Client Design Requirements for Accessible Tram Stops

Foreword

These Client Design Requirements for Accessible Trams Stops (CDR) represent the Department of Transport’s (DOT) requirements that planners, designers, engineers and project managers need to take into account when developing a tram stop for the Melbourne network.

The CDR does not replace existing processes for tram stop development but provides clarification on the DOT interpretation of the Disability Discrimination Act 1992 (DDA) Disability Standards for Accessible Public Transport 2002 (DSAPT). The CDR will assist DOT and the providers and suppliers of public transport meet the compliance requirements set out in the DSAPT and improve access to the tram network for people with a disability.

The document itself builds on existing work within DOT and incorporates policies and standards from VicRoads and Yarra Trams to provide a single point of reference when considering tram stop design. The development of the CDR is a good example of cooperation across key agencies integral to the design, operation and management of road based transport in Victoria.

HECTOR MCKENZIE
DIRECTOR OF PUBLIC TRANSPORT
December 2010.

Department of Transport

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1.0 APPLICATION

These Client Design Requirements are to be used to deliver accessible tram stops on the Melbourne network. The document includes the functional requirements for passenger amenity, accessibility, tram operations and road design and traffic management that apply to the development of platform tram stops.

This document is to be used in conjunction with the Disability Standards for Accessible Public Transport (DSAPT) 2002, referenced Australian Standards and other applicable Regulations including VicRoads’ Guidelines and documents. Where ambiguity exists between the referenced documents, the DSAPT shall take precedence.

The word ‘Shall’ is to be understood as mandatory.

The word ‘Should’ is to be understood as non-mandatory (i.e. advisory or recommended).

EXCEPTIONS

Where space is not available to meet the minimum DSAPT requirements, an Exception process applies and the issue shall be referred to the Department of Public Transport (DOT) for consideration and approval. The Department may accept a proposal that does not meet DSAPT requirements only in certain circumstances.

The DSAPT requirements are the minimum standards required for people with a disability to safely manoeuvre around the public transport system. However: in a mass transport system; where possible and practicable, design and construction should not be based on minimum standards but the best achievable.
## 2.0 DEFINITIONS

Terminology used and/or applied in this document is based in the DDA 1992 and DSAPT 2002 and clarified as follows. A number of the definitions are illustrated in Figure 1 (Client Design Requirements: Illustrations of Definitions).

<table>
<thead>
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<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accessible</td>
<td>Describes all or part of a facility or site that can at least be approached, entered and used by people with disabilities</td>
</tr>
<tr>
<td>Access path</td>
<td>A continuous path that provides access to and from a conveyance, facility, building or service</td>
</tr>
<tr>
<td>Accessible tram stop</td>
<td>A DDA compliant tram stop that can be used by people with a disability</td>
</tr>
<tr>
<td>AHRC</td>
<td>Australian Human Rights Commission</td>
</tr>
<tr>
<td>Approach Side Stop</td>
<td>A tram stop located on the approach side of an intersection, that is, prior to the traffic lights.</td>
</tr>
<tr>
<td>ATSP</td>
<td>The Accessible Tram Stop Program</td>
</tr>
<tr>
<td>Concept design scheme</td>
<td>A sketch arrangement of the proposed configuration of a tram stop, or group of tram stops, used as the basis of a consultation process with a municipal council, or councils</td>
</tr>
<tr>
<td>Crash protection</td>
<td>Barriers or bollards to protect people in cars and passengers at tram stops from being injured in the event of a vehicle crash into a tram stop</td>
</tr>
<tr>
<td>Departure Side Stop</td>
<td>A tram stop located on the departure side of an intersection, that is, after the traffic lights</td>
</tr>
<tr>
<td>DDA compliant tram stop</td>
<td>A tram stop that has been designed and constructed to incorporate not less than the minimum requirements of the DSAPT with respect to access and facilities for people with a disability</td>
</tr>
<tr>
<td>Design Speed</td>
<td>The speed at which a road has been designed to operate safely at for matters such as clearances to obstruction, sight distances, etc. It is at least the posted speed limit, but can be higher.</td>
</tr>
<tr>
<td>Designer</td>
<td>The organisation contracted to undertake the design and documentation for a tram stop</td>
</tr>
<tr>
<td>DBYD</td>
<td>Dial Before You Dig</td>
</tr>
<tr>
<td>DOT</td>
<td>Department of Transport</td>
</tr>
<tr>
<td>Front edge of platform</td>
<td>That platform edge, parallel to the rails, which is nearer the rails</td>
</tr>
</tbody>
</table>
### 2.0 DEFINITIONS

Terminology used and/or applied in this document is based in the DDA 1992 and DSAPT 2002 and clarified as follows. A number of the definitions are illustrated in Figure 1 (Client Design Requirements: Illustrations of Definitions).

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Functional specification</strong></td>
<td>A list of agreed site-specific requirements for a proposed tram stop design which is signed off by the Partners</td>
</tr>
<tr>
<td><strong>Handover Package</strong></td>
<td>The data set that specifies the scope of work for the detailed design of an accessible tram stop</td>
</tr>
<tr>
<td><strong>Inbound</strong></td>
<td>Tram direction of travel towards the Melbourne CBD</td>
</tr>
<tr>
<td><strong>Intersection stop</strong></td>
<td>A tram stop located at a road intersection</td>
</tr>
<tr>
<td><strong>Kerb/Step ramp</strong></td>
<td>A short access path ramp steeper than 1 in 14 but not steeper than 1 in 8, and not longer than 1520mm, to cross the kerb at the road edge</td>
</tr>
<tr>
<td><strong>Landing</strong></td>
<td>A resting area at the top and bottom of a ramp</td>
</tr>
<tr>
<td><strong>Leading end</strong></td>
<td>The tram departure end of a platform</td>
</tr>
<tr>
<td><strong>Luminance contrast</strong></td>
<td>The amount of light reflected from one surface or component, compared to the amount of light reflected from the background or surrounding surfaces. See Australian Standard AS/NZ1428.4 (2009)</td>
</tr>
<tr>
<td><strong>Median stop</strong></td>
<td>A DDA compliant tram platform stop located in a roadway median or reservation or a grassed reservation</td>
</tr>
<tr>
<td><strong>Mid-block stop</strong></td>
<td>A tram stop at locations other than a road intersection</td>
</tr>
<tr>
<td><strong>Municipal footpath network</strong></td>
<td>The footpath network in the vicinity of a tram stop administered by the local municipality or VicRoads. May include paths, car parks and other open areas which pedestrians traverse in order to reach the approach path to the tram stop</td>
</tr>
<tr>
<td><strong>O&amp;HS Act</strong></td>
<td>Occupational Health &amp; Safety Act 2004 (Victorian legislation)</td>
</tr>
<tr>
<td><strong>Operating speed</strong></td>
<td>85th percentile vehicle speed as measured at a particular location</td>
</tr>
<tr>
<td><strong>Outbound</strong></td>
<td>Tram direction of travel away from the Melbourne CBD</td>
</tr>
<tr>
<td><strong>Pair of stops</strong></td>
<td>A platform structure on each of the inbound and outbound tram tracks at one location</td>
</tr>
<tr>
<td><strong>Partners</strong></td>
<td>Department of Transport, Yarra Trams and VicRoads</td>
</tr>
<tr>
<td><strong>Path of travel</strong></td>
<td>The alignment taken along a path, landing, ramp, walkway or other space used for circulation</td>
</tr>
<tr>
<td><strong>Pedestrian refuge</strong></td>
<td>A protected area, at road level, at the foot of the ramp</td>
</tr>
<tr>
<td><strong>Platform</strong></td>
<td>An elevated area protected from traffic for passengers to move on and off trams</td>
</tr>
</tbody>
</table>
## 2.0 Definitions

Terminology used and/or applied in this document is based in the DDA 1992 and DSAPT 2002 and clarified as follows. A number of the definitions are illustrated in [Figure 1](Client Design Requirements: Illustrations of Definitions).

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<thead>
<tr>
<th>Term</th>
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<tr>
<td>Platform cross fall</td>
<td>The gradient of the platform, measured between edge strips</td>
</tr>
<tr>
<td>Platform height</td>
<td>The vertical distance between the nearest rail head plane and the front edge of the platform</td>
</tr>
<tr>
<td>Platform length</td>
<td>The length of structure at a uniform height above the rail</td>
</tr>
<tr>
<td>Platform tram stop</td>
<td>The area of the tram stop, raised above the tram tracks, that provides level access to trams</td>
</tr>
<tr>
<td>Platform width - gross</td>
<td>The overall horizontal distance, perpendicular to the front edge of the platform, to the rear edge of the platform and including a 200mm wide kerb. Where an ‘F Barrier’ is installed for additional VicRoads road safety requirements this gross width must be increased by 185mm</td>
</tr>
<tr>
<td>Platform width - nett</td>
<td>The clear horizontal distance, perpendicular to the front edge of the platform to the platform side face of the rear fence</td>
</tr>
<tr>
<td>Posted speed</td>
<td>Maximum legally enforced speed a motorist may travel on a section of road</td>
</tr>
<tr>
<td>Prevailing Speed</td>
<td>The speed that motorists have been observed to actually travel along a particular stretch of road</td>
</tr>
<tr>
<td>Program Manager</td>
<td>The Department of Transport’s representative responsible for the Accessible Tram Stop Program</td>
</tr>
<tr>
<td>Rail head</td>
<td>Top surface of tram track</td>
</tr>
<tr>
<td>Ramp</td>
<td>An inclined access way that connects the designated DDA access end of the platform with a pedestrian refuge, pavement level road, municipal footpath network or pedestrian road crossing, at a longitudinal gradient steeper than 1 in 20, but not steeper than 1 in 14</td>
</tr>
<tr>
<td>Ramp length</td>
<td>The horizontal distance from the end of the platform to the beginning of the pedestrian refuge at pavement level or intermediate landing</td>
</tr>
<tr>
<td>Refuge</td>
<td>A place that provides protection for passengers</td>
</tr>
</tbody>
</table>
| Right of Way                              | 1. **Tram Lanes (part time or full time)** - Delineated by a solid yellow line; road traffic is not allowed to drive along tram tracks whilst tram lanes are operating. Some are full time tram lanes (e.g. within CBD) and some are part time tram lanes operating at specific times of the day (usually peak). Traffic may enter a tram lane to avoid an obstacle or turn right.  
2. **Tramway** - Delineated usually by some sort of physical separation (e.g. separation kerbing): road traffic is not allowed to drive along tram tracks at any time except to avoid an obstacle. |
## 2.0 DEFINITIONS

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</tr>
</thead>
<tbody>
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<td>3. Median/Parkway/Light Rail</td>
<td>Where tram tracks are fully separated from general traffic by physical means (e.g. tram tracks within a central median in the road) or run in its own reserve (e.g. through a park or an old railway reserve).</td>
</tr>
<tr>
<td>Road Safety Auditor</td>
<td>Road Safety Auditors, prequalified by VicRoads, provide audit works impacting roads from a safety perspective.</td>
</tr>
<tr>
<td>Running edge of rail</td>
<td>The inside vertical face of the rail head that provides the contact point with the wheel flange of the tram</td>
</tr>
<tr>
<td>Signalised Pedestrian Access</td>
<td>Traffic light triggered by a pedestrian to stop road traffic and permit safe access to the tram stop</td>
</tr>
<tr>
<td>Trailing end</td>
<td>The tram arrival end of a platform</td>
</tr>
<tr>
<td>Tram operator</td>
<td>Holder of the current Franchise Agreement with the State of Victoria. At present, the tram operator is Yarra Trams</td>
</tr>
<tr>
<td>Tram stop</td>
<td>A designated area for picking up and setting down tram passengers</td>
</tr>
<tr>
<td>Tactile Ground Surface Indicators (TGSI)</td>
<td>Tactile Indicators placed to assist people who are blind or vision-impaired with their orientation.</td>
</tr>
<tr>
<td>VRIOG</td>
<td>The Victorian Rail Industry Operators’ Group comprising the following members:</td>
</tr>
<tr>
<td></td>
<td>Vic Track</td>
</tr>
<tr>
<td></td>
<td>V/Line Passenger</td>
</tr>
<tr>
<td></td>
<td>Metro Trains Melbourne</td>
</tr>
<tr>
<td></td>
<td>Yarra Trams</td>
</tr>
<tr>
<td></td>
<td>Australian Rail Track Corporation</td>
</tr>
<tr>
<td></td>
<td>Public Transport Division of the Department of Transport</td>
</tr>
<tr>
<td>Walkway</td>
<td>An access path with a gradient not steeper than 1 in 20</td>
</tr>
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FIGURE 1. CLIENT DESIGN REQUIREMENTS: ILLUSTRATIONS OF DEFINITIONS
3.0 SCOPE

3.1 Background

The Department of Transport (DOT) intends to upgrade tram stops to comply with the requirements of the Disability Discrimination Act 1992, Disability Standards for Accessible Public Transport 2002 (DSAPT) and referenced Australian Standards. The DOT has prepared the Client Design Requirements (CDR) for accessible tram stops to achieve a consistent approach to design and construction.

These requirements are targeted towards design teams charged with the design of a stop or group of tram stops to clarify the design requirements for accessible tram stops which are DSAPT compliant. The CDR will also provide information to VicRoads, Local Councils, developers and others for related planning.

It is assumed that design teams using this document are competent practitioners experienced in the engineering techniques upon which these requirements are based.

3.2 Purpose

This document presents the design principles, standards, and dimensions that shall be employed when designing new, or executing substantial alterations to, tram stops on the Melbourne network. The purpose of this document is to define the scope of work for the design of accessible tram stop platforms.

3.3 Consultation

All designs based on these client requirements are subject to a consultation/review process with the partners - Yarra Trams, VicRoads and DOT – specifically, the Social Transit Unit and Franchise Relationships.

