Standard

Infrastructure - Tram Stop Platform Design

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1 PURPOSE

The purposes of this standard are to specify the minimum requirements for:

- design of new accessible tram stops on the Yarra Trams network, and
- enhancements of existing and new tram stops to ensure they are accessible and compliant with relevant legislation and regulations.

2 SCOPE

The scope of this standard is design of accessible tram stops.

This standard includes requirements for design, function, passenger amenity and access that are applicable in the development of accessible tram stops.

This document is to be used in conjunction with the Disability Standards for Public Transport (DSAPT) 2002, referenced Australian Standards and other applicable regulations including VicRoads Guidelines and documents.

3 COMPLIANCE

This standard shall be fully complied with. Deviation from this standard is only permitted when a waiver has been sought and approved by Yarra Trams. Where the deviation is against a PTV standard, additional approval from PTV will be required.

'Shall' statements are mandatory in the context of compliance with requirements stipulated in this standard.

'Should' statements are considerations only in the context of compliance with requirements stipulated in this standard.

'Information' statements provide additional explanatory content for clarification purposes in the context of compliance with this standard.

'So far as is reasonably practicable' statements must result in the provision of a risk assessment including proposed design controls to demonstrate compliance to this standard.

All Yarra Trams, supplier, contractor or third parties who undertake design activities for Yarra Trams shall comply fully with this standard when performing design of tram stops on the Melbourne Metropolitan Tram Network (MMTN).

All designs are subject to a consultation and review process with Yarra Trams and external stakeholders including: TfV, TSV, PTV, VicTrack, relevant Local Council, VicRoads, Heritage Victoria, utility service authorities, Yarra Trams suppliers, special user groups and the general public. Yarra Trams approvals are required on completion of final design plans, prior to tender acceptance, and on completion of construction.

Any third party or contractor undertaking design activities on the Yarra Trams network shall complete and return a compliance schedule for this standard. Assessment of compliance shall be provided for each requirement, defined by one of three permissible responses:

- Compliant;
- Partially Compliant;
- Non-Compliant.

Absolute requirements in this standard are defined within square brackets i.e. [AM]. Absolute values shall not be accepted without prior consultation and acceptance by Yarra Trams. Deviation beyond Absolute values shall not be accepted under any circumstances.

The designer shall ensure that the latest revision of all drawings used in the design are obtained from the DMS.

4 REQUIREMENTS

4.1 General

Information: Tram stops should be designed in consideration of the surrounding environment, particularly access to and from the tram stop. The scope of works boundary for tram stops should be confined to:

- *Interfaces with the pedestrians and the road environment, including kerb ramps to the footpath;*
- *Access paths from the interface with the pedestrian and road environment to the tram stop infrastructure and;*
- *Tram stop infrastructure located within the platform area.*

4.1.1 Design Principles

4.1.1.1 The tram stop design shall consider future urban design profile characteristics, including:

- Proposed new schools, building developments and other infrastructure;
- Patronage (current and future);
- Demographic location to inform specific amenity provisions, such as retirement villages.

4.1.1.2 The tram stop design and review process shall comply with requirements of the Yarra Trams 'Manage Design' procedure and design deliverables of Appendix C listed in this standard.

Information: This procedure requires consideration of design constructability, Safety in Design, RAM, Human Factors, design sustainability, single design platform, security in design, design competency and all relevant statutory requirements.

4.1.1.3 All design activity shall be undertaken by engineers with engineering design competency accepted and delegated by Yarra Trams in accordance with 'Engineering Design Authority' procedure.

4.1.1.4 Where ambiguity or conflict exists between requirements in the referenced documents, the designer shall bring forward the conflict for resolution by the relevant Yarra Trams Engineering Design Authority.

4.1.1.5 The designer shall seek approval for all deviations from standards whenever a requirement cannot be met in accordance with the Yarra Trams 'Deviation from standards' procedure.

4.1.1.6 Design Drawings submitted to Yarra Trams shall clearly identify any departures from standards with red cloud, including relevant explanatory comments with cross-reference to requirement clauses from standards.

4.1.1.7 Drawings submitted to Yarra Trams and management of drawings by third parties shall comply with requirements of PTV Infrastructure Drafting Standard and PTV-NTS-012 Drawing Management

System Standard Processes.

