = $\left\{\frac{\text{platform load per headway} \times P \times 0.93}{\text{platform length} \times 0.25} + 1\right\}$ m Where: P = the proportion of the platform load – in this case 0.35 and where the platform load per headway is determined from the following steps: 1) Peak three-hour platform load = peak three-hour entry flow to platform + peak three-hour exit flow from platform 2) Peak hour platform load = peak three-hour platform load x relevant factor from the table in section 3.2 above, unless observed peak hour data is available 3) Peak 15-minute platform load = peak hour platform load x relevant factor from the table in section 3.2 above, unless observed peak 15-minute data is available 4) Peak minute platform load = peak 15-minute platform load / 15 5) Train service headway = 60 / number of trains per hour 6) Platform load per headway = peak minute platform load (step four) x train service headway (step five) Standard – Island platforms Island platform widths shall be calculated by treating them as two separate platforms and adding the two widths together. Standard – Entry or exits from platforms Platform entry or exit widths shall be determined as follows: two-way platform entry or exit width = $\left\{\frac{\text{Peak 1 minute platform load}}{40} + (2 \times 0.3)\right\}$ m one-way platform exit width = $\left\{\frac{\text{Peak 1 minute alighting load}}{50} + (2 \times 0.3)\right\}$ m one-way platform entry width = $\left\{\frac{\text{Peak 1 minute boarding load}}{50} + (2 \times 0.3)\right\}$ m The peak one minute platform load shall be as given in step four of platform width calculation. The peak minute boarding load shall be derived in the same way as the peak minute platform load, except that only the flow to the platform shall be used (as above). Similarly, for the peak 1minute train alighting load, only the flow from the platform shall be used. If the total capacity required is to be provided by more than one platform entry or exit then the 'edge effect' of 0.3m per sidewall shall be included for each platform entry or exit (eg one exit of 4.6m is equivalent to two exits of 2.6m each). The greater of the capacities required for normal operations or for emergency evacuation (see section on Planning for Hazards) shall be provided.			
3.12 Planning criteria and levels of service  Guideline – Level of service			

London Underground Station Planning Standards and Guidelines, Transport for London, 2012 Edition	Pedestrian Comfort Guidance for London – Guidance Documents, Transport for London, 2010	Victorian Rail Industry Operators Group Standards VRIOGS 002.1, Railway Station Design Standard and Guidelines. Revision A, 29/03/2011	*Network Rail Station Capacity Assessment* Guidance, May 2011
The diagram below highlights the LoS concept for the normal operations category of station operations in more detail: 			

Platform Size Calculations – Service Method and Demand Method

Traffix Group / UNSW

Appendix E

UNSW

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Platform Size Calculations - Service Method or Demand Method - 2014-02-13

Different methods have been adopted by TfNSW and UNSW to determine the required size of the light rail platforms at Anzac Parade and High Street as descrbied below.

Service Method (TfNSW)	Demand Method (UNSW)
For alighting, this method restricts the number of passengers alighting on to a platform to the maximum capacity of each Light Rail Vehicle (approx. 300 pax). For boarding, this method restricts the number of passengers that can fit on to a platform to board the next light rail vehicle. Passengers that cannot fit on to the platform are required to wait off the platform.	For alighting, this method allows passenger demand to exceed the capacity of the LRV. For boarding, this method allows all passengers wanting to be on the platform to be accomodated.

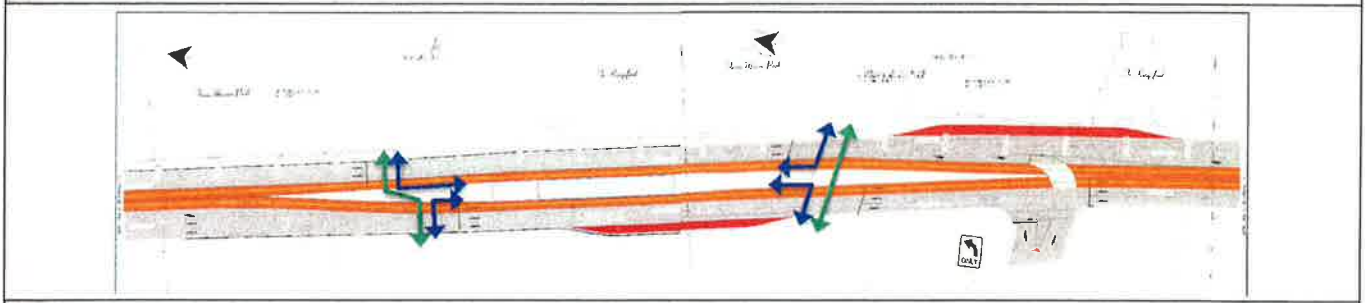
Below is an assessment of the different methods with the following assumptions:

- LRV maximum capacity – 300 passengers.
- Average headway (in each direction) – 6 minutes.

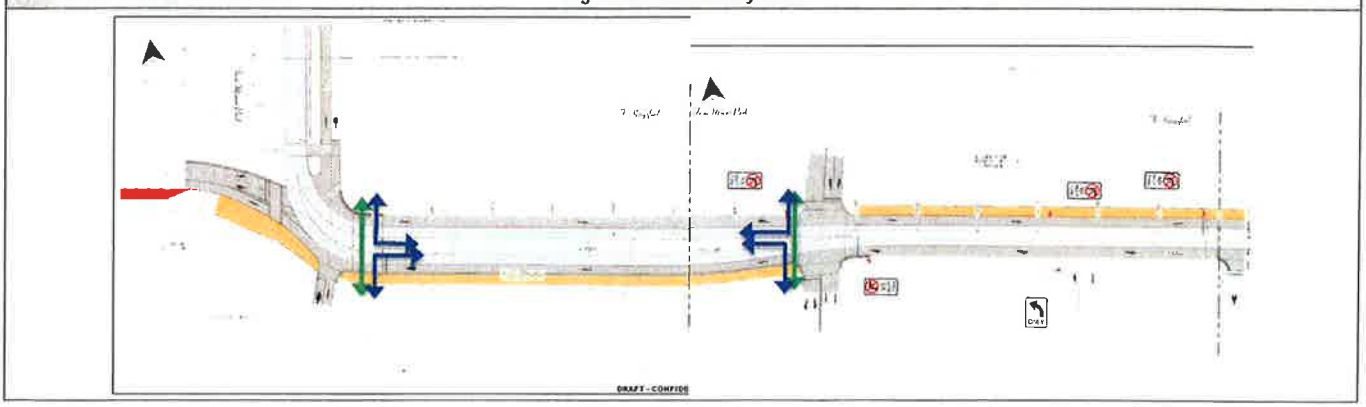
Type	Service Method (TfNSW)		Demand Method (UNSW)	
	Advantages	Disadvantages	Advantages	Disadvantages
Alighting	▪ Assumption that maximum number of alighting passengers restricted to maximum capacity of LRV (300 pax).	▪ Does not provide an indication of the unconstrained passenger demands for the service. ▪ Limiting the number of passengers will 'spread' the peak period i.e. passengers will have to wait until next LRV.	▪ Provides an indication of the unconstrained passenger demands for the service. ▪ If OpCo changes operating pattern to more frequent services, may result in second LRV arriving whilst passengers from previous LRV are still departing the platform. ▪ If OpCo changes the LRV type, may result in larger capacities and therefore more alighting passengers.	▪ Demand flow may exceed LRV capacity and result in a very conservative stop design.
Boarding	▪ Stop design only required to 'fit' one LRV load on platform at a time. ▪ Reduces dwell time of LRV as only one LRV load on platform at a time ▪ Passengers wait off the road and do not spill out from a crowded platform back on to road. ▪ Restricts the number of people on platform if service disruption occurs.	▪ Restricts the number of passengers that can fit on to a platform to board the next light rail vehicle. ▪ Passengers that cannot fit on to the platform are required to wait off the platform. In some situations, this can be accomodated on ramps and approaches. However, for very high boarding volumes, passengers may need to wait on the side of the road, with multiple waiting areas due to different origins. ▪ Requires 'options' to manage passenger access to the stop e.g. marshalling. Staff resources will increase operating cost of system. ▪ Very difficult to manage passenger access for stops with multiple access points and/or adjacent crossing points.	▪ Stop design to cater for peak demands that reduces risk of overflow on to road. ▪ Reduces need for 'options' to manage passenger access to the stop e.g. marshalling. ▪ Provides an indication of real passenger demands for the service.	▪ Uncontrolled number of people on platform if service disruption occurs.

The figures below show the access points and crossing points to and from the proposed platform stops. Options to control pedestrian movements would be required at each of these points.

Anzac Parade near High Street



High Street near Wansey Road



Summary:

For alighting, it is considered that the Service Method, adopted by TfNSW, is an appropriate method to determine the required size of the platform stops, taking into account the concurrent boarding and alighting demands at each stop.

However, for boarding, it is considered that the Demand Method, adopted by UNSW, will estimate the unconstrained passenger demands for the service, the stop design should cater for peak demands that reduces risk of overflow on to the road and reduces need for 'options' to manage passenger access to the stop e.g. marshalling.

Victorian Rail Industry Operators Group Standards (VRIOGS) – VRIOGS 002.1 – Railway Station Design Standard & Guideline – Rev A

VRIOG

Appendix H

Victorian Rail Industry Operators Group Standards

VRIOGS 002.1

Railway Station Design Standard and Guidelines

Revision:	Revision A
Issue Date:	29/03/2011

VRIOGS 002.1 Railway Station Design Standard and Guidelines
Revision A
Issue Date: 29/03/2011

APPROVAL STATUS

APPROVER	STATUS	DATE	QUALIFICATIONS
Document Developer			
VRIOG Steering Committee	Approved	29/03/2011	
Accredited Rail Operator			
Metropolitan Train			
Intrastate Train			
Interstate Train			
Tram			
VicTrack			

PURPOSE OF THIS STANDARD

This standard has been created through the collaboration of members of the Victorian Rail Industry Operators' Group (VRIOG) for the purpose of establishing a standard which, if implemented throughout the Victorian Rail Network, will facilitate the interoperability of infrastructure.

The use of this standard is not prescribed by law but, if adopted, conformity with the provisions of the Standard is mandatory in order that the purpose of the Standard be achieved

DISCLAIMER

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Each person is responsible for making his or her own assessment of all such information and for verifying such information. The content of this publication is not a substitute for professional advice.

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TABLE OF CONTENTS

SECTION 1.0 CONVENTIONS

1. Words or phrases that appear capitalised out of context are defined within the definitions section of this VRIOG Standard.
2. The word "Shall" is to be understood as mandatory.
3. The word "Should" is to be understood as non-mandatory i.e. advisory or recommended.
4. Uncontrolled Standards may not be referenced within the VRIOG Standards. These include former PTC Standards, Franchisee Standards, Franchisee Subcontractor Standards and Infrastructure Lessee Standards.
5. Controlled Standards, including Australian Standards and other VRIOG Standards, may be referenced but only if :
    - The referenced item can not be adequately explained with an amount of text that could not reasonably be inserted into the body of this standard.
    - The reader is not referenced to another Controlled Standard necessary for the item to be adequately explained i.e. one document link only.
    - The referenced document is a Figure or table and could not reasonably be included in the appendices of this standard.
6. The numbering system for the VRIOG standards is chronologically sequential from the point of introduction, and is not based on any form of interpretive system.
7. VRIOG standards will not contain any information that can be construed as a work instruction, procedure, process or protocol. This information forms the basis of each individual entity's Safety Accreditation Certification, and, as such, is outside the scope of VRIOG standards.

SECTION 2.0 DEFINITIONS

Terminology used and/or applied in this standard is defined as follows:

Accessible	Having features to enable use by people with a disability
Access Path	An access path is a path that permits independent travel for all passengers within public transport premises, infrastructure or conveyances.
Aerodynamic Effect	The effect of a train's aerodynamic forces as a train arrives at, passes by or leaves a station platform. These effects can affect people waiting on a platform, platform equipment and associated platform structures.
Accredited Rail Operator (ARO)	An Accredited Rail Operator is a Rail Infrastructure Manager or a Rolling Stock Operator who is accredited under Part 5 of the Rail Safety Act 2006.
Authorised Officers (Ticket Inspectors) (AO)	Authorised Officers are staff employed by public transport operators (train, tram and buses) to ensure that people comply with ticketing and behavioral requirements while traveling on or using public transport services and facilities.
Automatic Ticketing (AT)	A central computer and data communications network, monitoring and controlling a range of 'intelligent' micro-processor based peripheral devices located throughout the rail system. These include staff operated Ticket Office Machines (TOM), passenger operated Ticket Vending Machines (TVM) or Authority to Travel Machines.
Canopy	Overhanging structure on a platform for the protection of passengers from the elements, for example wind and rain.
Centre Line - Track	A vertical line equidistant to the running edge on the two adjacent rail heads on a section of track.
CER	Communications equipment room
CHP	Customer help point
Circulation Space	A clear unobstructed area, to enable persons using mobility aids to manoeuvre
Contra Flow	A flow in the opposite direction to the normal flow, as in traffic.
Class 9b building	A class 9b building is defined by the Building Codes of Australia as an assembly building of public nature. An assembly building is defined as a building where people may assemble for transit purposes including a bus station, railway station, airport or ferry terminal.

Coping - Platform	The uppermost and outermost section along a platform edge.
CVM	Card Vending Machine – component of the smart card ticketing system
Disability Standards for Accessible Public Transport (DSAPT)	The Disability Standards for Accessible Public Transport 2002 is an act which legislates accessibility requirements for public transport infrastructure.
DOT	Department of Transport
DOPT	The Director of Public Transport or his legally appointed replacement.
Down platform	The 'Down' platform is the platform side that passengers will board the train to travel away from the centre of Melbourne.
Existing Infrastructure	Infrastructure currently present on the Victorian Rail Network.
Footbridge	A bridge connecting two or more locations intended for the use of pedestrians and cyclists.
FPD	Fare Payment Device – component of the smart card ticketing system
Fruin Level of Service	The Fruin Levels of Service is a concept used in the design of places of public assembly. It utilises a typical body ellipse to represent the space occupied by a person without touching an adjacent person
GAC	Gate Attendant Controller
Group Announcement Public Address system	A public address system which can be operated remotely usually under the control of a main station within a group.
Hearing Augmentation	The communication of information for people who are deaf or hearing impaired by using a combination of audio, visual, and tactile means.
HHD	Hand held device – component of the smart card ticketing system
Horizontal Clearance	The horizontal distance, measured square to the track, separating any infrastructure and the centre line of the two outermost sections of track
Host Station	A station classification which is made according to the extent of services, staff facilities and customer amenities provided.

Infrastructure	Any structure or asset, be it new or existing, that exists in the railway environment
Island Platform	Island platforms, also known as centre platforms, lie between at least two tracks, serving both of them
Landing	A resting place on a path of travel
Level Crossing	A crossing provided for road vehicles, pedestrians and/or stock traffic to cross rail tracks at grade.
Manoeuvring area	A manoeuvring area is a space which a wheelchair or similar mobility aid is able to turn
Paid Area	The paid area is a recognized point (usually in the form of a sign and/or ticket barriers and/or ticket validators) at which once past a member of the public shall hold a valid ticket.
Platform	A platform is a raised surface running parallel to a rail track that enables passengers to board and alight from trains safely and efficiently.
Platform Cross Fall	On the surface of the platform, the gradient across the width of the platform.
Platform End Barrier	A barrier situated at the end of a platform that prevents unauthorized access to the track and stops people falling off the end of platforms.
Platform Height	The platform height is defined as the vertical distance separating the rail level and the top of the platform edge.
Platform Length	The actual platform edge distance running parallel to the track from one the end of a platform to its corresponding opposite platform end.
Platform Width	The platform width is defined as the horizontal distance, square to the track, separating the platform edge and the corresponding opposite platform edge.
Platform Setback Width	The platform setback width is defined as the horizontal distance, square to the track, separating the Platform Edge and the nearest face of any permanent structure situated on the platform.
PIDS	Passenger Information Display System
Premium Station	A station classification which is made according to the extent of services, staff facilities and customer amenities provided.
PRIDE	The PRIDE (Passenger Real-time Information Disssemination Equipment) system is an electronic timetable and

	announcement system used on the Metropolitian Rail network.
Rail Level	A reference point for measuring vertical heights or clearances relative to the top of the lowest rail.
Safety Accreditation Certification	The certification required by an entity or party to a infrastructure management agreement with the Director that ensures that, amongst other things, it has a robust Safety Management System
Single Faced Platform	Single faced platforms are characterized by one side of the platform being adjacent to a section of track while the other usually comprising of a wall or fence.
SEM	Stand alone enquiry machine – component of the smart card ticketing system
Slip Resistant	A property of a surface having a frictional force-opposing movement of an object across a surface.
Smart Card Ticketing System	A communications network, monitoring and controlling a range of smart card ticketing devices located throughout the Victorian rail system. Devices include: TOT Ticket Office Terminal CVM Card Vending Machine FPD Fare Payment Device SEM Stand Alone Enquire Machines
SPOT Infrastructure	The SPOT (Single Person Operated Trains) Agreement identifies platform mirrors and CCTV systems, to assist driver visibility of passenger movements, as SPOT Infrastructure.
Station Category	Victorian railway stations are classified according to the extent of services and public facilities provided. See Section 5 for a more descriptive definition of these categories.
Tactile Ground Surface Indicators (TGSI's)	Areas of raised ground surface texture treatment, designed to provide the blind or vision impaired with warning and/or directional orientation information.
TOT	Ticket Office Terminal – component of the smart card ticketing system
Track Cant	The difference in vertical height of adjacent rail heads
Track Curvature	The longest section of track of the same arc expressed in terms of radius of that arc (metres).
Transport operator	Any commercial entity having a lease/franchise agreement with the Director of Public Transport.

Unpaid Area	The unpaid area is any area prior to a recognized point (usually in the form of a sign and/or ticket barriers and/or ticket validators) at which once a member of the public is past, they shall hold a valid ticket.
Up platform	The 'Up' platform is the platform side that passengers will board the train to travel towards Flinders St Station.
Vertical Circulation Elements	Any form of infrastructure that allows vertical movement between landings. These may include lifts, stairs, escalators, ramps etc.
VRIOG	Victorian Rail Industry Operators' Group (VRIOG) comprises the following members: • Australian Rail Track Corporation (ARTC) • Metro Trains Melbourne • VicTrack • V/Line Passenger • Yarra Trams • Public Transport Division of the Department of Transport
Walkway	Any surface on a continuous path of travel with a gradient not steeper then 1 in 20.[1]
Warning Strip	The warning strip includes platform edge detail such as white coping, yellow safety line and coloured tactile ground surface indicator strip.
Winterm	Windows Terminal – component of the smart card ticketing system

[1] AS 1428.1 – 2009 Definitions

SECTION 3.0 SCOPE AND GENERAL

3.1 SCOPE

This Standard specifies the accepted criteria that shall be employed when designing new or executing upgrades or refurbishments to all passenger railway stations and the associated intermodal connections both on the Regional and the Metropolitan railway networks in the State of Victoria. This Standard consists of four parts:

i. Part A – Design Guidelines and Engineering Requirements

Part A describes the design guidelines and the functional and engineering requirements that need to be determined when designing elements within a railway station.

ii. Part B –DDA Design and Engineering Specifications

Part B focuses on the DDA design and engineering requirements for the provision and integration of each component of station infrastructure.

iii. Part C – Platform Engineering Specifications

Part C focuses on the platform engineering requirements.

iv. Part D – Style Requirements

Part D describes the style requirements for the operational and passenger areas within a station.

Each part of this standard is aimed to highlight the different types of requirements and considerations for the different elements of a station and its associated intermodal connections. This standard must be read in entirety in order to provide an overall view of the station design and the dependencies between elements.

3.2 PURPOSE

The purpose of this Standard is to ensure that all future station design is compatible with the network configuration and that the station environment is designed to be as accessible, safe and enjoyable so far as practicable for passengers and staff. It seeks to guide a designer by defining key functional aspects of railway stations, but does not endeavour to specify the detailed operations at a particular station nor does it seek to prescribe the architectural detail of the station.

The guiding principles behind this document are to:

a) Improve the station experience for passengers and staff by providing high quality amenities, public information display and installations;
b) Improve safety and security;
c) Improve quality and longevity of finishes used within the station environment;
d) Provide a railway station and surroundings that are accessible to everyone.
e) Improve maintainability and reliability of finishes, fittings, and systems at railway stations;
f) Improve sustainability standards across the rail network through the integration of sustainable principles and technologies with station design.

3.3 APPLICATIONS

This standard is to be applied to the construction of new or the undertaking of upgrades and refurbishments, of existing station facilities for the Victorian railway network. In regards to any upgrades or refurbishments of a station, any physical changes should be designed so as to incorporate the relevant section of the standard applicable to the nature of that physical change.

Given each station related project is reviewed on a case-by-case basis, the Director of Public Transport (DOPT) is required to provide sign off in instances where this standard has not been applied, or minimum requirements have not been met. In providing approval, the DOPT requires verification that the design process has demonstrated adherence to this Standard or if not demonstrated that all possible efforts have been made to do so.

For any given station project, some compromises may be necessary; however, the goals defined in this document must always remain the goals of the designers. It should also be noted that this document is not intended to preclude alternative solutions, particularly if they exceed the minimum defined standards.

This Standard does not replace relevant Commonwealth or State legislative requirements, and all legislative requirements must be met. It is intended to be used in conjunction with relevant Australian Standards, Disability Standards for Accessible Public Transport, Building Code of Australia, and other Victorian Rail Industry Operators Group (VRIOG) Standards.

3.4 DIMENSION

The dimensions given throughout this standard shall not be reduced by projecting skirtings, kerbs, handrails or other fixtures. Dimensions that are not qualified by a range or as being either minimum or maximum shall have normal building tolerances applied. For further information refer to 'Guidelines to Standards and tolerances 2007, Victorian building commission document.

3.5 BACKGROUND

This document has been compiled to present a document that is a combination of previous VRIOG drafts including VRIOG 002.0 Railway Station Design Manual – Principles, VRIOG 002.1 Railway Station Design Manual – Design Requirements and 002.3 Criteria for Design of New and Substantially Altered Railway Platforms.

PART A DESIGN GUIDELINES AND ENGINEERING REQUIREMENTS

SECTION 4.0 DESIGN REQUIREMENTS AND CONSIDERATIONS

4.1 GOOD DESIGN PRINCIPLES

The following 'Good Design Principles' are extracted from the 'Good Design of Transport' publication of the Office of the Victoria Government Architect and should be promoted where possible in the design:

Functional	Fit for purpose, well planned and constructed with appropriate materials and technology.
Safe, Legible	Understandable, feels safe and secure, includes good visual link and strong passive surveillance. Signage is carefully considered as part of the project.
Seamless	A cohesive and linked network which is easy to understand and navigate; integrates different transport modes, providing direct connections and easy transitions.
Universally Inclusive	Main access routes are obvious and accessible to all members of the community, whether able bodied or mobility impaired, without barriers or discrimination.
Walkable	Supported pedestrian links across transport corridors, pathways and usable public space around major roads and railway reservations. This is to include access for people who use mobility aids (for example prams, wheelchairs, walking frames, and luggage).
Sustainable	Promote positive environmental, social, cultural and economic values; recurrent cost savings
Engaging	Reflect and respond to diverse community values and encourage positive interaction
Socially Responsive	Support and encourage communities, connecting nearby facilities, incorporating shops, art, recreation spaces
Site Responsive	Respond to specific local landscape, topography and orientation
Valuing Heritage	Respond to history, memory, understanding of and continuity with the past
Enduring	Relevant across life-spans of many generations; representative of its time and of a high quality
Enjoyable	Create a desire to experience the journey rather a just pass through
Durable	Easy to maintain and will age gracefully
Delightful	Authentic, sensitive and intelligent in design of form, space, proportion, craft and detail

4.2 STATUTORY REQUIREMENTS

Designers should ensure that they are familiar with the requirements of all relevant legislation and rely on their own independent advice. The following are the main legislative instruments, which shall be utilised in the design and construction of buildings and structures for the railway:

a) The Disability Discrimination Act (DDA), the Disability Standards for Accessible Public Transport (DSAPT) (as amended) and the Disability Standards for Accessible Public Transport Guidelines (as amended), and referenced clauses and versions of Australian Standard. The DDA Disability (Access to Premises – Buildings) Standards also apply, with Section H2 applying specifically to public transport buildings;

b) Victorian Rail Safety Act and Victorian Rail Safety Regulations;

c) Victorian Transport Act;

d) Building Code of Australia, with referenced Australian Standards;

e) Heritage Act;

f) Occupational Health & Safety Act;

g) Victorian Transport Integration Act.

The regulations under the Federal Disability Discrimination Act (DDA) are the basis for accessible station design. The Disability Discrimination Act (DDA) and the 'Disability Standards for Accessible Public Transport' (DSAPT) override state-based regulations such as the Building Act and its regulations.

4.3 SAFETY

Passenger safety is the overarching requirement for design aided by implementation of the Crime Prevention through Environmental Design (CPTED) principles. Well designed public spaces, accessible and efficient intermodal connections, passive wayfinding and station identity and well considered interlinking with the surrounding community and environment will assist in creating lively and well used stations and foster a sense of community. It is essential that any station design provides:

a) A safe environment for:
   i. Station & train operational and other staff.
   ii. Passengers and the general public.
   iii. Contractors working within the station.
   iv. Emergency workers.

b) Functional rail infrastructure and systems for the safe operation of the railway

c) Safety during design and construction
   i. For all of the above mentioned in ongoing day to day operation.
   ii. Design and investigative work.
   iii. Related rail infrastructure and station systems works.[2]

[2] RailCorp Design Principles

The statutory requirements for Emergency Services as outlined in the Building Code of Australia does not provide for a live rail environment and the rail operational and access issues which are unique to railway stations. Due to this, additional infrastructure is required for fire fighting, emergency access and portable extinguishers with the design input for these elements to be provided by the Accredited Rail Operator (ARO) as part of the normal design approval process.

4.4 SECURITY

The purpose of security design is to protect passengers, staff and rail infrastructure assets from crime. Basic security requirements and site-specific issues vary from station to station depending on the station category and the surrounding locale.

Security can be achieved by the provision of:

a) Natural surveillance. Including the location of key station facilities such that active surveillance of the passenger's facilities and vertical elements are maximised. Provision where possible should also be made to allow for uninterrupted views from the station building to the platforms;

b) Access control. Including providing fencing and gate control;

c) Target Hardening. Strengthening the security of the station in order to reduce or minimise the risk of attack or theft. It is directed at denying or limiting access to a crime target through the use of physical barriers such as fences, gates, locks, electronic alarms and security patrols;

d) Systems. Including remote surveillance via closed circuit television (CCTV) and provision of designated passenger Safety Zones with associated Passenger Information Devices linked to the security system.

4.5 ACCESSIBILITY

Accessible public transport refers to the provision of access to public transport for all members of the community, including people with special needs.

Requirements include:

a) Enabling commuters to easily change to other modes of transport that are situated in close proximity to the station, for example bicycle parking/storage, car parks and bus/coach/tram stops.

b) Designing and locating the station entry and station infrastructure, as identified by its category and the ARO's requirements, to allow for physical access for all passengers (current and future).

c) Ensuring that the rail passenger's needs are taken into account, for example passenger facilities identified by the station category and the rail operator's requirements are provided.

d) The station should be designed so that its layout is able to be comprehended by unfamiliar users and orientation only supplemented by signage and maps.

e) New station designs and/or substantial alterations comply with the DDA and the DSAPT.

The design of DDA Infrastructure Access needs to take into account the failure of any mechanical systems that may be proposed. It is preferential that vulnerable mechanical infrastructure for DDA access be avoided where possible. Reliability of mechanical DDA Access is a major design consideration when proposing mechanical/electrical means Specific details of the design requirements mentioned above are further addressed in the later sections of this document.

4.6 MAINTENANCE AND LIFE CYCLE

Station design shall take into account the cost and ease of maintaining a station and its features. It is common to extend the functional life of stations (100 year economic life as principle) as long as possible because they exist in the fixed context of expensive infrastructure and boundary configurations which are often physically difficult and very costly to change to accommodate any new station building.

The level of required maintenance (both cleaning and servicing) and the life of building component assemblies, parts, systems, materials, finishes or fixings (due to decay, wear and tear) can therefore amount to many times the capital cost of the building over its functional life. It is essential to consider ongoing maintenance costs and their requirements, as well as related infrastructure change costs when undertaking station design, in order to optimise assets costs for the full station lifecycle.[3]

a) Design Considerations

Designs shall seek to minimise recurrent cleaning, maintenance and replacement cost by specifying materials, finishes, components, assemblies, systems and the like with:

i. Physical ease of maintenance;

ii. Long life expectancy;

iii. Durability of elements; the need to consider potential for damage;

iv. Low operating and energy consumption costs;

v. Resistance to the anticipated wear and tear, appropriate to the environment;

vi. Long periods between required servicing, cleaning and/or maintenance.

b) Maintenance Considerations

Maintenance design considerations shall include:

i. Finishes, fittings and furnishings in the public access areas to be as vandal resistant as possible;

ii. Plant and equipment that require regular maintenance are easily accessible. This includes access without requiring specialist's equipment, track occupations, power outage or major disruption of pubic access to the station and platform;

iii. Finishes, fittings and furnishings in the public access areas are not to require specialist cleaning or specialist equipment to repair;

iv. Designed to minimise ledges that will collect dust or enable birds (or other vermin) to nest.

[3] Railcorp Design Principles

4.7 HERITAGE CONSIDERATIONS

Heritage Victoria is the Victorian Governments principal cultural (non-indigenous) heritage agency and is part of the Department of Planning and Community development. Heritage Victoria administers the Heritage Act 1995 and maintains the Victorian Heritage Register.