Consultation is also required with the relevant Local Council, Heritage Victoria, service authorities, shelter suppliers and special user groups.

3.4 Associated Documents

The following documents shall be read in conjunction with these client requirements:

All infrastructure drawings and PASS Asset data requirements shall be provided to DOT as per:

- Victorian Rail Industry Operations Group Standards VRIOGS 001 Structural Gauge Envelopes – Minimum clearances for Infrastructure adjacent to the Railway
- Victorian Rail Industry Operations Group Standards VRIOG 007.1.2 PASS Assets Data Requirements - Tram
- Victorian Rail Industry Operations Group Standards VRIOGS 007.2 Infrastructure Drawing Standards
- Referenced Documents in Section 10.0

3.5 Limits of Infrastructure Works

The limits of infrastructure works constructed under the Accessible Tram Stop Program (ATSP) are as follows:

- The interface with the pedestrian and road environment, including kerb ramps to the footpath
• Access path from the interface with the pedestrian and road environment to the tram stop infrastructure
• Tram stop infrastructure – ramp and elevated platform
4.0 CRITERIA FOR TRAM STOP DESIGN

4.1 General

This section describes the inputs required to design an accessible tram stop including relevant special user group requirements and consultation with stakeholders.

Diagram 1 (Handover Package Development) describes the process required to prepare the handover package to initiate the detailed design of a tram stop, or group of tram stops.

Approvals are also required on completion of final design plans, prior to tender acceptance, and on completion of construction.

Diagram 1: Handover Package Development
4.2 Concept Design Scheme

The concept design scheme shall comprise the items listed in this section.

In developing a concept design scheme for a tram stop, the designer shall consider the following:

- Tram stop platform types detailed in Section 5.0
- Tram stop accessibility requirements in Section 6.0
- Tram stop geometric requirements in Section 7.0
- Tram stop fit-out requirements in Section 8.0
- Safety in design principles introduced in Section 9.0

Unless otherwise nominated by the DOT, tram stops should be designed to service one typical large low floor Light Rail Vehicle (LRV) such as a Combino Five Module tram. In some locations due to high patronage or multiple routes it may be necessary to accommodate more than one tram at a stop.

The dedicated DSAPT access to a tram stop shall be from one end only but steps or a second ramp at the other end may be acceptable. Informal access to the stop along its length may also be acceptable subject to traffic conditions.

An accessible tram stop shall comprise the following structural elements:

- platform for direct level access to trams;
- ramps and walkways for access to platforms;
- pedestrian refuge areas as required; and
- appropriate treatment to allow tram passengers to safely traverse between tram tracks, platforms and footpaths, including tactile ground surface indicators (TGSI) and kerb ramps on footpaths.

4.2.1 Scheme Plan

A plan drawing shall be prepared, drawn to a scale of 1:500, of the extent of the proposed works superimposed on an aerial photograph having a resolution of 15cm per pixel, or better.

4.2.2 Platform Scheme Drawings

An A3 drawing of each platform, or pair of platforms, shall be prepared, superimposed on a feature survey drawing, and showing the proposed arrangements for the platform(s). The drawings shall be dimensionally correct to ensure compatibility with future detail design. The following items should be included for each tram stop in the group:

- Platform location and general layout of facilities
- DSAPT compliant access location
- Traffic management, line marking features and adjacent parking modifications, safety barrier protection scheme, traffic lane widths and offsets to rigid structures
- Impact on the surrounding environment

4.2.3 Platform Scheme Cross Sections

Once the platform and crash protection arrangements have been prepared for a particular tram stop, the designer shall prepare three cross sections - one at each...
end of the platform and the other at the bottom of the ramp - showing the cross section through the stop from the inner tram rail to the adjacent traffic lane to allow VicRoads to assess the amount of platform encroachment into the traffic lane.

4.2.4 Platform Scheme Illustrations
Illustrations depicting completed tram stops shall clearly inform parties unfamiliar with engineering drawings.

4.2.5 Feature Survey
The designer shall undertake a feature and level ground survey of the proposed site, including sufficient detail to design all platform and civil works, and intersection traffic signal remodelling, if required. The survey shall be presented in MGA95 Z55 projection horizontally and to AHD vertically, for subsequent inclusion in the DOT PASS Assets database.

4.3 Functional Specification
A functional specification shall be prepared to record the design criteria for each tram stop. It shall be prepared using the information agreed in the concept design scheme and incorporate the site-specific requirements developed in the concept design scheme.

A sample functional specification is presented in Appendix A.

4.4 Reporting
The following investigations and reporting provide additional input into the development of the concept design scheme.

4.4.1 Dial Before You Dig (DBYD) Search and Services Reporting
A Melbourne One Call System Dial Before You Dig (DBYD) services search shall be made at the beginning of the tram stop design phase and services information shall be added to drawings. All potential design conflicts with existing services shall be identified during the development of the concept design scheme.

The reporting of this information shall include a strategy for the resolution of service conflicts and such strategy shall be agreed by the relevant service authorities. Copies of correspondence shall be included in the reporting documentation.

Where new conduits are to be installed, a conduit and trenching plan identifying all new services, and alterations to existing services, shall be provided. Common trenching practice shall, wherever possible, be adopted to minimise the disruption to construction, and to the extent of works.

Proving of service locations may be required to confirm the feasibility of a concept design. Service authorities may need to be consulted for approval to build over assets.

4.4.2 Planning Report
The planning report shall include the relevant planning policies at the state and local levels and assesses the statutory planning approvals required. It should clarify any outstanding issues in relation to shelter design. Local authorities and Heritage Victoria may be consulted for preliminary assessment.
4.4.2 Traffic Impact Assessment

Where the concept design at a particular location affects the operation of adjacent traffic lanes and roads, a Traffic Impact Assessment shall be undertaken to determine the requirements of mitigating works. The functional specification will document the need for the assessment.

The objectives of the Traffic Impact Assessment are:

1. To demonstrate that the level of service is not diminished from existing levels
2. To demonstrate that the functionality of the existing road in the vicinity of the stop is not changed

The policy basis of ‘no change to existing traffic flow’ is subject to further investigation and review where in conflict with the policy of improved accessibility.

Mitigating works may include parking restrictions; traffic signal modifications and turn lane storage.

Mitigating works shall be designed in accordance with VicRoads’ Traffic Engineering Manual Volume 1 (e.g.; Part 3, Part 4, Part 5 and Part 6), Austroads’ Guides to Road Design (AGRD) and relevant VicRoads Supplements to the AGRD.

4.4.3 Road Safety Audit

Rather than ‘checking for compliance’, a road safety audit is ‘checking fitness for purpose’. This means that assessing whether the road or treatment will work safely for its expected users. For accessible tram stops, it is a formal audit of a stop on an existing road or tramway reserve, in which an independent auditor reports on the tram stop’s crash potential and safety performance.

Road Safety Audits shall be undertaken by a VicRoads pre-qualified auditor to identify road safety issues associated with the design and construction of an accessible tram stop including any mitigating works. The road safety audit schedule shall comprise a minimum of three audits:

- Audit of the concept design
- Audit of the detailed design
- Audit of the constructed works

The concept design should be assessed by DOT, Yarra Trams and VicRoads for functional layout, pedestrian access requirements such as Zebra versus pedestrian crossings, provision for cyclists, traffic lanes, turning movements and sight lines.

The steps in the audit process for an accessible tram stop shall be as follows:

- The designer shall engage a Road Safety Auditor (RSA)
- The designer shall provide background information, concept design schemes and drawings at an inception meeting with the auditor
- The RSA shall examine the background information, design data, and undertake a site visit

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1 The Austroads’ Guide to Road Design Set comprises of:
Part 1: Introduction to Road Design
Part 4: Intersections and Crossings - General
Part 4C: Interchanges
Part 6A: Pedestrian and Cyclist Paths
Part 8: Process and Documentation

Part 2: Design Considerations
Part 4A: Unsignalised and Signalised Intersections
Part 5: Drainage Design
Part 6B: Roadside Environment

Part 3: Geometric Design
Part 4B: Roundabouts
Part 5: Drainage Design
Part 7: Geotechnical Investigation and Design
• The RSA shall prepare an audit report of the concept design and submit it to the designer that is compliant with the Partners’ specific audit Terms of Reference.
• The designer can either accept the RSA recommendations (in which case the design shall be modified accordingly) or reject the RSA recommendations. The designer shall prepare a report for the Project Manager specifying those recommendations that shall be included, and those not included in the detailed design, for approval.
• The auditor shall prepare an audit report of the detailed design and submit it to the designer.
• The designer can either accept the RSA recommendations (in which case the design shall be modified accordingly) or reject the RSA recommendations. The designer shall prepare a report for the Project Manager specifying those recommendations that shall be included, and those not included in the detailed design, for approval.
• The auditor shall inspect the constructed works, prepare an audit report, and submit it to the designer.
• The designer can either accept the RSA recommendations (in which case the design shall be modified accordingly) or reject the RSA recommendations. The designer shall prepare a report for the Project Manager specifying those recommendations that shall be included, and those not included in the constructed works, for approval.

4.4.4 Accessibility Compliance Audit

Accessibility Audits of tram stops, undertaken by an accredited auditor, shall identify compliance with the DSAPT Parts and any disability access issues associated with the design and construction of an accessible tram stop including any mitigating works. An audit of DSAPT compliance should be undertaken and reported in anticipation of any DDA Complaint to be defended at the Australian Human Rights Commission (AHRC) or in the federal court.

It is the role of the Accessibility Auditor to comment on compliance with the DSAPT. Where compliance has not been met at any point the Accessibility Auditor shall provide a solution that meets the obligations of the DSAPT. It is not the role of the Accessibility Auditor to provide policy advice instead of providing a workable solution to DSAPT non-compliance.

Where compliance is not achieved the Exception Process (refer Appendix E) must be followed.

The accessibility audit schedule shall comprise a minimum of three audits:

• Audit of the concept design
• Audit of the detailed design
• Audit of the constructed works

The steps in the audit process for an accessible tram stop shall be as follows:

• The designer shall appoint an Accessibility Auditor.
• The designer shall provide background information, concept design schemes and drawings at an inception meeting with the Auditor.
• The Auditor shall examine the background information, design data, and undertake a site visit.
• The Auditor shall prepare an audit report of the concept design specifying areas of compliance and non compliance. Any design component that does not meet DSAPT requirements needs to be satisfactorily addressed and solutions proposed.

• The designer shall amend the design plans accordingly and prepare a report specifying any non-compliances remaining in the detailed design.

• The auditor shall prepare an audit report of the detailed design and submit it to the designer. Any design component that does not meet DSAPT requirements needs to be satisfactorily addressed and solutions proposed.

• The designer shall prepare a report specifying those recommendations that shall be included, and any not included in the final design, for approval. Any design component that does not meet DSAPT requirements needs to be satisfactorily addressed and solutions proposed.

NOTE: Experience suggests that an on-site visit throughout construction can identify and emerging non-compliant DSAPT issues prior to the completion of construction and this should permit a remediation intervention prior to conclusion of works.

• The auditor shall inspect the constructed works, prepare an audit report, and submit it to the designer.

NOTE: DSAPT compliance should not be compromised and the auditor advice should identify any non compliances. The Exception process should be followed in all such cases.

4.4.5 Risk Register

The management of risk for all activities is conducted within the life cycle of the works from inception to operation by the Tram Operator.

In consideration of the duties of all stakeholders in relation to tram stop design, set out in the Occupational Health & Safety Act 2004, Safety in Design processes are introduced in Section 9.

The outcomes in consideration of the OH&S issues are recorded in the Risk Register.

4.5 Handover Package

The Handover Package is the data set that specifies the scope of work for the detailed design. Any changes to this data set, such as changes to the endorsed final concept design scheme or functional specification, after handover, shall be subject to the agreement of DOT.

The detailed design shall not commence until the Handover Package has been agreed by the DOT Project Manager.

The Handover Package shall include, at least:

(a) Final Concept Design Scheme
(b) Final Functional Specification
(c) Concept Road Safety and Accessibility Compliance Audit Reports (RSACAR) and the designer’s response
(d) Traffic Impact Assessment report
(e) Services Report
(f) Planning Report
(g) Concept design risk register

(h) Other data relevant to the design.

The concept design scheme, plus additional information from the Handover Package as required, shall be submitted to the Municipal Council for information and agreement.

Following the assembly of the Handover Package, a Partner Handover Meeting; led by DOT and including Yarra Trams and VicRoads, shall be convened. The purpose of the meeting is to endorse the Handover Package for a stop, or a group of tram stops, and authorise commencement of detailed design.
5.0 PLATFORM TYPE

The platform shall be designed to reflect the expected level of commuter patronage, road traffic volumes, roadway cross section and the urban landscape in conjunction with the nominated requirements of the Partners. Urban design considerations may generate variations to the design of the platform tram stop and the streetscape and achieve a high level of design integration. There are five types of platform tram stops which should be considered in the development of a design at a specific location. Atypical designs must be approved by the Partners in the design stage. The footprints shown in the Figures 2 - 8 identify the space requirements for tram passengers, tram operations, road design and traffic management.

The five platforms types are:

1. Single Face Platforms;
2. Kerb Extension Platforms;
3. Median Platforms;
4. Double Faced (Island) Platforms; or
5. Trafficable Platforms.

5.1 TYPE 1: Single Face Platforms

Tram passengers board and alight from free standing platforms located within the roadway carriageway, with a vehicular traffic lane immediately behind the back of the platform fence. These platforms are provided as a safety zone under the VicRoads’ Road Safety Rules. Single Face Platforms require pedestrian access from the footpath to the platform by a signalised crossing or a pedestrian crossing, and possibly an informal crossing as well. These platforms allow tram passenger boarding and traffic movements to continue independently of each other. This type of platform provides for faster safer boarding for tram passengers with travel time savings for operators. Platform widths should be determined by patronage levels which may require above minimum dimensions.