4.1.1.8 All relevant elevations, coordinates, grades, location and dimensions of physical features inside the tram stop design area shall be captured in the survey drawing for Yarra Trams review in accordance with Tramway Engineering Survey Standard.

4.1.1.9 The designer shall complete a survey of all underground services located within the tram stop design area, to ensure outputs of surveys are translated onto design drawings.

Information: Dial Before You Dig services are available to complete searches, resulting information is to be added to drawings for informed decision making. Proving of service locations may be required to confirm the feasibility of a concept design, where utility authorities may need to be consulted for approval to build over existing assets.

4.1.1.10 Tram swept path analysis shall be completed and provided to Yarra Trams confirming no interference exists between the tram kinematic envelope and platform, for the maximum operational tram stop passing speed.

4.1.1.11 The final tram swept path to tram stop structure clearances as per drawing STD_T0306, shall be clearly marked on drawings for Yarra Trams review and approval.

4.1.1.12 The designer shall ensure that all road authority requirements are considered in the platform design.

4.1.1.13 Tram stop design shall employ universal design principles to create a user centric experience addressing the full range of human diversity.

4.1.1.14 The tram stop designer should consider analysis of peak passenger flow and waiting at the proposed tram stop location for achieving Fruin level of service - C.

4.1.1.15 The tram stop designer shall consider line of sight visibility for trams, pedestrians and road users.

4.1.2 Human Factors

4.1.2.1 The tram stop design shall enable Yarra Trams and PTV to meet their responsibilities under the Disability Discrimination Act (DDA) and meet the accessibility requirements set out in the Disability Standards for Accessible Public Transport (DSAPT) 2002, and relevant Standards and legislation**.**

Information: The safe functioning of a platform environment for DSAPT compliant access where both stationary and moving commuters will be present, requires the following: space requirements on a platform; safe level access between platform and footpath, including ramps, walkways and handrails; pedestrian refuge areas; appropriate surface treatment to allow tram passengers to safely traverse between tram tracks, platforms and footpaths; pedestrian signals at road crossings; fit out in consideration of all users, including those with disability or activity limitations.

4.1.2.2 The tram stop design shall avoid placing infrastructure requiring frequent maintenance access in areas with poor accessibility so far as is reasonably practicable.

4.1.2.3 The tram stop design shall be suitable for routine and unplanned maintenance, cleaning, and emergency situations during normal and degraded modes of operation so far as is reasonably practicable.

4.1.2.4 The tram stop design shall comply with legislated environmental requirements including noise emissions, construction materials and waste disposal.

4.1.2.5 The tram stop design shall be compatible with surrounding environments, including roads, pedestrian crossings, bicycle tracks and emergency service routes.

4.1.2.6 The tram stop design shall include assessments on the impact of design decisions on Yarra Trams operational training, staffing and resourcing requirements.

4.1.2.7 The tram stop design shall reduce driver workload, and or distractions that would impair performance of tram drivers and other road users travelling in the vicinity of the tram stop so far as is reasonably practicable.

4.1.3 Safety

4.1.3.1 The tram stop designer shall identify single points of failure, including sources of human error that could result in equipment and or fixture failure, so far as is reasonably practicable.

4.1.3.2 The tram stop designer shall identify potential reasons for deliberate vandalism or misuse of platform and stop fixtures, to ensure proposed design controls reduce violation risk and or cost of correction so far as is reasonably practicable.

4.1.3.3 The safety in design process shall be managed in accordance with the Yarra Trams 'Safety in Design' procedure.

4.1.3.4 Tram stops shall be designed to ensure safety of users is maintained under all operating conditions.

4.1.3.5 Tram stop design shall minimise safety impact on adjacent land use, existing transport networks and or loading on bridge structures.

4.1.3.6 Tram stop track alignment shall ensure safe passenger boarding of the tram so far as is reasonably practicable.

4.1.3.7 The designer shall arrange for the undertaking of road safety audits for both design and post-implementation stages.

4.2 Tram Stop Accessibility

4.2.1 Access Paths, Ramps, Walkways and Landings

4.2.1.1 Tram stop access paths shall have a minimum clear width of 1200mm, in accordance with DSAPT (2002).

Information: 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 (300mm) from platform face coping.