Subject to the criteria set out for the classification of a heritage railway station building under the Heritage Act, any work, improvement, alteration, sale or demolition of a classified station must have the approval of the Heritage manager and the Heritage Management Committee before the work commences.

The appropriate Heritage Victoria procedures for maintenance and permissible alterations to Heritage Classified railways stations and their environment must be carried out in accordance with the guidelines set out by Heritage Victoria.

It is important to establish an understanding of how a Heritage place can be used by people with disabilities. There should be a consultative process carried out with all relevant disability groups, Heritage Victoria, Transport Operators and the Accessibility unit of DOT.

There are also locally significant heritage railway stations which are governed by local Council's planning requirements. Check with the council planning department to confirm any restrictions and obtain a planning permit during the design stage shall be undertaken.

4.8 ENVIRONMENTAL SUSTAINABILITY

The station building shall include environmental design elements that include but are not limited to:

i. Use of energy efficient fittings i.e. energy efficient lighting;
ii. Orientation to gain benefits from natural light and heating;
iii. Collection of rainwater and/or grey water that will be treated on site stored in tanks and may be used for toilet flushing, station cleaning and landscape purposes

a) Environment Design

Better building environments offer healthier, more liveable spaces that save resources and impact less on the surrounding environments. New station designs shall promote the principles of environmental design that address:

i. Energy efficiency through passive design principles;
ii. Reduced operational energy demand by utilising natural lighting and ventilation;
iii. Application of renewable energy sources;
iv. Environmentally friendly products which conserve natural resources;
v. Reduce toxicity and minimise carbon footprint over its life cycle;
vi. Recycling and waste management;
vii. Water conservation and harvesting, including the collection of stormwater for station re-use;
viii. Ecological construction and maintenance methods;
ix. Maintaining biodiversity within the existing environment.

b) Sustainability

Sustainable procurement assessment tools shall be used as a basis for product and material selection, such as green product certification bodies or programs such as:

i. Good Environmental Choice Australia;

ii. Energy Star;

iii. Greenhouse Friendly;

iv. Water and Energy Labelling Scheme star ratings;

v. GreenPower.

4.9 ACOUSTICS

The acoustic design of a station shall provide the travelling public and station staff with an acoustic environment commensurate with a safe and comfortable travel experience. This will include the provision of audible, intelligible announcements and easily used self-service information.

The areas where acoustic treatment shall be considered are station platforms, station entrance areas, station escalator/s, station lifts, air-conditioning supply and exhaust systems and plant rooms. In acoustic design, reference shall be made to the following standard: AS2107 (Acoustics – recommended design sound levels and reverberation times for building interiors). This standard provides design sound level and reverberation times for quasi steady state noise levels with occupied parts of buildings (such as noise generated by service systems). For railway stations the nominated criteria are:

a) 45 to 50dB (A) for ticket sales areas[4];

b) 45 to 50dB (A) for waiting areas[4]

Survey of noise levels within station buildings is required to be carried out to verify compliance with the standards. The method of measurement shall be consistent with section 6 from AS2107.

[4] AS2107 Table 1 pg 10.

SECTION 5.0 STATION CATEGORIES

Metropolitan and Regional stations are classified according to the extent of services, staff facilities and customer amenities they provide. The station categories to adequately describe the extent of the services, staff facilities and customer amenities are outlined in Table 1 Station Categories Metropolitan and in Table 2 Station Categories Regional.

TYPE	DEFINITION
	METROPOLITAN STATIONS CATEGORY
Premium	▪ Station staffed at all train operating times. ▪ Modal hub location with significant modal interchange facilities. ▪ Number of staff facilities increased to cater for greater staff numbers (See Section 10.4 for station category specific facilities). ▪ Passenger amenities supplied (See Section 11.2 for station category specific amenities) with the quantity of amenities dependent upon patronage. ▪ Increased services and security measures. ▪ Enhanced smart card ticketing sales and smart card reading facilities provided. (See Section 12.4 for station category specific ticketing requirements; ▪ Heating/Ventilated enclosed waiting area/s provided which are supervised by CCTV and staff. ▪ On account of the focus on modal interchange, they will have low to medium volume car parks.
Host	▪ Station staffed during morning peak periods. ▪ Modal hub location with modal interchange facilities. ▪ Basic staff facilities provided See Section 10.4 for station category specific facilities). ▪ Passenger amenities supplied (See Section 11.2 for station category specific amenities) with the quantity of amenities dependent upon patronage. ▪ Services and security measures supplied. ▪ Smart card ticketing sales: CVM and smart card reading facilities: FPD provided. ▪ On account of the focus on modal interchange, they will have medium volume car parks.
Un-staffed	▪ Station un-staffed. ▪ Selected services and security measures required. ▪ CCTV provided but monitored from nearby control station. ▪ No ticket office, Smart card ticketing sales: CVM and smart card reading facilities: FPD provided. ▪ Associated modal transfers provided with a focus on local connections. ▪ High volume car park facilities where small or no modal interchange provided.
Terminal	Where a station is a terminating station, driver's facilities shall either be incorporated in the existing operational facilities or provided as separate facilities in addition to the general requirements of the station category.

Table 1: Station Categories Metropolitan

The allocation of each station to one of the above categories is done by assessment of current and potential future patronage combined with the nature of the typical journey, as detailed in Appendix A and Section 8 Circulation.

	REGIONAL STATIONS CATEGORY
Premium	▪ Station staffed at all train operating times. ▪ Modal hub location with significant modal interchange facilities. ▪ Number of staff facilities increased to cater for greater staff numbers (See Section 10.4 for station category specific facilities). ▪ Passenger amenities supplied (See Section 11.2 for station category specific amenities) with the quantity of amenities dependent upon patronage. ▪ Increased services and security measures. ▪ Enhanced smart card ticketing sales and smart card reading facilities provided. (See Section 12.4 for station category specific ticketing requirements; ▪ Heating/Ventilated enclosed waiting area/s provided which is supervised by CCTV and staff. ▪ Medium to high volume car parking.
Modal Hub Station	▪ Station staffed to meet patronage peaks, which may be for the majority of the train operating times. ▪ Modal hub location with significant modal interchange facilities. ▪ Number of staff facilities provided dependant on staff numbers (See Section 10.4 for station category specific facilities). ▪ Passenger amenities supplied (See Section 11.2 for station category specific amenities) with the quantity of amenities dependent upon patronage. ▪ Increased services and security measures. ▪ Enhanced smart card ticketing sales and smart card reading facilities provided. (See Section 12.4 for station category specific ticketing requirements; ▪ On account of the focus on modal interchange, they will have medium volume car parks.
Commuter Station	▪ Station staffed during morning peak periods as a minimum. ▪ Associated modal transfers provided with a focus on local connections. ▪ Number of staff facilities provided dependant on staff numbers (See Section 10.4 for station category specific facilities). ▪ Passenger amenities supplied (See Section 11.2 for station category specific amenities) with the quantity of amenities dependent upon patronage. ▪ Increased services and security measures. ▪ Smart card ticketing sales: CVM and smart card reading facilities: FPD provided. ▪ High volume car park facilities.
Regional Station	▪ Unstaffed station. ▪ Associated modal transfers provided with a focus on local connections. ▪ No ticket office, Smart card ticketing sales: CVM and smart card reading facilities: FPD provided. ▪ Low volume car parks facilities, selected customer amenities, services and security measures required.
Crew/Other maintainers Facilities	▪ Premium, Modal hub and Commuter stations may have conductor and train crew facilities in addition to the station staff facilities already provided. Stabling, regional signalling facilities and rolling stock maintenance/provisioning facilities may also be located in the vicinity.

Table 2 : Station Categories Regional

The allocation of each station to one of the above categories is done by assessment of current and potential future patronage combined with the nature of the typical journey, as detailed in Appendix A and Section 8 Circulation.

SECTION 6.0 STATION/PLATFORM LOCATION AND CONFIGURATION

6.1 ENGINEERING DESIGN CONSIDERATIONS FOR LOCATING A STATION

The engineering design considerations when locating a station are outlined below:

a) Top of a hill or rise on undulating terrain

On undulating terrain the ideal position for locating a station is on the level section at the peak of a hill or rise due to a greatly increased braking ability of a train approaching stations situated at the top of a rise. Situations where this is possible are obviously limited and heavily dependent upon the existent terrain. However where this condition is prevalent the safety benefits should be taken into consideration and assessed against other risks for what can be achieved through earthworks associated to the particular location.

b) On Tangent of Track

A station and its associated platforms shall be located on straight sections of track and be constructed with straight platform edges where possible. This alleviates the need for Single Person Operated Trains (SPOT) Closed Circuit Television (CCTV) and platform mirrors as well as keeping stepping distances and heights to a minimum.

Deviation from this requirement (for example where there are topography or built environment constraints) would require acceptance by the ARO who will assess each situation on its merits and determine whether the deviation can be incorporated in its safe working system.

Where alterations are made to existing curved platforms, all endeavours should be made to achieve straight platform edges. Clearances for curved platforms are outlined in Appendix C.

c) Away from Level Crossings

As per VRIOG Standard 012.0 'Victorian Signalling Principles', there shall be a 20 metre minimum, horizontal separation between the end of a platform and the corresponding signal. There should (where practical) be an additional 200m metres horizontal separation between the corresponding signal and to any adjacent level crossing. Where this cannot be achieved then the signal shall not be less then 20 metres from a level crossing. This is shown diagrammatically in Figure 1: Separation between platform and level crossing Separation between platform and level crossing on the following page. These distances should allow for any potential extensions to meet the future platform requirements as described in Section 18.2.

For further track engineering design requirements at platforms refer to Section 18.1.

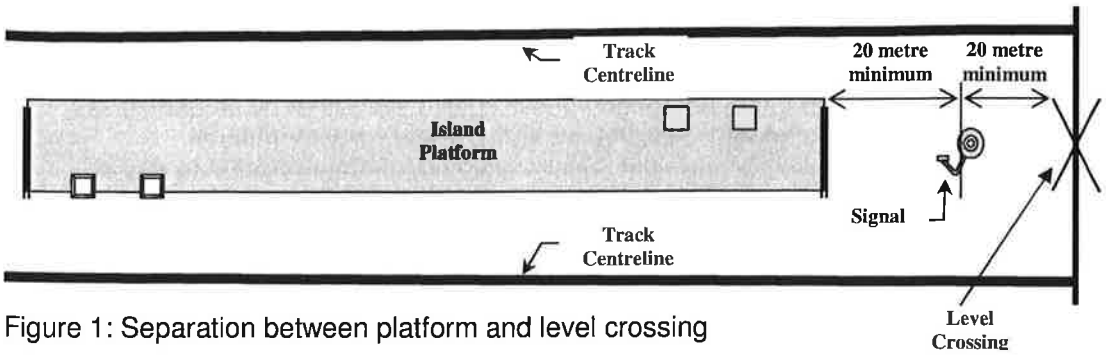

Figure 1: Separation between platform and level crossing

6.2 STATION LAYOUT DESIGN PRINCIPLES

Station facilities shall always be provided on the platform that services the main morning commuter patronage (usually Melbourne bound). Where significant commuter patronage exists in both directions (to and away from Melbourne) station facilities consistent with this standard may be required on more than one platform.

Where new platforms are to be constructed at existing locations, it may be necessary to construct additional station facilities on the new platform (even though they may already exist on the existing platform), where the new platform is to serve the main commuter patronage. Consideration can then be given to decommissioning and removing existing station facilities to achieve the above.

6.3 PLATFORM CONFIGURATION DESIGN PRINCIPLES

There are two recognised platform configurations, these being single faced platforms and island platforms.

Single faced platforms are characterised by one side of the platform being adjacent to a section of track while the other comprising of a wall or fence. Island platforms are characterised by both sides of the platform being adjacent to a section of track so that passengers can embark/disembark to and from a train from either side of a platform. At larger stations there may be a multiple combination of single faced and island platforms.

Where staff are to be present on all platforms, island platforms are the preferred option. This is due to the ability of staff on an island platform to monitor and manage more then one platform. There are a number of conditions that make the implementation of an Island platform prohibitively expensive, for instance if the track is already in place it will have to be slewed to accommodate the island platform. This may not be possible due to tighter land constraints on the network and also the existing overhead structures may be expensive to relocate. Finally a greater degree of access is required to the Island platform via foot bridges or underpasses compared to a Single Faced platform.

There are advantages with both Island and Single Faced platform configurations in terms of construction costs, commuter access and operational management, but as each locality is different, a site assessment should be performed to determine the preferred platform configuration.

6.4 CONSIDERATIONS FOR DESIGN OF TRACK CROSSINGS AND PLATFORM CONNECTIONS

Track crossings by commuters and the general public shall occur either by an underpass (subway) or an overpass (footbridge). Existing landform, terrain, environmental considerations, land use, elevation and relationship to adjacent features such as roads and associated approaches to a station may dictate whether a station is located either underground, above ground or at ground level and thus determine the type of track crossing to be used.

Whether an underpass or overpass is selected, they should be designed so as to exit directly to ground level. When combined with clear sightlines, bright colours, mild grades and good illumination, the passive security of the facility can be heightened, generating a sense of safety.

Factors to consider when determining the type of track crossing are:

a) The track clearance to which an overpass (footbridge) shall be constructed. The track clearance shall comply with the clearance requirements detailed in VRIOGS 001 Structure Gauge Envelopes – minimum clearances for infrastructure adjacent to the Railway.

b) The topography of the station environment. Including:

   i. The impacts on the surrounding streetscape, privacy and deterrent to the use of the station for commuters, an overpass or underpass should be carefully measured against the community acceptance;

   ii. Locations where rail lines are running on embankments an underpass is more suited in these situations;

   iii. Locations where rail lines and platforms are in cuttings an overpass is more suited in these situations.

c) The requirement to provide an access path that conforms with the DSAPT, which allows commuters access:

   i. To and from the platform/s.

   ii. To and from the modal interchange/s.

   iii. To and from the station entry/s.

   The design of DDA Infrastructure Access needs to take into account the failure of any mechanical systems that may be proposed. It is preferential that vulnerable mechanical infrastructure for DDA access be avoided where possible. Reliability of mechanical DDA Access is a major design consideration when proposing mechanical/electrical means

d) The requirement to provide a permanent track crossing in addition to providing access to the station for commuters.

A basic summary on which mode of track crossing is preferable based on the factors described above is presented in Table 3 Track Crossing modes – Preferred and Non-Preferred Design Considerations.

	Preferred Use	Non-Preferred Use
Overpass - Footbridge	Where space or engineering constraints exist preventing the construction of an underpass	Where there are no engineering or space constraints preventing the construction of an underpass at level grade and an overpass is required to be built in excess of 5.7m over the track
	Where DDA compliant ramp access to an underpass is not possible due to space and/or engineering constraints.	Where engineering, topographical, environmental considerations or land use constraints prevent the construction of an overpass.
	Station and track located in a cutting.	
Underpass - Subway	Where the track is elevated on an embankment	Risk of flooding which is not able to be mitigated by gravity or pumps.
	Where the track and station is located at level grade and an overpass is required to be built to a height of 5m or above the track	Where there is engineering, topographical, environmental considerations or land use constraints preventing construction of an underpass.
	Where the underpass design is able to incorporate a clear line of sight from entry to exit and where design can be aligned to most direct travel path	Where a clear line of sight from entry to exit which can be viewed from the adjacent street or footpath cannot be provided
	To reduce costs associated with providing crash protection for overhead structures used for station access within the station design	Where space constraints exist that a DDA compliant ramp access to the underpass is not possible

Table 3: Track crossing modes – Preferred and Non-Preferred Design Considerations

6.5 UNDERPASSES

The use of a pedestrian underpass becomes the preferred option of track crossing where the track is at a level grade or is elevated on an embankment. Underpasses design shall incorporate natural light, ventilation and appropriate durable textured finishes. They shall be straight runs without corners or curves and provided a clear line of sight from entry to exit which can be viewed from the adjacent street or footpath. This more user friendly design generates a sense of safety for the user.

A major consideration when determining the suitability of an underpass is the depth the underpass and the means by which pedestrians are to access the underpass. The means to achieve the required depth of the overpass can be by individual elements or a combination of elements comprising of stairs, ramps, lifts and escalators. At least one means shall be designed to allow accessible access/egress from the station and be designed to comply with the requirements of the DSAPT[5]. For further information on determining the type of vertical elements to be provided see Section 9 'Circulation'

Where underpasses are to be built they shall be provided with a minimum clear width of 3.5 metres between the platform connections and the existing street. The underpass dimensions shall include:

a) A minimum clear height of 2.5 metres with a preferred height of 3 metres;

b) A minimum clear width of 3.5 metres between handrails, but a larger area may be required for passenger flow and general comfort.

[5] DSAPT Part 2 Access Paths

Tamper proof lighting and emergency lighting are compulsory in new underpasses and their associated exits, stairs and ramps. Their design and installation shall meet the requirements of AS3000 Electrical Installations, AS2293 Emergency escape lighting and exit signs for buildings – systems, design, installation and operation and the BCA. Tamper proof lighting shall typically be mounted on the ceiling or walls of the underpass and ramps. Emergency lighting in underpasses and their access paths shall have a central monitoring and testing facility.

Security measures shall be incorporated in any underpass design. This is to include both in the underpass and any access paths to and from the underpass. Security measures shall include CCTV coverage, clear sightlines and good illumination. CCTV coverage, installation and monitoring shall be in accordance with VRIOGS 13.2 CCTV Development for Fixed Installations

6.5.1 Water migration in Underpasses

The underpass shall be designed such that the ingress of moisture into the subway is kept to an absolute minimum and adequate measures to mitigate the risk of flooding shall be employed. Total area drainage shall be such that the water is removed from the underpass within X time for a 1 in 200 year flood event.

Where a pump or pumps is deemed to be necessary, a staged sump pumping system is to be designed and installed to prevent flooding. The design of the sump pumping system shall consider how maintenance access to the pumping system is to be achieved without disruptions to pedestrian traffic. Where the underpass is the only means of crossing the track an alarm should be included to indicate flooding and/or operational issues with the sump pumping system.

a) Engineering Requirements

Where there is a requirement for a pump to be installed to mitigate the risk of flooding in underpasses the following engineering requirements shall be applied:

i. Pumps shall be an automatic duty/standby arrangement Flygt pump and controls or approved equivalent.

ii. Pumps system health and operation shall be monitored by a telemetry system connected to the station alarm network.

6.6 OVERPASSES

The use of a pedestrian overpass becomes the preferred option of track crossing where the track is situated in a cutting or where space constraints exist. An overpass shall be designed to comply with the clearance requirements of VRIOG Standard 001 Structure Gauge Clearances. The means of accessing an overpass can be by individual elements or a combination of elements comprising of stairs, ramps, lifts and/or escalators. At least one means shall be designed to allow accessible access/egress from the station and be designed to comply with the requirements of the DSAPT.

Accessibility issues arise with overpasses when the vertical distance required to access an overpass becomes excessive (greater than 5.7 metres). At and above this height, stairs become demanding for able bodied people and the length of the ramp becomes excessive and thus making them difficult for those unable to ascend stairs to use (for example people with prams, young children, wheelchairs, health problems). When faced with this issue other viable options (lifts or underpasses) should be considered in terms of providing an accessible path for pedestrians to access the station platform/s. For further information on determining the type of vertical elements to be provided see SECTION 8.0 Circulation.

Overpasses shall be designed in accordance with AS5100.1 Bridge design – Scope and General Principles, AS5100.2 Bridge Design – Design Loads, AS5100.3 Foundations and soil supporting structures and VRIOGS 011.1 General Rail Bridge Design Requirements.

Security measures are to be included in any overpass design. These are to include both the overpass and any access paths to and from the overpass. These should include CCTV coverage either to the station or to a location which is able to monitored, clear sightlines and good illumination.

6.7 RAILWAY LEVEL CROSSING

It is the Department of Transport policy that no new railway level crossings shall be built as a means to traverse a railway track.[6] Any existing pedestrian rail level crossing that is included in the project and/or forms part of the station access path should be upgraded in accordance with the VRIOGS 003.2 Criteria for Infrastructure at Railway Level Crossings – Pedestrian Crossings.

[6] Planning policy in the Victorian Planning Provisions

SECTION 7.0 STATION ENTRY

7.1 OBJECTIVE

The station entry is a clearly identifiable location that provides legal entry to a station and enables safe access to platform(s). Different station entry configurations exist, some in the form of an automated sliding door into a station building or a canopy and gated access to the platform.

7.2 STATION ENTRY CONFIGURATION

The configuration of the station entry is determined by the:

a) Station environment and the surrounding urban development;

b) Platform and track configuration;

c) Operational and passenger facilities required at the station entry.

7.3 STATION CONTEXT AND URBAN DESIGN

Many aspects of the local context and surrounding urban design will influence the station entry configuration. A thorough study of the station catchment area is required to determine the most appropriate placement of the entry or entries in order to attract patronage by:

a) Encouraging the use of the station by simplifying connections with existing and future urban design;

b) Providing accessibility, convenience, clarity and quality of arrival to and from the station;

c) Providing safe and attractive public spaces that contribute positively to the local identity;

d) Providing for the safe, accessible, convenient and efficient interchange with other transport modes. This may include implementing a traffic management strategy to support this.

7.4 PLATFORM AND TRACK CONFIGURATION

The station entry design shall work within the constraints of the rail alignment and platform positions to develop:

a) Simple, direct and accessible circulation paths from the station entrance to the platforms, with the minimum vertical and horizontal travel;

b) The siting of the entry point(s) to facilitate entrance to and exit from the station;

c) A coherent interface between the station entrance and adjacent interchange facilities and local community facilities.

7.5 STATION ENTRY FACILITIES

The critical facilities required at the station entry are those associated with:

a) Access and circulation from intermodal facilities to the station entry or entries;

b) Smart card Ticketing sales (CVM) and card reading facilities (Gates or FPD);

c) Ticket purchasing and validation.

d) Security.

At a number of stations, staff and passenger facilities may also be provided at the concourse entry. There may also be a requirement for weather protection or enclosure of the station entrance. The station category assigned to a particular station as discussed in Section 6 will identify the minimum facilities and services required.

7.6 DETAILED REQUIREMENTS

Note: The requirements and facilities described here are explained in greater detail in other sections of this standard. The following sections outline how these facilities relate specifically to the station entrance:

A station entry shall provide:

a) Entry or entry points that are easily identifiable, obstruction free and provide safe access to station platforms and staff operational facilities and passenger facilities;

b) An efficient and accessible circulation path from the station entrance to the platforms, with the minimum vertical travel and walking distances;

c) Smart card ticketing sales (CVM) and card reading facilities (Gates or FPD);

d) Directional way finding, statutory signage, timetable and associated train operator information;

e) Security for staff and commuters;

f) Clear identification of the point at which passengers transition from the unpaid to paid area of the station;

g) Clear accessible connections to other modes of transport for exiting and interchanging passengers;

h) Staff and passengers facilities, as determined by the station category and the current and future staff and passenger numbers.

7.6.1 Access, Queuing and Circulation

The entry configuration should be designed to:

a) Provide a continuous, accessible and direct route between the station entry/s, operational and customer facilities and the platform/s;

b) Ensure connections to other modes of transport are accessible and direct as possible;

c) Incorporate connections between the station and surrounding local context, public roads, bike lanes and spaces to provide safe, accessible and direct modal interchange links;

d) Accommodate anticipated queues free of obstructions both in regular and peak conditions;

e) Provide sufficient space to allow queuing that doesn't conflict with passenger flows and which satisfies as a minimum a Fruin Level of Service C (see Appendix A).

For detailed requirements for 'Access, Queuing and Circulation' refer to Section 8.1.

7.6.2 Staff and Operational Facilities

The operational facility that may be located within the station entry in order to manage the station operations and systems is the station ticket office. The necessity of this facility is determined by the station category (see Table 4), and its location and sizing determined by the current and future staff numbers and patronage numbers. Any facility shall be located and sized with regards to the priority for unimpeded passenger circulation and operational efficiency.

Staff and Operational	Staff and Operational Facility Selection						
	Metropolitan			Regional			
	Premium	Host	Unstaffed	Premium	Modal Hub	Commuter	Regional
Ticket Office	Yes	No	No	Yes	Yes	Yes	No

Table 4: Station Entry - Staff and Operational Facility Selection.

Detailed requirements for staff operational areas facilities are addressed in Section 10.1

7.6.3 Passenger Facilities

The necessity of the passenger facilities provided at a station entry is determined by the station category (see Table 5). The facilities location and sizing is determined by the current and future patronage numbers. All facilities must be located and sized with regards to the priority for unimpeded passenger circulation.

Passenger Facilities	Passenger Facility Selection						
	Metropolitan			Regional			
	Premium	Host	Unstaffed	Premium	Modal Hub	Commuter	Regional
Customer Toilets	Yes	Yes	No	Yes	Yes	Yes	No
Enclosed Waiting Areas	Yes	No	No	Yes	Yes	Yes	No
Public Telephone	Yes	Yes	Yes	As specified by the ARO	As specified by the ARO	As specified by the ARO	As specified by the ARO
Rubbish bins	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Retail facilities	Yes	No	No	As specified by the ARO	As specified by the ARO	As specified by the ARO	No
Commercial Vending Machines	Yes	Yes	Yes	As specified by the ARO	As specified by the ARO	As specified by the ARO	As specified by the ARO
Ticket Window	Yes	Yes	No	Yes	Yes	Yes	No
Smart Card Vending Machine	Yes	Yes	Yes	As specified by the ARO	As specified by the ARO	As specified by the ARO	As specified by the ARO
Fare Payment Device	Yes	Yes	Yes	As specified by the ARO	As specified by the ARO	As specified by the ARO	As specified by the ARO
Stand alone Enquire machine	Yes	No	No	As specified by the ARO	As specified by the ARO	As specified by the ARO	As specified by the ARO

Table 5: Passenger Facility Selection.

Further detailed requirements for passenger facilities are addressed in Section 11.1.

7.6.4 Security

Security systems that shall be provided at the station entrance include:

a) CCTV coverage to maximise passenger safety and asset protection;

b) A lockable barrier (e.g. automated sliding doors, roller doors, gates, smart card gates) shall be provided at the entrance/s to a station building. The type of lockable barrier is site specific and consultation should be undertaken with the ARO and DOT to determine what lockable barrier is required. Whatever barrier is chosen it shall be able to be locked remotely from the station supervisor's office;

c) Where 24 hour public pedestrian overpasses are part of access to a station, roller doors shall be installed to prevent public access to the platform/s after hours. The doors shall be electrically operated with remote operation from the Station Ticket Office and/or from a remote regional location;

d) The use of mirrors to show what is around corners or in concealed areas.

For detailed requirements of 'Security Systems' refer to Section 12.2.

7.6.5 Enclosed entry and Weather Protection

The extent of the enclosed area and the weather protection required at the station entry shall be determined by the station category, the DOT and the ARO's requirements.

Where an enclosed station entry is to be provided, the following factors shall be considered within the design:

a) Maximise the penetration of daylight into public areas and station facilities. In achieving this, daylight should not fall directly or interfere with clear viewing of information display screens and not cause any discomfort (e.g. glare) to staff, patrons and train drivers.

b) Create a generous space with high ceilings and wide concourses where possible;

c) Create clear, open spaces without dead ends, blind corners or structural elements infringing on passive and active surveillance;

d) Avoid concealment and entrapment opportunities and minimise climbable elements;

e) Maximise the opportunities to use the weather protection structure to create a sense of public space.

7.6.6 Smart Card Ticketing Facilities

This section describes the design considerations for smart card facilities in the station entry. Ticketing Facilities may include Ticket Windows, Ticket Vending Machines, Ticket Validators and Electronic Barriers.

Smart Card ticketing facilities at any station shall be located:

a) Away from the circulation paths, vertical circulation elements and queuing areas;

b) On all access paths to the station platform;

c) Within views of the station entry points;

d) Under cover so sunlight does not fall directly on or interfere with clear viewing of the display screens;

e) Provide a clearly defined demarcation between PAID and UNPAID zones;

f) Installed indoor, out of rain and direct water sprays;

g) Where practicable in such a position that allows staff from within the ticket office to have an unobstructed view of the adjacent CVM, the concourse and preferably the station entry points.

When determining the location for smart card ticketing facilities consideration shall be given to the type of smart card reading facilities system to be installed. The type of card reading facility (Gate or FPD) may be identified in the project brief but there is also a need to consider the future ticketing requirements at the station.

There are 2 types of smart card ticket validation systems available, those being smart card gates, and FPD, The 'footprint' of each of these systems are quite different and are outlined later in this document in Section 12.4 'Smart Card Ticketing Systems'. If smart card gates are identified as being the preferred means of smart card reading facility, provision shall be made for future expansion of the number of smart card gates. Where smart card gates are not installed, the transition area between the unpaid and paid areas shall allow space for FPD to be installed in the future. For detailed requirements of smart card ticketing systems, refer to Section 12.4.

7.6.7 Passenger Information

Passenger information that shall be provided at a station entrance includes static information, audible information and physical information. Electronic Information may also be provided based on the requirements of the ARO. General information about transport systems shall be accessible to all passengers[7].

i. Static information provided at the station entry shall include:

   a) Stations signage provided in accordance with the Metlink Master Style Guide and the DSAPT;

   b) Metlink train running information prior or adjacent to smart card ticketing;

   c) Building Code of Australia statutory signage;

   d) Local area way-finding information, within the unpaid area;

   e) Station identification and maps.

ii. Audible information provided at the station entry shall include:

   a) Public Address (PA) system;

   b) Where provided, ticketing window/s and waiting area/s to include Audio Frequency Induction Loops System (AFILS).

iii. Physical information provided at the station entrance may include:

   a) Tactile Ground Surface Indicators where required by DSAPT.

For detailed requirements of passenger information systems, refer to Section 12.3 Passenger Information.