Single Face Platforms may be located mid block, or at arrival or departure sides of an intersection.

A DSAPT compliant ramp access located at least on one end but Single Face Platforms may be designed with ramps each end or with steps at the alternate access end. Track or overhead electrical supply wires do not generally require change.

Design configurations for Type 1 platforms include:

- Type 1A 3100mm wide platform and 2785mm wide platform (Refer Figure 2 - Single Face Platforms)
- Type 1A platforms are the preferred standard to be adopted as a base requirement for all new stops
- Design development must provide documentation detailing the reasons for any variations from the stated criteria.
- The Dimensions of the Type 1A 3100mm wide platform and Type 1B 2785mm wide platform (Refer Figure 3 - Platform Space Requirements)
Figure 2: TYPE 1 – Single Face Platforms
Figure 3: TYPE 1 – Platform Space Requirements
5.2. TYPE 2 – Kerb Extension Platforms

Tram passengers board and alight from platforms provided by the widening and raising of the pedestrian pathway or nature strip from the kerb into the roadway to form a continuous pedestrian zone (Refer Figure 4 - Kerb Extension Platforms). There is no vehicular trafficable lane immediately behind the back of the platform and traffic follows the tram. Two lanes of traffic may merge into one lane and back again into two lanes. These platforms provide for faster safer boarding for tram passengers with travel time savings for operators, and immediate access to the tram without signalised road crossings to the platform. Kerb Extension Platforms accommodate larger numbers of passengers as required on occasions.

These platforms may be located mid block. Track centres and overhead electrical supply wires may need to be altered.

Cyclists in dedicated bike lanes travel behind the tram passenger waiting area and adjoining the pedestrian footpath.
Figure 4: TYPE 2 – Kerb Extension Platforms
5.3. **TYPE 3 – Median Platforms**

Tram passengers board and alight from platforms located within a roadway median or a wide tram Right of Way in a park or boulevard (refer Figure 5 - Median Platforms). Median Platforms usually require a signalised pedestrian access from the footpath to the centre of road median. Depending on the width of the median there may be considerable space between the back of the platform tram stop and the adjoining vehicular trafficable lane allowing for reduced fencing, traffic bollards and crash barriers.
Figure 5: TYPE 3 – Median Platforms
5.5 TYPE 4 – Double Face (Island) Platforms

Tram passengers’ board and alight from a wide double sided island platform constructed between relocated tram tracks with access in both directions simultaneously (refer Figure 6 - Double Face (Island) Platforms). Where patronage levels are high, or the fit-out includes more than basic seating and shelter provision, additional platform width may be required. The preferred width is 4.8m.

These platforms must be provided with DSAPT compliant ramp access located at least at one end but may also have ramps at each end or steps at the alternate access end (with the accessible end signed).

A signalised pedestrian crossing is generally required.

Track and overhead electrical supply wires and poles must be relocated and track curves sufficient to maintain smooth passenger travel in the transition zone.

These platforms may be located mid-block or at arrival or departure side of an intersection. The Double Faced Island Platforms are particularly suited to locations where patronage tends to peak in one direction.
Figure 6:  TYPE 4 – Double Face (Island) Platforms
5.6 TYPE 5 – Trafficable Platforms

Level access to trams is provided for passengers by integrating platforms within the roadway, raising the road pavement and providing vehicular lanes up and over the platform area. Tram passengers will still be required to wait on the footpath or nature strip area, and cross the roadway to board or after alighting the tram. Traffic will still stop for tram boarding and alighting and dwell time and passenger safety are not substantially improved. This type of platform design occupies less road space and allows traffic flow to be maintained on narrow roads. There are several variations of this type of stop design.

Design configurations for Type 5 platforms include:

- Type 5A Raised Road Pavement Platform shared roadway - all road vehicles are directed to keep left of the tram alignment and travel over the passenger platform area. 50 km/h street, 20 km/h advisory limit over platform (Refer Figure 7 – Trafficable Platforms; Platform Shared Roadway).

- Type 5B Commuter shared roadway - the raised roadway, platform, bike lane and footpath are all at the same level with bollards separating the commuter platform area and the road vehicle lanes. Pedestrians have right of way over traffic which is restricted to a road speed limit of 10 km/h. (Refer Figure 8 – Trafficable Platforms; Commuter Shared Roadway).
Figure 7: TYPE 5A – Trafficable Platforms – Platform Shared Roadway
Figure 8: TYPE 5B – Trafficable Platforms – Commuter Shared Roadway
6.0 TRAM STOP ACCESSIBILITY REQUIREMENTS

6.1 General
This section describes the requirements for accessibility at tram stops.

6.2 Access paths
An access path shall have a minimum clear width of 1200mm. Obstacles abutting an access path shall have a colour luminance contrast of 30 per cent with its background.

NOTE: The DSAPT requires a minimum access path of 1200mm wide clear of the combined 600mm width of the tactile ground surface indicators (300mm) and the safety set back of 300mm.

6.3 Ramps, Walkways and Landings
The longitudinal grade of the platform tram stop should generally be level but the context of the tram stop in the roadway may impose local grading issues. Melbourne trams rarely operate on grades more than 6 per cent (1 in 16.7). Platform tram stops have been developed with longitudinal grades for some sections up to 5 per cent (1 in 20) without evident problem or complaint. At grades greater than 5 per cent (1 in 20) the platform becomes a walkway.

The maximum longitudinal gradient of a walkway shall be 1 in 20 and the length shall not be longer than 15m. If the walkway length, at gradient 1 in 20, is greater than 15m, a landing shall be included. A walkway having a longitudinal gradient of 1 in 33 shall be designed with a landing if the length of the walkway is greater than 25m. Landings are not required where walkway gradients are flatter than 1 in 33.

Ramp access to a platform tram stop is generally required. The maximum longitudinal gradient of a ramp shall be 1 in 14 and the ramp shall not be longer than 9m. If the ramp length, at gradient 1 in 14, is greater than 6m, a landing shall be designed.

Landings shall have a minimum length of 1200mm.

Handrails shall be provided on both sides of ramps. Handrails shall have semi-circular return ends.

A ramp, walkway or landing, shall have a clear width of 1200mm minimum between the inside edges of handrails to maintain the access path.

A kerb/step ramp shall be provided at all kerb access points to a platform tram stop accessed by a ramp. A kerb/step ramp may be used with a longitudinal gradient not steeper than 1 in 8 and length not longer than 1520mm.

6.4 Platforms
The safe functioning of a platform environment for DSAPT compliant access where both stationary and moving commuters will be present requires the satisfaction of each of the following:

1. Space requirements on a platform;
2. Surface Finishes; and
3. Tactile Ground Surface Indicators (TGSI) and Safety Setback.
6.4.1 Space Requirements on a Platform

An access path of minimum width 1200mm shall be provided. The extent of the access path may be limited to providing access to the tram doors leading to the allocated space for passengers with a disability in the tram. If a shelter is provided the returns shall be clear of the access path. All platform fixtures shall be located clear of the access path.

The minimum allocated space for a single wheelchair or similar mobility aid to wait is 1300mm x 800mm.

The minimum area required for a 180 degree wheelchair turn is 2070mm in the direction of travel, and 1540mm wide, with 2270mm X 1740mm preferred. It should be noted that people using wheelchairs and scooters may be less accurate in their manoeuvring and become a safety risk at the platform tram stop edge. The circulation space in front of any vending machine shall allow for a 180 degree wheelchair turn.

The minimum clear access path width of 1800mm shall be provided for two wheelchairs to pass at least every 6 metres.

Clearances and space requirements are illustrated in Figure 1 (Features of an Accessible Tram Stop) and Appendix C Figure 9 (Structural Gauge Platform Clearances) and Figure 17 (Provision for Ticketing Equipment).

6.4.2 Surface Finishes

Non-slip surface treatments shall be used for the tram stop and access path surfaces (Refer to Section 8.5.2 within this document).

Floor surfaces must comply with AS1428.2 (1992) Clause 9 Ground and Floor Surfaces and be tested in accordance with AS4586-2004 to V/W rating wet pendulum TRRL rubber.

6.4.3 Tactile Ground Surface Indicators (TGSI) and Safety Setback

A safety setback ‘no-go zone’ of 300mm is required at the edge of a tram stop platform. This space should not form part of the tram stop’s circulation space.

TGSI assist people with vision impairment to identify hazards or indicate direction.

Warning TGSI shall be provided at the following locations:

- 300mm set back from the front edge of tram stop platforms, as a continuous strip 300mm wide. The 300mm TGSI strip should not intrude into the minimum circulation or access path space.
- at thresholds of pedestrian egress from pedestrian refuges
- 300mm set back, onto the platform, from the top and bottom of a ramp

The use of directional TGSI shall be designed to the minimum necessary.

The TGSI shall consist of appropriate hazard warning markers which have a luminance contrast of 30 per cent for solid tiles and 45 per cent for discrete units. TGSI arrangements are shown on Figure 1 (Client Design Requirements – Illustrations of Definitions). The width of the TGSI will vary depending upon the nature of the hazard and reference needs to be made to the relevant Australian Standard and should be confirmed by the accessibility compliance audit.
6.5  **Steps**

The construction of steps as the sole means of access to a platform does not constitute a DSAPT compliant solution and is not acceptable as a design solution for the Accessible Tram Stop Program.

Steps may be included at one end of a DSAPT compliant platform tram stop but in this case additional signage would be required to identify the direction of the accessible path via the ramp end of the platform.

The DSAPT required configuration for each step is a riser of 150 – 165mm high maximum and tread of 275 - 300mm long maximum, with an overhang of 25mm, and safety nosing to tread.

6.6  **Handrails**

Handrails shall comply with AS1428.2 (1992) Clause 10.1. Handrails shall be provided on both sides of ramps.

The end of a handrail shall be continuous rail returned 180 degrees at a centreline radius of 75mm.

6.7  **Signs**

Signs are installed by Metlink in accordance with the standard Style Guide for all public transport in Victoria.

Signs shall be located where directional decisions are made and at DSAPT prescribed heights. Destination signs shall be visible from boarding points.

Sign locations and any non standard signs (e.g. directional arrow to an accessible ramp end) shall be designed, and shall be confirmed with the accessibility audit.

Road and traffic related signs are to be in accordance with [VicRoads’ Traffic Engineering Manual Volume 2](#).

6.8  **Shelters**

Shelters are preferred for passenger amenity but are not required under the DSAPT. Where installed, however, a shelter must comply in full.

Transparent glazing is preferred but advertising shelters may be used where:

1. allowed under Local Government planning requirements;
2. the advertising material is suitable, placed parallel to the direction of traffic, and shall be neither brightly lit nor have flashing lights thus minimising driver distraction ; and
3. the shelter design is appropriate to the project.

If a shelter is provided on one of a pair of opposite platforms then a shelter must be provided both platforms.

Where provided the shelter design shall include the following:

- Seats or benches for two people shall be identified (by signage) as available for passengers with special needs as a priority
- The height of the seats shall be 450mm to 520mm
- Two spaces, 800mm by 1300mm, shall be available for passengers using mobility aids
- Shelter frame shall have a colour luminance contrast of 30 per cent with the platform surface
• Decals shall be installed on glass shelter return for passengers who are vision impaired, so that the return may be clearly identified as a glass frame and not an opening
• Provision for a card vending machine in the second shelter
• Front edge of shelter canopy minimum 1120mm from the running edge of the track rail
• Maintenance of 1200mm wide access path across shelter returns and all fittings located within the shelter

6.9 Lighting

Any lighting to pedestrian crossings shall be in accordance with VicRoads’ Traffic Engineering Manual Volume 1.
7.0 TRAM STOP ACCESSIBILITY GEOMETRIC REQUIREMENTS

7.1 Tram Stop Platform

The platform shall contain provision for all fixtures, furniture and fittings described in the functional specification.

The designer shall, as far as is reasonably practicable, design the platform to minimise encroachment into the adjacent traffic lane, retain the existing platform footprint, avoid removing trees and vegetation and minimise the need to relocate tram and other authorities infrastructure assets.

Existing traffic signal pedestals, passenger operated traffic signals and poles supporting the tram overhead network, shall not be relocated, unless nominated in the functional specification.

The length of a tram stop platform shall be 33 metres unless otherwise specified. Should site constraints restrict this length, it should be of sufficient length to accommodate all access doors of the design tram vehicle. The design platform length shall be achieved using a combination of standard fence panels of uniform length, and special length panels, as required, for a design shelter and end returns. Refer to Figure 1 (Client Design Requirements: Illustration of Definitions) and Appendix C Figure 13 (Fence Types), Figure 14 (Fence Details & Handrails) and Figure 15 (Fence Set-out Arrangements).

The platform length shall be defined in the functional specification for a particular tram stop.

The height of a tram stop platform shall be 290mm at the front edge of the platform measured from the level of the near rail. The post-construction platform length accuracy shall be within +/- 5mm.

The DOT standard gross platform width for an accessible tram stop from platform edge to the rear edge of the platform and including a 200mm wide kerb shall be 3100mm. Where an ‘F Barrier’ is installed for additional road safety requirements the standard gross platform width is 3285mm.

The platform, as signed-off in the functional specification, may have a reduced width beyond the tram designated access door area.

In areas not in the Melbourne Central Business District, a 2785mm gross platform width may be considered if it can be demonstrated that there is no or minimal encroachment into the adjacent road lane. In making this determination, the designer shall include the crash protection requirements of VicRoads’ Road Design Note RDN3-02.

NOTE: The preference for ‘No’ or ‘minimal’ encroachment into the adjacent traffic lane may not be relevant or applicable in all situations and may vary with location where road lane widths vary.