4.2.1.2 All platform fixtures shall be located clear of the access path.

4.2.1.3 The designer shall arrange for the undertaking of DDA audits for both design and post-implementation stages.

4.2.1.4 Obstacles abutting an access path shall have a colour luminance contrast of at least 30 per cent with its background to ensure improved hazard awareness for people with vision impairment, in accordance with DSAPT (2002).

4.2.1.5 Passing areas shall be provided at least every 6m along tram stop access paths with a minimum width of 1800mm and length of 2000mm, in accordance with DSAPT (2002).

4.2.1.6 Platforms shall include ramped access to all platform entrances, in accordance with DSAPT (2002).

Information: Stair access may be considered as an alternative, where site constraints prevent the provision of ramped access to every platform entrance, pending deviation submission and assessment by Yarra Trams. 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 any tram stop.

4.2.1.7 Where tram stop seating is provided, an additional 500mm shall be provided clear of the 1200mm for the access path, in accordance with AS 1428.2 (1992) and DSAPT (2002).

4.2.1.8 Tram stops shall allow for wheelchair users to perform a 180 degree turn within 2m of a dead end along a path of travel and in front of any vending machine, in accordance with AS 1428.2 (1992) and DSAPT (2002).

4.2.1.9 Landings shall be provided at specified intervals where the longitudinal gradient exceeds maximum limits as per Table 1 - Landing/Length Requirements for Walkways and Ramps in accordance with AS 1428.1 (2009) and AS 1428.2 (1992).

Table 1 - Landing/Length Requirements for Walkways and Ramps

Classification	Longitudinal Gradient	Maximum Length	Maximum Length Between Landings
Walkway	less than 1 in 33	N/A	landings not required
	1 in 33	N/A	25m
	Between 1 in 20 and 1 in 33	N/A	By interpolation (15-25m)
	Not steeper than 1 in 20	N/A	15m
Ramp	1 in 20	N/A	15m
	Between 1 in 14 and 1 in 20	N/A	By interpolation (6-15m)
	Not steeper than 1 in 14	N/A	6m
Step Ramp	Not steeper than 1 in 10	1900mm	N/A
Kerb Ramp	Not steeper than 1 in 8	1520mm	N/A

4.2.1.10 Landings provided at intersecting pathways shall comply with dimension requirements of AS 1428.1 (2009).

4.2.1.11 Walkways and landings with gradients shallower than 1 in 33 in the direction of travel, shall incorporate cross falls no steeper than 1 in 40 to assist with shedding of water.

4.2.1.12 The designer shall consider application of walkways as the preferred ramped access, to ensure the gradient supports independent access by individuals with a wider range of abilities.

4.2.2 Steps (As Required)

4.2.2.1 Where stairs are approved by Yarra Trams as an alternative means of tram stop access, signage shall be provided to identify the direction of the accessible path via the ramp end of the platform.

4.2.2.2 Step risers shall be 150 - 165mm high with step treads 275 - 300mm long in accordance with DSAPT (2002).

4.2.2.3 Stair treads and nosing shall not overhang beyond the face of the riser, where this is not practical an angled riser with a maximum set back of 25mm may be provided in accordance with AS 1428.1 (2009).

4.2.2.4 Stair treads shall include warning edge strips of not less than 50mm and not more than 75mm wide with a minimum luminance contrast of 30 per cent to the background in accordance with AS 1428.1 (2009).

4.2.2.5 Stair tread nosing shall achieve a minimum slip resistance of R11 for external surfaces.

4.2.3 Handrails

4.2.3.1 Handrails shall comply with AS 1428.1 (2009) requirements.

4.2.3.2 Handrails shall be provided on both sides of ramps, landings and steps.

4.2.3.3 Where handrails are provided, kerbs and or kerb rails shall be provided directly below handrails, in accordance with AS 1428.1 (2009).

4.2.3.4 Posts and other obstructions shall not be placed directly in front of handrails, to ensure continuous handrail contact can be maintained by users.

4.2.3.5 Where there is a perimeter fence provided to platforms, handrails shall be provided along the full length of trafficable areas to assist in passive guidance without encroaching on general circulation along a platform in accordance with DSAPT (2002).

4.2.4 Surface Finishes

4.2.4.1 Tram stop trafficable surfaces shall be slip resistant with smooth transitions across changes in level complying with DSAPT (2002) and AS 1428.1 (2009) requirements.

4.2.4.2 Tram stop trafficable surfaces shall be tested for slip resistance characteristics using the wet pendulum method in accordance with AS 4586.