[7] DSAPT Part 27.1

SECTION 8.0 CIRCULATION

8.1 OBJECTIVE

The management of passenger circulation is critical to the efficient operation of a station. Circulation design shall be easy to follow and comprehended by visitors and shall require little additional way-finding aids. Paths of travel shall be simple and accessible between all areas within and outside the station.

If vertical circulation elements are required between the station entry/s, interchange points and platform/s these will become key factors in the design and management of passenger circulation.

8.2 DESIGN CONSIDERATIONS

Circulation can be divided into two categories, one being the day to day circulation throughout the station and the platform/s and the second being emergency egress/circulation from the station when some vertical circulation elements (lifts and escalators) may not be operable.

a) Day to day circulation shall be determined by a demand analysis allowing for:
   i. Boarding and alighting at AM and PM peak, for both directions;
   ii. Interchange boarding and alighting at AM and PM in both directions;
   iii. Emergency situations/disruptions.

b) Day to day circulation shall take into account space required for passengers who are:
   i. Queuing, which is ordered, at Ticket Offices, smart card gates, GAC, CVM, SEM, FPD and commercial vending machines;
   ii. Congregating at passenger info (train timetables, PIDS and train running)
   iii. Waiting at platforms and associated facilities.

8.3 EQUITABLE ACCESS

At new stations and at stations where major work is to take place, circulation elements and the vertical transportation elements shall be designed to facilitate accessibility with specific requirements for mobility impaired people in accordance with:

a) The Disability Standards for Accessible Public Transport (DSAPT);
b) Department of Transport Accessibility Policy;
c) Building Code of Australia;
d) AS1735 Lifts, Escalators and moving Walkways – General Requirements;
e) AS1428.1 Design for access and mobility Part 1: General requirements for access – New building work;
f) AS1428.2 Design for access and mobility Part 2; Enhanced and additional requirements – Buildings and Facilities;
g) DDA Act.

8.4 DETAILED REQUIREMENTS

All passenger and staff circulation elements should be designed with consideration to the expected patronage of the station and the frequency of service. Arriving and departing passengers will typically follow the entry and exit sequences as illustrated in Figure 2 Typical Passenger and Staff circulation

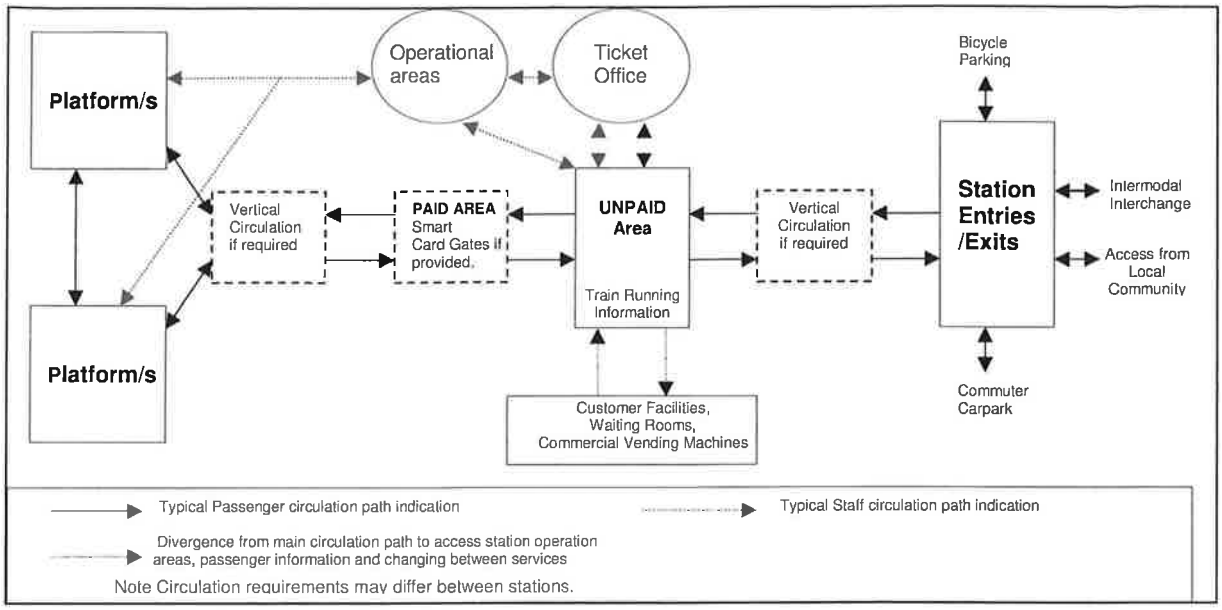

Figure 2: Typical Passenger and Staff Circulation

Passenger Circulation Concourses including platforms, thoroughfares, footbridges and underpasses as appropriate, shall be provided to connect the following station areas:

a) All sources of pedestrian traffic (on-street footpaths, modal interchange, kiss and ride, car and bicycle parking) to the station entrance;

b) Station entrance to Platform(s);

c) Platform to Platform and all sources to the platform.

These concourses should be designed to assist with the efficient flow of passengers within the station in accordance with the level of service of the proposed facility.

The general requirements for all circulation elements are to include:

i. Passenger circulation concourses including platforms should be designed to Level of Service C for Walkways (as defined by Fruin – see Appendix A). However, for short periods (up to 3 minutes within arrival of a train), up to Level of Service E is acceptable on platforms only;

ii. Develop easy and clear circulation for the first time user;

iii. The location of access paths, vertical circulation elements, waiting areas and platform canopies that allow access/egress to and from a platform and commuters protection from inclement weather will have an impact on the carriage loading patterns of trains especially during periods of inclement weather. For this reason the placement of these circulation elements and waiting areas at stations throughout the network and especially neighbouring stations should be taken into consideration during the design stage so as to synchronise carriage loading patterns;

iv. Co-ordinate decision points so that passengers are not confronted with multiple choices of entry, exit, of vertical circulation at any one position and thus impede flow whilst decision making;;
v. Minimise grade changes;
vi. Provide surge and queuing spaces ahead of any barrier and change in circulation, direction, or mode;
vii. Provide effective queuing areas adjacent to any areas where queues may form so they do not impede on the access path;
viii. Cross flows, dead ends, and turns greater than 90 degrees are undesirable for patron security and circulation;
ix. Avoid contra-flows. Where it is not possible to avoid contra-flows, the sizing of the circulation elements will need to be increased to take into account the reduced capacity realised under contra-flow conditions;
x. Meeting points, seating and rest areas shall be positioned so as not to disrupt pedestrian circulation;
xi. All passenger circulation concourses and vertical elements shall meet the requirements of the DSAPT;
xii. Use colour, texture, tactile guides and sight distances to increase guidance, patron safety and security at all circulation elements.

8.4.1 Access Paths

An access path is an uninterrupted path of travel into or within public transport premises, infrastructure or conveyances that permits independent travel for all passengers. It shall not include a step, stairway, turnstile, revolving door, escalator, moving walkway or any other impediment. Accessible Paths shall be designed to:

a) Provide a continuous accessible path of travel from transportation stops, parking (in particular accessible parking) and passenger loading zones, and public streets or walkways to the accessible building entrance they serve;[8]
b) Connect accessible buildings, facilities, and spaces that are on the same site;[8]
c) Connect accessible buildings entrances with all accessible spaces and facilities within a building;[8]
d) Connect accessible entrances of each accessible building with those exterior and interior spaces and facilities that serve it;[8]
e) So that the accessible elements of buildings and facilities are arranged so as to minimize distances to be travelled between them.[8]

The engineering and DSAPT design requirements for Access Path construction elements are outlined in Section17.1. Please refer to this section for more detail.

8.5 VERTICAL CIRCULATION ELEMENTS

Any station configuration that contains changes in level shall have vertical circulation elements to provide:

a) An accessible connection between the station entry, platforms, customer facilities and station facilities.
b) Safe and efficient circulation.
c) Equity of access.

[8] DSAPT Part 2 Access Paths

The relationship between the station entry and the platform(s) will establish the:

i. Vertical travel distances.

ii. Type, capacity and location of the vertical circulation elements to achieve safe emergency exit routes.

iii. Optimum location of vertical circulation elements to achieve an even distribution of passengers along the platform.

iv. Constraints regarding the placement of vertical circulation.

In many instances these factors alone may establish the most appropriate mode of vertical circulation. A summary of where a vertical circulation element is preferable and non preferred is presented in Table 6.

	Preferred Use	Non-Preferred Use
Stairs	Medium height changes preferably between 3-5 metres	Tiered or turning stair wells
	In combination with either a ramp or lift	Emergency egress results in overcrowding
	Clear line of sight	As a sole mode of access
	Medium passenger flow	In combination with escalators only
	When financial outlay may be constrained	High passenger flow with limited width
Ramps	Small to Medium height changes, preferable no greater then 3.6m[9]	Long ramp lengths due to large height differences.
	Where there is adequate ramp landing space	Where travel time/distances are to be kept to a minimum
	High pedestrian flows	Space requirements result in stacked or layered ramps
	For emergency egress	If multi-landings are required
	Clear line of sight and where design can be aligned to most direct travel path	As the sole means of DDA access where a significant proportion of patrons are mobility or health impaired
	May be sole mode of access	
	In combination with a quicker mode	
Lifts	Medium to large height changes – greater then 5 metres	Small height changes
	Space constraints exist	As a sole mode of access
	In combination with stairs or ramps	When financial outlay may be constrained
	As a cost effective modification to an existing structure or station	Where the station and lift design and/or operational procedures are not able to ensure lift downtime is limited and there is no alternative accessible access available.
	Significant proportion of patronage are mobility or health impaired	Where ramps can be installed and do not present a barrier to access due to their length.
Escalator	High patronage levels	When financial outlay may be constrained
	Medium to large height changes	Un-staffed stations due to monitoring required by station staff
	In combination with ramps or lifts	As a sole mode of access
	Space constraints exist	In combination only with stairs

Table 6: Patron Access Modes Preferred and Non-Preferred Usage for Underpasses and Overpasses

[9] BCA Access to Premises standard

8.5.1 General requirements for all vertical circulation elements are:

a) There must be at least one accessible path from each station entry to the platform;
b) Ramps and stairways should be designed to Level of Service C (as defined by Fruin – see Appendix A);
c) Potential vandalism to all vertical circulation elements should be minimised by providing heavy duty, robust elements, good lighting, and passive and active surveillance;
d) Vertical circulation elements should be designed so that they are not climbable and do not provide access to any adjacent canopies, structures or hazards;
e) In consultation with the Rail Operator and DOT, areas of glazing should be considered for use in balustrades, escalators, lift cars and shafts to increase user perception of security and opportunities for passive surveillance.

8.5.2 Ramps

A ramp is defined as an inclined surface on a continuous accessible path of travel between two landings with a gradient steeper than 1 in 20 but not steeper than 1 in 14. DDA compliant ramps can be used as a sole means of access/egress and incorporated into the Accessible Path to and from a station and platforms (See Section 17.2 for the DSAPT requirements for ramps and landings). DDA compliant ramp grades area a minimum of 1 in 14 with a clear width between handrails of 1800mm and landings of 1200mm every 9m.

Ramps have a relatively large capacity and have a pedestrian flow rate of 74 pedestrians per metre per minute, based on a service level of E, as outlined in Appendix A. This relatively large capacity enables efficient transport of peak passengers flows especially where there may be width considerations on platforms. They are also suited to instances where they may be required for emergency egress of large patronage volumes. As a mode of accessible access for vertical circulation, ramps are the preferred option over other forms of vertical access where there are small vertical travel distances (less then 3.6 metres). This is due to their ease of use, high pedestrian flows for both regular circulation and emergency egress, low on-going cost (unlike lifts which have considerable on-going cost such as maintenance and lift monitoring) and lack of accessibility issues compared to vulnerable mechanical infrastructure such as lifts which may be out of service. Preferred ramps are generally of short length with a clear line of sight from ramp access to ramp end.

The application of ramps in the case of large vertical travel distances can impose access issues such as long ramps heights, travel time and comfort particular with the mobility impaired patrons and therefore alternative means of access should be contemplated (See Appendix C Ramp length reckoner). As ramps lengths become excessive or deviate from a direct travel path as in the case of layered or stacked ramps, patrons become considerably more adverse to their use. Ramps also have a significant space requirement due to their relatively flat grades when compared to other modes of access. They may become impractical when land acquisition is required in instances of retrofitting and new constructions. As such, assessment of existing ramps subject to redesign or replacement must be done on a per-site basis.

Refer to Table 6 'Patron Access Mode Preferred and Non-Preferred Usage' for detail on where ramps should be utilised. The engineering and DSAPT requirements for ramp construction elements are outlined in Section 17.2

Figure 3: An example of a DDA compliant ramp for a 7.1m overpass

8.5.3 Stairs and Landings

Stairs are a quick and efficient option for able bodies; however they are not permitted as a sole means of access under the DSAPT[10]. DSAPT compliant ramps or lifts, or both shall be provided as an alternative. It is essential that stairs are designed so that they are safe for both regular circulation and emergency egress. In circumstances where there is insufficient space for ramps, the compact nature of allows them to be placed in more constricted spaces.

The pedestrian flow rate on stairs is considerably less than other modes. As outlined in Appendix A, the pedestrian flow rate on stairs based on a service level of E is 49 pedestrians per metre per minute. As such, when stairs are constricted in width they are not suited for large volumes and are often associated with blockages if used at peak or emergency times. Ramps are better suited to handling large peak volumes.

It has been established that stairs with a clear line of sight are much safer for commuters than those which are tiered or have turning points on their landings. A straight stairway significantly reduces accidents that occur as a result of the directional change which can cause cramming and conflicting travel paths. A clear line of sight on stairs also reduces the occurrence of blind spots which create a security risk.

Stairs should be designed to the following requirements:

a) The designer is to exercise their judgement in evaluating the traffic patterns and peaking characteristics to achieve a flow rate of 26 passengers per minute (Fruin level C). See Appendix A for more detail;

b) Stairs should be designed to provide protection from the weather;

c) Stair flights shall:

   i. If used as a means of entering/leaving a platform, shall run in the same direction as the platform length;

   ii. Not include winding, curved and spiral configurations;

   iii. Provide an equal or as close as possible to, number of treads for each stair flight.

d) Stair widths shall:

   i. Accommodate normal passenger movement in two directions;

[10] DSAPT Clause 14 Stairs

ii. Facilitate emergency egress;

iii. Have a minimum clear stair width of 2400mm between handrails for a two-way stairway. Where stair widths are wider then 2400mm a centre hand rail shall be provided.

e) Handrails shall be:

i. Continuous between stair flight landings and have no obstruction on or above them that will tend to break a hand-hold[11];

ii. Not more then 2 metres apart where an intermediate handrail is used[12].

f) A splayed entrance to a flight of stairs should be considered as it provides a welcoming point of access and seems a less onerous trip;

g) The underside of stair flight shall be designed to prevent passengers and staff from accessing areas where the head height is less then 2m;

h) Stairs shall be designed to shed water;

i) Where access to the platforms is only available using stairs/lifts, consultation shall be undertaken with DOT and the ARO on if a bike channel is to be provided within the stairs.

Refer to Table 6 'Patron access modes preferred and non-preferred usage for underpasses and overpasses' for detail on where stairs should be utilised. The engineering and DSAPT requirements for stair construction elements are outlined in Section 17.3.

8.5.4 Escalators

Escalators are a quick and efficient way to transport large patronage volumes in confined or constricted spaces and have the potential to transport 100 pedestrians per metre per minute. However, they are a relatively expensive mode of access and only should be considered as a substitute for stairs where stairs cannot satisfactorily accommodate the passenger capacity. Escalators shall not be the sole means of access to stations as they are non DDA compliant, in both their moving and stationary modes and as such shall be installed in combination with either lifts or ramps.

Escalators require a relatively small footprint as compared to other modes of access, though are required to extend approximately 3m into a building or concourse at each end. At the landings of the escalator and passenger conveyor, a sufficient unrestricted area (run-off) to allow customers to further circulate and disperse upon leaving shall be available to accommodate passengers. The width of the unrestricted area shall at least correspond to the distance between the handrail centrelines. The depth shall be at least 2.5 metres, measured from the end of the balustrade. It is possible to reduce it to 2 metres if the width of the unrestricted area is increased to at least double the distance between the handrail centrelines.[13] Further information on run-offs can be found in 8.5.6

Escalators shall meet the following design and engineering considerations:

a) Heavy duty construction;

b) Weather proof if installation may be affected by the elements;

[11] BCA Clause 2.17
[12] BCA Clause 2.17
[13] AS 1735.5 Lift, escalators and moving walkways

c) Peak and off peak speed options;

d) Controlled by station staff by a key and remotely operated from the ticket office.

The necessity for escalators shall be determined by an analysis of the current and future passenger patronage. Escalator design shall comply with the BCA, AS1735 and other applicable standards. Refer to Table 6'Patron access modes preferred and non-preferred usage for underpasses and overpasses' for more detail on where escalators should be utilised.

8.5.5 Lifts

Lifts cater well for a great spectrum of passenger types and their ease of use is especially suited to people who are elderly, those unable to use stairs (for example people with prams, scooters, young children) or those who suffer from health problems. Travel times and the distance of travel are significantly reduced by the provision of lifts.

Lifts should be considered where there are excessive vertical distances (greater then 3.6 metres)[14] to be negotiated by people with reduced mobility. Lifts are not suitable as the sole means of access to station platforms due to their low passenger carrying volumes and loss of availability due to failures and maintenance requirements.

Lifts have minimal space requirements when compared to other modes of access, and as such are ideally suited to constricted or confined spaces. The location of lifts as part of a the station layout requires the designer to take into account the dynamics of the station including passenger circulation, access path requirements, security including maximising passive surveillance and reducing distance to boarding points for train and other intermodal transport networks. To maximise the passive surveillance of lifts, the lift doorway should be located where they can be viewed from the main ticket office. A run-off space of a minimum 2.5 metres shall be left between the lift doors and passageway. Further information on run-offs can be found in 8.5.6

Vandalism of lifts is an area of concern which can result in lift failure and damage. Mitigation through design, for instance locating lifts to maximise passive surveillance, can be successful in increasing the reliability and the usage span of lifts and to reduce vandalism.

Lift design shall comply with the BCA, DSAPT, AS 1735.1 - Lifts, escalators and moving walkway, General Requirements and AS1735.12 - Lifts, escalators and moving walkway, Facilities for persons with disabilities. More specific requirements for lifts with regard to their design are detailed in VRIOGS Standards 002.6 Lift General Requirements.

Refer to Table 6'Patron access Modes preferred and non-preferred usage for underpasses and overpasses' for more detail on where lifts should be utilised.

[14] BCA Access to Premises Standard

8.5.6 Circulation Run-Off

The design and construction of run-offs are important to maintain safe and efficient circulation. Run-off lengths need to be incorporated into the design of vertical circulation elements or whenever there is an impediment that affects normal circulation (e.g. smart gate lines). Table 7 below list the minimum run-off lengths that shall be provided in the circumstances as described above. Note that additional run-offs may be required based on functional layout and passenger demand.

Run-off type	**Minimum run-off length**	**Run-off type**	**Minimum run-off length**
One-way (note: for one-way flow, the direction is from the first item to the second item)		**Two-way**	
Escalator to Gateline	8m – 12m	Lift Doors to Passageway	2.5m
Gateline to Escalator (when the ratio of the number of gates to each escalator is less than or equal to 4)	6m	Escalator to Escalator	8m-12m
		Escalator to Passageway	6m
		Escalator to Staircase	6m-10m
		Escalator to Street	6m
Gateline to Escalator (when the ratio of the number of gates to each escalator is more than 4)	8m-12m	Gateline to Passageway (note run-offs from the gateline adjacent to platforms shall be in addition to the platform width	4m
Gateline to Passenger conveyer (when the ratio of the number of gates to each passenger conveyor is less than or equal to 4)	6m	Gateline to Platform	4m
		Gateline to Street	6m
		Passenger conveyor to Passageway	6m
		Passenger conveyor to Escalator	12m
Gateline to Passenger conveyer (when the ratio of the number of gates to each passenger conveyor is more then 4)	8m-12m	Passenger conveyor to Passenger conveyor	8m-12m
		Passenger conveyor to Staircase	6m-10m
		Passenger conveyor to Street	6m
		Staircase to Passageway	4m
Passenger conveyor-Gateline	8m-12m	Staircase to Street	4m
		Staircase to Gateline	6m-10m
		Staircase to Stair Landing	2.5m
		Staircase to Passageway	4m

Table 7 Run-off Lengths[15]

Note - Escalator run-offs are measured from the comb not working point.

[15] LUL Station Planning Standards and Guidelines November 2005

8.6 EMERGENCY EGRESS

Railway stations shall be quickly and safely evacuated during emergencies. To comply with government legislation, the design of new train stations shall meet the performance requirements of the BCA. Each train station shall be designed to meet the performance requirements by either satisfying the prescriptive Deemed to Satisfy (DTS) requirements or through performance based fire engineering.

The Deemed to Satisfy provisions of the BCA state that a class 9b building (which incorporates train stations) shall not have to travel more then 60m to an emergency exit. However this would be difficult to achieve on a linear structure such as a rail platform and in general the length of escape routes for train stations do not comply with the deemed to satisfy provisions of the BCA. Furthermore moving from one end of the platform to another may put a person at sufficient distance from the emergency to be considered safe. Therefore, using public access paths to leave the station or relocating to other parts of the platform, the performance outcome allowed by the building code is met.

The objective of the fire safety strategy is to ensure that people can move away from a potential fire or danger. There are numerous methods to achieve this, some relying on rules governing escape routes and others emphasising evacuation time. NFPA 130 is the primary standard for fire and lift safety, developed to address urban rail system, it is a standard specifically written to ensure safe egress from all types of railway stations. The principal of the standard is to establish a reasonable occupant load, including both the passengers waiting on the station and those on a train, then design enough means of egress for that population to leave the station platform within 4 minutes in the event of an emergency. Further the standard requires that the 'occupants' should be able to escape to a 'point of safety' within 6 minutes.

The key design aspect for the means of escape is to utilise the main entry and exit routes for escape, not the traditional method of using separated fire isolated stairs, as would be used in a retail or commercial building. The main entry and exit points of the station are aimed at moving high volumes of people quickly. In a fire emergency, this is exactly what is required; people to move off platforms as quickly as possible.

As an extension to providing emergency egress through the use of a platform as a place of safety and utilising the main entry and exit points for escape, in the event that the main entry and exit route to or from a station is impassable during an emergency an alternative emergency egress route to a place of safety shall where possible be provided. The provision of an alternative emergency exit shall be assessed on a station by station basis. A risk assessment shall be undertaken and the outcome used to determine when an emergency exit is to be provided.

Where emergency egress from the platform is able to be provided it shall consist of a gate, fencing and signage that meet the design and engineering requirements described in Section 9.12. Exit paths shall be easily located by people with a disability during emergencies. Clear directional signage to enable this shall be provided.

SECTION 9.0 PLATFORMS

9.1 OBJECTIVE

A railway platform shall be designed primarily as a component of an overall journey. As such functional and accessible paths of travel shall be designed / considered first. The design of a railway platform shall enable passengers to board and alight from trains in a safe and efficient manner.

9.2 PLATFORM CONFIGURATION CONSIDERATIONS

A critical element in station design is the location, configuration and sizing of the platform because these will decide many other aspects of the station design. Basic platform configuration is determined by the:

a) Constraints of track geometry and station siting;

b) Clearances in relation to the operation of rolling stock and infrastructure;

c) Dimensions of the warning strip (incorporating the platform edge TGSI strip, yellow safety line, and white coping), accessible path and circulation space;

d) Patronage and platform sizing as platform crowding can have a significant impact on the train service regularity through determining the length of dwell time;

e) Position of platform entrance/exit points at neighbouring stations as this will have an impact on the carriage loading patterns of trains;

f) Clearances of fixtures, fittings and furnishings.

When enhancing existing stations with major works, near life expired platform infrastructure should be demolished and new platform faces and platforms considered in the design and scope.

9.3 PLATFORM DIMENSIONS

The platform length is a fixed dimension that is based on the operational needs of rolling stock currently operating across the Victorian rail network and for the type of rolling stock proposed in the future. The dimension of the platform width will need to be ascertained to ensure that sufficient space is provided on platforms to allow:

a) Passenger circulation to, from and along the platform;

b) Operational and passenger facilities where provided;

c) Passengers to wait for trains in relative comfort and provide protection from the weather (including sun, wind, rain).

9.3.1 Platform Length

The length of a platform is defined as the actual platform edge distance running parallel to the track from one platform end barrier to its corresponding opposite platform end barrier. The engineering requirements for the platform length are outlined in Section 18.2.

9.3.2 Platform Width

Design considerations for new, or alterations to existing platforms shall be that the platform/s be designed so that the capacity at peak patronage allows for:

a) Safe passenger circulation;

b) A Fruin level of comfort C during disembarkation in peak periods.

The peak patronage circulation requirements and the horizontal width of the structures on the platform will determine the horizontal platform width over and above the DSAPT requirements.

The preferred minimum platform setback width to any building element or platform fixture is 3500mm, the absolute minimum width to ensure compliance to DSAPT is 2535mm. If the minimum width of 2535mm is to be used, this width can only run for a maximum length of 6 metres before an area is provided to allow wheelchairs to pass[16]. A typical platform layout is shown below in Figure 4.

The engineering design and the DSAPT requirements that determine the minimum width are outlined in Section 18.4. Please refer to this section for more detail.

Section 9 'Circulation' details the appropriate criteria to consider when carrying out a design assessment to determine the platform width.

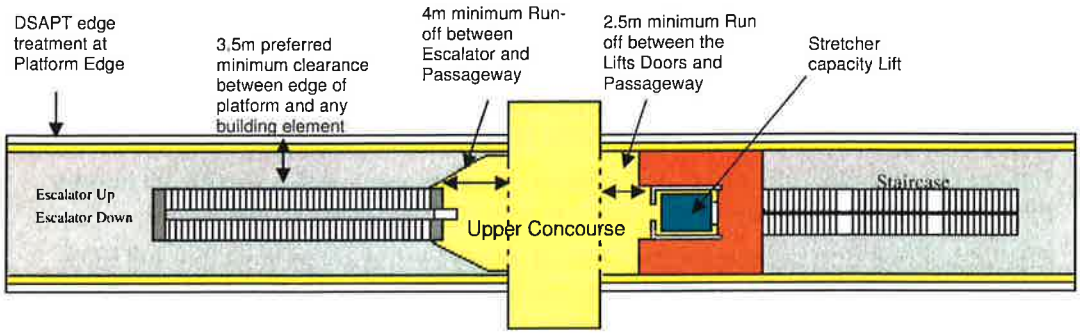

Figure 4: Typical Platform Layout

9.3.3 Warning strip and Accessible Path

In addition to providing for circulation based on patronage, there must be sufficient platform width to provide an accessible path and a warning strip running the length of the platform which is clear of fixtures, structures and furniture. The combination of these areas make up the minimum total platform setback width defined in Section 18.4.2. The access path and particular elements of the warning strip are a requirement of the DSAPT[17]. The warning strip includes platform edge detail such as white coping, yellow safety line and coloured tactile ground surface indicator strip.

9.3.4 Platform Height

The platform height is defined as the vertical distance separating the adjacent rail head plane and the platform level. The engineering requirements for the platform height are outlined in Section 18.3.

9.4 PLATFORM CONSTRUCTION ELEMENTS

The engineering design requirements for the platform construction elements are outlined in section 18.5

[16] DSAPT Part 4.1 Minimum width
[17] DSAPT Part 2 Access Paths and Part 18, Tactile Ground Surface Indicators

9.5 CLEARANCES TO OVERHEAD TRACTION SYSTEMS

In any direction other then vertically above, the minimum clearance between the overhead traction system (including return conductors) and the location of platform buildings or structures (including waiting rooms, canopies and windbreaks) shall be 2100mm.[18]

9.6 FIXTURES, FITTINGS AND FURNISHINGS

The type and number of fixtures, fittings and furnishings required on a station platform will be determined by the station category, the station functionality and the station locale (for example an aged care facility may be in the vicinity of the station leading to increased number of mobility impaired patrons using the station).

9.6.1 Location

Factors that determine the placement of fixtures, fittings and furnishings on a platform are:

a) Safe clearances from all track operations;

b) The need to provide a warning strip, accessible path and circulation space;

c) The need to maintain clear sightlines along the platform to facilitate passenger way-finding;

d) The need to provide drivers with clear sightlines to speed boards and signal.

9.6.2 Design Requirements

The design requirements for fixtures, fittings and furnishings shall include:

a) All platform furnishings shall be standardized to provide a uniform appearance and for ease of maintenance and replacement;

b) Any structures, fixtures and furnishings required on the platform (e.g. waiting areas, bins and commercial vending machines) shall be located outside the warning strip, accessible path and circulation space. Any queuing generated by these facilities must not encroach into any of the spaces outlined previously;

c) Passenger facilities on platforms (including vertical circulation, seats, public phones, and commercial vending machines) shall be distributed to avoid congestion at the entrance/s to the platform and to encourage passengers to spread out more evenly along the platform;

d) Platforms should be free of unnecessary fixtures, fittings and furnishings;

e) Fittings (for example light fittings) shall be clear of the yellow line and be as close to the station building as possible. This reduces the need for a lookout during maintenance callouts to repair faulty fittings.

Further detailed requirements for platform seating are addressed in Section11.5.

[18] Electrical Safety (Installations) Regulations

9.7 PLATFORM SURFACES AND DRAINAGE

All platform surfaces shall meet the following design and engineering requirements:

9.7.1 Slip Resistance

All ground surfaces (TGSIs, asphalt, concrete, tiles, paving, pit lids, grates, markings, etc) shall be slip resistant in both wet and dry conditions as set out in the relevant slip resistant standards – AS4586 - Slip resistance classification of new pedestrian surface materials, AS4663 - Slip resistance measurement of existing pedestrian surfaces and HB197 - An introductory guide to the slip resistance of pedestrian surface material. They shall be designed to a minimum rating of R10 as outlined in AS4586;

9.7.2 Gradients and Crossfall

Gradients and crossfalls for floor surfaces in platform pedestrian areas shall comply with the DSAPT and DOT policy as outlined below.