Accuracy of the construction of platform width, post construction, shall be within +/- 5mm.

The cross fall of a platform shall be between 1 in 75 and 1 in 40, measured perpendicular to the front edge of the platform. The direction of downwards cross fall shall be away from the front edge of the platform. Transitioning down relative to the road surface may warrant minor local grading variation.
The front edge of a tram stop platform shall be 700mm, in plan dimension, on tangent track, from the running edge of the nearest rail. Platforms should not be built on curved track but where encountered refer also to Section 7.5 in this document.

Exception

The designer should note that existing conditions and major services in the vicinity of the platform at some sites may prevent a minimum gross platform width of 2785mm being designed in accordance with these client design requirements without significant modification to road infrastructure and/or services. Such situations should follow the DOT Exception procedure.

7.2 Tram Stop Protection

Tram stop protection for Accessible Tram Stops in Medians shall be designed in accordance with VicRoads’ Road Design Note RDN 3–02, presented in Appendix D. This Road Design Note provides guidelines for crash protection at tram stops located in medians for posted design speeds in the range from 60kph to 80kph.

The key issues for the designer in using this Road Design Note are:

1. to take into account site conditions at a particular stop
2. to design the crash protection to be as unobtrusive as possible
3. to minimise as far as reasonably possible encroachment of the accessible platform into adjacent traffic lane

The Road Design Note makes provision for steel guard fence, Type F concrete barriers, and Vertical Face concrete barriers, depending on the posted speed. For posted speed in the range 60kph to 80kph no other type of crash barrier is permitted. Crash protection should be based on the prevailing speed rather than the design speed.

In the first instance, the designer shall design for a steel guard fence, as this is less obtrusive and easier to install and maintain, compared to concrete barriers.

Type F and Vertical Face concrete barriers may be used as the rear edge of the platform.

The end face of a Type F or Vertical Face concrete barrier facing oncoming traffic shall be protected from errant vehicle impact using either steel guard fence or an impact attenuator. Steel guard fence is preferred and shall be designed in accordance with VicRoads’ current road design practice.

VicRoads Road Design Note RDN 6-04 Accepted Safety Barrier Products presents a range of accepted end treatments.

Where impact attenuators are used, these may be installed with an attack angle of 15 per cent to the straight, to ensure the front of the barrier does not protrude into a turning lane or a through lane. Impact attenuators shall be located sufficiently clear of all platform structures to ensure operation in accordance with the manufacturer’s design.

Refer also to VicRoads Road Design Note RDN 3-03 Accessible tram stops in safety zones.

7.3 Tram Stop Ramp

A ramp shall have a clear width of 1200mm minimum between inside edges of handrails to maintain the access path width between the platform and the off-platform pedestrian refuge.
The designer should confirm that the swept path(s) of design vehicle(s) does not impact on the standard ramp geometry.

The only fittings to be located on a ramp are fences with handrails.

### 7.4 Tram Stop Pedestrian Refuge

The minimum length of a pedestrian refuge for a platform stop shall be 2070mm minimum, 2270mm preferred. This is to provide space for a person using a wheelchair or scooter to manoeuvre through a 90 degree turn out of the refuge on to the road crossing.

When a tram stop is located at an intersection, a ramp may discharge onto a pedestrian crossing zone controlled by pedestrian lights. In such a case, a pedestrian refuge will not be required.

Where nominated in the functional specification for a platform stop at specific central city locations, a pedestrian refuge may be configured with a minimum length of 3800mm.

At mid-block stops, the configuration of a pedestrian refuge may be defined by the arrangement of existing pedestrian crossings and line marking or containment fencing.

The cross fall of a pedestrian refuge shall match the cross fall of the existing road pavement.

### 7.5 Tram Stops on Curves

Locating platform tram stops on curved track shall be avoided under all circumstances.

Tram stops should be constructed on tangent track with straight platform edge where possible. Where tram stops are located on curved track or near crossovers, consideration shall be given to the clearance requirement and the curve effect for the adjacent track as well as the platform edge. Curves should be avoided where possible to avoid the increase of the horizontal gap due to curve affect.

Where tram stops are unavoidably located on curved track or near crossovers, consideration shall be given to the effect of the clearance envelope of a tram on the tram stop geometry.

Platforms and ramps designed at tram stops where the adjacent track is curved shall include an allowance for the clearance envelopes for all tram types used on the network. The curve effect shall be added to the nominal 700mm clearance requirement between platform edge and nearest running rail.

### 7.6 Static Tram Vehicle Swept Path Analysis at Each Stop

A static tram vehicle swept path analysis shall be carried out at each stop, whether it is located on straight or curved track, to ensure that a B-Class tram and a Combino 5 Part tram and a typical new LRV clear the accessible platform. Confirmation that the swept path analysis has been carried out at each stop shall be included in the functional specification. The maximum offset should be specified (e.g. 715mm) and will be dependent on the location of the offset relative to tram door locations especially the accessible doors.
8.0 TRAM STOP FIT-OUT REQUIREMENTS

8.1 General

This section describes the fit-out requirements for accessible tram stops. Fit-out installations include shelters, ticket machines, timetable totems, seats, rubbish bins, fencing, handrails, and poles each of which create further restrictions to circulation on platform tram stops. The installation of fixtures should be planned to avoid passenger congestion. Wing walls of shelters must be carefully designed. All fit-out items should be set out at design stage to ensure a functional and visually clear layout.

8.2 Platform Stop Fit-out

The fit-out of a platform stop at a particular location shall be defined by the functional specification.

Generally, the platform stop will comprise:

- Precast concrete platform kerbing
- Asphalt finish to platform and ramp
- Tram flag pole and timetable case
- Fence
- Handrail on ramp
- TGSIs
- Shelter with seats or benches.

Passenger Information Displays (PID) and audio buttons may be included.

8.3 Alternative Fit-out of Finishes for a Platform Stop

Basic finishes are concrete and asphalt paving and galvanised steel fencing and structures. A platform stop may have an alternative fit-out at a particular location if this is required by the functional specification. The Program Manager DOT may recommend consideration of aspects of the DOT Enhanced Finishes Policy, in Appendix B, for a platform stop at a particular location.

Pavement finishes should be specified to avoid ambiguity where there is share use of areas such as where tram passenger waiting areas are at the same level as vehicular road pavement or where pedestrians and cyclists share the same zone.

8.4 Tram Stop Drainage

Where required by the functional specification, the designer shall investigate existing drainage flow paths and underground stormwater drainage in the vicinity of the proposed tram stop.

The drainage investigation shall demonstrate that:

- stormwater runoff from the tram stop is captured by existing stormwater drainage pits
- the construction of the tram stop does not affect existing overland flow paths and does not overload the existing stormwater drainage system
- additional drainage structures are designed to mitigate effects of overloading the existing stormwater drainage system
Shelters on tram stops do not require gutters and downpipes for the control of stormwater runoff.

Stormwater drainage shall be designed in accordance with the VicRoads Supplement to Austroads Guide to Road Design Part 5: Drainage.

8.5 Tram Stop Structure

8.5.1 Tram Stop Platform Structure

Appendix C Figure 11 (Indicative Platform Sections; Flexible Platform Construction) documents the minimum requirement of a platform structure comprising layers of engineered crushed rock.

A reinforced concrete slab may be designed in lieu of compacted courses of crushed rock. To minimise the number of construction/movement joints, the platform slab shall be designed as a continually reinforced concrete structure as illustrated in Appendix C Figure 12 (Indicative Platform Sections; Concrete Platform Construction).

8.5.2 Asphalt Pavement to Platforms and Ramps

Asphalt paving shall be placed on platforms and ramps. Materials used in asphalt paving to platforms and ramps shall comply with the requirements of VicRoads Standard Specification Section 407 for Type N. Asphalt colour shall be natural black.

TGSIs shall be installed as soon as practicable after the completion of asphalt paving works.

8.6 Fixtures

The functional specification for a tram stop shall prescribe the type and number of fixtures to be constructed on each platform. During the design phase all elements should be identified and an integrated solution developed before construction. The requirements in Section 6.4.1 within this document shall be taken into consideration in designing all fixtures on platforms.

Fixtures shall be designed clear of the permanent structural gauge.

A shelter canopy and all other fixtures mounted on a platform, measured from the inner edge of the tram rail, shall not be closer than 1120mm from the running edge of the rail as shown in Appendix C Figure 9 (Structural Gauge Platform Clearances) and Figure 10 (Platform Furniture Clearances).

Provision shall be made for all the following fixtures by the installation of service conduits and bonding cables. Conduits shall be terminated below the platform surface and their locations indicated with a brass disc set into the finished pavement surface. Future installations shall be secured with Chemset, or similar holding down systems at the time of installation.

8.6.1 Fencing, Handrails and Access to Track

The rear of platforms may, subject to road safety and accessibility audit recommendations, be fenced to prevent access on to the tram stop platform. The ends of platform stops, where access is not designed, shall be fitted with a fence return barrier.

Appendix C Figure 13 (Fence Types) and Figure 14 (Fence Details, Ramps & Handrails) illustrate typical arrangements for fencing and handrails.

There are four configurations for fences on a tram platform depending on the direction of tram travel and the location of the ramp access and these are illustrated in Appendix C Figure 15 (Fence Set-out Arrangements).
8.6.2 Platform Shelter and Seats

The requirements for shelter(s) shall be included in the functional specification.

The designer shall take into consideration, regarding the selection of widths of shelter returns and shelter seats, that no part of the shelter (except the canopy) shall be closer than 1800mm from the front edge of the platform.

A shelter can be installed on a 2785mm wide platform. A shelter return shall have a maximum width of 485mm, measured from the centreline of the shelter post.

A shelter can be installed on a 3100mm wide platform. A shelter return shall have a maximum width of 1100mm, measured from the centreline of the shelter post.

The dimensions of shelter returns shall comply with the requirements of Appendix C Figure 10 (Platform Furniture Clearances).

Seats or benches shall be generally 450mm high, up to 520mm maximum, with space under for feet when rising and optional arm rests. DOT has a preference that seats include arm rests.

8.6.3 Signage

The tram stop signage shall comply with the requirements of the DSAPT Standards, Australian Standards and the Metlink Master Style Guide.

Signage shall be mounted to not hinder the flow of passengers at a tram stop or obstruct sight lines.

Sign R3-V100, ‘Pedestrians Give Way to Trams’ shall be used at mid-block tram stops, where fencing is constructed to direct passengers to a single track crossing location. Road signage layouts, including safety zone and parking signage shall be prepared in consultation with VicRoads.

The requirements for warning signs on platforms shall be included in the functional specification.

8.6.4 Ticketing, Card Vending and stand-alone Enquiry Machines

A card vending machine (CVM) may be fitted on a platform, under a second shelter. A stand alone enquiry machine (SEM) may be fitted on a platform, close to a shelter, but not under a shelter. Ticketing requirements to be installed on a platform stops are to be confirmed during project design.

8.6.5 Tram Stop Route Flag Post and Timetable Case

A tram stop route flag post shall be located clear of the access path and mounted securely on the platform.

A route timetable and map shall be mounted on the tram stop route flag post. A totem may be also be required.

8.6.6 Passenger Information Display Unit and Audio Unit

Provision may be made for displaying public transport information by a passenger information display unit (PID) mounted on the trailing end of the shelter canopy as shown on Appendix C Figure 9 (Structural Gauge Platform Clearances). A passenger information display unit may be installed on a shelter canopy or pole.

Provision shall be made for a fence mounted audio unit on a tram stop platform. The fence mounted audio unit shall be located on the platform, one fence panel length along from the top of the ramp, as presented in Figure 1 (Client Design Requirements; Illustrations of Definitions) and Appendix C Figure 15 (Fencing Set-out Arrangements).
8.6.7 Tram Stop Platform Furniture

Platform furniture including service pit covers, manhole covers and litter bins shall be firmly secured to the platform. Platform furniture shall be positioned so as not to encroach into the access path.

8.6.8 Provision for Future Equipment

The functional specification shall list the specific items to be included in a platform design. Items not in the functional specification shall not be designed, supplied or installed.

The electrical supply requirements for platforms are described in this document in Section 8.9.1 through Section 8.9.3. The electrical supply to a platform shall not be designed to a standard higher than that nominated in the functional specification.

Section 8.9.4 and Section 8.9.5 within this document describe the electrical and communications conduits to be designed for a platform. Conduits are provided for platform items not included in the functional specification, but that may be installed in the future. Conduits shall not be installed across tram tracks or roads unless nominated in the functional specification.

Electrical bonding conductors shall be provided for all conductive platform items and fixtures nominated in the functional specification. Should a fixture be installed after platform construction, a 70mm² electrical bonding conductor shall be bonded directly to an existing, bonded structure or fixture. Refer Yarra Trams Standards.

8.7 Tram Stop Line Markings

The functional specification shall confirm any line marking requirements associated with access paths or roadways.

Road line marking and line marking for vehicle parking shall be designed in accordance with VicRoads Traffic Engineering Manual Volume 2 Signs and Line marking and particular requirements of the municipal council where appropriate. The designer shall submit road line marking drawings, including changes to vehicle parking arrangements, to be included in the functional specification for partner sign-off.

8.8 Pedestrian Crossings

Safe pedestrian crossings should be provided to platform tram stops. Kerb/Step ramps should be provided at kerbs where not already existing. Crossings from kerbs to platforms shall be made DSAPT compliant as part of tram stop upgrades.

New pedestrian operated signals may be required by the functional specification. The designer shall base the design on VicRoads drawing VicRoads TC-1003 (Standards Drawing: Typical Layouts For Pedestrian Operated Signals).

The power supply arrangements shall be confirmed with the electricity authority. Conduits and service pits shall be incorporated into the tram stop conduit design.

8.9 Electrical and Communications Services on a Platform

Requirements for overhead power lines and poles, which vary by location, are not included in this document. Refer to VRIOG Standards.