The crossfall on platforms is to lead away from the platform edge[19] with the gradient having a minimum of 1:100 and a maximum of 1:40[20]. This gradient shall be consistent to prevent water collecting on the platform surface.

9.7.3 Drainage

Platform drainage construction elements shall meet the following design and engineering requirements:

a) Surfaces shall be free draining;

b) Single face platforms shall have drainage points located at the rear of the platform in sufficient numbers to prevent water collecting on the platform and/or overflowing from the rear of the platform;

c) Island platforms shall have drainage points located in the centre of the platform in sufficient numbers to prevent water collecting on the platform;

d) Surface water on the platform shall be directed away from station building entrances/exits so as not to allow the flow of water to enter or pool at these locations;

e) All platform design shall incorporate overflow prevention in such a manner that water does not discharge onto the track.

9.7.4 Grates

Grates when located in a walking surface, shall meet the following engineering and design requirements:

a) Circular openings shall not be greater than 13mm in diameter[21];

b) Slotted openings shall not be greater than 13mm wide and not more then 150mm long and be oriented so that the long dimension is transverse to the dominant direction of travel;[21]

c) Grates shall be clipped into position.

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[19] DOT Policy
[20] DSAPT Part 2 Access Path
[21] DSAPT Clause 10 Surfaces

d) Grates in access paths shall be 'heel guarded'

e) Grates shall be slip resistant. They shall be designed to a minimum rating of R12 as outlined in AS 4586.

9.7.5 Trip Hazards

a) Abrupt changes in level shall not exceed the limits set by DSAPT;

b) Exposed base plates are not permitted within pedestrian area.

9.8 TRAIN STOPPING MARKS

Train stopping markings indicate a safe stopping position to the train driver and also indicate the most suitable embarking positions for passengers using mobility aids.

9.8.1 Location

The location of the stopping point shall take into account other factors such as obstructions on the platform (structures, drainage covers) and the position of the rear of train to ensure it is clear of track circuits. The position of stopping marks is to be determined by a signal sighting working party.

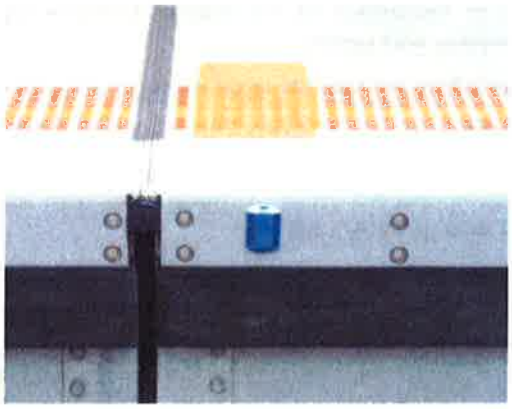
9.8.2 Design Requirements

The design for train stopping marks shall meet the following requirements:

a) There shall be an 1100mm x 300mm rectangular marking, painted yellow on the Up side of the platform and white on the Down side of the platform[22];

b) Platform TGSI's shall be incorporated within the stopping mark. They shall be coloured yellow for the Up trains and white for the Down trains[22];

c) Metropolitan stations shall have a blue cats eye positioned on the vertical face of the platform, adjacent to the stopping mark, to assist the driver in poor lighting conditions[22].



Example of a train stopping marker and blue cats eye.

9.9 PLATFORM COPING MATERIAL AT STATIONS

Non-conductive coping edges shall be used at all stations to prevent stray current discharges between the train and platform.

[22] DOT Policy

9.10 FENCING

Platform fencing shall be designed to provide the functionality of security, safety and to delineate boundaries. Fencing on platforms shall be provided to prevent patrons falling from the rear and end of platforms and to prevent illegal access onto the platform and to and from the track.

9.10.1 Design Requirements

Fencing design shall meet the following design requirements:

a) Trackside fencing shall be setback from the track centre-line in accordance with VRIOGS 001. Fencing at platform ends shall comply with VRIOGS 001 but returns may encroach to within 2135mm of the track centre-line;

b) Fencing shall be 1800mm high except at the end of platforms where they shall be 1200mm high so that a train driver's view of the platform and any signals is not obscured;

c) In consultation with the ARO, VicTrack and DOT, gates for track access by authorised vehicles or pedestrians shall be provided where required;

d) Platform and boundary fencing should be of a consistent style across the station and shall extend a minimum of 30m past the ends of platforms or station car parks;

e) Canopy style fencing in any part of the rail corridor will not be accepted;

f) Where applicable for access by railway staff and/or emergency egress, gated access shall be provided which shall have a minimum 600mm wide opening as a means of safely moving between the platform and track level.

9.10.2 Engineering Requirements

The engineering design requirements for platform fencing and platform end fencing elements shall include:

a) Fencing shall be of vanguard or equivalent product type which consists of galvanised steel tubing and posts.

b) Fence post caps shall be metal and secured by a security screw;

c) All fencing shall comply with the appropriate Australian Standards, including but not limited to AS 1725.1 - Chain link fabric fencing - Security fences and gates - General requirements and AS 2423 - Coated steel wire fencing products for terrestrial, aquatic and general use;

d) Gates for the above access/egress shall be spring loaded for self closing. Access/Egress shall be opened using a 5P key on both sides of the gate;

e) Steps to/from the platform shall have a yellow slip resistance surface material located on the stair nosing of the tread of 50 – 75mm wide to 50mm high;

f) Fencing should be dark in colour – preferably black;

g) Top and bottom rails shall be set on the outside of the fence facing away from the platform or station area;

h) Where a platform is of a pier and slab construction, fencing should be provided to exclude casual access. Lockable gates to access the underside of the platform shall be provided for maintenance access.

Platform end fencing has some separate design requirements, see Section 9.11

Example of Platform fencing

9.11 PLATFORM END FENCING

Where the station infrastructure does not enclose the platform ends, a fence shall be provided at each open end of the platform to discourage unauthorised entry to the railway track and rail corridor.

9.11.1 Design Requirements

Platform end fencing shall:

a) In consultation with the ARO, VicTrack and DOT, provide emergency egress for patrons and/or access by railway staff. This is to include gated access and stairs or a ramp as a means of safely moving between the platform and the track level (see Section 9.12 for emergency egress requirements);

b) Where access onto the track is not applicable at a platform end it shall be fenced and signed to deter unauthorised access as per the MetLink requirements.

Engineering design requirements for platform end fencing can be found in Section 9.10.

9.12 PLATFORM EMERGENCY EGRESS POINT

Alternative emergency egress routes to a safe place should where possible be available on stations with few or only one accessible entrance in the event that the access path is blocked during an emergency (see Section 8.6 for emergency egress requirements). The following design requirements should be considered in their design and construction:

9.12.1 Location

The emergency egress should be located towards or at the end of a platform. However, the 'safe place' where commuters are to congregate once exiting the platform shall not necessitate commuters having to encroach on railway infrastructure, for example such as to cross the track and placing commuters in further danger.

9.12.2 Design Requirements

Platform emergency egress points shall:

a) Display appropriate signage to notify patrons of its purpose and to deter access to it by unauthorised patrons at other times.

b) Located and operated taking into consideration the site conditions such as the position of existing infrastructure, topographical constraints and train operations.

9.13 DDA BOARDING POINTS

As per the DSAPT[23] boarding points for passengers who require a boarding device to board the train shall have a firm and level surface to which a boarding device can be deployed. This area will include a circulation space and access paths as per the DSAPT requirements.

A waiting shelter shall be provided adjacent to the first door of the train carriage. This is to allow passengers with disabilities a sheltered waiting space to allow for the driver to assist loading.

9.14 PLATFORM LIGHTING AND ILLUMINATION

9.14.1 Design Requirements

Interior and exterior lighting on platforms at new stations shall use white light. If the station is to undergo a major refurbishment - white light shall be installed.

The positioning of platform lighting shall consider the requirement by the AROs maintenance personnel to access lighting fittings from within the warning strip.

9.14.2 Exterior Lighting and Illumination

i. Location

Lighting installations must not interfere with signal sighting, the drivers' line of sight, or the operations of CCTV installations and Passenger Information Displays (PIDs). Where this is unavoidable light globes should be shielded. Positioning of lighting and signage shall be consistent such that non-illuminated signage is visible during station opening hours.

Light fittings shall be clear of the platform yellow line and as close as possible to the station building.

The exterior lighting on a platform shall be designed to incorporate and comply with the requirements and guidelines of AS1158.0 – Lighting for Roads and Public Spaces, VRIOGS 0010.1 Power and Lighting Design Standard and other relevant Australian standards.

9.14.3 Light Poles

i. Location

Poles shall not be located within an access path and shall be set back from the platform edge at a minimum distance as described in Section 18.4 Platform Width. Light Poles shall be positioned to prevent obstruction to passenger movement. Pole location shall not interfere with signal sighting.

ii. Engineering Requirements

The engineering design requirements for platform light poles shall include:

a) All pole lighting shall be powered by an underground supply;

b) Pole earthing and Multiple Earth Neutral (MEN) connections are to be in accordance with VRIOGS 0010.1;

[23] DSAPT Part 8.1

c) New poles as directed by the rail operator shall be galvanised and powder coated or painted with the relevant station colour scheme. Any existing poles to be painted full length to the rail operator's requirements. Lighting pits to be labelled as 'Electrical Services;

d) Modifications (i.e. Holes drilled into poles for PA conduits) to standard light poles will require structural certification.

9.14.4 General Lighting

Lighting shall be located at all changes of direction and in accordance with VRIOGS 0010.1, AS1158.0 and appropriate Australian Standards. More detail information on lighting can be found in Section 15.8.5

SECTION 10.0 STATION OPERATIONAL AREAS

10.1 OBJECTIVE

Station operational areas are provided so that station operational staff can safely and efficiently manage the operational requirements of each station. These operational requirements include smart card ticket selling, customer service, station management and wider system management as required.

10.2 DESIGN CONSIDERATIONS

When designing station operational areas, a number of competing objectives need to be resolved with the minimal compromise. These include:

a) The constraints of the station entry and platform configurations;

b) Maximising passive surveillance;

c) Developing efficient passenger and staff circulation.

10.2.1 Location

The precise location and configuration of the station operational area is determined by:

a) Station category and specific features of the static location (e.g. hospital, football ground);

b) Station entry and platform configuration;

c) Effective functional relationship between operational areas.

10.3 STATION OPERATIONAL FUNCTIONALITY

The station category, quantity of station staff and the services required will identify the operational requirements of the station, the range of facilities to be provided, and their dimensions. Consistent across all station categories and all functional areas is the requirement for the operational areas to:

a) Provide a comfortable, efficient and safe workplace;

b) Provide flexibility for new, additional and upgraded equipment, changes in staffing levels and function of space (25% extra space is good practice);

c) Maximise the opportunity for passive surveillance of public spaces;

d) Manage the interface between public and staff areas;

e) Provide for secure, vandal resistant and low maintenance facilities;

f) Manage the interface between operational and private contractors, emergency services providers and commercial facilities/operators.

Ideally, all station operational areas should be grouped together. However, due to site constraints, at times these areas may be divided into a number of smaller elements.

10.4 MINIMUM REQUIREMENTS AND FOOTPRINT FOR STATION COMPONENTS

The recommended minimum footprint for metropolitan station staff facilities are detailed in Table 8 and for regional stations detailed in Table 9. Note that not all these facilities are mandatory; the facilities required and their footprints will be determined by the station category, ARO's requirements, staff numbers, project specific requirements and the site constraints and conditions. The station design should allow for the provision for future conversion to a higher station category.

Consultation with the ARO and with DOT shall also determine if any facilities for other transport operators (for example bus drivers, tram drivers) are to be provided.

Staff and Business Facilities	**Station Type - Minimum footprint**		
	Premium	**Host**	**Unstaffed**
Ticket Office	$20m^2$	Provision made for future conversion to $20m^2$	Provision made for future conversion to $20m^2$.
	The $20m^2$ allows for 2 Ticket selling windows. For each additional Ticket Window an area of 1.8m width by 2.5m depth is to be added		
General Office	$12m^2$	$12m^2$	Provision made for future conversion to $12m^2$.
Station Supervisors Office	$10m^2$	Provision made for future conversion to $10m^2$.	Provision made for future conversion to $10m^2$.
Station Control Office	$10m^2$ where designated as a control station.	Not required	Not required
Kitchen and Meals Area	4-10 staff = 11.5 m^2 11-25 staff = 21.5 m^2 26+ staff = 32.7 m^2		Provision made for future conversion to sizing as detailed to the left. .
Staff Toilet	$4m^2$	$4m^2$	Provision made for future conversion to $4m^2$
Locker Room	Minimum of $7m^2$ or $0.7m^2$ per person	Minimum of $7m^2$ or $0.7m^2$ per person	Provision made for future conversion to $7m^2$
Authorised Officer Office (Only where designated as satellite depot)	$15m^2$	Not required	Not required
Storage Room	$7m^2$	Provision made for future conversion to $7m^2$	Not required
Cleaners Room	$7m^2$	$7m^2$	$7m^2$
Train Crew Facilities (Required at terminal and turn back locations)	$15m^2$ if not integrated within the station facilities	Not required	Not required

Table 8 : Minimum footprint for Metropolitan station components

Note: The design footprint for station components areas must be in accordance with the BCA, DDA and relevant Australian standards.

A guide to the required station staff facilities and their footprint that shall be provided at regional stations is contained in Table 9 (actual numbers to be assessed in the light of local operational arrangements, particularly the number and waiting times of interconnecting bus services), For ticket windows the patronage used is the maximum patronage through a station for a peak train (P_{max}).

Facilities	Staff and Business Facilities				Driver Depot Facilities	Conductor Depot Facilities
	Premium	Modal Hub	Commuter	Regional	Required at terminal and turn back locations)	
Ticket Office and ticket office windows	0.75% x P_{max}, minimum number of 2 ticket windows	0.25% x P_{max}, minimum number of 1 ticket windows	0.5% x P_{max}, minimum number of 1 ticket windows	As specified by the ARO.	Not required	Not required
General Office	Required	Required	Required	As specified by the ARO	Required	Required
Supervisors Office	Required	As specified by the ARO	As specified by the ARO	As specified by the ARO	Required	Required
Station Control Office	Required	As specified by the ARO	As specified by the ARO	As specified by the ARO	Not required	Not required
Kitchen and Meals Area	13 m^2 minimum	13 m^2 minimum	13 m^2 minimum	As specified by the ARO	Required	Required
Staff Toilet	Minimum 4m^2	Minimum 4m^2	Minimum 4m^2	As specified by the ARO	Required	Required
Locker Room	Minimum 2350L x 1600w	As specified by the ARO	As specified by the ARO	As specified by the ARO	Required	Required
Staff Shower	Not required	Not required	Not required	Not required	Required	Required
Authorised Officer Office	As specified by the ARO	As specified by the ARO	As specified by the ARO	As specified by the ARO	Not required	Not required
Storage Room	Minimum 1500d x 1750w	As specified by the ARO	As specified by the ARO	As specified by the ARO	Required	Required
Cleaners Room	Required	As specified by the ARO	As specified by the ARO	As specified by the ARO	Not required	Not required
Safe Working office	As specified by the ARO	As specified by the ARO	As specified by the ARO	As specified by the ARO	As specified by the ARO	Not required
Provision for OH&S representatives	As specified by the ARO	As specified by the ARO	As specified by the ARO	As specified by the ARO	As specified by the ARO	As specified by the ARO
Secure staff Car parking	Required	Required	Required	As specified by the ARO	Required	Required

Table 9 : Minimum Requirements and footprint for Regional station components

Note: The design footprint for station components areas must be in accordance with the BCA, DDA and relevant Australian standards.
For design purposes, staff amenities shall be provided/built separately from the ticket office (cash area)
The facilities listed above are only an indication of what is required. Flexibility shall be allowed when determining the required facilities (especially in already established heritage sites).

10.5 GENERAL OPERATIONAL AREA REQUIREMENTS

All station operational areas within the station main building should:

a) Accommodate a broad range of equipment, fixtures and fittings in a configuration that primarily enables the station to operate in a safe, secure and efficient manner;

b) Utilise natural light and ventilation wherever practicable;

c) Incorporate a reverse cycle air-conditioning or equivalent heating, ventilation and air condition system;

d) Incorporate separate security access arrangements between public and staff operational areas and between operational areas where required by the ARO; This is to include a eye hole in doors so that staff are able to check who is standing outside the door before opening it.

e) Be designed to provide informal surveillance of the whole station precinct to optimize security and perceptions of surveillance for passenger's wellbeing to minimize vandalism. See Figure 5 for a diagrammatical representation of the sightlines required.

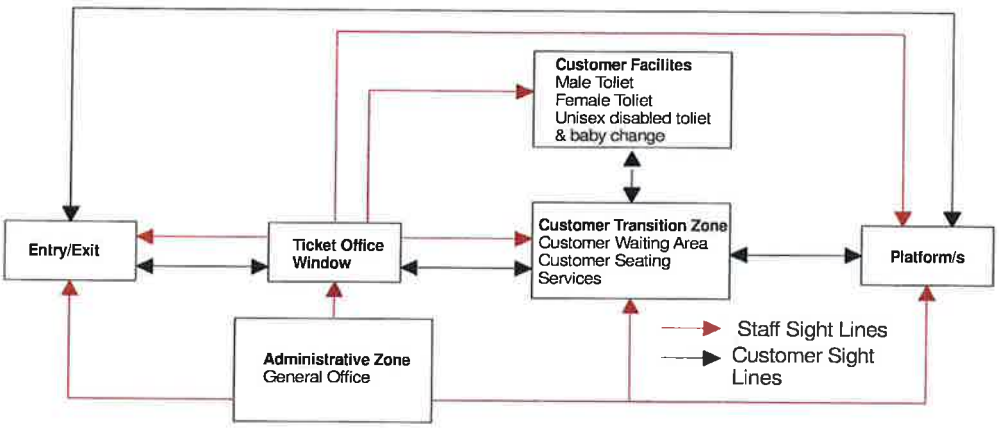


Figure 5: Staff & Passenger Required Sight Lines

10.6 TICKET OFFICE

The ticket office, and in particular the ticket window, is the first point of contact for passengers and staff. As such, it is important that this area is a comfortable, well-organized and attractive working environment and presents a clearly identifiable, well maintained and attractive image to customers. The ticket office area includes smart card ticket selling facilities, cash counting areas and a range of management and operational facilities. The number of ticket windows, staffing numbers and current and future passenger patronage will determine the size of this office.

10.6.1 Location

The ticket office should be located to maximise staff passive surveillance across the station entry, the unpaid areas and the customer facilities. It should be located along the station entry sequence, within the unpaid area and allow staff to be able to view the entrance and customer transition zone, the platforms and the entrance to the customer toilets. A diagrammatical representation of the required passenger and staff sightlines in relation to the ticket office is shown in Figure 5.

10.6.2 Design Requirements

The Ticket office design shall include:

a) At minimum one double ticket office window (including one counter compliant with the DSAPT[24]) with full security screens. The security screens installed shall provide easy maintenance access;

b) When identified by the ARO, direct access from the ticket office to the customer transition zone. This shall be achieved via a secure door, and preferably a secure corridor, to separate the operational and public areas;

c) No sun glare impacts the ticket office;

d) Secure access to the ticket office from other station operational areas;

e) Station security system and CCTV monitors;

f) PA system;

g) At a minimum one ticket selling workstation and associated equipment, layout space, and storage space.

For the passenger, the ticketing area design shall provide:

h) Customers should have a restricted 'presentation' view over the ticket office. Passenger should not be able to view the cash drawers and cash counting area;

i) Sheltered queuing area that provides overhead protection from weather conditions including wind, rain, dust and direct and indirect sunlight;

j) Effective queuing area adjacent to the windows that does not impinge on the access path or any other TGSI's or other signage for people with disabilities;

k) Ticket counter profiled for equitable access;

l) A grabrail or handrail at fixed locations where passengers are required to pay fares[25];

10.6.3 Engineering Requirements

The engineering requirement for the ticket office construction elements shall include:

a) Secure door/s, with the door to open outwards for security and keyed access restricted to authorised personnel only;

b) Hearing augmentation loops shall be provided to both the DDA and primary service counter area;

c) Duress button provided;

d) Remote locking controls for automated door, gates, roller doors, lifts, escalators and waiting room.

The style requirements for the ticket office are outlined in Part D Section 19.1.

[24] DSAPT Part 22.2 Information desks, check-in counters etc.
[25] DSAPT Clause 11.6 Grabrail to be provided where fares are to be paid

10.7 GENERAL OFFICE

The general office provides an area for station accounting and finance, station information management system, data management, and station sign-on management.

10.7.1 Location

The general office is required to connect directly to the ticket office. It also may require, when identified by the ARO, an independent external door for staff and staff visitors to access the paid area of the station.

10.7.2 Engineering Design

The engineering design requirement for the general office construction elements shall include:

a) One way glass providing clear sightlines through to the ticket office/ticketing desk

b) Secure access with the door to open outwards to enhance security.

The style requirements for the general office are outlined in Part D section 19.2.

10.8 STATION SUPERVISOR'S OFFICE

The station supervisor's office provides a separate, lockable room to conduct general office duties. The station category should determine the necessity for this office.

10.8.1 Location

The station supervisor office should be located next to the general office.

The style requirements for the station supervisor's office are outlined in Part D section 19.3.

10.9 STATION CONTROL OFFICE

The station control office contains a control desk with screens to monitor Passenger Information Display System (PIDS) and where required by the ARO CCTV recording of nearby stations. The station category and the ARO's requirement should determine the necessity for the office.

10.9.1 Location

The layout in relation to other station operational areas will be determined in consultation with the ARO, but it should connect directly to the general office and have a visual connection to the ticket office.

The style requirements for the station control office construction elements are outlined in Part D section 19.4.

10.10 AUTHORISED OFFICERS OFFICE

The authorised officer's office provides a secure room at stations designated as a depot for authorised officer's to use as an outstation base. The station category and the ARO's requirement should determine the necessity for the office.

10.10.1 Location

The layout in relation to other station operational areas will be determined in the consultation with the ARO, but it should allow access from the paid area of the station.

The style requirements for the authorised officer's are outlined in Part D Section 19.5.

10.11 CLEANER'S ROOM

All stations shall be provided with a cleaner's room that includes storage space for cleaning equipment. The room dimensions will be determined by the station category and any project specific requirements.

10.11.1 Design Requirements

The cleaner's room design requirements should include a:

a) Appropriate floor drainage;

b) Secure external door access from paid area;

The style requirements for the cleaners room construction elements are outlined in Part D Section 19.6.

10.12 STORAGE ROOM

All stations should be provided with a storage room that includes storage space for general storage. The required size will be determined by the station category and any project specific requirements.

The style requirements for the storage room construction elements are outlined in Part D Section 19.7.

10.13 STAFF AMENITIES

General staff facilities are to be provided at every manned station so that staff:

i. Have access to potable water, instant hot water and chilled water;

ii. Are able to carry out food preparation;

iii. Are provided with an area where they can sit for their meal breaks;

A change room and lockers shall be provided so that railway staff are able to store and change into and out of their uniform. The size and layout of these facilities will be determined by the station category, station staff numbers and any other railway staff numbers that may use these facilities. The layout in relation to other station operational areas will be determined by the ARO requirements. The facilities provided are to be entirely functional and robust and withstand heavy use.

10.13.1 Location

The location of the staff amenities should be adjacent to the general office.

10.13.2 Design Requirements

The design requirements for the staff amenities shall include:

a) Kitchen and Meals Area

i. **Dimensional Requirements:** The maximum number of staff per shift determines the size of this room and the number of tables and chairs provided. (See Section 10.4 Minimum footprint for station components for the size requirements based on staff numbers)

ii. **Design Requirements:** Where a meals facility is provided it should include

1) A minimum clear area of 1200mm around the food preparation bench area. This provides 600mm for the person standing at the bench, and an additional 600mm for someone passing by. It also enables the space for a fridge door to be opened without causing obstruction;
2) A clearance of 1200mm around the table for the person at the table, and a second person passing by;
3) Regional stations - Meal area/room should maintain sightlines through the office to the ticket desk.

b) Staff Toilets/Shower

i. **Dimensional Requirements:** The staff toilet/s and shower provisions at any station shall be established by the station category and the number of staff who are located at the station. At larger stations there will be a need for multiple numbers of male and female toilets in accordance with the Buildings Code of Australia.

ii. **Design Requirements:** Where toilets are provided should include:

Where practicable install a recycled water system so that grey water will be treated on site, stored in tanks and used for toilet flushing;

c) Locker/Change Room

i. **Dimensional Requirements:** The dimensions of the locker/change room are dependent on the number of lockers to be provided (See section 10.4 Minimum Footprint for station components for the locker requirements based on staff numbers). Each staff member shall be provided with a locker and thus the number of lockers to be provided shall take into account the number of full time staff that are situated at the station, other railway staff that use the station as a home base and for any future increase in staff numbers. Further consultation shall be undertaken with the rail operator to determine the number of lockers to be provided.

ii. **Location:** The location of the locker room should be adjacent to the toilets and showers.

10.13.3 Engineering Requirements

Staff Amenities

a) Staff Amenities

The engineering design requirement for staff amenities construction elements shall include power points to be provided for a grill, refrigerator, micro-wave and ice-machine.

b) Staff Toilets/Shower

The engineering design requirement for staff toilets/showers construction elements shall include all toilets and changing room facilities shall be provided with an exhaust system in accordance with AS1668.2 - The use of ventilation and air-conditioning in buildings – Ventilation design for indoor air contaminant control.

c) Locker room/area

The engineering design requirement for locker room/area construction elements shall include that lockers are to be secured to prevent tipping.

The style requirements for the staff amenities are outlined in Part D Section 19.7.

10.14 TRAIN CREW FACILITIES

At terminal and turn-back locations train crew facilities are required to support the efficient utilisation of driver resources. Facilities for train crews should if possible be integrated within those facilities (if any) already provided within the station operational areas of a station. If this can be achieved extra capacity must be made in the design for the kitchen and meals area, lockers/change room and staff toilets/showers to cater for the train crew.

If integration is not possible within the station operational areas then a train crew facility shall include, but should not be limited to a designated meal room, sign on room, female and male change rooms and showers and male and female toilets.

Due to business demands, driver numbers at each location can vary greatly. As a result, detailed design requirements and amenity items should be based on operational requirements and thus consultation shall be undertaken with DOT and the ARO to determine further requirements.

10.14.1 Location

The location of train crew facilities should be adjacent to the train stabling area or if possible integrated within the station operational areas.

SECTION 11.0 PASSENGER AREAS AND FACILITIES

11.1 OBJECTIVE

Passenger facilities are provided to enhance customer comfort and convenience. The passenger facilities that may be provided include: Passenger toilet facilities, retail facilities, public telephones, seating and waiting areas, luggage rooms and rubbish bins

The passenger facilities that are to be provided at a station fall into a number of categories, these being mandatory, station category specific and optional (See Table 10 below). Passenger facilities that are optional are only provided where a requirement has been identified by the ARO and they can be accommodated without compromising passenger circulation and the safe operation of the station.

Mandatory	Station Category specific(see Table 11 for further information)	Optional
Rubbish Bins	Waiting Areas (Enclosed and shelters)	Retail Facilities(including newsstands, kiosks, coffee carts)
Seating	Passenger Toilet Facilities	Commercial Vending machines
Public Telephone		Advertising Boards (illuminated)

Table 10: Passenger Facilities categories

11.2 REQUIREMENT FOR PASSENGER AREAS AND FACILITIES

The required passenger facilities at Metropolitan and Regional stations are outlined in Table 11 below. The station design should allow for the provision for future conversion to a higher station category and thus allow room for these facilities to be added or expanded in the future.

Passenger Facilities	Passenger Facilities minimum footprint						
	Metropolitan			Regional			
	Premium	Host	Unstaffed	Premium	Modal Hub	Commuter	Regional
Customer Toilets	Provided	Provided	Not provided	Provided	Provided	Provided	Not provided
Waiting Areas	Provided	Provided (not fully enclosed)	Not provided	Provided	Provided	Provided	Not provided
Platform Canopy Coverage	A minimum of 60% linear coverage on the upside of the platform and a minimum 30% linear coverage on the Down platform. See 11.4.3 for further information.						

Table 11: Required passenger facilities

11.3 PASSENGER TOILET AND BABY CHANGE FACILITIES

Toilets for the use of rail and intermodal passengers are provided as a customer service. The station category will determine if passenger toilet and baby change facilities are required and if so, their requirements above those outlined in DSAPT. Where toilets are provided the size, number and mix of facilities shall be decided with consideration to station and intermodal patronage.

11.3.1 Location

The key priority is to make passenger toilets safe and secure for passengers. Therefore unless otherwise specified, passenger's toilets shall be:

a) Located within the paid concourse area, directly off a public circulation route and preferably be visible from the ticket office for security monitoring.

b) Designed to ensure that the view from the toilet entrance door allows full visibility into the room for passenger and staff security.

c) Located so when toilets are in a corridor situation, that the ladies and disabled toilet are first to avoid female commuters having to walk past the men's toilet first.

11.3.2 Design Requirements

A guide to the number of passenger toilet and baby change facilities to be provided on a station is outlined in Table 12 below. This table expresses the number of passenger toilets facilities in terms of a percentage of the patronage and a minimum number of toilets which shall be provided. The patronage used is the maximum patronage through a station for a peak train (P_{max}).

	Metropolitan			**Regional**			
	Premium	Host	Unstaffed	Premium	Modal Hub	Commuter	Regional
Passenger Toilet	0.75% x P_{max}	0.5% x P_{max}	0	0.75% x P_{max}	0.5% x P_{max}	0.25% x P_{max}	0_x
Minimum Toilet numbers	3	3	0	3	3	1	0
	Note: Where toilet facilities are provided, a minimum of one unisex, accessible toilet with a baby change table facility shall be provided in accordance with the DSAPT.						
	Note: In situations where more then one toilet is to be provided, a minimum of one male, one female and one accessible, secure, individual, self contained toilet cubicle shall be provided. Multiple cubicles may be provided as dictated by the current and future passenger patronage.						
Minimum Footprint	$20m^2$	$20m^2$ lockable during non peak	Not provided	As specified by the ARO	As specified by the ARO	As specified by the ARO	Not provided

Table 12 Matrix of quantity of Passenger Toilet facilities

11.3.3 Engineering Requirements

The design and engineering requirements for passenger toilets and baby change facilities construction elements shall at a minimum comply with BCA and DSAPT. The engineering design shall include:

a) Designed and engineered to include natural light and ventilation wherever practicable;

b) Entry doors to the toilet/s shall be securely lockable by the station staff for increased security;

c) Light fittings on ceilings lower than 2700mm for the floor are to be tamper proof;

d) An exhaust system provided in accordance with AS1668.2;

e) Materials, finishes, fixtures and fittings which are highly durable, vandal resistant, self-finished where possible and with an emphasis on ease of cleaning;

f) Passenger toilet facilities to avoid dust and urine traps and to avoid dripping hands on benches.

The style requirements for the passenger toilet and baby change facilities are outlined in Part D Section 20.1.

11.4 WAITING AREAS

Waiting areas can either be enclosed within the station or located on the platform as part of the station structure itself or as a separate structure on the platform. The requirement for an enclosed and/or sheltered platform waiting area will depend on the station category.

11.4.1 Design Requirements

Waiting areas shall be designed so that the final floor area is in accordance with the BCA and DSAPT. The minimum waiting area footprint that shall be provided is outlined in Table 13. The number of passengers to be accommodated within the waiting area shall be determined with consideration to service spacing and peak station patronage. Where a waiting area is provided a minimum of 2 seats or 5% of the seats and 2 allocated spaces or 5% of the area shall be identified as available for passengers with disabilities[26].

	Metropolitan			Regional			
	Premium	Host	Unstaffed	Premium	Modal Hub	Commuter	Regional
Enclosed Waiting Areas	$30m^2$	$25m^2$ (not fully enclosed)	Not provided	As specified by the ARO	As specified by the ARO	As specified by the ARO	As specified by the ARO.

Table 13 Waiting Area Footprints

11.4.2 Waiting area enclosed waiting area within a station building

Enclosed waiting areas provide a secure and temperature controlled environment for passengers while waiting for rail services or other transport connections. They consist of a fully enclosed; temperature controlled passenger waiting space, which is highly visible with maximum natural light.

a) Location

Waiting areas enclosed within the station should be designed so that they are highly visible, overseen from the ticket office and located near to the main access and exit points. From the waiting area the passengers should be able to view the incoming trains and the modal interchange area. If this is not achievable then the minimum requirement for what visual and audible information shall be provided within the waiting area is outlined in the design requirements below.

b) Design Requirements

The minimum footprint for an enclosed waiting area is outlined in Table 13. For an enclosed waiting area the seating requirements are outlined in Table 14.

c) Engineering Design Requirements

The engineering design requirements for the construction elements of an enclosed waiting area within a station building shall at a minimum comply with BCA and DSAPT.

[26] DSAPT Clause 7

Engineering design elements that shall be contained within the waiting area include:

i. Reverse cycle air-conditioning (or equivalent Heating, Ventilation and Air Conditioning system);

ii. PA system coverage that complies with DSAPT Clause 26 Hearing augmentation – listening systems;

iii. Seating provided as per Section11.5 Seating;

iv. Passenger Information Display System (PIDS) as per Section 12.3.6;

v. Access via censored automatic doors, manufacture and type subject to the rail operator's approval, which are to be able to be switched off from the ticket office. The automatic door shall allow secure maintenance access to the mechanical system as required;

vi. Light fittings are to be tamper proof on ceilings lower than 2700mm from the floor.

Style requirements for enclosed waiting areas are outlined in Part D Section 20.2.

11.4.3 Platform Waiting Areas

Sheltered waiting areas on station platforms provide protection from inclement weather including but not limited to wind, rain, dust and direct and indirect sunlight. They can be canopy style waiting shelters with seating and windbreaks; weather protected waiting areas or a combination of both. The type of waiting area shall be determined by the forecast passenger numbers, the platform configuration and the station configuration (e.g. where the station building is located at the one end of a platform, a weather protected shelter should be provided at a location further along the platform to allow for even carriage loading patterns). The design of sheltered waiting areas should consider the nature of train configuration, the proximity to staff assistance and designed to allow passive surveillance.

a) Location

Sheltered waiting areas may be designed as part of the station structure, situated along the platform or a combination of both. In the majority of cases sheltered waiting areas should be more concentrated on the 'Up' side of the station. The location of a waiting area/s will have an impact on the carriage loading patterns of trains during periods of inclement weather. For this reason the location of waiting areas at neighbouring stations and key destinations should be taken into consideration during the design stage so as to synchronise carriage loading patterns.

A waiting shelter shall be provided adjacent to the first door of the train carriage. This is to allow passengers with disabilities a sheltered waiting space to allow for the driver to assist loading.

b) Design Requirement

When determining the extent of the weather protected waiting areas to be provided, an assessment of peak circulation and waiting patterns must be carried out. As a general rule designated waiting areas should be developed on the basis of providing a weather protection area of a minimum 60% linear coverage on the 'Up' platform and a further 30% linear coverage on the 'Down' platform. There may be exceptions to the above coverage requirements especially in the case of new or existing stations that are located at interchange points, where the 'Down' platform may be used as extensively

as the 'Up' platform. When this is the case a patronage assessment should be performed to determine what coverage is required.

The station roof overhang can provide weather protection over the platform for the perimeter of the station, but must be designed in such a way to minimise the number, or use of posts to ensure they do not restrict operational and passive surveillance sightlines. Where the station roof overhang is able to provide the protection needed, sufficient canopy area should extend away from the platform entry location/s to avoid congestion.

Platform canopies and windbreaks should be integrated with the overall station architecture. Their supports constitute permanent structures so they shall be setback by the minimum distance specified within Part C Section18.4.2. Their support elements shall not impede passenger circulation paths, queuing areas or restrict operational and passive surveillance sightlines.

c) Engineering Requirements

Engineering design elements that shall be contained within the waiting area include a:

i. PA system coverage;

ii. Seating provided as per Section 11.5 Seating;

iii. Light fittings on ceilings lower than 2700mm for the floor are to be tamper proof.

11.4.4 Canopies and Windbreaks – Design detail

a) Canopy Structure: The canopy structure shall be designed to:

i. Minimise column supports and associated visual obstructions;

ii. Co-ordinate with the circulation requirements of the station entry and platform/s;

iii. Conceal base plates below finished floor level to avoid trip hazards;

iv. Support operational equipment.

b) Canopy Dimensions: The canopy dimensions shall be as follows:

i. Canopy Height

The lowest point on the underside of any canopy structure shall be 2500mm. Where PIDS, clocks, downpipes or any other fittings are to be fitted, the height of the canopy shall be so that these fittings are a minimum of 2400mm from the finished floor level. Exceptions may occur where clear sightlines to train running signals cannot be achieved due to proposed canopy location.

ii. Canopy Width

The width of a canopy must be designed to comply with VRIOGS 001. The leading edge of a canopy structure on a platform (including gutters) should be a minimum of 2.4 m from the vertically projected line of the centre line of track for an electrified track and 2.5m for a non-electrified track.[27]

c) Canopy Details: Canopies shall be designed to:

i. Integrate with lighting, communication and information systems, CCTV and associated conduit and support brackets;

[27] VRIOG Standard 001-2005 Envelope H

ii. Provide maximum security to the overall structure – the structure excluding the roof should be as transparent as possible which permits passive surveillance ;

iii. Be non-climbable;

iv. Provide unobtrusive and accessible maintenance access;

v. Be vandal resistant;

vi. Be fitted with anti-vermin measures; including pigeon netting or spikes if the underside of the structure is to remain exposed.

d) Windbreaks: Windbreaks shall incorporate the following design and engineering requirements**:**

i. For maximum security windbreaks shall be as transparent as possible which permits passive surveillance. The use of glass shall be assessed on a case by case basis;

ii. The design shall allow for the ease of floor cleaning around the windbreak and any adjacent seating;

iii. The design shall be robust and vandal resistant as possible;

iv. The design shall prevent footholds and handgrips that encourage climbing;

v. Windbreaks shall be designed and constructed to be at a minimum height of 2500mm. Where PIDS, clocks or any other fittings are to be fitted, the height of the windbreak shall be built so that these fittings are a minimum of 2400mm from the finished floor level.

e) Stair Canopy: Canopies provided over stairs shall be:

i. Wide enough to provide protection to the stair from weather conditions;

ii. Designed to provide consistent weather protection (canopies that protect the top of the stair and not the bottom are unacceptable);

iii. Extend sufficiently over the top and bottom stair landings to avoid congestion.

11.4.5 Platform Canopies – Engineering Requirements

The engineering design requirements for platform canopy construction elements located on platforms are to include:

a) Design Loads

As described by the BCA, Australian and VRIOG standards the following engineering design loadings shall be addressed;

i. Wind Loads;

ii. Seismic loads;

iii. Collision loads;

iv. Earthing and bonding.

b) Fall Arrest System

A fall arrest system shall be incorporated into the canopy design when there is a requirement to service mechanical roof mounted equipment or a need to access the roof to clear stormwater collectors. SectionSECTION 14.0 Clause B details further requirements for fall arrest systems.

11.5 SEATING

Seating as described in this document includes seating located within the station grounds (e.g. platforms, waiting areas, station entrance) and on the rail land component. The station functionality, station locale and the passenger patronage will determine the type and number of seating over and above the requirements of the DSAPT and those outlined below.

11.5.1 Location

Seating location shall meet the following requirements:

a) On the rail land component, a resting point that includes seats shall be provided along any access path if the walking distance between facilities or services exceeds 60 metres[28];

b) Seating (and people sitting on the seats) shall not obstruct or protrude into an accessible path of travel or queuing zones and shall be a minimum of 500mm away from the path of travel[29];

c) Seats located in a 'back to back' configuration shall be spaced apart sufficiently for effective cleaning between the seats. A minimum of 300mm separating the backrests is recommended to avoid clashing of heads;

d) Platform seating shall be evenly distributed along the length of the platform subject to circulation and queuing analysis;

e) Generally seating numbers and their placement should be more concentrated on the 'Up' side of the platform. There may be exceptions to the above seating requirements especially in the case of new or existing stations that are located at interchange points (for example Dandenong station and Richmond station), where the 'Down' platform may be used as extensively as the 'Up' platform. When this is the case a patronage assessment should be performed to determine the seating requirements required.

11.5.2 Design Requirements

A guide to the number of seating facilities to be provided on a station is outlined in Table 14**Error! Reference source not found.** below. This table expresses the number of seating facilities in terms of a percentage of the patronage and a minimum number of seating which shall be provided. The patronage used is the maximum patronage through a station for a peak train (P_{max}).

	Metropolitan			**Regional**			
	Premium	Host	Unstaffed	Premium	Modal Hub	Commuter	Regional
Seating	20% x P_{max}	20% x P_{max}	20% x P_{max}	20% x P_{max}	20% x P_{max}	10% x P_{max}	20% x P_{max}
Minimum seating numbers	20	20	16	20	20	10	5
Seating – Waiting Area	10% x P_{max}	10% x P_{max}	Not provided	10% x P_{max}	10% x P_{max}	Not provided	Not provided
Minimum seating numbers	10	10	Not provided	10	10	Not provided	Not provided

[28] DSAPT Clause 5.1 Resting Points
[29] DSAPT Clause 23 Street Furniture

Table 14 Matrix of quantity of seating facilities

On side platforms the seat numbers outlined in Table 14 shall be provided on each platform. For island platforms, some seating can be used by passengers regardless of the direction they are travelling (e.g. seating located within waiting areas and platform seating that permits passengers are able to view approaching trains) and as such the seating numbers provided shall reflect this.

11.5.3 Engineering Requirements

The engineering design requirements for seating construction elements shall include:

a) Seats shall be designed so they are low maintenance, resistant to vandalism and suitable for use in both internal and external areas;

b) Seats shall be securely fixed to the base building structure. Top surfaces of footings shall be level with adjoining surfaces to avoid tripping hazards;

c) Armrests should be provided for all seats. The armrest should be within the centre of gravity and the top surface of the armrests shall be at a height of 260 ± 49mm above the seat[30].

11.6 PUBLIC TELEPHONES

If specified by the ARO and DOT a Telstra public pay telephone shall be installed (by Telstra under Franchisee negotiation) at railway stations. The quantity of pay telephones to be made available at each station shall be decided with regard to passenger volume estimation.

11.6.1 Location

Public telephones shall be situated

a) In a location such that they will not encroach on the normal free-flow of passenger circulation;

b) As close as possible to the station entrance and generally situated on the downside platform;

c) Not in waiting rooms;

d) Not be in a earth potential rise zone (for traction supply or HV mains);[31]

e) So that the telephone does not represent a touch potential risk by being located adjacent to (but electrically isolated from) structures bonded to traction earth. [31]

11.6.2 Design Requirements

The pay telephone installation design:

a) Shall comply with Telstra standards for pay telephone devices located in public places;

b) Should be integrated with other equipment and infrastructure within the public spaces so as to avoid clutter;

c) Any new public telephones shall include at least one accessible payphone designed to the requirements specified in AS 1428.2 Clause 30 'Telephones';

[30] DSAPT Part 23 Street Furniture, 23.1 Seats
[31] Generic Station ICT Systems Specifications

d) Shall provide a clear floor space in front of the payphone of not less than 800mm by 1300mm that allows a forward approach by a person using a wheelchair. The required space shall not be restricted by bases, enclosures and fixed seats.[32]

For more technical specifications on pay telephones please refer to the 'Generic Station ICT Systems Specifications' document.

11.7 SAFETY ZONE – METROPOLITIAN STATIONS

A safety zone is an area provided to customers to increase their sense of safety and security whilst waiting for a train on a platform. It is a requirement that all metropolitan stations have a safety zone established; there is no current requirement for a safety zone to be provided at regional stations.

11.7.1 Location

If a Customer Help Point (CHP) system has already been established on the station, the safety zone shall be located adjacent to this. Where a CHP system is not established the safety zone shall be located based on the following requirements:

a) Located on the platform with a minimum distance to the train and platform entrance;

b) Located to maximise staff surveillance of the zone;

c) Located so no dark areas are in close proximity;

11.7.2 Design Requirements

The design requirements are to include:

a) Safety zone shall be line marked;

b) The Safety Zone dimension shall be 3300mm high and 1900mm wide. Where this cannot be provided at established stations the dimension of the safety zone shall be sized in relation to the area that is available adjacent to the Customer Help Point. The Safety Zone shall not intrude upon the platform edge tactile.

c) 'Safety Zone' shall be marked within the safety zone which shall be approximately 300mm in height, and the yellow hatching should be approx 150mm in width..

11.7.3 Engineering Requirements

The engineering requirements for safety zone construction elements include:

a) White lighting shall be installed directly above the safety zone. Lighting levels shall provide a minimum illumination of 250 lux measured at one metre above the ground with a uniformity of 0.7. The lighting should be installed at a minimum height of 3m above the platform. Light fittings shall be clear of the yellow line and be as close to the station building as possible. This reduces the need for a lookout during maintenance callouts to repair faulty lights or fittings;

b) All line marking shall be slip resistant;

The design requirements for the customer help point system are outlined in Section 12.2.2.

[32] AS 1428.2 Design for access and mobility Part 2, Clause 30 Telephones

11.8 VENDING MACHINES

Vending machines shall be provided at stations throughout the network where specified by the ARO. Vending machines shall not detract from, or impede, the essential station operations.

11.8.1 Location

Vending machines shall be integrated with other fixed elements. The station design should allow vending machines to be recessed within the building structure and shall be located clear of vertical circulation and station operational facilities.

11.8.2 Design and Engineering Requirements

There design and construction shall comply with the DSAPT and as such their height and type of operating buttons, vending machine profile and adjacent circulation space shall conform to DSAPT requirements. Vending machines are to be provided with power, water and drainage and thus these elements shall be taken into account with the station design.

Vending machines can provide hiding spots for suspicious packages and thus the top of the vending machine shall be design with a sloping roof to prevent packages being left on top of the machine and the skirts placed on the bottom to prevent packages being left underneath the machine.

SECTION 12.0 STATION OPERATIONAL SYSTEMS

12.1 OBJECTIVE

Station operational systems are generally related to providing customer service or station operational effectiveness. These systems include:

a) Security systems.

b) Passenger information systems.

c) Ticketing systems.

There is often a need for uniformity of station systems across the network in terms of connectivity, operational uniformity and consistency of presentation.

12.2 SECURITY SYSTEMS

12.2.1 CCTV (Closed Circuit Television)

CCTV facilities are provided at stations for the safe and efficient operation of trains, the management of assets and the safety of passengers.

a) Location: The minimum requirement for placement and number of cameras required is determined by the coverage requirements indicated in VRIOGS 013.2 CCTV Development for Fixed Installations and the constraints of the related site layout. Additional cameras may be required for operational reasons including Single Person Operation of Trains (SPOT) on curved platforms, and surveillance of areas subject to crime or vandalism threats (such as car parks and associated walkways).

b) Design Requirements:

Integration of CCTV into the station design should be considered early in the design process. VRIOGS 013.2 outlines the requirements in relation to CCTV facilities for stations.

12.2.2 Customer Help Points (CHP) - Metropolitian Stations Only

Customer Help Point (CHP) intercoms provide train patrons with access to pre-recorded-voice schedule announcements and to an emergency intercom call to a control station desk operator. All metropolitan stations shall have a CHP system installed; currently there is no requirement for a CHP system to be installed at regional stations.

CHP are usually installed adjacent to a safety zone, if a safety zone has already be installed then the CHP shall be located adjacent to this. The design requirements for the customer help point system are outlined in Section 11.7

a) Location

Stations shall have CHP points in each of the following locations with a minimal distance to the train and the platform entrance:

i. One on every single faced platform

ii. One on each side of every island platform pair

b) Design Requirements

The engineering design for the customer help point construction elements shall meet the following requirements:

i. A red call (emergency call) and green call (timetable information) button shall be incorporated within the CHP.

ii. By pressing the green button the caller shall be connected to customer information. The customer information shall be provided by an auto-attendant which assembles voice announcements based on PRIDE train scheduling data[33] ;

iii. By pressing the red call button the customer shall immediately be connected to the control room of the controlling station. The red button shall also trigger the CCTV system to switch a monitor at the control station to the camera covering that CHP and display it on the CHP monitor at a station control desk.;[33]

iv. The CHP shall be mounted to a standard CHP Intercom mounting panel to be procured from Metlink. Panel size is 650mm wide by 900mm high to be mounted 900mm from the platform surface. The CHP shall be secured to the mounting surface with fastening devices (such as "Snake Eye screws, "caged nuts" and stainless steel "shrouds") to reduce the risk of theft and vandalism.[34] A bottom rail shall be integrated into the base of double poled signs in accordance with DDA accessible design criteria.

v. The CHP system shall be thoroughly integrated into the architectural finishes and materials of the station environment.

For more engineering and technical specifications on customer help points please refer to the 'Generic Station ICT Systems Specifications' document.

12.3 PASSENGER INFORMATION

12.3.1 Objective

The function of passenger information is to assist the rail operator's customers to access and navigate the metropolitan and regional rail networks and other intermodal services, safely, efficiently and with minimum anxiety. While individual customer service is needed in some situations, well-placed information can alleviate the need for customers to seek out staff or wait in line for information. General information about transport systems shall be accessible to all passengers[35].

12.3.2 Design Requirements

What passenger information is required at each station and the means of delivering it, especially in relation to technology will be determined by the site constraints, Department of Transport policy and the rail operator's policy. The prime means by which information is delivered to commuters are:

a) Static information: Signage, maps, general information displays, brochure and timetable brochure stands.

[33] Generic Station ICT Systems Specifications
[34] Generic Station ICT Systems Specifications
[35] DSAPT Part 27.1

b) Electronic information: Passenger Real-Time Information Dissemination Equipment (PRIDE), Passenger Information Displays (PID) and Synchronised LED clocks.

c) Audible information: Public Address (PA) Announcements via Digital Voice Announcements (DVA), manually by station staff or by the Group Announcement PA system.

d) The physical environment: Tactile Ground Surface Indicators (TGSI's) and Braille.

Given the range of passenger information to be co-ordinated, the information system should be developed as soon as the basic configuration/reconfiguration of the station entry, platforms and station operational areas is established.

12.3.3 General requirements for Visual/Audible and Physical Information

Whether passenger information elements are static or dynamic, they should incorporate the following general requirements:

a) As far as practicable, passenger information shall be incorporated into the architectural elements of the station, thereby minimising the individual elements on the station.

b) To minimise the overall number of passenger information elements, items such as clocks, PIDs, statutory signage, speakers etc: may all be grouped, provided that the integrity of each element is maintained.

c) The design of all passenger information (visible, audible and physical) shall take into consideration the needs of mobility impaired and visually impaired passengers. Their design shall meet the requirements of the DSAPT.

12.3.4 Static Signage

Typically eight categories of static information are found at stations. They are station identification, directional/wayfinding information, train timetables, passenger services (For example ticket windows, toilets), general station operations, passenger information posters, regulatory signage, and train operator promotional information

a) Location

For signage to be accessible, it shall be located on the accessible path, in areas where audio, visual and tactile information is available. Signage (including emergency signage) shall be located to comply with the requirements of the DSAPT[36], BCA and Metlink. Signage at the main entrance to the station should include clear advice to wheelchair and scooter users on the requirement to wait at the front of the train so that the driver can deploy a boarding ramp.

b) Design and Engineering Requirements

Metlink is the authority for all static signage and can provide design, supply and installation services. The design and engineering requirements for static signage construction elements should incorporate the following:

i. A design life of 20 years minimum;

ii. Enclosures, sub frames, support structures and fixings should withstand the wind effects of train movements;

[36] DSAPT Section 17 Signs

iii. Static signage shall comply with the requirements of the DSAPT, relevant Australian Standards and the Metlink Master Style Guide;

iv. Withstand extreme wear and tear conditions and be resistant to vandalism;

v. Be highly durable, self finished where possible, with an emphasis on ease of cleaning.

12.3.5 Passenger Real-Time Information Dissemination Equipment (PRIDE) - Metropolitan Stations Only

The PRIDE system is a computer-based system that provides the following functions:

i. Update of station passenger information displays;

ii. Automatic station public announcements, and

iii. Automatic station customer help point announcements.

a) Design Requirements

Only selected stations (Host stations) have PRIDE systems installed. Host stations are then able to manage passenger information display and automatic station public announcement equipment at adjoining and remote stations within the host stations corridor. It is a requirement that all metropolitan stations are able to receive information from a PRIDE system; there is no current requirement for a PRIDE system to be provided at non-metropolitan stations.

For more technical specifications on PRIDE systems please refer to the 'Generic Station ICT Systems Specifications'.

12.3.6 Passenger Information Display (PID)

PIDs provide updated train running and disruption information to commuters on entering a station, at interchange points and whilst waiting on a platform. This enables passengers to make informed decisions on the timing and most efficient route for their journey. The design and location of PIDs should be made in consultation with the Rail Operator to ensure the functionality of the system is consistent across the network.

a) Location

The design of a station PID system may need to incorporate PIDs in the following areas: Station entry/exit within the unpaid area, Station interchange zones within the paid area, platforms, waiting areas and station staff operational areas.

Design requirements for locating PIDs include:

i. Located in accordance with disability requirements;

ii. Located in accordance with best practice for way finding signage (for example located at decision points);

iii. Located in order to avoid glare from direct sunlight;

iv. PIDs positioning shall be coordinated with CCTV cameras to ensure that suspended PIDs do not obstruct the camera target fields of views;

v. Located so as not to obstruct the train driver's view of any signalling aspect.

b) Design Requirements

PID elements shall be designed and located to meet the following requirements:

i. Two line LED PIDs are to be deployed at suburban platforms, with four line LED PIDs deployed at concourses, waiting rooms and interchange zones[37];

ii. The PID shall be affixed to a suitable strong part of the station structure;

iii. Ensure that there are no permanent structures around the location of the PID which might hinder maintenance to the unit;

iv. To maximise the visibility of PIDs to passengers, PIDs should be mounted so that it is not obscured by other devices or structures. Infrastructure associated with the platform PIDs shall be positioned so as not to hinder the sighting of signals and is to be agreed in consultation with a signal sighting committee;

v. The bottom of the PID is mounted so that it is at least 0.5 metres below any roofing structure within the immediate area[37];

vi. Support structures designed so they are able to hold additional loads during maintenance; [37]

vii. All dynamic displays shall be legible and easily understood from a distance of 20 metres in daylight and a minimum of 10 metres under platform lighting levels;

viii. Be weatherproof and vandal resistant.

c) Specific design requirements for PIDS at Station entries, Waiting Rooms and Interchanges are

i. PIDs should be placed so that commuters can glance at the information without stopping. If commuters need to stop and read information, the placement of the PID should not impede the flow of other passengers. They ideally should draw passengers away from congregating at platform entry points or vertical circulation elements;

ii. PIDs to provide an overview for each direction/platform at the station.

d) Specific design requirements for Platform Indicators are

i. A minimum of two double sided PIDs shall be provided on each side of a single faced platform and on both faces on an island platform;

ii. Platform PIDs shall always be located under the cover of platforms awnings or canopies. The dimensional design requirements for these locations are:

The minimum vertical clearance from the underside of a PID enclosure to the platform surface shall be 2400mm;[38]

The minimum horizontal distance from the platform edge to the closest edge of a PID and its fixtures shall be 1050mm.[38]

iii. To maximise their visibility to passengers, PIDs shall be positioned away from the platform clock display;[37]

[37] Generic Station ICT system specification
[38] Generic Station ICT system specification

iv. A platform PIDs shall be installed within 4 metres of the entry point to each platform with the displays facing in the UP and DOWN directions;[39]

v. If more then one PID is installed they shall be equally spaced along the platform and provide a clear unobstructed sightline of 15m so that passengers can easily locate and orientate themselves to an indicator as they approach.

For more technical specifications on PIDs please refer to the 'Generic Station ICT Systems Specifications' document.

12.3.7 Synchronised Digital Clock

The provision of a synchronised clock system provides passengers with a readily identifiable, accurate time keeping instrument across the network.

a) Location

One double sided illuminated digital clock shall be located on each single face platform and also on each side of an island platform. It shall be located under the cover of platform awnings or canopies and be visible from all parts of the platform. Digital clocks shall be positioned so as not to hinder the sighting of signals and is to be agreed in consultation with a signal sighting committee.

b) Design Requirements

The general design requirement for digital clocks is that the clock is to be double sided and illuminated. Consultation with the ARO's will determine the style of clock to be used to ensure that there is consistence across the rail networks.

For more technical specifications on synchronised digital clocks please refer to the 'Generic Station ICT Systems Specifications' document.

12.3.8 Public Address (PA) system

Audible information is provided at stations by the public address system (PA) and remote announcement system. It enables rail operators to communicate spoken information to passengers in both regular and emergency situations via digital voice announcements, by station staff via the public address system and via remote public announcement systems.

a) Location

The station buildings (including toilets and waiting areas), platforms and concourse area (excluding footbridges) shall be serviced by a public address system. In providing this coverage the designer should be mindful of any interference to the surrounding residential environment and the issues that this may cause

b) Design Requirement

Each rail station shall have both PA and Group Announcement capability, delivered through the same infrastructure (For example sharing the same speakers and conduits). Manual public announcements shall be possible from telephones and dispatch consoles. The group announcement system is to operate remotely, when the station is un-staffed, during track occupations and during emergency situations.

The Public Address system shall support the following announcements (in priority order):[39]

i. Group call (Metropolitan stations only): Remote train operations announcements (to all stations in the line section grouping) via telephony input from the PRIDE control station;

ii. PRIDE automated digital voice announcements and remote access by station staff via telephony input (metropolitan stations only);

iii. Local station operator microphone with push to talk;

iv. Background music (provision for this capability in the event of host station upgrade).

c) PA Systems Engineering Elements

The engineering elements for PA systems shall meet the following requirements:

i. The PA audio level and associated speaker volume shall be set to exceed the peak ambient station noise by a set intelligibility margin. This is to include when trains are passing through the station;

ii. Two separate audio zones per platform shall be provided, these being the Core zone and the Extended zone[39];

1) The core zone covers areas near the entrance to each platform where customers are most likely to congregate while waiting for trains during off-peak times. The core area is intended to be a low noise zone that can be used at any time of the day or night without disturbing the surrounding community;

2) The extended zone covers the remaining public access areas and is to use higher powered speakers. The extended zone is mainly used during peak times.

iii. A separate control button should be provided for each platform in the ticket office and/or station control office.

d) PA Speaker Engineering Elements

The engineering elements for PA speakers shall meet the following requirements:

i. Speakers shall be placed for optimal audio coverage and audibility along the platform without undesirable noise impacting on surrounding areas. As general design principle this requires more speakers along the platform with each speaker operating at a lower output level. The maximum spacing between speakers along each platform shall be:

1) One speaker for every 5 metres within the core area;

2) One speaker every 10 metres along the platform (outside the core area).[40]

ii. Speakers shall be installed at a minimum of 3.5m from the nominal level of the surrounding platform, pavement or ground. Where roof or canopies prevent this alternative mounting arrangements shall be submitted for approval by the Infrastructure Manager;

[39] Generic Station ICT system specification
[40] Generic Station ICT system specification

iii. Where practical, light poles, roof trusses, or other existing platform structures shall be used to mount speakers using appropriate mounting hardware;

iv. Speaker cabling shall be installed and routed to reduce public access to the cable and associated vandalism risk;

v. When run in exposed areas or publicly accessible the station loudspeaker cabling shall be installed in galvanised steel conduits to AS/NZS 2053.7 - Conduits and fittings for electrical installations – rigid metal conduits and fittings or AS/NZ 2053.8 – Conduits and fittings for electrical installations – Flexible conduits and fittings of metal or composite material, to minimise vandalism damage risk.[40]

For more technical specifications on Public Announcements systems please refer to the 'Generic Station ICT Systems Specifications' document.