Provision shall be made for the installation of service conduits for electricity and communications on all platforms.

Appendix C Figure 16 (Electrical Supply & Bonding Schematic) illustrates a schematic electrical layout while Appendix C Figure 17 (Communications Conduits & Equipment Upgrade for Ticketing System) illustrates a schematic layout for
communications requirements for the new ticketing system for Melbourne’s public transport system. The provision of service conduits for electricity and communications requirements associated with new ticketing equipment shall be included in the platform design.

8.9.1 Supply Requirements

Consideration for providing power to shelter lighting shall include the design of photoelectric panels mounted on the shelter canopy, or the design, in consultation with the electricity distributor and electricity retailer, of an unmetered power supply.

If required by the functional specification, the electrical supply shall either be a direct supply from an existing power source or a metered supply. A distribution cabinet will be provided on each platform for earthing cables and electrical equipment.

If required by the functional specification, conduits to transfer power and/or communications from one platform to another, or across road pavements, shall be undertaken using thrust boring/trench-less technology. The works shall be undertaken by a VicRoads’ approved contractor. The conduits shall have a cover of not less than 1200mm. These conduits shall be included on the conduit and trenching plan.

8.9.2 Earth Spike

The earth stake shall be located at least 2m clear of the platform and rail in the tramway reserve. Installation is to comply with the Australian/New Zealand Standard for Wiring Rules (AS/NZS 3000:2007).

8.9.3 Electrical Service Pits

Pit covers on platforms shall be ACO light duty recessed solid bottom ‘Lock and Seal’ type units. Access covers and frames shall be galvanised mild steel with locking bolts as required. Pit covers shall be in filled with asphalt. Where in the road reserve, pits and covers shall be as per authority requirements. A brass plaque shall be attached to the top of each pit to indicate ‘Electrical Cables’ or ‘Telecommunications Cables’, as appropriate.

8.9.4 Electrical Conduits

Underground electrical conduits shall comply with AS/NZS 3000 (Wiring Rules), all other relevant Australian Standards, the requirements of the Electricity Distribution Company, and other relevant local authorities.

The ends of terminating conduits that are not designed to be connected to above mounted platform fixtures shall be indicated on the surface by a brass plaque securely fixed and flush with the asphalt.

Electrical conduits shall be provided for:

- Ticket machine / Card Vending Machine
- Stand alone Enquiry Machine
- Shelter lighting
- Platform lighting
- PIDs where required.

The conduit layout provides for:

- An 80mm diameter conduit from the point of supply to either an on-platform electrical switchboard or an on-platform meter cabinet
• An 80mm diameter conduit between the platforms to the electrical distribution cabinet on the opposite platform, if required by the functional specification
• A 32mm diameter conduit from the distribution cabinet on a platform to each electrically powered fixture
• Two spare 32mm diameter conduits and one 50mm diameter conduit running the length of the platform and extending beyond both ends of the platform.

8.9.5 Communications Conduits
Underground conduits shall comply with all relevant Australian Standards, the requirements of Telstra, and other relevant local authorities.

The ends of terminating conduits not connected to surface mounted platform fixtures shall be indicated on the platform surface by a brass plaque securely fixed and flush with the asphalt.

Communications conduits shall be provided for:
• Ticket machine / Card vending machine
• Stand alone Enquiry Machine
• Real time information display mounted on a shelter
• Audio unit mounted on a fence post.

The conduit layout provides for:
• An 80mm diameter conduit from the point of supply to the service distribution pit on a platform
• An 80mm diameter conduit between the platform to the service distribution pit on an adjacent platform, if required by the functional specification
• A 32mm diameter conduit from the service distribution pit on a platform to each of the required communications connections, except as noted for the audio unit
• A 20mm diameter conduit from the audio unit to the footing of the shelter post closest to the shelter mounted Passenger Information Display (PID).

8.9.6 Provision for New Ticketing System Equipment
In addition to the electrical and communications requirements of Section 8.9.4 and Section 8.9.5 while Figure 17 (Communications Conduits & Equipment Upgrade for Ticketing System) in Appendix C identifies and shows arrangements for items that shall be designed for the Accessible Tram Stop Program to accommodate equipment for Melbourne’s new ticketing system:
• VicTrack joint pit, 1000mm x 750mm, on each platform
• 50mm diameter communications conduit, with large radius bend, to facilitate fibre optic cable installation, from the pit clear of the platform
• 100mm diameter communications conduit between joint pits on platforms with large radius bends at joint pits
• Replacement of secondary distribution cabinet with larger cabinet, and incorporating all “Rack” equipment.

2 The arrangements and details shown in Figure 9 have not been endorsed by the stakeholders involved with the New Ticketing System.
A heavy duty trafficable pit between the tram tracks would be designed if:

- Existing VicTrack conduits located between tram tracks
- The new ticketing equipment was to be installed at the tram stop.

### 8.10 Electrical Bonding Philosophy

Pending introduction of a relevant VRIOG Standards, earthing arrangements for a tram stop shall be developed in accordance with the *Interim Electrical Standard Technical Standard for Earthing and Bonding at Tram Stops Tram Bonding Standard 21_06*.

An earthing schematic for a tram stop is included in Appendix C [*Figure 16 (Electrical Supply & Bonding Schematic)*] and shall comprise the following main elements:

Where a tram stop is required by the functional specification to have a power supply, an isolation transformer for the metered power supply shall be installed to minimise the possibility of contact between the DC and AC systems.

All platform hardware on each platform shall be bonded individually and directly to the central bonding earth bar located in a distribution cabinet.

The Earthing System for a stop shall be designed as follows:

- Connect the primary earthing conductor to an earthing electrode installed off-platform, in the general vicinity of the metering enclosure, at least 2 metres from any point of the secondary earthing system and any tram stop hardware and rail.
- If a tram stop has no power supply point, the earth spike shall be located more than 2m beyond the end of the platform and 2m clear of rail.
- The DC rail shall comprise the earthing point for the secondary side of the isolation transformers.
- Provide bonding conductors to connect the secondary earth bars to any extraneous conductive parts to form an equipotential zone. Extraneous conductive parts include fence posts and all unearthed built-in metal objects on the platform.
- Connect the central bonding earth bar to the negative DC rail of the tram system in accordance with Yarra Trams requirements and in the same excavation to minimise disruption to the track.
- All steel reinforcing shall be provided with an electrical earth by means of suitable tie wire distribution and connections into the earthing system.
- The minimum size of earthing and bonding conductors shall be 120mm².
- Design separate earthing systems for the communication system in accordance with the requirements of Austel and Telstra.
9.0 SAFETY IN DESIGN

The duties of all stakeholders in relation to the design, construction, operation and maintenance of a workplace – in this case a tram stop - are set out in the Occupational Health and Safety Act 2004 (OHS Act). In the context of the Accessible Tram Stop Program, this includes the DOT, Yarra Trams, VicRoads, constructors and the designer.

Designers have a duty under Section 28 of the OHS Act to ensure that hazards and risks that may exist in the design of a tram stop are eliminated or controlled at the design stage so far as is reasonably practicable.

Safety in Design is a process that identifies and mitigates OH&S hazards, or minimises potential OH&S risk. Tram stops should be developed with input from stakeholders so that potential OH&S risks are identified and managed.

The minimum requirements for circulation space in the DSAPT 2002 are the minimum standards for access public transport for people with disabilities (including those using wheelchairs, scooters, mobility aids, assistance animals and mobility aids such as canes. The circulation space prescribed in the DSAPT 2002 may not, however, be the relevant minimum standards that need to apply to the design of mass public transport to accommodate high patronage levels at particular locations such as special events. At these locations significantly more circulation space may be warranted.

Safety requirements also apply for older and frail people, children, people with prams and toddlers, luggage and shopping. Safety consideration should also be given to other road users such as cyclists, motorcyclists, service, freight and heavy vehicles. The overall design should take into account their special requirements for safe and effective operation. Consideration should also be given to safe tram stop maintenance practices, such as replacing fencing, light bulbs and cleaning. Therefore safety requirements in the section have broad application.

A safety risk workshop shall be convened by a Review Leader who is independent of the design team.

The workshop shall follow a structured study methodology, including checklists. Examples of methodologies that may be adopted include:

- HAZOP (Hazard and Operability Study)
- HIRA (Hazard and Risk Identification Assessment)
- PHA (Preliminary Hazard Analysis)

Workshop participants shall include representatives from designers, constructors, operators, passengers, and maintainers.

Outcomes of the workshop shall be recorded on a risk register together with mitigations to allow the risks to be tracked during the design process and closed off at the appropriate time. The Risk Register shall provide an on-going basis for safety risk management.

The Risk Register shall be included in the Handover Package. The designer shall update the register during the detail design phase. Construction issues in the Risk Register shall be handed over to the construction project manager for update during the construction stage.
At completion of the tram stop upgrade works, the Risk Register shall be handed over to the tram operator, who shall then be responsible for the maintenance of the register until the tram stop is decommissioned.
10.0 REFERENCED DOCUMENTS

AS 1428.1-2009 Design for access and mobility – Part 1: General requirements for access - New building work
AS 1428.2-1992 Design for access and mobility – Part 2: Enhanced and Additional requirements - Buildings and Facilities
AS 1428.4.1-2009 Design for access and mobility – Tactile Ground Surface Indicators
AS/NZS 3000:2007 Wiring Rules
AS 4586-2004 Slip resistance classification of new pedestrian surface materials
Austroads Guide to Traffic Management: Parts 1 to 8
Austroads Guide to Road Design
- AGRD01-10 Guide to Road Design Part 1: Introduction to Road Design
- AGRD02-06 Guide to Road Design Part 2: Design Considerations
- AGRD03-10 Guide to Road Design Part 3: Geometric Design
- AGRD04-09 Guide to Road Design Part 4: Intersections and Crossings – General
- AGRD04A-10 Guide to Road Design Part 4A: Unsignalised and Signalised Intersections
- AGRD04B-09 Guide to Road Design Part 4B: Roundabouts
- AGRD04C-09 Guide to Road Design Part 4C: Interchanges
- AGRD05-10 Guide to Road Design Part 5: Drainage Design
- AGRD06-10 Guide to Road Design Part 6: Roadside Design, Safety and Barriers
- AGRD06A-09 Guide to Road Design Part 6A: Pedestrian and Cyclist Paths
- AGRD06B-09 Guide to Road Design Part 6B: Roadside Environment
- AGRD07-08 Guide to Road Design Part 7: Geotechnical Investigation and Design
- AGRD08-09 Guide to Road Design Part 8: Process and Documentation

Disability Discrimination Act 1992
Disability Standards for Accessible Public Transport 2002 (as amended) and Disability Standards for Accessible Public Transport Guidelines 2004
Enhanced Finishes Policy (Department of Transport)
Occupational Health & Safety Act 2004 (Victoria)
Sign R3-V100, ‘Pedestrians Give Way to Trams’
VicRoads Austroads Guide to Road Design
- Introduction to VicRoads Supplement
- VicRoads Supplement to Part 1: Introduction to Road Design
- VicRoads Supplement to Part 2: Design Considerations
- VicRoads Supplement to Part 3: Geometric Design
- VicRoads Supplement to Part 4: Intersections & Crossings General
- VicRoads Supplement to Part 4a: Unsignalised & Signalised
## 10.0 REFERENCED DOCUMENTS

<table>
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<td>VicRoads Supplement to Part 4b : Roundabouts</td>
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<td>VicRoads Supplement to Part 4c : Interchanges</td>
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<td>VicRoads Supplement to Part 5 : Drainage Design</td>
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VicRoads Road Design Note RDN 3–02 Accessible Tram Stops in Medians

VicRoads Road Design Note RDN 3 – 03 Accessible Tram Stops in Safety Zones

VicRoads Road Design Note RDN 6-04 Accepted Safety Barrier Products

VicRoads TC-1003 (Standards Drawing: Typical Layouts For Pedestrian Operated Signals).

VicRoads Standard Specification Section 407 for Type N

Victorian Rail Industry Operations Group Standards VRIOGS 001 Structural Gauge Envelopes – Minimum clearances for Infrastructure adjacent to the Railway

Victorian Rail Industry Operations Group Standards VRIOG 007.1.2 PASS Assets Data Requirements - Tram

Victorian Rail Industry Operations Group Standards VRIOGS 007.2 Infrastructure Drawing Standards

Yarra Trams Interim Electrical Standard Technical Standard for Earthing and Bonding at Tram Stops Tram Bonding Standard 21_06
APPENDIX A
SAMPLE FUNCTIONAL SPECIFICATION
## SAMPLE FUNCTIONAL SPECIFICATION

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<td>Posted road speed (kph)</td>
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<td>Platform fit-out</td>
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### SAMPLE FUNCTIONAL SPECIFICATION

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<td>Seat(s) in shelter</td>
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<tr>
<td>Replace existing non-platform fence as detail attached</td>
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<td>Fence to rear of platform</td>
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<td>Number of 2400 fence panels (10 maximum) location of deleted panel(s) as detailed</td>
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<td>2 No shelter infill panels</td>
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<td>Handrail on both sides of ramp</td>
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<td>Ramp/walkway/intermediate landing surface finish asphalt</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Ground level refuge surface finish</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>TGSI type</td>
<td>TacPave</td>
<td>TacPave</td>
</tr>
<tr>
<td>Tram stop flag and timetable</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Audio unit</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Replace litter bin</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Number of litter bins</td>
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<td>NA</td>
</tr>
<tr>
<td>Ticket machine / card vending machine</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Change machine / add value machine</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Real time information display on shelter canopy</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Other fit-out item(s)</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Crash protection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Longitudinal crash protection required</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Tram stop protection energy absorbing bollards</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Number of energy absorbing bollards</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Tram stop protection steel guard fence</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Tram stop protection vertical face barrier</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Tram stop protection Type F concrete barrier</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>End protection required</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Type of approach end protection</td>
<td>Crash barrier return 4.3m IA</td>
<td></td>
</tr>
<tr>
<td>Longitudinal crash protection replaces rear edge kerbing</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Special fence mounting details along longitudinal crash protection</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Traffic management</td>
<td></td>
<td></td>
</tr>
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<td>Preliminary road safety audit</td>
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<td>Complete</td>
</tr>
<tr>
<td>Traffic signal remodel design required</td>
<td>No</td>
<td>No</td>
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<tr>
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<td>Complete</td>
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<td>DESCRIPTION</td>
<td>INBOUND</td>
<td>OUTBOUND</td>
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<tr>
<td>-------------------------------------------------</td>
<td>---------</td>
<td>----------</td>
</tr>
<tr>
<td>Line-marking layout as detailed</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Electricity and Communications to platform</td>
<td></td>
<td></td>
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<tr>
<td>Platform is powered</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Platform to have direct power supply</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Platform to have metered power supply</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>New conduits required to cross tram tracks</td>
<td>No</td>
<td>No</td>
</tr>
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<td>New conduits required to cross road</td>
<td>No</td>
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</tr>
</tbody>
</table>
APPENDIX B

URBAN DESIGN PRINCIPLES FOR TRAM STOPS

DOT ENHANCED FINISHES POLICY
APPENDIX B.1: URBAN DESIGN PRINCIPLES FOR TRAM STOPS

Urban Design Principles for Tram Stops

Purpose
This document is designed to complement the Department of Transport's (DOT) Client Design Requirements for Accessible Tram Stops. It contains a set of urban design principles that should be considered in the delivery of accessible tram stops on the Melbourne tram network.