12.3.9 Hearing Augmentation

Hearing augmentation shall be located, and signage provided, in compliance with the DSAPT and AS1428.5 - Communications for people who are hearing impaired. The type of Assistive Listening System (ALS) that shall be installed for hearing augmentation – listening systems is an audio frequency induction loops system (AFILS). AFILS shall be installed at the following locations:

a) Ticket office windows (where provided);

b) Customer help points/timetable information;

c) Internal waiting areas within the station building.

Each loop shall be sized to cover at least 90% of the full area indicated by the hearing disability signage (typically 4mx8m) at magnetic levels in compliance with AS6011.4 Hearing aids – Magnetic Field Strength in Audio-frequency Induction Loops for Hearing Aid Purposes. For more technical specifications on hearing augmentation please refer to 'Generic Station ICT Systems Specifications'.

12.4 SMART CARD TICKETING SYSTEM

Station ticketing shall provide an identifiable, legal right to travel on the railway. The smart card ticketing system shall be installed by a specialist contractor. The extent of the ticketing system to be installed is determined by the current and future passenger patronage.

12.4.1 Location

The location of smart card ticketing equipment shall consider the following:

a) Smart card gates, Gate Attendant Controller (GAC), Card Vending Machines (CVM), Fare Payment Devices (FPD) and Stand Alone Enquire Machine (SEM) shall be positioned so that they are easily identifiable and accessible by all members of the public. They should be located at platform entries and in view of the ticket office;

b) The location of smart card gates, GAC, CVM, FPD and SEM shall not unduly hamper the flow of passenger and should be positioned to allow passengers to pass unimpeded from queues waiting to use the machines. The location shall consider an allowance for the space required for maintenance and operational activities;

c) The potential for multiple points of entry into the station;

d) An ability to have passive surveillance from staffed areas of the station;

e) The separation of paid and unpaid concourse areas and connection to the vertical and horizontal circulation paths;

f) Recessed where possible.

12.4.2 Design Requirements

The design requirements for smart card ticketing system are

a) The number of smart card gates and fare payment devices required for both entry and exit flows (forecast peaks 5min entry/exit flow), standalone enquiry machines and card vending machines shall be based on the patronage of the station;

b) Signage shall be clear and appropriately located to facilitate the equipments use;

c) Enhanced lighting shall be provided around smart card gate, CVM, FPD and SEM;

d) Cameras should be placed to view the appropriate smart card ticketing equipment;

e) A grabrail or handrail shall be provided at fixed locations where passengers are required to pay fares.

The following is a list of Smart Card Ticketing Equipment that may need to be provided at a station. The actual equipment to be provided is to be determined with the DOT, TTA and the ARO:

i.	TOT	Ticket Office Terminal
ii.	CVM	Card Vending Machines
iii.	FPD	Fare Payment Device
iv.	SEM	Standalone Enquiry Machine
v.	Gates	Smart Card Gates
vi.	GAC	Gate Attendant Controller
vii.	HHD	Hand Held Device
viii.	HO	Holsters for Hand Held Devices
ix.	SEOS	Station Emergency Operating System
x.	LEOS	Local Emergency Operating System
xi.	FIP	Fire Indicator Panel
xii.	POP network	Point of presence – local connection to VicTrack wide area
xiii.	ARCOS	Station Computer
xiv.	WinTerm	Windows Terminal
xv.	Rack	Communication Cabinet (Internal or External).

For more engineering and technical specifications on ticketing systems please see the TTA: Gate Mechanical and HW Specification

12.4.3 Smart Card Gates

a) Location

The placement of smart card gates shall consider the following:

i. Gatelines shall be sighted so that all gates are readily accessible to passengers moving in an expected manner through the concourse/unpaid area;

ii. There shall be a minimum offset from gateline and any obstruction (i.e. ticket window or similar);

iii. Gatelines shall never be placed on platforms.

b) Design Requirements

The design requirements for smart card ticketing system are:

i. Smart card gates shall be designed as a single line of automated gates with the capacity for a gate attendant to have a visual oversight along the entire length of the barrier from a singular position and to provide assistance if required. A typical gate configuration is shown in Figure 6;

ii. Entry or exit barriers shall be grouped to one side of the gateline (i.e. they shall not alternate between entry and exit;

iii. The smart card gateline footprint dimensions for station design purposes are;

1) Height: 1072mm
2) Width: 300mm
3) Length: 1932mm
4) Width of aisle: 500mm (regular aisle) / 900mm (wide aisle)
5) Maintenance access of at least 50cm (both sides) must be left open in order to access side panels.

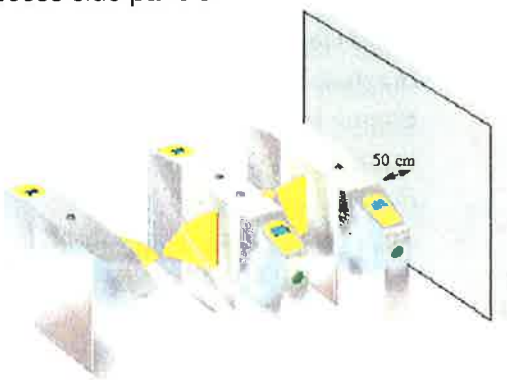


Figure 6: Example of smart card gate footprints and a two lanes configuration (wide and regular).

iv. Gateline length flow capacity shall be based on circulation. Passenger flow rates can be up to 75 passengers per minute based on passengers walking at an average speed of 1m/s, distance between passengers of about 800mm and smart card processing time of 0.8s per smart card;

v. At least one accessible wide smart card gate shall be provided at each gate line. It shall be 900 mm wide with any gate/barrier not less then 1200mm past the ticket feed point in the direction of travel. Accessible smart card gates should be reversible and bi-directional freestanding units[41];

vi. A bypass gate shall be provided for emergency and maintenance access;

vii. A Gate Attendant Control (GAC) shall be provided adjacent to the gateline (preferably next to the accessible gate);

viii. Provision should be made for additional floor duct in the ground to allow for future expansion of the number of barriers. Where barriers are not provided floor ducting should be installed to allow for barriers to be installed in the future;

ix. Smart card gates shall have a Local Emergency Operating System (LEOS) manual override button located near the gated area and a Station Emergency Operating System (SEOS) manual override button controlled from the ticket office;

[41] AS 1428.2 Section 28.4

SECTION 13.0 MATERIALS & FINISHES

13.1 OBJECTIVE

Selected station materials, finishes, fixtures and fittings must withstand extreme wear and tear, be highly resistant to vandalism, self finished where possible, be non-combustible, easily cleaned and maintained with minimal disruption to station operations.

13.2 DESIGN CONSIDERATIONS

The careful selection of all finishes is critical to achieve a standard of station presentation and quality consistent with that of a public building. The 'finishes' selection process must include the critical assessment of each element's form, size, material, composition, fixing system and detail. The finish of each floor, wall, column, ceiling and soffit elements must be selected with regards to:

a) Fitness of purpose within the rail environment. Considerations must be given to material resistance to ultra-violet light, high humidity, corrosive environments, reflections interfering with signal sighting and/or driver vision and exposure to stray electrical currents;

b) Fitness for purpose within the local environment. For example some structures on coastal lines will need to be able to withstand the corrosive coastal environment;

c) Ease of cleaning, maintenance and replacement;

d) Durability (with emphasis on vandal resistance and moisture resistance);

e) Life cycle costs;

f) Ease of repair and replacement and availability of spare parts. For example where a glass pane is used and is subsequently damaged. Consideration should be given to the replacement time especially when a standard pane is not available;

g) Slip resistance surfaces;

h) Structural integrity (particularly resistance of materials, fastening devices and support systems to train-generated vibrations).

13.3 MATERIALS AND FINISHES - GENERAL REQUIREMENTS

a) Finishes shall be durable, easily cleaned, non-combustible and be replaced with the minimum of disruptions to station operations. Finishes, which minimise the impact of graffiti and are resistant to graffiti solvents are highly recommended.

b) The general design service life should be 100 years with various parts of the station having the following design life periods:

i.	General structures	100 years
ii.	Drainage elements that are not accessible	100 years
iii.	Sign Faces	20 years
iv.	Platform Faces and Coping	50 years
v.	Support structures	50 years
vi.	Other station furniture	40 years
vii.	Lighting	20 years

viii.	Floor Finishes	40 years
ix.	Retaining Walls	50 years
x.	Architectural Linings	40 years

c) All materials and surfaces shall be high quality, cost effective over the life of the station and easily cleaned and managed;

d) Corrosion, air pressure and vibration – Selected materials should be reviewed for corrosion resistance including stray electric currents and also the effects of air pressure and vibration due to train movements on materials, fixings and support systems;

e) All materials and surfaces that may have an impact on the operational railway and any other area where this creates a secondary hazard should be anti-glare and non-reflective. This includes overhead structures such as footbridges;

f) Weather Seals – All internal openings will have rubber seals or brush seals to reduce the ingress of insects and dust and minimise draft;

g) Where there is no chair rail, handrail or transom, all frameless or fully glazed doors, sidelights, including any glazing capable of being mistaken for a doorway or opening, shall be clearly marked for their full width with a solid contrasting line. The contrasting line shall be not less than 75 mm wide and shall extend across the full width of the glazing panel. The lower edge of the contrasting line shall be located between 900mm and 1000mm above the plane of the finished floor level. Any contrasting line shall provide a minimum of 30% luminance contrast when viewed against the floor surface or surfaces within 2m of the glazing on the opposite side;[42]

h) For station upgrades to existing stations, consideration of new structural elements adjacent to life expired elements, listed in Section 13.3 part (b) of this document need to be considered in the full scope of the station upgrade. (I.e. it is not appropriate to extend/modify or refurbish a platform where the adjacent platform face/ground anchors are near/of life expired.

13.4 THE USE OF GLASS IN STATIONS

The following should be considered when proposing glass in or adjacent to public areas in railway stations.

i. Security & Safety
   a. Passive surveillance;
   b. Vandalism – impact – kick – propelled object – scratch;
   c. Accidental damage;
   d. Screening or enclosure (to prevent unlawful access, exposure to danger);
   e. Structural stability / crowd loading;
   f. Elimination of glare and reflection onto the operational railway and any other area where this creates a secondary hazard.

ii. Passenger Comfort
   a. Protection from weather;

[42] AS 1428.1 Clause 6.6 Visual indicators on glazing.

b. Thermal effects;
c. Enable natural light entry;
d. Enhance the quality and perception of the space.

iii. Maintenance

a. Cleaning – both inside and outside, as in the case of lifts;
b. Proximity of glass to live rail and requirements for occupations for construction, maintenance and repair;
c. Replacement and the availability of replacement components;
d. Repair (including enclosed elements).

13.4.1 Design Requirements

All glass within a public area reach zone should be filmed to prevent scratching vandalism.

For further design requirement for the use of glass in lifts please refer to the VRIOGS 002.6 Lift General Requirements.

SECTION 14.0 MAINTENANCE REQUIREMENTS

Station buildings, structures, services and systems shall all incorporate the necessary maintenance access and safe working requirements within their design. This may include providing a functional space to maintain equipment, providing the appropriate installations to access equipment and providing safe working systems when maintenance is to be been carried out.

The design and engineering maintenance requirements for the maintenance of stations buildings, structures, services and systems shall include;

a) Ladders and catwalks – Elevated areas of the station including roofs, ceilings and soffits shall be readily accessible by either movable ladders, staging or by fixed installations comprising ladders as required;

b) Fall arrest systems shall be incorporated into the design of any building and/or structure where there is a requirement to service mechanical roof mounted equipment or the need to access the roof to clear stormwater collectors. . The fall arrest system may include a horizontal lifeline, rails and safety mesh under the roof. What ever fall arrest system is to be install it shall comply with AS 1891.4 - Industrial fall-arrest systems and devices - Selection, use and maintenance;

c) Platform pits – Access to platform pits shall be away from the platform edge and avoid key circulation paths;

d) Access to all voids and ventilation shafts – Suitable safe inspection or physical access shall be provided to all voids and shafts. All voids shall be ventilated to the relevant BCA standard.

SECTION 15.0 STATION SERVICES AND SYSTEMS

15.1 OBJECTIVE

This section details the design requirements of the services and systems which are required or impinge on stations.

15.2 DESIGN CONSIDERATIONS

Station services and systems need to be carefully incorporated into station design with respect to the accommodation of:

a) Plant, equipment and controls;

b) Cable/conduit/pipe routes;

c) Junctions with related major trunk services;

d) Critical proximities, clearances, separation and/or safety precautions.

15.3 MINIMUM FOOTPRINT FOR STATION SERVICES AND SYSTEMS

The minimum footprint for a selection of station services and systems which impinge on stations is shown in Table 15.

Component	Minimum footprint
Communications equipment room (CER) where required	15.5 m^2 arranged to achieve the minimum clearances specified in VRIOGS 013.1.
Signal equipment room (Relay room) where required	12 m^2
Signal Equipment Room (Signal computer based interlocking equipment room) where required	8 m x 4m (32 m^2)
Smart card ticketing equipment room (Power and communication cabinet)	3 m^2 Internal 1.5m x 2.5m External

Table 15: Minimum footprint for station services and systems

15.4 COMMUNICATIONS EQUIPMENT ROOM (CER)

The communications equipment room is a controlled and secure environment capable of accommodating equipment associated with CCTV equipment, VicTrack communications services, public address equipment and train radio equipment. It shall be provided where advised as a project specific requirement, or where the requirements of the station project identified during design planning cannot be accommodated in the existing equipment room. VicTrack in conjunction with DOT and the relevant ARO shall approve any final CER layout and specification.

15.4.1 Location

As far as possible from the station business area so that station staff are not inconvenienced by heat, noise and maintenance activities. Consideration shall be given to ensure access to the CER is provided 24 hours, 7 days a week, which in the majority of cases means access will need to be provided from the platform.

If the CER is provided as part of the main building structure, the designer needs to determine how access is to be attained to meet these requirements.

15.4.2 Design Requirements

A communications room where required shall be designed and constructed as per VRIOGS 013.1 - Standard Brief for Communications and CCTV Equipment Room. It shall be accessible to the infrastructure maintainer and VicTrack on a 24/7 basis and only via separately keyed locked door/s with a monitored security system.

15.5 SIGNALS EQUIPMENT ROOM (SER)

The signals equipment room is provided to house equipment associated with signal systems. It shall be provided where advised by the Department of Transport, or where the requirements of the station project identified during design planning cannot be accommodated in the existing equipment room.

15.5.1 Location

As far as possible from the station business area so that station staff are not inconvenienced by heat, noise and maintenance activities.

15.5.2 Design Requirements

A signalling equipment room where required shall be designed and constructed as per VRIOG Standard 012.2 - Specification for Signalling Supply, Construction and Installation. It shall be accessible to the Infrastructure maintainer only via separately keyed locked doors with a monitored security system.

15.6 SMART CARD TICKETING CABINET

An area should be provided at all stations to house smart card ticketing cabinets. The cabinet can be either located on the platform (external) or in a room (internal). It shall be provided where advised by the DOT in the project brief, or where the requirements of the station project identified during design planning.

15.6.1 Location

Smart card ticketing cabinets are to be situated on each single faced platform or island platforms as far as possible from the station business area so that station staff are not inconvenienced by heat, noise and maintenance activities. Preferably smart card ticketing cabinets are to be located externally on platforms or other publicly accessible areas to minimise the need for building and track access formalities. Where cabinets are located indoors they are to be in dedicated lockable plant rooms located next to or nearby the communications room.

15.6.2 Design Requirements

It shall be accessible to the Infrastructure maintainer only via separately keyed locked doors.

15.7 CONDUITING OF SERVICE

All underground services shall be designed and constructed beneath railway tracks or within railway property in accordance with VRIOGS 013.3, VRIOGS 012.2.1, AS4799 - Installation of Underground Utility Services and Pipelines within Railway Boundaries and AS 3000.

The underground services in a typical station may include:

a) Low Voltage Power for
    i. Platform lighting;
    ii. Power points;
    iii. Smart card ticketing
b) Communications for
    i. Public address system;
    ii. Safety zone (red and green button intercom);
    iii. Post phone;
    iv. PIDS;
    v. Clock;
    vi. Smart Card Ticketing;
    vii. CCTV.
c) VicTrack fibre (separate lockable system)
d) Signals (low voltage, signals communications and high voltage)Smart Card Ticketing)

All cables shall be accessible for routine and regular maintenance without the need to interrupt train or station operations including passenger circulation areas. All service pits shall be either labelled with 'communication' or 'electrical services' as appropriate.

All new solid fill platforms shall include provisions for service routes to be placed in conduit. The conduit shall be accessible by covers, setback from the platform edge, so as to allow access for working while the station is open to the public and to avoid conflict with the location of the TGSI's. Location of service pits should be away from any surface drains or potential surface water collection.

Smart card ticketing equipment is not to be combined with nor integrated into other switchboards, equipment racks or other components. The smart card system operates completely independently and is required to be accessible to specialists without requiring access to locked or inaccessible spaces. Conduiting of services for smart card ticketing system shall be designed, One cable, one conduit for both power and communications. Where smart card ticketing is to be installed provision shall be made to allow for future expansion, additional floor ducting for smart card gates and conduit in the ground for FPD's, CVM's and SEM's to allow for the number of addition devices should be provided.

15.7.1 Engineering Requirements

The engineering design requirement for platform cross-section and surfaces construction elements shall include service pits covers that are engineered to withstand a loading of 7.5 kPa and be suitably well secured so as not to become dislodged as a result of the aerodynamic effect. The preferred minimum service pits are to be a P2 (533mm Length x 180mm Wide x 514mm Depth) in size. They shall be designed to AS3996 - Access Covers and Grates. Pits shall be level and when located in earth filled platforms shall have a concrete apron for stability.

Where grates are to be installed they shall comply with the AS1428.1 as outlined in Section 9.7.4 of this document.

As part of the site Information and Communications Technology (ICT) infrastructure supporting public transport, communications conduits, pits and cables shall be designed to conform to VRIOGS 013.3 Generic ICT communications pathway specifications.

As part of the site signalling infrastructure supporting public transport, signalling conduits, pits and cables shall be designed to conform to VRIOGS 012.2.1 Standard for Construction of Cable Route and Signalling Civil Works.

Low voltage and Communication systems are to utilise separate conduit systems that conform to AS 3000, VicTrack and VRIOG Standards.

15.8 ELECTRICAL SYSTEMS

15.8.1 Objective

Safe and efficient electrical supply is required at every station and comprises an electrical arrangement for station services from the station main switchboard. At larger station the electrical supply may be required to provide additional facilities, which will be determined in consultation with the rail operator.

15.8.2 Detailed Requirements - Electrical

Electrical elements that are to be design for at a station include the following:

a) Station power supply;

b) Station main switchboard;

c) Supply for station systems;

d) Communication and data system;

e) Lighting.

15.8.3 Standards

Electrical installation at new stations or upgrade projects will comply with of all the relevant codes and in accordance with the requirements of all regulatory authorities, in particular VRIOG Standard 010.1 'Lighting and Power Design and Construction'.

15.8.4 Station Power Supply and Station Switchboard

a) Location

Low voltage and mechanical service switchboards shall not be installed in staff areas. All switch boards shall be located for 24 hour access by railway operator's maintenance staff. Switchboards are to be clearly shown on design drawings.

VRIOGS 010.1 outlines the requirements in relation to station power supply and station switchboard design requirements. Please refer to this document for further design requirements.

15.8.5 Lighting

a) Design considerations

The fundamental standard of designing installations shall have full regard to whole of life economic factors, energy conservation and maintenance requirements. Station lighting shall be designed and constructed to VRIOGS 010.1. All new and upgraded stations shall use white light throughout the station including the station carpark. Section 9.14 lists detailed design requirements for external lighting specifically in relation to platform lighting.

Typically to provide low voltage power and communication services, where possible two pits should be provided at the base of each light pole.

15.8.6 Communication and Data System

The main data backbone and cabling systems shall consist of fibre-optic, copper and leaky co-axial cables.

a) Location

The Information and Communications Technology (ICT) equipment and systems are generally housed in an ICT Rack in the Communications Equipment Room, designed and built to the VRIOGS (see Section 15.4). Where this is not possible, detailed design will need to clearly show locations of communications cabinets, free standing and wall mounted. Additional cooling for these devices will need to be considered in mechanical services design. Installation of communication cabinets in station staff areas should be avoided

b) Engineering Requirements

ICT equipment racks where required shall met the requirements detail in the 'Generic Station ICT System Specifications' document.

15.8.7 Supply for Station Systems

Where communications equipment rooms and signalling equipment rooms are provided, separate distribution boards shall be installed within these rooms to feed the separate equipment room outlets. This is to ensure that communications services and signalling services are not compromised or tripped by faults, transients and noise general light and power circuits.

Uninterruptible power supplies to the communication and signalling equipment systems shall be provided to ensure smoothing of the power supply and to allow seamless transfer to an alternative main power source in the event of a failure.

For further design and engineering requirements for the power supply for station systems please refer to the VRIOGS 013.1, VRIOGS 012.2 and VRIOGS 012.4.

15.8.8 Labelling

All light fittings, electrical circuits and power points are to be labelled as per the ICT nomenclature specification.

SECTION 16.0 EXTERNAL STATION AREAS

External areas that may be incorporated within a station are intermodal facilities, bicycle parking facilities, station car parking facilities and waste disposal facilities.

16.1 INTERMODAL FACILITIES

Interchange facilities are provided to assist passengers to change from one mode of transport to another. The type of interchange facilities that may be provided at a station include:

a) Bus stopping areas ranging from a single on-street bus stop, to dedicated bus bays or off-street bus/rail interchanges;

b) Tram zones;

c) Taxi zones;

d) Bicycle parking;

e) Car parking ranging from small off-street at grade to large multi-storey car parks;

f) Kiss 'n' Ride zones (including accessible drop off areas).

A hierarchy of access priority should be considered when allocating space to the various modes, as follows:

g) Pedestrians – arriving and waiting;

h) Informal bike storage (small number of bike racks);

i) Bike cages (At established station this may not be possible, and a position away from the station may be necessary);

j) Disabled car parking (as close to the station entrance as possible);

k) Taxi ranks;

l) Kiss 'n' Ride;

m) Emergency service vehicles (as close as possible to the station entrance);

n) Service vehicles (as close as possible to the station building);

o) Bus – including train replacement buses.

Further afar:

p) Tram (stop location and track of low flexibility);

q) Private car parking and secure staff parking.

16.1.1 Design Requirements

Intermodal facilities may be simple or complex depending on the patronage and demand for services. Interchange facilities shall provide transfer between services that is accessible, efficient, easy, safe and equitable for all passengers. The needs of the commuters at modal interchanges can be summarised as:

a) Well lit, safe waiting facilities with shelter and seating;

b) Close to the station, therefore minimising the distance and the length of time taken to interchange;

c) Provide accessible, clear, continuous and direct routes to transit stops and between modes of transport. Ensure high visibility, activity and surveillance along these routes;

d) Safe access to the station with adequate directional signage to ease the complexity of navigating an unfamiliar interchange;

e) Where feasible a covered walkway should be provided between intermodal facilities particularly between train and wheelchair accessible taxi loading area, taxi waiting areas and bus services;

f) Accommodate current capacity and future growth;

g) Integrate with the surrounding urban environment.

The accessibility of the station should be enhanced by providing access for arrival by each mode in accordance with its relative space needed and priority for passengers. The context and local urban design will impact significantly on the layout of what can be designed and liaison with local authorities, land owners and public transport operates may be required to achieve good accessibility, safety and amenity for public transport passengers.

16.2 BICYCLE PARKING AND STORAGE

Dedicated bicycle parking facilities (hoops and secure bicycle cages) are being incorporated into stations to promote the use of the railway and provide convenience for railway customers.

16.2.1 Location

Ideally secured bicycle parking should be located on the 'up side of a station'. It should be equally accessible from both sides of the railway line and as a general rule; the level of accessibility from different directions for the secured bicycle parking should be comparable to that provided for patronage accessing the station by walking and private vehicles (park and ride). Bicycle parking facilities should be located in:

1. A convenient location as close as practically to the station entrance at street concourse level;
2. Prominent, very visible, well illuminated area that is at a minimum able to fall under good passive surveillance;
3. Located where there is easy access to bicycle trails or dedicated bike paths;
4. Located away from trees and bus/taxi shelters.

16.2.2 Design Requirements

The number and type of bicycle facilities will be determined by the station category and expected passenger patronage, though bike hoops should be provided at a minimum. Bicycle parking facilities should be designed to meet the following minimum requirements:

1. Comply with AS2890.3 – 'Parking Facilities - Bicycle Parking Facilities';
2. Easy to find and sign posted where necessary to direct cyclist to bicycle parking facilities and to advise the public of there presence;
3. Designed for quick and easy maintenance and kept clean along with the surrounding station area on a regular basis;

4. Operated requiring minimum intervention by station staff.

The policy of providing bicycle parking is complemented by the provision of providing Parkiteer bicycle cages at stations where a need has been identified for them. The design requirements for bicycle cages have been determined with all bike cages having standard dimensions as follows:

Parkiteer bicycle secure storage cages	2.9m high by 7m (L) x 5m (W)

The required number of bicycle cages, if any, is determined by Bicycle Victoria in conjunction with the rail operator and the Department of Transport. However, if Bicycle Victoria cannot determine demand, typically the bike cage slab is still included in the design of the station (for a future bike cage)

16.3 STATION CAR PARKING

Station car parking provided adjacent to railways stations promote the use of the railway and provide convenience for railway customers. Long term commuter car parking is generally provided by the railway operators for this purpose where land is available and demographics and demand dictate. Station car parks should be designed and developed within context of the local surroundings. Station car parking shall be:

1. Clean.
2. Safe.
3. Secure.
4. Well lit as per VRIOG Standard 008.2 Car Park General Requirements.
5. Provide an easily negotiated, safe and secure path to the railway station

16.3.1 Design Requirements

The size and shape of the car parking sites are the principal determinants in designing the most efficient parking site layout. Designers should seek consultation from DOT and the railway operators on a case by case basis to determine the minimum number of parking spaces. Allowances may be made for kiss 'n' ride zones, bus interchanges, taxi zones, motorcycle parking, staff parking where required and bicycle cages and/or hoops. The facilities to be provided should be determined in consultation with the railway operator and the Department of Transport.

DDA-compliant disabled car parking shall be provided within the car park. The ratio of disabled car parking spaces to normal car parking spaces shall be 1:50[43]. Disabled car parking spaces shall be marked with the access symbol on the pavement and signage. An accessible path must be provided from any disabled car parking to a station entry, which includes ramps, walkway lighting and other facilities, all in accordance with the DSAPT. Parking layout should minimize the length of the accessible route to the platform

At stations where trains terminate and/or train stabling facilities are provided, car parking for train drivers may be required. The size and shape of the car parking site will be based on the staff numbers and designers should seek input from DOT and the ARO on a case by case basis. The train staff parking area shall be separated from the main station car parking by fencing and a barrier to allow staff cars to be left securely parked.

[43] BCA Clause D3.5 Car Parking

VRIOG Standard 008.2 'Car Park General Requirements' and VRIOG Standard 008.2.1 'Gazetted Car Park Signs General Requirements' outlines further design and engineering requirements in relation to station car parks.

16.4 WASTE DISPOSAL FACILTIES

Waste disposal facilities range from fully enclosed, weather protected spaces to simple chain wire mesh enclosures. The size and nature of the required facilities are determined by the station waste generation rate, available collection services, proposed bin sizes and local authority public health requirements.

16.4.1 Location

The waste disposal facilities should be located near the station building. It should be easily accessible from the car park zone for pickup and the platform for waste disposal.

16.4.2 Design Requirements

The size of the waste disposal area will depend on the number and size of the bins to be accommodated. These numbers should be determined in consultation with the ARO and the DOT. The design requirements are as follows:

1. The minimum dimension for waste disposal/recycling is $12m^2$. This dimension provides room for at least 1 general waste dumpster and 1 recycling waste dumpster and is large enough to accommodate the easy manoeuvre and sorting of empty and full bins. Where the bin requirement is more then that described above then the waste disposal/recycling dimension should be increased to cater for this;
2. The waste disposal area shall be fenced off and accessible by station staff with a key;
3. The waste disposal shall be screened from public view;
4. Allowance for waste truck access and turning circles shall be considered in the location and design of the disposal area;
5. The waste disposal area shall be of durable construction, so that waste disposal truck access will not damage pavement surfaces.

PART B DDA DESIGN AND ENGINEERING REQUIREMENTS

This section describes the engineering and DDA design requirements that are contained within the DSAPT, applicable Australian standards as nominated in this document, DOT design requirements and accredited rail operator's design requirements for station design and its associated infrastructure. The engineering design requirements described in this section are either mandatory by legislation (e.g. DSAPT) or mandatory to meet the policy requirements of the Department of Transport or the operation requirements of the accredited rail operators.

SECTION 17.0 CIRCULATION – ENGINEERING AND DDA REQUIREMENTS

The following are the engineering requirements that are contained within DSAPT, applicable Australian Standards nominated within this document, DOT design requirements and the ARO's design requirements in regards to circulation elements within station design.

17.1 ACCESS PATH

The engineering design requirements for access paths include:

a) The access path shall have a continuous unobstructed width of not less then 1200mm wide.[44] Walkways shall be provided with landings, as specified in Section 17.2, at intervals not exceeding the following:

   i. For walkway gradients of 1 in 33, at intervals no greater than 25 metres;

   ii. For walkway gradients of 1 in 20, at intervals no greater than 15 metres;

   iii. For walkway gradients between 1 in 20 to 1 in 33, at intervals that's shall be obtained by linear interpolation;

   iv. For walkways shallower than 1 in 33, no landings are required.[45]

b) Where the path of travel is less then 1800mm wide, passing spaces shall be provided for two wheelchairs to pass each other at intervals of not more than 6m. Passing spaces dimension are outlined in DSAPT, Clause 4.1, please refer to this for more information;[46]

c) Where the access path includes a moving walkway the minimum obstructed width may be 850mm;[44]

d) Where ramps form part of the access path, ramps shall be designed to comply with Section 17.2 of this standard;

e) The access path shall have a minimum unobstructed height of 2000mm or 1900mm at doorways.30

[44] DSAPT Part 2 Access Paths
[45] AS 1428.1 Part 10 Walkways, Ramps and Landings
[46] DSAPT Part 4 Passing Areas

f) The access path shall provide a manoeuvring area of 2070mm X 1540mm (2270mm X 1740mm preferred) in the direction of travel to provide for a wheelchair to make a 180° turn;[47]

g) The access path shall ensure that obstacles that abut an access path have a luminance contrast with a background of not less than 30%[44]

h) A resting point that shall include seats shall be provided for passengers along an access path if the walking distance between facilities or services exceeds 60 metres.[48].

17.2 RAMPS AND LANDINGS

The engineering design requirements for ramps and landings include:

a) Ramps shall have an unobstructed width of not less then 1800mm.

b) Ramps shall have a maximum longitudinal gradient of 1:14.[49]

c) Ramps shall be provided with landings at the top and bottom of the ramp and at intervals not exceeding[49]:

   i. For ramps of longitudinal gradients of 1 in 14: 9m.

   ii. For ramps of longitudinal gradients of 1 in 20: 15m and

   iii. For ramps of longitudinal gradients between 1 in 14 and steeper then 1 in 20, at intervals which shall be obtained by linear interpolation.

d) Where a ramp intersects a property boundary or an internal corridor, the ramp is to be setback by a minimum of 900mm so that the handrail and TGSIs do not protrude into the transverse path.[50]

e) Landings shall be of minimum 1200mm length including top and bottom of the ramp, as shown in Figure 7.[49]

f) Ramps shall have a handrail complying with Section 17.4 on each side of the ramp, as shown in Figure 7.

g) Have a constant gradient.

h) The ramp surface shall be designed as per Section 17.4.1 Surfaces.

i) Tactile Ground Surface Indicators shall be provided at the top and bottom of the ramp as indicated in Section 17.5 Tactile Ground Surface Indicators.[49]

j) Ramps and landings shall be designed so that water does not accumulate on surfaces and not have a crossfall greater then 1:40.[49]

Note: A table for calculating the length of a ramp for various rises and gradients is provided in Appendix C

[47] DSAPT Part 3 Manoeuvring Areas
[48] DSAPT Section 5.1 Resting Points
[49] DSAPT Part 6 Ramps
[50] AS 1428.1 Clause 10.3 Ramps

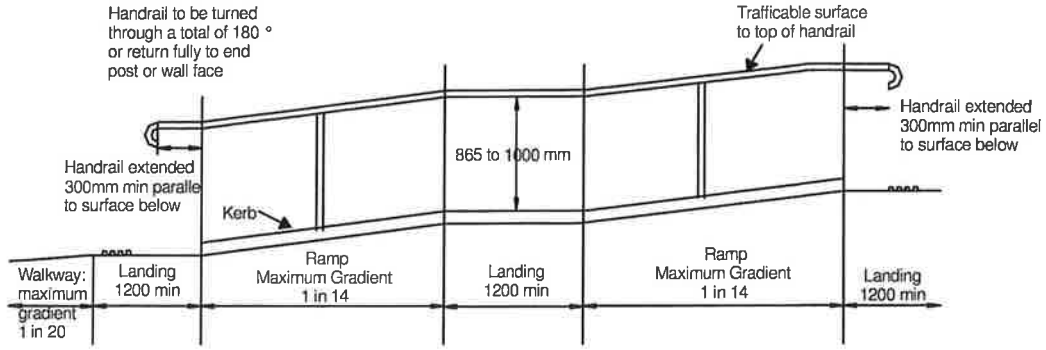


Figure 7: Ramp Handrails and Landings

17.3 STAIRS

The engineering design requirements for Stairs include:

a) The tread and rise configuration for each step shall be as follows:

   i. The tread is to be between 275 to 300mm;

   ii. The rise is to be between 150 to 165mm with a toe in of maximum 25mm;

   These dimensions are shown graphically in **Error! Reference source not found.**;

b) Non-slip, luminance contrasting material shall be located on the nosings of the tread of 50 to75mm wide and 25mm to 50mm high as shown in **Error! Reference source not found.**. They shall be designed so as to not create a trip hazard;[51]

c) Stairways shall not be provided with more then 18 risers between landings;

d) Stairs shall have opaque risers, open risers shall not be provided[51];

e) Stairway handrails shall be accordance with Section 17.4 Handrails and Grabrails

f) Tactile Ground Surface Indicators shall be provided at the top and bottom of stairs as directed in Section 17.5 Tactile Ground Surface Indicators. [60]

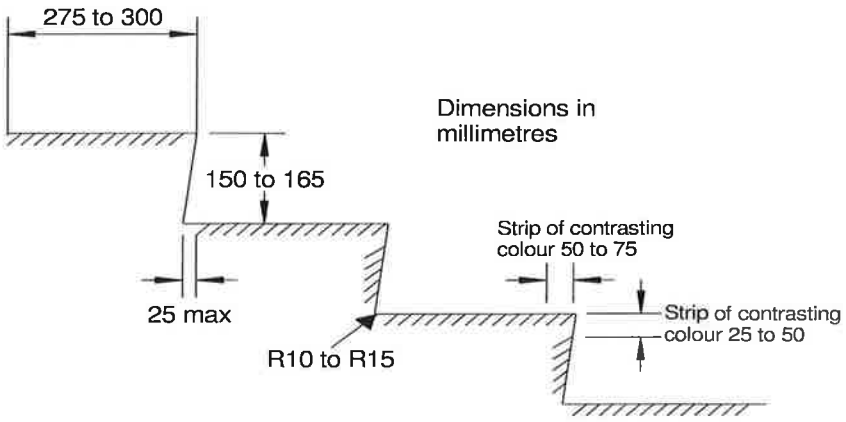


Figure 8: Cross Section of Stairs

[51] DSAPT Clause 14 Stairs

17.3.1 Stairs Landings

Stairway landings shall be designed and constructed in accordance with the following:

a) Provide a minimum stair landing of 1500mm long;

b) Landings shall be free draining. The landing level is to be at a maximum gradient of 1 in 50 (but riser height shall remain constant across the width of the tread).

17.4 HANDRAILS AND GRABRAILS

The engineering design requirements for Handrails and Grabrails include:

a) The design and construction of handrails shall comply with AS 1428.1;[52]

b) The top of the handrails shall be located not less then 865mm nor more than 1000mm above the nosing of stairway tread or the plane of finished floor of the walkway, ramp or landing (See Figure 7)[52];

c) The end of the handrail shall be extended parallel to the surface below for a minimum of 300mm (450mm is preferred). The end shall be continuous rail, turned down 100mm or be returned fully to the end post of the wall face. Where a handrail is not continued, a tactile button shall be provided 150mm from the end[52];

d) Handrails shall be provided along an access path wherever passengers are likely to require additional support[52];

e) Handrails shall not rotate within their fittings[52];

f) Grabrails shall not be less than 30mm and not more than 40mm diameter;

g) A grabrail or handrail shall be provided at fixed locations where passengers are required to pay fares[52];

17.4.1 Stairway Handrails

The installation of stairway handrails shall be in accordance with the following:

a) A handrail on steps need not extend beyond the top or bottom of the steps;[53]

b) Where there is a background wall, handrails shall have a luminance contrast factor with the wall of not less than 0.3 (30 percent).[53]

17.5 SURFACES

The engineering design requirements for surfaces include:

a) Surfaces to have a slip-resistant surface (They shall be designed to a minimum rating of R10 as outlined in AS 4586) of a texture (especially in areas which are regularly exposed to wet weather), which is traversable by people who use a wheelchair and those with an ambulant or sensory disability;[54]

b) Abutment of different surfaces shall have a smooth transition.[54]

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[52] DSAPT Clause 11 Handrails
[53] DSAPT Clause 11 Handrails
[54] DSAPT Clause 10 Surfaces

17.6 TACTILE GROUND SURFACE INDICATORS (TGSI'S)

TGSIs assist people with vision impairment to orientate and navigate their way around the built environment. Warning tiles (dots) alert them to hazards such as a change in level or direction of an access path, and directionals assist them to cross open space where there are no other cues such as a fence or building line.

Early consultation with people with vision impairment may be warranted. Paving should be designed to accommodate the installation of TGSIs of integral ceramic design, applied plastic types or stainless steel without conflict. There should be no small gaps or discrepancies in levels causing a trip hazard or compromise to the TGSI layout.

The engineering design requirements for Tactile Ground Surface Indicators are

a) Warning TGSIs are required on train stations along the platform edge of the platform, at the top and bottom of stairs, ramps and escalators, overhead obstructions below a height of 2000mm, hazards within a circulation space or adjacent to a path of travel and at various other locations as set out in the DSAPT[55]. The style and dimensions of TGSIs must comply with AS1428.4;

b) Close to the edges of railway platforms continuous strips of hazards tiles 600mm wide shall be installed. However where discrete TGSI dots are used, this width may be reduced to 585mm.[55]

c) The TGSI shall consist of appropriate hazard warning markers which have a luminance contrast of 30% for solid tiles and 45% for discrete units;[Error! Bookmark not defined.]

d) The luminance of the paving surface has to be measured before each installation. If the luminance of the paving surface is less then 17.4 cd/m², the TGSI's will comply with the relevant DDA standards. If the paving surface shows areas brighter then 17.4 cd/m², appropriate actions should be discussed;

e) Directional TGSI's installation should be kept at a minimum and should only be used where it is really necessary. Examples where directional TGSI's should be used are across wide open spaces, and when there are no other tactile cues for navigation such as a fence, kerb or wall.

17.7 SYMBOLS

The engineering design requirements for symbols used within railway station design are:

a) The international symbols for accessibility and deafness shall be used to identify an access path and which facilities and boarding points are accessible.[56]

b) The international symbol for deafness should identify where hearing augmentation of public address systems is used.[57]

[55] DSAPT Clause 18 Tactile Ground Surface Indicators
[56] DSAPT Clause 16
[57] DSAPT Clause 26

PART C PLATFORM ENGINEERING REQUIRMENTS

SECTION 18.0 PLATFORM ENGINEERING REQUIREMENTS

18.1 TRACK ENGINEERING DESIGN REQUIRMENTS AT PLATFORMS

Track engineering design at platforms shall meet the following requirements:

a. Track Geometry

New, or alterations to existing trackside infrastructure should be constructed to a re-engineered track centre-line. This re-engineered track centre-line shall ensure continuity between the track and trackside infrastructure and prevents misalignment of permanent infrastructure.

b. Gradient

The gradient of track passing through a passenger platform should be as level as reasonably practicable and shall not be steeper than 1:150. If it is not possible to achieve this grade due to constraints associated with topography, a risk assessment shall be conducted to demonstrate that a track gradient steeper than 1:150 may be introduced.[58]

At platforms where trains terminate or reverse, the track gradient shall not be steeper than 1:500 as a design limit and 1:250 as an absolute maximum gradient.

c. Track Cant

The maximum allowable cant for track located adjacent to a platform is 50mm. This maximum cant is specified to prevent the movement of wheeled equipment (i.e. wheelchairs) once onboard the train and to minimise the platform edge gap.[59]

d. Track work, Turnouts

Turnouts, points and other crossing works shall not be situated adjacent to platforms. However, under some operational circumstances, turnouts may have to be positioned within a platform. If this is unavoidable the platform coping shall be cut back or a longer turnout provided so as to prevent fouling of rolling stock.[59]

e. The Aerodynamic Effect

The velocity at which trains operate on certain parts of the network is 160kph. Canopies and platform furniture, including seating, rubbish bins, signage, and manhole covers, should all be designed with consideration to the Aerodynamic Effect. [59]

f. Clearances at Curved Platforms

Where track through a platform is permitted to be curved the corresponding platform edge requires special treatment. The height and horizontal clearance of the platform edge is dependant on the curvature of the track and are applied to the platform using a platform gauge. The indication of the relevant offset dimensions is provided in Appendix B)

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[58] MetRail Track Design manual & VRIOG 4.1 Heavy Track Design Manual
[59] VRIOG 002.3 Station Design Standard

Offsets to the platforms opposite and adjacent to the crossing work of transition curves shall be specified by the DOPT.[59]

18.2 PLATFORM LENGTH

The length of a platform is defined as the platform edge distance running parallel to the track from one platform end barrier to its corresponding opposite platform end barrier

18.2.1 Engineering Design Requirements

The engineering design requirements for the platform length shall be as follows:

a) A minimum length of the longest passenger rolling stock serving the platform plus a minimum 10 metres extra for operational requirements. The current default platform length where no further design requirements are specified is:

Metropolitan stations	Minimum operational length of platform is 160m
Regional stations	Minimum operational length of platform is 180m

b) The station design for metropolitan and regional stations shall also allow for future platform extensions. The current default for future platform lengths where no further design requirements are specified are:

Metropolitan stations	A minimum of 230m footprint which can extend in either direction along the existing platform length
Regional stations	A minimum of 250m footprint which can extend in either direction along the existing platform length.

c) When specified that the station is to be used as a combined stop (both Metropolitan and Regional trains utilizing the platform) the platform length shall be designed to the regional platform length requirement.

18.3 PLATFORM HEIGHT

The platform height is defined as the vertical distance separating the adjacent rail head plane and the platform level.

18.3.1 Engineering Requirements

The engineering design requirements for the platform height shall be as follows:

For new platforms or for extensive major alterations to existing platforms the height of the platform shall be:

Platform height of Regional & Metropolitan stations	Height from the top of the rail track level is 1080mm. Accuracy post construction, shall be within +10mm, -0mm.

Note that the platform and corresponding rail alignment shall conform to this height all through the platform length in the longitudinal direction. Where curved platforms are used please refer to Section 18.1 Paragraph f) for technical requirements for platform heights.

Consideration shall also be given, where the platform design permits, in providing space underneath a platform to allow maintenance activities to be performed. A minimum height of 1 metre should be allowed to allow personnel to undertake maintenance work beneath a platform.

18.4 PLATFORM SETBACK WIDTH

The platform setback width is defined as the horizontal distance, square to the track, separating the platform edge and the nearest face of any building element or platform fixture situated on the platform. Building elements and platform fixtures include retaining walls, station building structures, light poles, platform seating, vending machines and rubbish bins.

A minimum platform setback width, established as 2535mm by this standard, is comprised of a number of elements. These elements include an access path as defined by the DSAPT (see Section 17.1) and a warning strip which includes detail such as white coping, yellow safety line and coloured tactile ground surface indicator strip.

18.4.1 Engineering Design Requirements

For both single face and island platforms, the preferred, the DSAPT compliant and the absolute minimum setback platform width shall be:

Platform setback of Regional and Metropolitan stations	**Preferred setback width is 3500mm;** **Fully compliant DSAPT setback width is 3145mm;** **The absolute minimum width is 2535mm.** Note: As per the DSAPT this minimum width can only run for a maximum length of 6 metres before an area to allow 2 wheelchairs to pass each other is provided. See Figure 9 for a diagrammatical representation of the above.

The elements that have determined the desirable and absolute minimum width are explained in detail in Part C Section 18.4.2

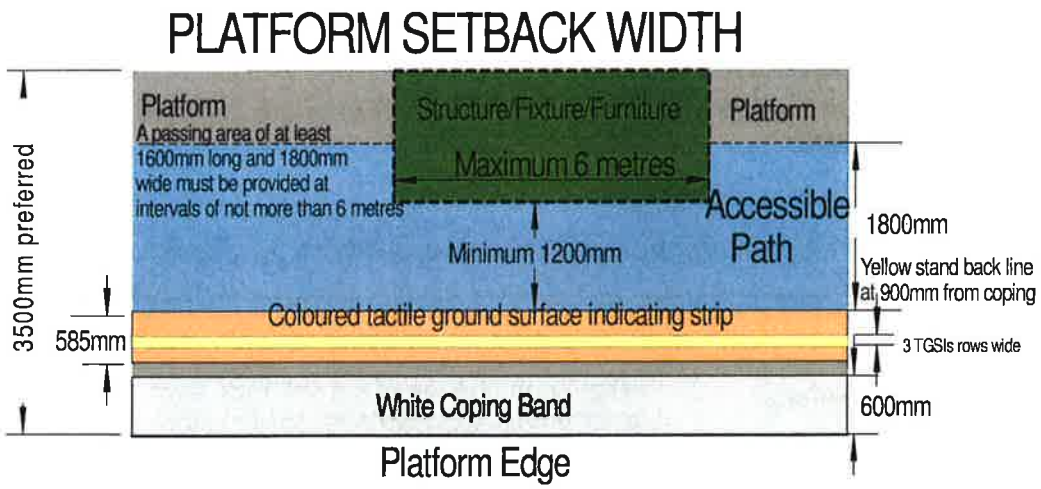


Figure 9: Example of the minimum standard for an access path when the path width is at a 1200mm clearance between the TGSI's and an obstacle.

18.4.2 Platform Warning strip and Accessible Path

The warning strip includes platform edge detail such as white coping, yellow safety line and coloured tactile ground surface indicator strip. For both single face and island platforms, the dimensional requirements for the warning strip and accessible path shall be as outlined in Table 16 below.

Description	Dimensions
Warning strip white coping band	600mm wide from the vertical face of the platform edge
Coloured tactile ground surface indicating strip dimensions	585mm wide using TGSI dots running the length of the platform[60]
Coloured tactile ground surface indicating strip (TGSI's) placement	At regional stations TGSIs shall be setback 900mm from the edge of the platform.
	At metropolitan stations TGSIs shall be setback 750mm from the edge of the platform. Where a metropolitan station platform is used for regional services the metropolitan TGSI standard shall be used for consistency.
Warning strip yellow line	Consists of three rows for Metropolitan stations or two rows for Regional stations of raised TGSIs set back 900mm from the edge of the platform, which are incorporated into a wider band of TGSIs as outlined above.
Accessible path	Desirable width is 1800mm. Absolute minimum width is 1200mm for a maximum of 6 metres.[61]

Table 16: Platform Warning Strip and Accessible Path Dimensional Requirements

The colour of the TGSI dots for the stand back line is yellow and the colour of the other dots along the TGSI located at the edge of the platform is "Light Terracotta" (pathfinder specifications: 1595C Orange MB 30827)

All access paths on platforms shall be designed to meet the following requirements:

a) Run adjacent and parallel to the mandatory TGSIs at the platform edge. The minimum width of the access path should be exclusive of the platform edge TGSIs;

b) As per the DSAPT requirements incorporate passing bays at a maximum of every 6 metres if the absolute minimum width of 1200mm is used for the access path;

c) Be free of any obstructions (For example poles, columns, stanchions, fixtures and fittings)[62];

d) Seats and other fittings/fixtures shall be set back an additional 500mm from access paths and passing bays to ensure unhindered passage.[63]

[60] DSAPT Tactile Ground Surface Indicators Part 18.4
[61] DSAPT Access Paths Part 2.4
[62] DSAPT Access Paths Part 2.5
[63] DSAPT Street Furniture Part 23.1

Dimensional requirements for the warning strip and accessible path are detailed graphically in Figure 9 on the previous page and Figure 10 and Figure 11 on the following page.

REMARK:
*The installation of discrete TGSI dots does not require a surrounding edge of 7.5mm like ceramic tiles. Hence the required width of 600 mm is reduced to 600mm-2*7.5mm=585mm.

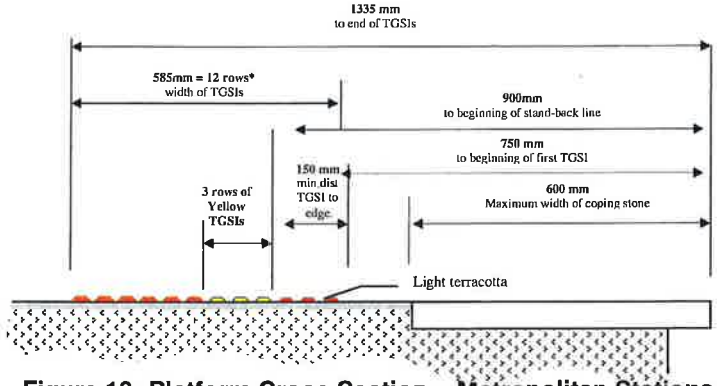


Figure 10: Platform Cross Section – Metropolitan Stations

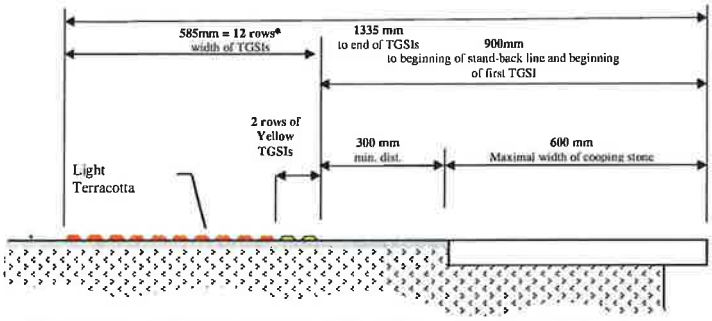


Figure 11: Platform Cross Section – Regional Stations

18.5 PLATFORM CONSTRUCTION ELEMENTS

18.5.1 Platform Loading - Vertical Loads

a) The engineering design for crowd loading on a platform shall meet the following requirement:

Platforms shall be designed for crowd loading in accordance with AS5100.2 – Bridge Design Clause 7, with the following enhancement: Pedestrian live load shall be 5kN/m^2 with no reduction based on loaded area applicable.

b) The engineering design of platforms to allow for maintenance activities on the platform shall meet the following requirement:

All platforms shall be designed to accommodate loads for access equipment utilised for safe working at heights above 2000mm. This access equipment shall not have a safe working load that exceeds 5kN/m^2 (this incorporates a factor of safety of 1.5).

c) Where it can be demonstrated that light vehicles are required for operational and/or maintenance purposes to access the station platform/s the engineering design for haulage equipment on a platform/s shall meet the following requirement:

AS5100.2 Clause 7 specifies a concentrated load of 20kN which is then factored by 2.0 for ultimate limit state design. This is to allow for light vehicle access (where it is possible for vehicles to access a typically pedestrian area) but excludes the use of a Dynamic Load Allowance DLA (impact loading).

18.5.2 Pier Protection at Platforms

A pier is defined as any load bearing member associated with a structure that crosses the track, i.e. a road or foot bridge. Pier protection at platforms shall be designed in accordance with AS5100.2 Clause 10 'Collison Loads'.

The main elements of AS5100.2 Clause 10 'Collison Loads' includes,

a) Where an alternative load path is provided, the superstructure shall be designed with sufficient redundancy to be capable of supporting the deck load plus 20% of the live load at the ultimate limit state with one or more piers or columns removed.

b) Unless specified otherwise by the rail authority, supports for bridges and structures located within 10m of the centre-line of the railway track, not complying with the redundancy requirements of point a), shall be designed to resist the following minimum collision loads applied simultaneously as an ultimate design load with a load factor of 1.0

   i) 3000kN parallel to rails

   ii) 1500kN normal to rails.

   The loads specified in item a) and b) shall be applied horizontally, 2m above the rail level and as an to the following minimum collision loads applied simultaneously as an ultimate design

c) Where supporting elements are located between 10m and 20m from the centre-line of the railway track, a risk analysis shall be carried out by the relevant railway authority, which shall determine the required level of protection. If the level of redundancy does not meet the requirements of point a), the piers and columns shall be designed to resist the minimum collision load applied as an ultimate load of 1500kN, at any angle in the horizontal plane, 2m above the rail.

The structural members that support a platform do not have to be designed in accordance with AS 5100 Clause 10 'Collison Loads', but instead meet the requirements of Part C Section 18.5.1 of this standard.

PART D - STYLE REQUIREMENTS

This section describes the particular style requirements in regards to the fixtures, furnishings, finishes and fittings that have been identified by the AROs and DOT for metropolitan and regional station building components.

SECTION 19.0 STATION COMPONENTS

19.1 TICKET OFFICE

The ticket office should contain at a minimum:

a) Ticket Office Terminal (TOT), Winterm Computer (Winterm), ARCOS Station computer and associated equipment, layout space, and storage space;

b) Joinery with cash drawer;

c) Carpeted floor with underlay;

d) Safe and key storage;

e) Associated equipment and desk space for monitoring/accessing train running;

f) Data/communication points for PCs, fax/printer and telephones;

g) Wall mounted synchronised clock for both staff and customers use.

19.2 GENERAL OFFICE

The general office should contain at a minimum:

a) Control desk with a staff chair/s;

b) Safe;

c) Sign-in bench;

d) Data/communication points for PCs, fax/printer and telephones;

e) Carpeted floor with underlay.

19.3 STATION SUPERVISORS OFFICE

The station supervisor's office should contain at a minimum:

a) Carpeted floor with underlay;

b) Data/communication points for PCs, fax/printer and telephones.

19.4 STATION CONTROL OFFICE

The station control office where provided should contain at a minimum:

a) Carpeted floor with underlay;

b) Data/communication points for PCs, fax/printer and telephones.

19.5 AUTHORISED OFFICERS OFFICE

The authorised officer's office where provided should contain at a minimum:

a) Carpeted floor with underlay;

b) Sign in bench, bulletin boards, and peep holes in external doors;

c) Hand Held Devices (HHD), Holsters (HO), Printers and associated equipment, layout space, and storage space;

d) Data/communication points for PCs, fax/printer and telephones.

19.6 CLEANER'S ROOM

The cleaner's room should contain at a minimum:

a) Cleaners grated sink with hot and cold water;

b) Floor finishes – slip resistant and impervious to attack from concentrated cleaning chemicals;

c) Wall finishes – ceramic wall tiles, directly behind cleaners sink/wet area;

d) Cupboard for the storage of cleaning equipment;

e) Shelving and space for the storage of cleaning materials.

19.7 STORAGE ROOM

The storage room should contain at a minimum:

a) Shelving for general storage.

19.8 STAFF AMENTITIES

a) Kitchen and Meals area

The kitchen and meals area should contain at a minimum:

a) Stainless steel sink and taps with hot and cold water;

b) Ceramic splash backs and resilient floor finish;

c) Preparation bench and cupboard storage. A table with 6 chairs will be appropriate at most stations, though at larger stations a table with capacity of 10 chairs and at smaller stations a table with the capacity for 4 chairs would be sufficient;

d) An under bench instant hot-water and chilled water unit;

e) For shared drivers facilities a bench mounted ice machine unit is required;

f) Fire blanket.

b) Staff Toilets/Shower

The staff toilets/shower should contain at a minimum:

a) Ceramic wall & floor tiles;

b) Ceramic toilet fixtures and fittings;

c) Staff showers (where required), to be provided with solid shower screens, change area, folding seating and privacy screen/door;

d) Hot and Cold Water supply.

c) Locker room/area

The locker room/area where provided should contain at a minimum:

a) Lockers (metropolitan stations 305mm wide, 1800mm long) and change bench;

b) Resilient floor finish.

SECTION 20.0 PASSENGER AREAS AND FACILITIES

20.1 PASSENGER TOILETS AND BABY CHANGE FACILITIES

a) Male Toilet Facilities should contain at a minimum:

a) Toilet cubicles with engaged/vacant locks;
b) Ceramic toilets with lids;
c) Concealed cisterns to mitigate vandalism;
d) Stainless steel sani step urinal or equivalent, with sensor flush, which is installed 'flush' with the finished floor level;
e) Stainless steel toilet paper dispenser (recessed;
f) Robust, vandal proof toilet partitions with graffiti proof finishes and coatings;
g) Ceramic underbench handbasins (concealed service);
h) Electric hand dryer with automatic sensor;
i) Soap dispensers over hand basins;
j) Waste bins (mounted and recessed) – only when a paper towel dispenser is provided;
k) Floor drains and cleaners tap;
l) Ceramic wall and floor tiles – floor to ceiling.
m) Wall mounted mirror
n) Syringe disposal unit (subject to ARO).

b) Female Toilet facilities should contain at a minimum:

a) Toilet cubicles with engaged/vacant locks;
b) Ceramic toilets with lids;
c) Concealed cisterns to mitigate vandalism;
d) Stainless steel toilet paper dispenser (recessed);
e) Robust, vandal proof toilet partitions with graffiti proof finishes and coatings;
f) Ceramic underbench hand basins (concealed service);
g) Electric hand dryer sensor;
h) Soap dispensers over hand basins;
i) Waste bins (mounted and recessed) – only when a paper towel dispenser is provided;
j) Floor drains and cleaners tap;
k) Ceramic wall and floor tiles – floor to ceiling;
l) Sanitary disposal;
m) Syringe disposal unit (subject to ARO);
n) Wall mounted mirror.

c) Disabled Persons Toilet/Baby Change Facility should contain at a minimum

a) Concealed cisterns to mitigate vandalism;
b) Stainless steel toilet paper dispenser (recessed);
c) Robust, vandal proof toilet partitions with graffiti proof finishes and coatings;
d) Ceramic underbench hand basins (concealed service);
e) Electric hand dryer with automatic sensor;
f) Soap dispensers over hand basins;
g) Waste bins (mounted and recessed) – only when a paper towel dispenser is provided;
h) Floor drains and cleaners tap;
i) Ceramic wall and floor tiles – floor to ceiling;
j) Stainless steel grab rails;
k) Baby change table;
l) Sanitary disposal;
m) Syringe disposal unit (subject to ARO);
n) Wall mounted mirror in accordance with AS 1428.1.