Background
Tram stops provide an important service to the community. They are key elements and serve a critical functional role linking the pedestrian movement network to the public transport network. Tram stops form important features in their local context and streetscape as they are the focus of activity where tram users intersect with other modes of transport. They provide an opportunity to celebrate and integrate public transport with the community and surrounds. They provide clearly identifiable markers in the public realm.

The spaces between and adjacent to major roads and tram infrastructure offer opportunities for positive and functional open space, including cycling and pedestrian pathways. Activating the most from these spaces can be enhanced with the use of good collaborative architectural, urban and landscape design teams working with local authorities.

Tram stop design should consider:
- Client (DOT) Design Requirements for Accessible Tram Stops
- These principles

A. Maximise pedestrian safety

Tram waiting areas should be visible and transparent and include opportunities for passive surveillance.

NOTE: Designing for pedestrian safety minimises the risks of personal harm.

NOTE: Straight road approaches will allow drivers sufficient time to see upcoming tram stops.

TIP: Tram stops should be located away from traffic hazards. Pronounced curves in the roadway and roundabouts can pose a hazard for pedestrians as car drivers’ sight lines are limited.

TIP: If a stop is near a traffic hazard, traffic calming measures should be incorporated in the tram stop design to maximise pedestrian safety.
APPENDIX B.1: URBAN DESIGN PRINCIPLES FOR TRAM STOPS

B. Integrate adjacent spaces and land uses

Tram stops should achieve ‘functional integration’ into their surrounding urban setting.

Tram stops should maximise linkages to adjoining and nearby uses through siting of facilities. This will make the physical connections between the tram facilities and adjoining areas both logical and efficient for tram users.

**NOTE:** With good design, the land between and adjacent to major road and tram infrastructure offers opportunities for positive and functional public open space, including pedestrian and cycling pathways.

**TIP:** The design and materials adopted for tram stops should respond to the built form and streetscape of their immediate context. For example:

- If adjacent built form, pavement surfaces, street furniture, lighting boxes or planting have a distinctive character, consider using similar details or elements that complement that character.
- As an alternative, a stop designer may consider using a contrasting or distinctive detail or elements to enliven the urban setting and aid travelers in locating the tram stop.

D. Maximise legibility of the tram stop and surrounding area

Pedestrian, vehicle, bicycle and tram areas should be clearly identifiable and delineated to avoid confusing road users.

**TIP:** This can be achieved through:

- Visual and physical threshold treatments such as varied surface treatments, line markings, safety barriers etc.
- Seamless pedestrian transitions from tram stop area to adjacent pedestrian paths and areas.
- Co-location and design of bus, taxi and tram waiting areas and shelter facilities.

C. Maximise pedestrian amenity

Tram stops should maximise the quality of the public realm and contribute to the creation of an environment that is attractive, functional and accessible.

**NOTE:** The public realm consists of the public spaces between private buildings. These public spaces and facilities that exist in the streetscape, such as kerb extension areas, pocket parks or small plazas have potential to add to the comfort and attractiveness of tram stops.

**NOTE:** Tram stops should aim to create a sense of place, in particular where located adjacent to or near public spaces.

**TIP:** This can be created by the provision of additional seating areas and amenities adjacent to tram stops. While this is unlikely to be included in the design brief for a tram stop, it may be achievable by working closely with the local council.
APPENDIX B.2: DOT ENHANCED FINISHES POLICY

Enhanced Finished Policy

Introduction
The CDR provides the requirements for platform tram stops across the Melbourne network at a basic level of finish and quality comprising concrete, asphalt paving and galvanised steel fencing and handrails.

There may be locations where a higher standard of finish is warranted, such as the Melbourne CBD, on the understanding that this does not affect the basic functionality of the stop.

Scope of the Policy
In particular circumstances, designers should consider the application of enhanced finishes policy to the design of tram platform stops for the Accessible Tram Stop Program.

Locations that are Application of the Policy
These locations include:

- Principal stops at activity centres, major shopping centre / complexes
- Stops serving or adjacent to heritage structures, significant landmarks or highly visible boulevards
- Situations in which the local council has a greater level of finish to approaching foot paths - such as stops in CBD
- High patronage inter-modal interchanges
- Situation where it merits a change from the reasonable standard.

Spatial requirements may not permit some design and finish details, for example the standard MCC stainless steel fence design requires more space than the galvanised steel fence design.

Types of enhanced finishes
The types of enhanced finishes may include one or more of the following:

- Use of kerbs with bluestone or other materials apart from concrete
- Tiling of platform surfaces using materials, including bluestone and granite
- Use of stainless steel fencing and protection barriers
- Use of stainless steel TGSIs (subject to luminance contrast) or special pavers
- Provision of multiple shelters, Passenger Information Display (PID) at platforms
- Additional lighting, signage or any other enhancements.

Application of the Policy
The Project Manager DOT shall determine to what degree the Policy should be applied to a particular tram stop, or group of stops, and shall:

- consult with stakeholders - particularly local councils
- document, with reasons, why a higher level of finish is required, or not, including stakeholder expectations including the reasonableness of the same, any funding implications and the source of additional funds;
- prior to committing any level of finish to the stakeholders / councils, seek the endorsement of the Steering Committee, or the Client funding agency, in the absence of the Steering Committee
- confirm that the use of enhanced finishes does not compromise on the safety or functionality of the stop
- confirm that whole of life maintenance costs or impacts are clearly understood, documented and agreed with the funding agency/Steering Committee.
APPENDIX C
Figures 9 - 17
Figure 9: Structural Gauge Platform Clearances
Figure 10: Platform Furniture Clearances

[Diagram showing clearances for platform furniture with\nnotations: 1. This figure illustrates the maintenance of an accessible along a platform\n2. This figure shows maximum shelter return dimensions for design widths\n3. A shelter seat may not protrude beyond the shelter return]
Figure 11: Indicative Platform Sections; Flexible Platform Construction
Figure 12: Indicative Platform Sections; Concrete Platform Construction
Figure 13: Fence Types

- Post and Handrail Fence
- Post and Wire Handrail Fence
- Vertical Bar Panel Fence
- Proprietary Fence

Note: If posts are not seated below finished pavement surface, the gap between the base plate and asphalt is to be filled with structural silicone coloured to suit, or an alternative approved treatment.
Figure 14: Fence Details; Ramp & Handrails
Figure 15: Fence Set-out Arrangement
Figure 16: Electrical Supply & Bonding Schematic
Figure 17: Communications Conduits & Equipment Upgrade for Ticketing System
Appendix D.1 VicRoads Design Note RDN 03-02

ROD DESIGN NOTE

Accessible tram stops in medians

1. Purpose
This Road Design Note (RDN) provides guidelines for the design of road infrastructure associated with accessible tram stops located in medians of dual carriageway roads.

Accessible tram stops provide a platform and associated ramp/pedestrian facilities that comply with the requirements of the Disability Discrimination Act (1992) Disability Standards for Accessible Public Transport (2002) (DSAPT) and referenced Australian Standards.

This RDN should be read in conjunction with the Client (DCO) Design Requirements for Accessible Train Stops (2006) which will include this RDN in an appendix.

2. Scope
This RDN is applicable for tram stops in medians:
- Where posted speed limits are between 60 km/h and 80 km/h.
- At intersections and mid-block between intersections.

This RDN provides guidelines on:
- Road safety barrier requirements.
- Traffic lane width reduction and traffic lane realignment where the platform cannot be contained within the existing median.
- Signing and line marking requirements.
- Intersection sight line requirements.

3. Road safety barriers
Road safety barrier requirements are dependent on the following factors:
- Posted speed limit.
- Platform level relative to adjacent roadway.
- Protection of other shielding features.

Appendix A provides details of road safety barrier requirements for different speed zones.

Appendix B provides details of acceptable layouts for road safety barriers and platform terminations.

4. Traffic lane width reduction & realignment
Widths required for platforms are provided in the DCO design guidelines referenced in Section 1.

Wherever possible, traffic lanes should be left unaltered with the platform fitted into the existing median.

Where encroachment of the platform into traffic lanes is necessary, changes to lane arrangements shall consider:
- Traffic lane width requirements. Refer to Section 4.2.5 (Urban Road Widths) of AusRoads Guide to Road Design – Part 3: Geometric Design.
- Lane alignment. Any lateral shifts in traffic lanes adjacent to platforms shall include appropriate changes to the lane alignment on both the approach and departure sides of the platform. These changes can be achieved by adopting:
  - Horizontal geometry as defined in AusRoads Guide to Road Design – Part 3: Geometric Design and VicRoads Supplement to the AGPD based on a speed equal to the speed limit plus 10 km/h.
  - Pavement width requirements for turning movements at intersections. Refer AusRoads Design Vehicles and Turning Path Templates (2006) and applicable VicRoads Region for advice on appropriate design vehicles.
  - Method of removal of redundant lane marking. The extent and method of redundant line marking removal is subject to the approval of VicRoads. The practices usually adopted for VicRoads projects shall be used. Placement of asphalt overlays for the full width of pavement to cover redundant line marking may be required where substantial shifts in lane lines are required.

Proposals for changes to traffic lane widths and/or alignments are subject to the approval of VicRoads.
5. Signing & line marking
Signing and line marking shall comply with the requirements of VicRoads Traffic Engineering Manual Volume 2 - Signs and Markings.

Where platforms are within the existing median edge lines will usually be required. Where platforms cannot be accommodated within the existing median edge lines, diagonal markings, RIPMs and chevron hazard marker signing may be required.

6. Intersection sight line requirements
Sight line requirements at intersections and mid-block locations are defined in Austroads Guide to Road Design – Part 2: Geometric Design and VicRoads Supplement to the AGRD.

Platform stops and associated pedestrian waiting shelters, etc. shall not reduce sight distances currently available, unless agreed otherwise with VicRoads. Any reduction in sight distances shall be subject to the approval of VicRoads.

7. Approval process
The DOF design guidelines referenced in Section 1 include a detailed design workflow. This workflow shall include road safety audit and all changes to road infrastructure associated with each tram stop. Approval of DOF, Yarra Trams and VicRoads is required for concept designs before proceeding to detail design.

VicRoads approvals shall be obtained from the relevant VicRoads Region.

References
Supersedes – RDN 03-32 (Nov 2006)
VicRoads Standard Drawings for Road Works

Approved by
David Barton
PRINCIPAL ROAD DESIGN ENGINEER
VicRoads

Contact
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Email: technicalconsulting@roads.vic.gov.au

Road Design Notes are subject to periodic review and may be superseded.

APPENDIX A: Road Safety Barrier Requirements
APPENDIX B: Layouts for Road Safety Barriers & Platform Terminations
Appendix D.1 VicRoads Design Note RDN 03-02

Appendix A

Road safety barrier requirements

Road safety barrier requirements will vary depending on site conditions and the design of the platform. Two categories of road safety barrier treatment are possible. These are:

Category 1 - Full length barriers

This Category requires road safety barriers for the full length of the platform including protection of the end facing approaching traffic.

Category 2 - Barriers at Approach Ends Only

This Category only requires road safety barrier protection for the end of the platform facing approaching traffic. Platforms shall be designed with Category 1 barriers where any of the following conditions apply, except where omission of barriers is acceptable as described in Section A3 below:

- The Design Speed Limit is greater than 60 km/h - refer Section A1 below for definition of Design Speed Limit.
- The platform is below the level of the adjacent road pavement. This condition applies when the platform edge closest to the road is below the adjacent pavement level.

Category 2 barriers shall be adopted for all other sites, except where omission of barriers is acceptable as described in Section A3 below.

A1. Design speed limit

Design speed limit is the posted speed limit applicable at the platform site, except as follows:

- Where the platform is located within 250m of a change in speed limit with the platform in the lower speed zone (e.g. platform in 60 km/h zone, near 70 km/h zone), design should be based on the higher speed limit when:
  - The platform is downstream of a reduction in speed limit and road/traffic conditions indicate that the reduced speed limit has not substantially reduced vehicle speeds at the platform site.
  - The platform is upstream of an increase in speed limit and road/traffic conditions indicate that vehicle speeds at the platform site are already close to those expected in the higher speed zone.