20.2 WAITING AREA – (ENCLOSED WITHIN A STATION BUILDING)

The waiting area (enclosed within a station building) should contain at a minimum:

a) Where ceiling are installed, ceilings lower then 2700mm are to be solid plaster. Light fittings are to be vandal proof;
b) Walls to internal/external areas to waiting rooms are particularly vulnerable to vandalism and as such are to be a minimum smooth stopped painted fibre cement sheet 12mm thick.

SECTION 21.0 REFERENCES

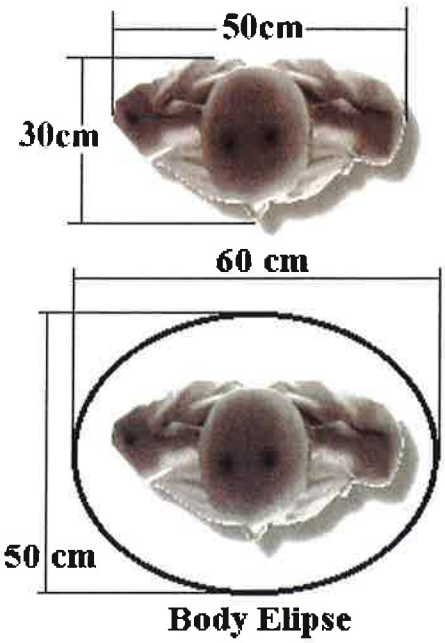
The following documents have been used as references in preparation and usage of this Standard:

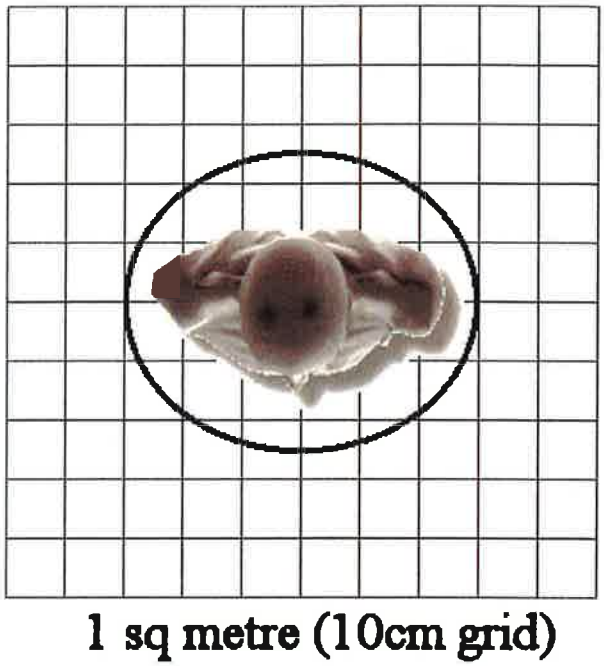
- Australian Standard AS1158.4: The lighting of urban roads and other public thoroughfares
- Australian Standard AS1428 Design for Access and Mobility
- Australian Standard AS1428.2: Design for access and mobility, Part 2 : Enhanced and additional requirements – Buildings and Facilities
- Australian Standards AS1668.2 : The use of ventilation and air-conditioning in buildings – Ventilation design for indoor air contaminant control
- Australian Standard AS1680 – Interior Lighting
- Australian Standard AS2107 – Ambient Sound Levels for Areas of Occupancy within Buildings
- Australian Standard AS2293 – Parts 1, 2 & 3 Emergency Lighting, Installation and Maintenance
- Australian Standard AS3000 – SAA Wiring Rules
- Australian Standard AS4292.2: "Railway Safety Management Part 2: Track, civil and electrical infrastructure".
- Australian Standard AS4799: 'Installation of Underground Utility Services and Pipelines within Railway Boundaries'.
- Australian Standard AS5100 : Bridge Design
- Building Code of Australia (BCA)
- Disability Standards for Accessible Public Transport 2002
- Disability Standards for Accessible Public Transport Amendment 2004 (No. 1)
- Disability Standards for Accessible Public Transport Guidelines 2004 (No. 2)
- General Criteria for Development at Railway Locations – Railway Operations and Engineering Design and Construction Aspects (ENG-AD-STD-0001)
- Heritage Act 1995
- National Code of Practice for Australian Rail Operation: Volume 4 "Track, civil and electrical infrastructure".
- PTC Train Overhead Design Standards for the Construction of New Railway Overhead Works – Issue Three (1997).
- Fruin, John J., Pedestrian Planning and Design, 1971
- Victorian Building Regulations
- RailCorp Station Design Standard Requirements July 2008
- Generic Station ICT system specification
- Patron Access at Rail Stations – Options and Issues – Maunsell/Aecom 2005
- Metropolitian Station Design Guidelines April 2010 Draft Rev 1)
- Victorian Electrical Safety (Installations) Regulations
- VRIOGS 001 Structural Gauge Envelopes - Minimum clearances for Infrastructure adjacent to the Railway
- VRIOGS 002.6 Lift General Requirements
- VRIOGS 008.2 Car park General Requirements
- VRIOGS 008.2.1 Gazetted Car Park Signs General Requirements
- VRIOGS 011.1 VRIOGS 011.1 General Rail Bridge Requirements
- VRIOGS 012.2 Specification for Signalling Supply, Construction and Installation
- VRIOGS 012.2.1 Standard for Construction of Cable Route and Signalling Civil Works
- VRIOGS 013.1 Standard Brief for Communication and CCTV Equipment Rooms

SECTION 22.0 APPENDIX

APPENDIX A FRUIN LEVELS OF SERVICE

The Fruin Levels of Service is a concept used in the design of places of public assembly. It utilises a typical body ellipse (see diagram below) to represent the space occupied by a person without touching an adjacent person i.e. it is slightly more than the space occupied by the physical person.





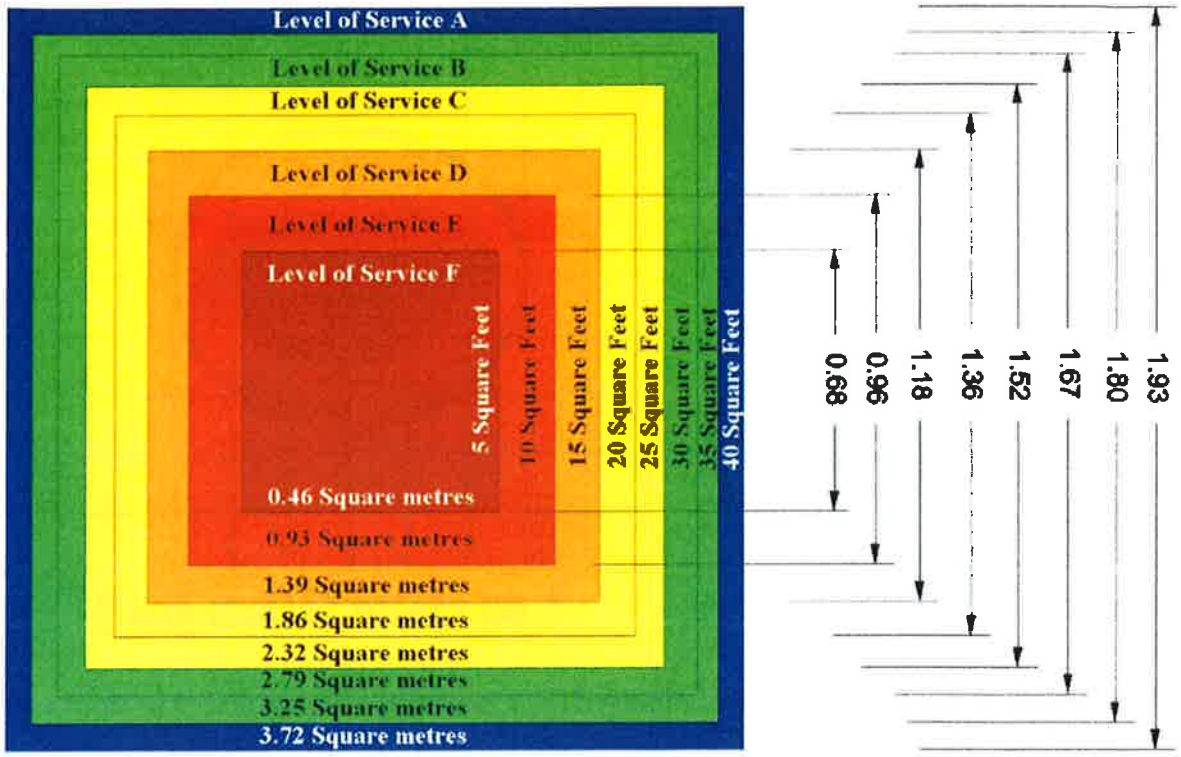
These dimensions are based on the following data. Converting from feet (Fruin) to Metres (metric) we derive the following table.

Fruin Level of Service	Area Per Person Square Feet	Sq Metres	Edge Feet	Edge Metres	Density
LoS F	5	0.46	2.24	0.68	2.17
LoS E	10	0.93	3.16	0.96	1.08
LoS D	15	1.39	3.87	1.18	0.72
LoS D	20	1.86	4.47	1.36	0.54
LoS C	25	2.32	5.00	1.52	0.43
LoS B	30	2.79	5.48	1.67	0.36
LoS B	35	3.24	5.92	1.80	0.31
LoS A	40	3.72	6.32	1.93	0.27

In the Level of Service concept flow rate is expressed as a function of density. As the density increases the flow rate increases, reaches a Maximum then drops again. Area per person for Level of Service A indicates above as greater than 3.24 square metres per person. However this causes a little confusion - the table below shows the conversion by using colours to indicate the appropriate Level of Service.

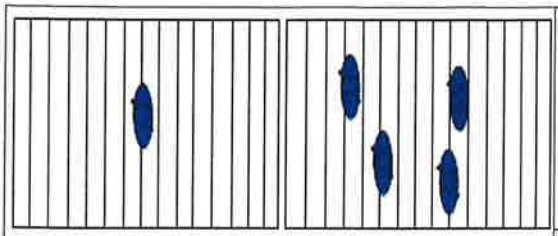
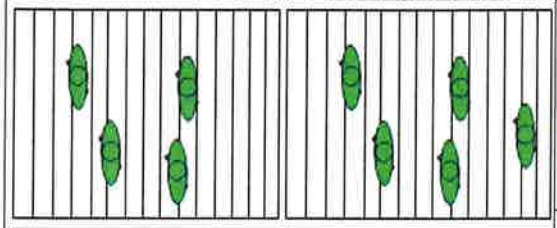
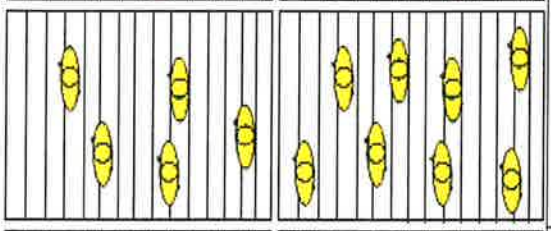
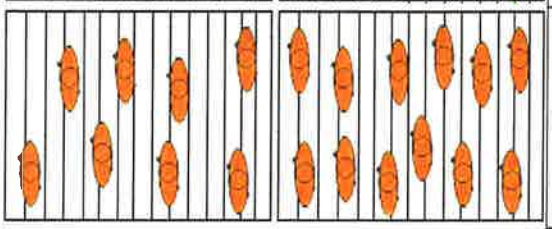
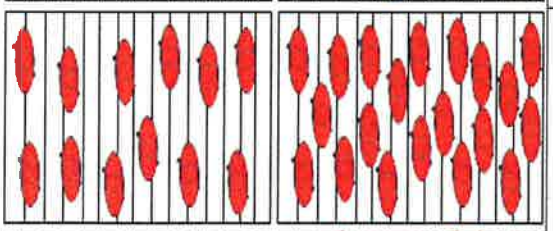
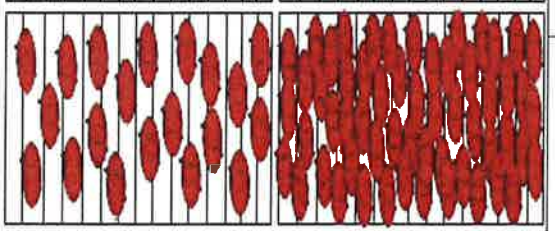
Fruin Level of Service	Space (m^2/ped)	Density (ped/m^2)	Flow Rate (ped/min/m)
LoS A	≥ 3.24	≤ 0.27	≤ 23
LoS B	2.32 to 3.24	0.43 to 0.31	23 to 33
LoS C	1.39 to 2.32	0.72 to 0.43	33 to 49
LoS D	0.93 to 1.39	1.08 to 0.72	49 to 66
LoS E	0.46 to 0.93	2.17 to 1.08	66 to 82
LoS F	≤ 0.46	> 2.17	variable

We display this as an area graph to highlight the Levels of Service as a square area



LoS	Density (ped/m^2)	Space (m^2/ped)	Space (ft^2/ped)	Flow Rate (ped/min/m)	Flow Rate (ped/min/ft)	Av. Speed (m/s)	Av. Speed (ft/min)	Capacity v/c ratio
LoS A	≤ 0.27	≥ 3.24	≥ 35	≤ 23	≤ 7	≥ 1.3	260	0.0 to 0.3
LoS B	0.43 to 0.31	2.32 to 3.24	25 to 35	23 to 33	7 to 10	1.27	250	0.3 to 0.4
LoS C	0.72 to 0.43	1.39 to 2.32	15 to 25	33 to 49	10 to 15	1.22	240	0.4 to 0.6
LoS D	1.08 to 0.72	0.93 to 1.39	10 to 15	49 to 66	13 to 20	1.14	225	0.6 to 0.8
LoS E	2.17 to 1.08	0.46 to 0.93	5 to 10	66 to 82	20 to 25	0.76	150	0.8 to 1.0
LoS F	> 2.17	≤ 0.46	< 5	variable	variable	≤ 0.76	≤ 150	variable

By taking an area 3 metres long by 1 metre wide we can display the above as a series of graphics (see below).

	**Level of Service A.** Flow rate less than 23 people per metre per minute. Virtually unrestricted choice of speed; minimum manoeuvring to pass; crossing & reverse movements are unrestricted.
	**Level of Service B.** Flow rate 23 to 33 people per metre per minute. Normal walking speeds only occasionally restricted; some occasional interference in passing; crossing & reverse movements are possible with occasional conflict.
	**Level of Service C.** Flow rate 33 to 49 people per metre per minute. Walking speeds are partially restricted; passing is restricted but possible with manoeuvring; crossing and reverse movements are restricted and require significant manoeuvring to avoid conflict, flow is reasonably fluid.
	**Level of Service D.** Flow rate 49 to 66 people per metre per minute. Walking speeds are restricted and reduced, passing is rarely possible without conflict; crossing and reverse movements are severely restricted with multiple conflicts; some probability of momentary flow stoppages when critical densities might be intermittently reached.
	**Level of Service E.** Flow rate 66 to 82 people per metre per minute. Walking speeds are restricted and occasionally reduced to shuffling; frequent adjustment of gait is required and passing is impossible without conflict; crossing and reverse movements are severely restricted with unavoidable conflicts; flow achieves maximum capacity under pressure, but with frequent stoppages and interruptions of flow.
	**Level of Service F.** Flow rate variable. Walking speed is reduced to shuffling; passing is impossible, crossing and reverse movements are impossible; physical contact is frequent and unavoidable; flow is sporadic and on the verge of complete breakdown and stoppage.

It should be noted that various crowd demographics can skew the above - such as the number of elderly or mobility impaired present in the crowd. Excerpt taken from 'Crowd Dynamics' website.

The widths of the key station elements – ramps, escalators and stairs – can be tested using a level of service approach whereby the recommended width is calculated by:

Width required = pedestrians/unit time/service level flow rate.

The service level flow rates normally adopted are shown in Table 7

	Flow Rate (pedestrians/m/min)	
Service Level	**Walkway or Ramp**	**Stair**
A	23	16
B	28	20
C	41	26
D	58	38
E	74	49

The following service levels are applicable to stairs and ramps:

1. Service level C is recommended for heavily used transportation terminals and links that have approximately equal flows in each direction
2. Service Level D represents some probability of intermittently reaching critical density on the walkway link, and is recommended for minor counter flows: and
3. Service Level E is recommended for short periods in the most crowded areas and where there are no counter flows.

APPENDIX B CLEARANCES AT CURVED PLATFORMS

The clearances given in this table are to be adopted for all new station platforms and are the desirable clearances for existing platforms. Where there are extensive substantial to existing platforms these offsets and clearances shall also be adopted.

TABLE 5.8.1 – NEW PLATFORMS – REQUIRED CLEARANCES

Radius of Curve Metres	Horizontal Clearances to Platform Coping		Minimum Horizontal Clearances to Platform Facing	
	Offsets from platform gauge mm	Distances from track centreline to platform coping mm	Offsets from platform gauge mm	Distances from track centreline to platform coping mm
Over 1500 to Straight	25	1550	200	1725
Over 1000 to 1500	40	1565	215	1740
Over 750 to 1000	55	1580	230	1755
Over 600 to 750	70	1595	245	1770
Over 500 to 600	80	1605	255	1780
Over 450 to 500	90	1615	265	1790
Over 400 to 450	100	1625	275	1800

Note: 1. The above clearances are based on 26 metre long carriages with18.3 metre bogie centres. Refer to 1992 ROA Manual of Engineering Standards and Practices, Diagrams 18.4 and 18.5 and 2002 Code of Practice for the Defined Interstate Rail Network Figures 7.6 and 7.7.

2. The above offsets and clearances allows for the passage of the above vehicle with 75mm gap between the vehicle and the coping or platform edge.

APPENDIX C RAMP LENGTH RECKONER

DDA Compliant 1 in 14 Ramps 1.2m landings at minimum intervals of 9m		**1 in 8 Ramps No Landings**
Vertical Rail Clearance (m)	Ramp Length (m)	Ramp Length (m)
1	17.6	8.0
2	34.0	16.0
3	49.2	24.0
4	65.6	32.0
5	80.8	40.0
6	97.2	48.0
7	112.4	56.0
8	128.8	64.0
9	144.6	72.0
10	160.4	80.0

Note Appendix C assumes that the ramps are straight in nature. Ramps lengths will be longer for ramps that double back due to the increased length of the ramp landings.

UNSW Academic Calendar and Key Major Events

UNSW

Appendix I

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APPENDIX I – UNSW Academic Calendar and Key Major Events

Screen Shots from UNSW webpages at - https://student.unsw.edu.au/calendar

Academic Calendar – Core Kensington / COFA

UNSW Academic Calendars

Here you can access Academic Calendar information for students. Please check the starting dates for each of your courses as they will vary depending on the specific teaching period offered. Most teaching periods fall between early March and late November, in Semesters 1 and 2. Summer Term offers a limited range of courses in December and January.

UNSW Academic Calendar

For all students except AGSM MBA, Faculty of Medicine and UNSW Canberra

Academic Year	2014	2015**	2016**
Summer Term	2 Dec 2013- 7 Feb 2014	1 Dec 2014- 6 Feb 2015	30 Nov 2015- 5 Feb 2016
Teaching period U1	2 Dec - 7 Feb	1 Dec - 6 Feb	30 Nov - 5 Feb
Teaching period U1C	9 Dec - 31 Jan	8 Dec - 30 Jan	7 Dec - 29 Jan
Christmas/New Year recess	20 Dec - 5 Jan	20 Dec - 4 Jan	19 Dec - 3 Jan
Teaching period U1B	6-31 Jan	5-30 Jan	4-29 Jan
Study period U1B, U1C	1-6 Feb	TBA	TBA
Study period U1	8-13 Feb	TBA	TBA
Exams U1B, U1C	7-11 Feb	TBA	TBA
Exams U1	14-17 Feb	TBA	TBA
Semester 1	**3 Mar- 30 Jun 2014**	**2 Mar- 29 Jun 2015**	**29 Feb- 27 Jun 2016**
O-Week	24-28 Feb	23-27 Feb	22-26 Feb
Teaching period T1	3 Mar - 6 Jun	2 Mar - 5 Jun	29 Feb - 3 Jun
Teaching period T1A	10 Mar - 17 Apr	9 Mar - 24 Apr	7 Mar - 22 Apr
Mid-semester break	18-27 Apr	3-12 Apr	25 Mar - 3 Apr
Teaching period T1B	28 Apr - 6 Jun	27 Apr - 5 Jun	26 Apr - 3 Jun
Study period T1	7-12 Jun	6-11 Jun	4-9 Jun
Exams* T1	13-30 Jun	12-29 Jun	10-27 Jun
Mid-year recess	1-27 Jul	30 Jun - 26 Jul	28 Jun - 24 Jul
Semester 2	**28 Jul- 25 Nov 2014**	**27 Jul- 24 Nov 2015**	**25 Jul- 22 Nov 2016**
O-Week	23-25 Jul	22-24 Jul	20-22 Jul
Teaching period T2	28 Jul - 31 Oct	27 Jul - 30 Oct	25 Jul - 28 Oct
Teaching period T2A	4 Aug - 12 Sep	3 Aug - 11 Sep	1 Aug - 9 Sep
Mid-semester break	27 Sep - 6 Oct	26 Sep - 5 Oct	24 Sep - 2 Oct
Teaching period T2B	15 Sep - 31 Oct	14 Sep - 30 Oct	12 Sep - 28 Oct
Teaching period T2C	3-28 Nov	2-27 Nov	31 Oct - 25 Nov
Study period T2	1-6 Nov	31 Oct - 5 Nov	29 Oct - 3 Nov
Exams* T2	7-22 Nov	6-24 Nov	4-22 Nov

** Examination dates are provisional and subject to change*

*** Subject to final approval*

Academic Calendar for Medicine

Here is the Academic Calendar for students in the UNSW Faculty of Medicine.

Academic Calendar (Faculty of Medicine)

The calendar is only for students in the Faculty of Medicine.

Medicine I, II	**2014**	**2015**
Teaching period 1	3 Mar - 4 May	2 May - 3 May
Mid-semester break	21-27 Apr	6-12 Apr
Teaching period 2	5 May - 29 June	4 May - 28 Jun
Mid-year break	30 Jun - 20 Jul	29 Jun - 19 Jul
Teaching period 3	21 Jul - 14 Sep	20 Jul - 13 Sep
Recess	15-21 Sep	28 Sep - 4 Oct
Teaching period 4	22 Sep - 16 Nov	14 Sep - 15 Nov
Study & exam period	17 Nov - 5 Dec	16 Nov - 4 Dec
Note: Teaching activities in Years I & II are limited to 7 weeks with end-of-course exam in Week 8 of each Teaching Period.		
Medicine III - Coursework students	**2014**	**2015**
Semester 1	3 Mar - 29 Jun	2 Mar - 28 Jun
Mid-semester recess	21-27 Apr	6-12 Apr
Mid-year break	30 Jun - 20 Jul	29 Jun - 19 Jul
Semester 2	21 Jul - 16 Nov	20 Jul - 15 Nov
Recess	1-7 Sep	31 Aug - 6 Sep
Study & exam period	17-28 Nov	16-27 Nov
Medicine III - ILP students	**2014**	**2015**
Semester 1	17 Feb - 29 June	TBA
Mid-semester recess	21-27 Apr	TBA
Mid-year break	30 June - 20 July	TBA
Semester 2	21 Jul - 16 Nov	TBA
Recess	1-7 Sep	TBA
Medicine IV - Coursework students	**2014**	**2015**
Semester 1	3 Mar - 29 June	2 Mar - 28 Jun
Mid-semester recess	21-27 Apr	2-12 Apr
Mid-year break	30 June - 20 July	29 Jun - 19 Jul
Semester 2	21 Jul - 16 Nov	20 Jul - 15 Nov
Recess	1-7 Sep	31 Aug - 6 Sep
Study & exam period	17-28 Nov	16-27 Nov

Academic Calendar – Medicine (continued)

Medicine IV - ILP students	**2014**	**2015**
Semester 1	17 Feb - 29 Jun	16 Feb - 28 Jun
Mid-semester recess	21-27 Apr	6-12 Apr
Mid-year break	30 Jun - 20 Jul	29 Jun - 19 Jul
Semester 2	21 Jul - 16 Nov	20 Jul - 15 Nov
Recess	1-7 Sep	31 Aug - 6 Sep
Note: Phase 2 Portfolio is due end of Semester 2		
Medicine V	**2014**	**2015**
Summer teaching period	13 Jan - 9 Mar	12 Jan - 8 Mar
Teaching period 1	10 Mar - 11 May	9 Mar - 10 May
Mid-semester recess	7-13 Apr	6-12 Apr
Teaching period 2	12 May - 6 Jul	11 May - 5 Jul
Mid-year break	7-13 Jul	6-12 Jul
Teaching period 3	14 Jul - 7 Sep	13 Jul - 6 Sep
Recess	8-14 Sep	7-13 Sep
Teaching period 4	15 Sep - 9 Nov	14 Sep - 8 Nov
Study and exam period	10-21 Nov	9-20 Nov
Medicine VI	**2014**	**2015**
Summer teaching period	13 Jan - 9 Mar	12 Jan - 8 Mar
Teaching period 1	10 Mar - 11 May	9 Mar - 10 May
Mid-semester recess	7-13 Apr	6-12 Apr
Teaching period 2	12 May - 6 July	11 May - 5 Jul
Mid-year break	7-13 July	6-12 Jul
Teaching period 3	14 Jul - 7 Sep	13 Jul - 6 Sep
Study and exam period	8 Sep - 12 Oct	7 Sep - 11 Oct
Teaching period 4	13 Oct - 21 Nov	12 Oct - 21 Nov

Academic Calendar – AGSM / MBA Programs

Academic Calendar AGSM MBA Programs

Here is the Academic Calendar for students in the AGSM MBA Programs.

Academic Calendar (AGSM MBA Programs)

This Academic Calendar is only for students in AGSM MBA programs.

MBA Program

Program	2014
Orientation	13-16 Jan
Foundations of management	17 Jan - 7 Feb
Session 1	**10 Feb - 11 May**
Exam week	5-9 May
Break	12-23 May
Session 2	**26 May - 31 Aug**
Exam week	11-15 Aug
Break	1-12 Sep
Session 3	**15 Sep - 14 Dec**
Exam week	8-12 Dec
Break	15 Dec - 5 Jan 2015
Continuing students*	
Session 4	**13 Jan - 13 Apr**
Exam Week	7-11 Apr

* Only Session 1 is different from commencing students; Sessions 2 and 3 are the same.

MBA (Executive) Program (Strategic Management Year)

N.B. SM Year teaching sessions are 10-week periods within these dates, depending on cohort allocation
Visit AGSM timetables and key dates for details.

Program	2014
Session 1	6 Jan - 11 Apr
Session 2	31 Mar - 4 Jul
Session 3	30 Jun - 26 Sep
Session 4	22 Sep - 19 Dec

Graduate Certificate in Change Management and Graduate Diploma in Management

Program	2014
Session 1	3 Feb - 2 May (including 1 wk mid-term break)
Exams	5 May
Session 2	26 May - 15 Aug
Exams	18 Aug
Session 3	8 Sep - 28 Nov
Exams	1 Dec

UNSW Examinations – Examination Room Locations

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UNSW Examinations: Examination Room Locations

To view a map of the examination rooms, click the relevant link below:

To Examinations main page

MAIN KENSINGTON CAMPUS	*Location*	*Map*
INTERNAL	On-campus examinations run by individual Schools, please consult School for venue information	View Map
EXTERNAL	Off-campus examinations run by individual Schools, please consult School for venue information	View Map
MATHEWS	Mathews Building, F23. Level 3 Rooms 309, 310, 311, 312	View Map
QUAD	Quadrangle Building, E15, Rooms G046, 1043, 1023	View Map
SCIENCE THEATRE	Science Theatre, F13	View Map
The Scientia - Gallery	Scientia Building Gallery Room G19 *(Southern end, enter near Civil Engineering building entrance)*	View Map
The Scientia - Leighton Hall	Scientia Building Leighton Hall, G19 *(Northern end, entry via main foyer door)*	View Map
The Scientia - Tyree	Scientia Building Tyree Room, G19 *(Southern end upstairs, enter near Civil Engineering building entrance)*	View Map
Law Building	Law Building, F8, Rooms 162, 163, 201, 202, 203, 275, 276, 301, 302, 303, 388, 389	View Map
Tyree Energy Tech Bld (Rm G15)	Tyree Energy Technologies Building, H6, Ground Floor	View Map

RANDWICK RACECOURSE	*Location*	*Map*
Oaks Marquee Randwick R'course	Oaks Marquee, Randwick Racecourse	View Map
Kensington Rm R'wick R'course	Kensington Room (Ground Floor), Randwick Racecourse	View Map
Grandview Rm R'wick R'course	Grandview Room (Level 1), Randwick Racecourse	View Map
Royal Ballroom R'wick R'course	Royal Randwick Ballroom (Level 2), Randwick Racecourse	View Map
Centennial Rm R'wick R'course	Centennial Room (Level 3 South), Randwick Racecourse	View Map
Skyline Room R'wick R'course	Skyline Room (Level 3 North) Randwick Racecourse	View Map

Useful Links

Exams at UNSW - essential information for students
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Caculators in exams
Academic Misconduct
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