Examples of road conditions which may warrant designing for the higher speed limit include downhill grades, widening cross section (e.g. added lanes), changes in parking restrictions.

A2. Site usage & road conditions warranting Category 1 barriers

Some stops typically attract high numbers of waiting passengers. Examples are near schools, universities, retail centres and near interchanging train, tram and Principal Public Transport Network bus services.

The road alignment and cross section at the site and on its approaches should be designed to minimise the vulnerability of the platform to errant vehicles.

However, even with a 60 km/h speed limit, Category 1 barriers shall be adopted if the stop is one typically attracting high passenger numbers, and any of the following road conditions apply:

- Road conditions that are considered within the existing median and existing traffic lanes do not exist around the platform site, the deviation does not meet the desirable standard for lane realignment defined in Section 4.
- Any traffic lane width reduction and/or realignment required to accommodate the platform does not meet desirable standards. Desirable standards for lane realignment are defined in Section 4.
- The platform is located on the outside of a curve of radius less than 500m.

A3. Omission of road safety barriers

Road safety barriers may be omitted from the design when site conditions are such that the platform is effectively shielded from errant vehicle impacts by other features in the road reserve not associated with the platform stop. Where these features are themselves roadway hazards (e.g. trees, poles, etc.) which could be shielded by barriers otherwise required for protection of the platform, then the barriers shall be installed. Where minor modification/extension of barriers required to protect the platform would provide protection of existing roadway hazards, then this modification/extension shall be adopted.

Any proposals to omit road safety barriers shall be considered on a site by site basis and submitted to VicRoads for approval.
Appendix D.1 VicRoads Design Note RDN 03-02

Appendix B
Layouts for road safety barriers and platform terminations

Fig B1 – Mid-Block Tram Stops with Category 1 Barriers
Appendix D.1 VicRoads Design Note RDN 03-02
Appendix D.1 VicRoads Design Note RDN 03-02

Fig B3 – Mid-Block Tram Stops with Category 2 Barriers
Appendix D.1 VicRoads Design Note RDN 03-02

Fig B4 – Intersection Tram Stops with Category 2 Barriers
Appendix D.1 VicRoads Design Note RDN 03-02

Fig B5 - Platforms with F Type Concrete Barrier

Fig B6 - Platforms with Vertical Face Concrete Barrier

NOTE: Refer Note 4 for conditions on use of Vertical Face Concrete Barrier
Appendix D.1 VicRoads Design Note RDN 03-02

Notes to Figures B1 to B6 – Layouts for road safety barriers and platform terminations

1. A minimum 25m ‘length of need’ of Type B guard fence aligned as per VicRoads standard drawing SD 3511 (latest version) shall be provided where the median slope is appropriate for a Line A installation. An equivalent Line B installation as per VicRoads standard drawing SD 3322 (latest version) shall be provided where the median slope is not suitable for a Line A installation. Where there is adequate clearance between the guard fence ‘start of need’ point and the tram line, a BCTA terminal as shown on SD 3511 (latest version) and SD 3541 (latest version) may be adopted. Where the clearance between the guard fence ‘start of need’ point and the tram line is inadequate for a BCTA terminal, an appropriate proprietary guard fence terminal may be adopted. Refer 06-04 for acceptable alternative terminals. Note that an ‘Omni Stop Terminal’ is not an acceptable terminal for speed limits between 60 and 80 km/h. Where the guard fence terminates at the platform concrete barrier, refer to Note 3 below. Guard fence terminating prior to a platform or pedestrian crossing point shall include a BCTA terminal as per SD 3511 (latest version).

2. Acceptable impact attenuators, or crash cushions, are listed in RDN 06-04. Impact attenuators shall be suitable for design speeds of at least the speed limit plus 10 km/h. Energy absorbing bollards are not an acceptable substitute for impact attenuators.

3. Where guard fence is used to provide end protection for signs that require concrete barrier protection, the guard fence shall be connected to the concrete barriers. Refer standard drawing SD 40994 (latest version) for details. The reduced post spacing shown on SD 40994 (latest version) shall apply for the first 10 m of guard fence beyond the concrete barrier, however the guard fence alignment shall be as per SD 3511 (latest version).

4. F-type concrete barrier as shown in Figure B6 and VicRoads standard drawing SD 3901 (latest version) shall be adopted as the preferred concrete barrier profile where site constraints permit. In 60 km/h zones where the available cross section width is restricted and adoption of F-type barriers would require reduction of traffic lane widths, vertical face concrete barriers as shown in Figure B6 may be adopted. Vertical face concrete barriers may only be adopted in 70 or 80 km/h zones where the stop is located adjacent to a right turn lane, the available cross section width is restricted, and adoption of F-type barriers would require reduction of traffic lane widths. Vertical face concrete barriers shall be designed to provide the same containment as F-type barriers. Concrete barriers shall not be installed behind new kerb and channel. Any existing kerb and channel in front of proposed concrete barriers shall be removed and the area between the pavement and barrier paved, unless the offset between the barrier and the face of kerb is greater than shown in Table 1.

<table>
<thead>
<tr>
<th>Speed Limit (km/h)</th>
<th>Minimum Offset from Barrier to Face of Kerb (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>1.5</td>
</tr>
<tr>
<td>70 or 80</td>
<td>2.1</td>
</tr>
</tbody>
</table>

5. Where Category 1 safety barriers are required and the stop is either mid-block with the access ramp on the departure side, or on the approach side of an intersection, guard fence may be used in lieu of concrete barriers where at least 300mm clearance can be provided between the back of the guard fence posts and the platform.

6. Where concrete barriers are used at stops on the approach side of intersections, an assessment must be made on whether or not protection of the concrete barrier end facing the intersection is required. Where this assessment determines that the concrete barrier end is vulnerable to end on errant vehicle impacts, then impact attenuator protection shall be provided.

7. Where Category 2 barriers are adopted, the offset between the platform and the nearest adjacent traffic lane should be as large as possible. The minimum offset between a platform and traffic lane is 3.5 m.

For further information please phone 13 11 71 or visit vicroads.vic.gov.au

VicRoads
Keeping Victorians Connected
Appendix D.2 VicRoads Design Note RDN 03-03

ROAD DESIGN NOTE

Accessible tram stops in safety zones

1. Purpose
This Road Design Note (RDN) provides guidelines for the design of road infrastructure associated with accessible tram stops located in safety zones.

Accessible tram stops provide a platform and associated ramps/pedestrian facilities that comply with the requirements of the Disability Discrimination Act (1992), Disability Standards for Accessible Public Transport (2002) (DSAPT) and referenced Australian Standards.

This RDN should be read in conjunction with the Department of Infrastructure (DOI) issued VRDCS 005.3-2006, which includes the Clients (DO) Design Requirements for Accessible Tram Stops (2006).

2. Scope
This RDN is applicable for tram stops in safety zones on arterial and local roads:
- Where posted speed limits are between 50 km/h or less
- At intersections and mid-block between intersections.

This RDN provides guidelines on:
- Road safety barrier requirements.
- Traffic lane realignment, removing or reallocating where the platform cannot be accommodated within an existing safety zone.
- Signing, line marking and street lighting requirements.
- Intersection sight line requirements.

3. Road safety barriers
Road safety barrier requirements are dependent on the following factors:
- Posted speed limit.
- Turn stop usage and road condition.
- Site constraints and/or urban design requirements.

Appendix A provides details of road safety barrier requirements for different speed zones.

Appendix B provides details of acceptable layouts for road safety barriers and platform terminations.

4. Traffic lane width reduction & realignment
Widths required for platforms are provided in the DOI design guidelines referenced in Section 1.

Wherever possible, traffic lanes should be left unaltered with the platform fitted into the available cross section. Where encroachment of the platform into traffic lanes is necessary, changes to lane arrangements shall consider:
- Traffic lane width requirements. Refer to Section 4.2.5 Urban Road Widths of Ausroads Guide to Road Design – Part 3, Geometric Design.
- Lane alignment. Any lateral shifts in traffic lanes adjacent to platforms shall include appropriate changes to the lane alignment on both the approach and departure sides of the platform. These changes can be achieved by adopting:
  - Horizontal geometry as defined in Ausroads Guide to Road Design – Part 3, Geometric Design and the associated VicRoads Supplement based on a speed equal to the speed limit plus 10 km/h, based on a speed equal to the speed limit plus 15 km/h.
  - Pavement width requirements for turning movements at intersections. Refer Ausroads Design Vehicles and Turning Path Templates (2006) and applicable VicRoads Region for advice on appropriate design vehicles.
  - Method of removal of redundant line marking. The extent and method of redundant line marking removal is subject to the approval of VicRoads. The practices usually adopted for VicRoads projects shall be used. Placement of asphalt overlays for the full width of pavement to cover redundant line marking may be required where substantial shifts in lane lines are required.

Appendix C provides details of the principles to be applied in developing proposals that require changes to traffic lane widths and/or alignments and issues that must be addressed.

Proposals to remove any existing traffic lanes shall be clearly identified at the concept design stage. Approvals...
for removal of existing traffic lanes shall be obtained from the Regional Manager of the relevant VicRoads Region. Proposals for changes to traffic lane widths and/or alignments are subject to the approval of VicRoads.

5. Signing, line marking & street lighting
Signs and line marking shall comply with the requirements of VicRoads' Traffic Engineering Manual Volume 2 - Signs and Markings.

Where platforms are within the existing safety zone/cross section, edge lines will usually be required. Where platforms cannot be accommodated within the existing safety zone/cross section, edge lines, diagonal markings and RFPMs may be required.

For the purpose of street lighting, roads adjacent to platform tram stops shall be lit to a minimum of V3 standard. Particular attention should be paid to ensure appropriate lighting of lane re-alignments, the nose of the tram platform, lane narrowings, pedestrian crossings, crash cushions and bollards.

Higher lighting levels may be required by the tram operator for passengers at the tram stop. The lighting design of the platform tram stops should ensure that no one particular feature is grossly over lit in comparison to other tram features or other road features. The lighting of tram facilities shall not be to the detriment of the lighting of the road.

6. Intersection sight line requirements
Sight line requirements at intersections and mid-block locations are defined in:

- Ausroads Guide to Road Design
  - Part 5: Geometric Design (midblock)
  - Part 4A: Unsignalised and Signalised Intersections (intersection);
  - Part 4B: Roundabouts (intersection);
  - Part 4C: Interchanges (intersection); and

- VicRoads Supplements to the Ausroads Guide to Road Design.

Platform stops and associated pedestrian waiting shelters, etc., shall not reduce sight distances currently available, unless agreed otherwise with VicRoads. Any reduction in sight distances below desirable standards based on an operating speed of 10 km/h above the speed limit shall be subject to the approval of VicRoads.

7. Drainage requirements
The effect of platform tram stops on the existing drainage regime should be checked. For drainage purposes, platform tram stops should be considered as traffic islands and comply with the requirements of VicRoads Supplement to the Ausroads Guide to Road Design – Part 5: Drainage Design and Section 7.1.3 of VicRoads Road Design Guidelines Part 7 – Drainage.

8. Approval process
The DCO design guidelines referenced in Section 1 include a detailed design workflow. This workflow shall include road safety audit and all changes to road infrastructure associated with each tram stop. Approval of DCO, Yarra Trams and VicRoads is required for concept designs before proceeding to detail design.

VicRoads approvals shall be obtained from the relevant VicRoads Region.

References
Supersedes – RDN 03-33 (July 2007)
VicRoads Standard Drawings for Road Works

Approved by

David Barton
PRINCIPAL ROAD DESIGN ENGINEER
VicRoads

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Road Design Notes are subject to periodic review and may be superseded.

APPENDIX A: Road safety barrier requirements
APPENDIX B: Layouts for road safety barriers & platform terminations
APPENDIX C: Development of proposals to modify traffic lanes
Appendix D.2 VicRoads Design Note RDN 03-03

APPENDIX A

Road safety barrier requirements

Road safety barrier requirements will vary depending on site conditions and the design of the platform. The situations described in Appendix A and B only covers crash protection for traffic traveling in the same direction as the tram using the platform. Equivalent crash protection should be installed on the departure end of the platform to cater for traffic traveling on the tram tracks in the opposite direction (other than right turn traffic). Three categories of road safety barrier treatment are possible. These are:

Category 1 – Full length vertical concrete barrier & crash cushion

This category requires an 800mm high vertical concrete barrier for the full length of the platform plus crash cushion protection of the platform end facing approaching traffic. Refer to Section A2 below for details of crash cushion requirements.

Category 2 – Crash cushion at approach end only

This category requires crash cushion protection for the end of the platform facing approaching traffic. Refer to Section A2 below for details of crash cushion requirements.

Category 3 – Crashworthy® array at approach end only

This category requires protection of the platform end facing approaching traffic by an array of crashworthy bollards. An alternative to a bollard array may be considered for sites where bollards are inconsistent with urban design objectives, and these objections warrant the omission of bollards. Refer to Section A2 for details.

Platforms shall be designed with Category 1 barriers where the following conditions apply:

- The speed limit at the site is 60 km/h.
- Stop usage and road conditions warrant Category 1 barriers – refer Section A1 below.

Category 2 barriers shall be adopted for all other sites, except where Category 3 barriers are acceptable as described in Section A3 below.

A.1. Stop usage & road conditions warranting category 1 barriers

Some stops typically attract high numbers of waiting passengers. Examples of such stops include stations near schools, universities, retail centers and near interchanging tram and bus services. The road alignment and cross section at these sites and on their approaches should be designed to minimise the vulnerability of the platform to errant vehicles.

Category 1 barriers shall be adopted if the stop is one typically attracting high passenger numbers, and any of the following road conditions apply:

- Any traffic lane realignment, width reduction or removal required to accommodate the platform does not meet desirable standards defined in Section 4.
- The platform is located on the outside of a curve of radius less than 200m.

A.2. Crash cushion requirements

The length and width of crash cushions can vary to account for variations in the design impact speed and the width of hazard requiring protection. Crash cushions shall be selected based on the following criteria:

- Design impact speed. Where site constraints permit, crash cushions shall provide for a design impact speed equal to the speed limit plus 10 km/h. Where the site is constrained and the length required to meet this requirement is not available, a design impact speed equal to the speed limit may be adopted.
- Width of Hazard Protected. Where the non-access end of the platform faces approaching traffic, a crash cushion that maximises the width of platform protected shall be adopted. Where the platform access ramp faces approaching traffic and site constraints permit the use of a crash cushion that maximises the width of platform protected, then such a crash cushion shall be adopted. Where the platform access ramp faces approaching traffic and site constraints are not compatible with the use of a wide crash cushion, a narrow crash cushion located at the foot of the ramp may be selected.

A minimum 1.2m clearance shall be provided between crash cushions and adjacent tram lines to ensure that pedestrians cannot be trapped between a tram and the crash cushion.

Refer to Appendix 3 for diagrams of acceptable crash cushion installations.

A.3. Site conditions where category 3 barriers may be acceptable

Crashworthy bollards shall not be used in lieu of an accepted crash cushion except where all of the following conditions are met:

- The speed limit is 50 km/h or less at all times.
- Actual traffic operating speeds at the platform site are consistent with the applicable speed limit.
- The site is constrained and/or urban design considerations are of such high priority that an accepted crash cushion cannot be accommodated or is not considered appropriate.

An example of an acceptable crashworthy bollard is the “Comfit Stop” bollard (Code 2211), supplied by Saffaroons Pty Ltd. This is a proprietary product. The foundations of these rigid steel bollards include a cartridge which allows the bollard to partially deflect on impact which reduces the forces to errant vehicles than simple rigid bollards. While these bollards have been successfully crash tested, their crash performance both from a vehicle...
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occupant and vehicle damage point of view is inferior to
that of accepted crash cushions.

Alternatives to "olumn" bollards may be considered
where these alternatives have been successfully crash
tested to at least Test Level 1 as defined in AS 3845:1999.

Acceptable configurations of crashworthy bollards for the
protection of platform ends are shown in Appendix E.

Bollard alternative

At sites that would otherwise be suitable for Category
3 barriers, where bollards are undesirable due to urban
design objectives, replacement of bollards with a
raised traffic island located between the platform and
approaching traffic may be considered. The minimum
requirements for the traffic island are as follows:

- The width of the island is no less than the maximum
  width of the platform.
- The length of island where the width requirement of
  point iii is met is no less than 10m.
- Barrier kerb as shown on standard drawing SD 2091
  (latest version), or accepted equivalent, shall be used.
  Movable or semi-movable kerb is not acceptable.
- Offsets to traffic lanes shall be as per normal traffic
  island requirements defined in Austroads Guide to
  Road Design Part 4C and VicRoads Supplement.

When considering this alternative, it must be recognised
that a traffic island will not provide the same level of
protection from errant vehicle impacts as the bollard
arrangement shown in Appendix A. The approval process
for such a proposal must consider the risks associated with
omission of bollards and conclude that the treatment
proposed is appropriate for the site.
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Appendix B
Layouts for road safety barriers and platform terminations

Traffic Lane Realignment / Width Reduction – Refer Section 4

Island Line Marking & Signing
Refer Note 1

Crash Cushion that Maximises Width of Platform Protected
Refer Section A2 & Note 2

Concrete Barrier
Refer Note 3

Section A-A Refer Fig B4

Traffic Lane Realignment / Width Reduction – Refer Section 4

INTERSECTION

Pedestrian Crossing

Narrow Crash Cushion
Refer Section A2 & Note 2

Section A-A Refer Fig B4

Concrete Barrier
Refer Note 3

Access Ramp on Departure Side of Platform

Access Ramp on Approach Side of Platform

Fig B1 – Tram Stops with Category 1 Barriers
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Fig B2 – Tram Stops with Category 2 Barriers
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Fig B3 – Tram Stops with Category 3 Barriers
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Figure B4 - Platforms with Vertical Face Concrete Barrier

Notes to Figures B1 to B4 – Layouts for road safety barriers and platform terminations

1. Island line marking and signing as per Section 18.2 and Figure 18.26 of VicRoads Traffic Engineering Manual Volume 2 – Signs and Markings shall be provided on approaches, except for departure side stops at intersections.

2. Acceptable crash cushions, or impact attenuators are listed in Road Design Note 08-04.

3. Vertical face concrete barriers shall be designed to satisfy a low performance level as defined in AS5100 – Bridge Design, or better. Concrete barriers with a Type F profile as shown on standard drawing SD3901 (latest version) are an acceptable alternative to vertical face profiles.

4. Bollards should be aligned to maximise the width of platform protected. An angled array of bollards as shown in Fig. B3 is preferred to minimise the likelihood of striking more than one bollard simultaneously.

5. A line of bollards perpendicular to the direction of approaching traffic is only acceptable where site constraints prevent the use of an angled array as described in Note 4 above. Bollards should be aligned to maximise the width of platform protected.

6. Where the access ramp is located on the approach side of the platform and the ramp is separated from the pedestrian crossing such that it is not shielded by bollards at the intersection or signal poles, then bollards should be provided between the crossing and the access ramp failing to maximise the protection provided to the platform.

7. Bollards should be a conspicuous colour to ensure they are highly visible to motorists and include a delineator as defined in Section 23.2.1 of VicRoads Traffic Engineering Manual Volume 2 – Signs and Markings.
Appendix C

Development of proposals to modify traffic lanes

Most existing safety zones will not be wide enough to accommodate a platform stop without encroaching on the adjacent traffic lanes. Where encroachment is necessary there are basically three options available. These are:

Option 1. Maintain the existing lane configuration and reduce the width of one or more lanes.

Option 2. Remove one lane and modify the width of the remaining lane(s).

Option 3. Widen the pavement on the outside of the carriageway and realign lanes around the platform stop.

Proposals for individual sites may combine two or more of these options. As each site may have unique constraints, it is not possible to be prescriptive in this design note about which option should be adopted, however principles which should be applied in developing proposals are as follows:

1. Lane widths

Minimum lane widths are as follows:

- Through lanes: 3.0m
- Turning lanes: 2.8m
- Bicycle lanes: 1.2m

Desirable traffic lane widths as shown in Section 4.2.5 (Urban Road Widths) of Austroads Guide to Road Design – Part 3: Geometric Design, or widths close to these as possible should be adopted in preference to minimum widths where feasible.

Lane widths less than shown above, or greater than shown in Section 4.2.5 (Urban Road Widths) of Austroads Guide to Road Design – Part 3: Geometric Design may be considered where the width proposed is consistent with those on the existing road either side of the stop. Lane width proposals shall consider the proportion of commercial vehicles in the existing traffic mix and ensure that lane widths are appropriate.

Where a single traffic lane is provided past a platform stop, the minimum pavement width required between the platform and the outer face of kerb is 3.6m, except where additional pavement width is required to meet the requirements of cyclists as described in Section 3 below.

2. Alignment shifts/lane merges

Changes in lane alignment, based on diverge tapers with a rate of lateral shift of 1.0m/s is generally acceptable.

Where lane merges are required, merge tapers based on a rate of lateral shift of 0.6m/s are required.

Taper details, including sight distance requirements are defined in Austroads Guide to Road Design Part 4C and VicRoads Supplement.

For platforms at intersections, it is not acceptable to shift the alignment of lanes on one side of an intersection without either:

- (a) Providing the same shift in alignment on the other side of the intersection before transitioning back to the original alignment, or
- (b) Providing clear delineation of lane alignments through the intersection.

Option (a) is generally preferable to Option (b). Approach sight distance appropriate to the speed limit is essential for either option.

3. Providing for cyclists

The safety of cyclists travelling past platform stops is a key issue that must be considered in developing proposals that require reductions in lane widths or changes in lane configuration. Short sections of roadway with reduced cross section width can be potentially hazardous for cyclists by creating “square points” when the road space available to them is significantly less than that on the adjoining sections of road.

Platform proposals that require changes to lane widths/configurations must ensure that provision for cyclists appropriate to the route is included. On routes that are likely to be popular with cyclists, consideration should be given to providing an on-road bicycle lane or a wide kerb-side lane. Refer to VicRoads Cycle Notes No. 7 (August 2000) and No. 13 (July 2004) for further guidance on this issue.

Provision for cyclists must consider not only the cross section width available but also the suitability of the pavement surface for bicycles. Examples of pavement surfaces that may not be suitable for cyclists include blue stone kerb or channel with wide blue stone channels or depressed grated pits.

Where the platform proposal will effectively force cyclists to traverse an unsuitable pavement surface, they were previously able to avoid, modification of this unsuitable surface to make it traversable for cyclists shall be included in the platform works.

4. Lane removal – assessment of proposals

The retention of the existing lane configuration is a highly desirable objective, even if lane widths need to be reduced. Where this is not possible, VicRoads should be advised prior to concept designs being submitted for approval to enable an assessment of the effect of changing the lane configuration on the operation of the affected road(s) to be carried out. VicRoads may conduct its own assessment of traffic impacts and/or provide direction on the traffic assessment required to be carried out by others prior to submission of concept designs for approval.

Where a number of stops are expected to have a similar effect on lane configurations along a route these should all be advised to VicRoads at the same time to enable the route effects and individual site effects to be considered concurrently.
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The feasibility of relocating stops to avoid changes to lane configurations at critical intersections or mid-block locations should be investigated to enable an assessment of all available options to be completed.

5. Parking

Where lane realignment or removal impacts on existing parking capacity, the number of parking spaces affected should be identified and shown on any proposals submitted to the relevant municipality for approval. The relevant municipality shall be consulted on the feasibility of modifying existing parking arrangements before any proposals are submitted for approval. Where changes to the road layout will have an impact on existing parking arrangements, the relevant municipality should be invited to submit proposals for mitigation measures, including the feasibility of modifying adjacent parking areas for additional capacity, which would be included in the platform works.

The number of parking spaces affected should be minimised subject to the lane width and realignment provisions of this design note being satisfied.

6. Local Access

The effects of any changes to existing traffic lanes on points of access to adjoining properties shall be identified and shown on any proposals submitted to the responsible road authority for approval. Changes to existing traffic lanes may affect local access in a number of ways, examples of which include the following:

- Commercial vehicle access. Reduced lane widths may force larger vehicles to occupy more than one lane in order to turn into or from a point of access. Proposals must demonstrate that existing access conditions can be maintained – i.e. design vehicles currently able to access a property must continue to have viable access.

- Access in merge areas. If lane merges are required, points of access within merge areas may be more hazardous than those within single or dual lane sections of road due to the increased demands on drivers in these areas. Merge areas should be located clear of points of local access if possible.

- Sight lines to access points. Changes to lane alignments may change sight lines available to vehicles exiting points of local access, particularly if parking is permitted near the approach side of the access point. Sight lines available to points of local access must be appropriate to the speed environment.

7. Bus Stops

Any bus stops located within sections of road where lanes will be modified or removed should be identified and shown on any proposals submitted to the responsible road authority. The effect of buses stopping within the modified section on traffic operation and safety should be considered as part of the assessment of the proposal.

Bus service operators and the responsible road authority shall be consulted on all proposals where existing bus stops may be affected by tram platforms and associated roadworks to ensure that bus operations are not adversely affected.

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APPENDIX E: Exception Process
Exceptions

Where space is not available to meet the DSAPT requirements, an Exception process applies as follows. The matter must be referred to the Director of Public Transport (DOPT) for resolution.

Typical site or geometric constraints which may occur at a particular location may include:

- a platform width less than 2785mm
- steep road grades
- a ramp with a longitudinal gradient steeper than 1 in 14
- a ramp longer than 9m with a longitudinal gradient of 1 in 14
- clear width between inside edges of handrails of less than 1200mm.

The Disability Discrimination Act 1992 Disability Standards for Accessible Public Transport (DSAPT) 2002 are the minimum standards required for people with disabilities to safely manoeuvre around the public transport system. The Disability Discrimination Act 1992 and Disability Standards for Accessible Public Transport (DSAPT) 2002 are not, however, the minimum standards applicable to mass transport infrastructure.

Many other passengers with additional needs for access, such as parents with prams and small children, older people, and passengers with luggage, shopping or bicycles also benefit from the access provided by meeting the minimum DSAPT requirements.

The DSAPT require that compliance should be achieved ‘as far as possible’ and that minor non-compliances may be inevitable in retrofitting existing infrastructure.

At locations on the tram network where it is not possible to achieve a fully DSAPT compliant solution for platform stops, the Disability Discrimination Act 1992 makes provision to apply Clause 11 of the Act dealing with unjustifiable hardship as a defence for non compliance when challenged under a Complaint to AHRC or the federal court. The details of the relevant circumstances in determining if compliance would involve unjustifiable hardship are set out in the DSAPT Part 33.7.

There is no sign off for this provision and the legislation does not authorise parties to determine its application. The parties must refer such cases to the Director of Public Transport (Project Steering Committee - PSC) for determination under the following process:

EXCEPTION PROCESS

Program Manager to identify the DSAPT requirements which cannot be met (including any minor non-compliance) during the early conceptual stages of the project.

Project Manager to provide written advice to the Social Transit Unit Public Transport Division on the non-compliances and any proposed alternative solutions, including all relevant issues and the estimated costs involved to achieve compliance.

Social Transit Unit to advise Project Manager on options and the way forward. This may include referral to the Public Transport Access Committee (PTAC) for consideration.

Timeframes for all phases shall be articulated by the parties and shall be consistent with approved program and project requirements.