4.2.4.3 Tram stop trafficable surfaces shall comply to prescribed slip resistance limits as per Table 2 - Slip Resistance Requirements for Tram Stop Trafficable Areas, in accordance with the National Construction Code (NCC) Volume 1, Table D2.14.

Table 2 - Slip Resistance Requirements for Tram Stop Trafficable Areas

Application	Slip Resistance - Wet Conditions
Ramp steeper than 1 in 14	P5
Ramp steeper than 1 in 20 but not steeper than 1 in 14	P4
Tread or landing surface	P4
Nosing or landing edge strip	P4

4.2.4.4 Where asphalt is used for paving of platforms and ramps, asphalt shall comply with the requirements of the Department of Transport's standards and specifications.

4.2.4.5 Asphalt colour shall be natural black, machine rolled to provide an even surface.

4.2.4.6 Other paving types may be used depending on the required level of surface finish, subject to prior Yarra Trams, and Department of Transport approvals.

4.2.4.7 Pavement finishes should match those existing where there is shared use of areas such as tram passenger waiting areas at the same level as vehicular road pavement or where pedestrians and cyclists share the same zone.

4.2.5 Tactile Ground Surface Indicators (TGSI)

4.2.5.1 A continuous 300mm wide warning TGSI strip shall be provided 300mm from the front edge of the platform, to demarcate the 'no go zone' setback.

4.2.5.2 The continuous 300mm wide warning TGSI strip shall not intrude into the minimum circulation spaces or access paths.

4.2.5.3 Combination of directional and warning TGSIs shall be used at tram stop access points to actively guide pedestrians from footpaths onto the platform.

4.2.5.4 Combination of directional and warning TGSIs shall be used to guide passengers to information points and around hazards.

4.2.5.5 The selection of directional and warning TGSI type for each tram stop shall be assessed for compliance with AS 1428.4.1 (2009), VicRoads standards and approved by Yarra Trams.

4.2.5.6 Directional and warning TGSIs shall be secured to the surface they are mounted on so that they cannot be dislodged by vandals or pavement sweeping machines so far as is reasonably practicable.

4.2.5.7 Directional and warning TGSIs shall have a luminance contrast of at least 30 per cent for integrated (solid) tiles and at least 45 per cent for discrete units against the surface they are mounted on.

Information: The use of composite discrete units (two-tone), which require luminance contrast of at least 60 per cent against the surface they are mounted on should be avoided.

4.2.5.8 Directional and warning TGSI colour scheme shall be chosen in consultation with Vision Australia and Blind Citizens Australia and approved by Yarra Trams.

4.3 Tram Stop Structure

4.3.1 Platforms

4.3.1.1 The tram stop design shall consider one of eight types of platform designs used on the Yarra Trams network for development at a specific location as per the criteria described in **APPENDIX B – TYPES OF PLATFORM TRAM STOPS**, subject to Yarra Trams approval.

4.3.1.2 Tram stop platforms shall be design on tangent track, subject to track asset performance impact analysis conducted by the designer in consultation with Yarra Trams.

4.3.1.3 Where construction of platforms on tangent track adversely impact the track asset whole of life performance, an alternative design shall be proposed for approval by Yarra Trams.

4.3.1.4 Tram stop platforms shall be constructed using materials to the quality of finish as specified in the Yarra Trams system requirements specification.

4.3.1.5 The length of a tram stop platform shall be designed to service a single E class Light Rail Vehicle (LRV) in the fleet, unless otherwise specified in the Yarra Trams system requirement specification.

Information: This will generally equate to a 33m long platform, constraints may restrict this length, therefore require a shorter platform accommodating all access doors of the specified light rail vehicle. In other instances, a 66m long platform may be required for locations where more than one tram route operates, tram patronage is very high, and or the stop is a termini tram stop. Where length is constrained the track horizontal alignment must be straight for the entire tram length even if the platform is shorter.

4.3.1.6 Where an 'F Barrier' is installed for additional road safety, the minimum gross platform width shall be increased to compensate for the "F barrier".

4.3.1.7 Tram stop dimensions for different platform types shall be in accordance with parameters in **Table 3.**

Table 3 - Minimum Platform Geometry Parameters based on 40km/h speed limit

Type	Track Centres	Length	Width	Platform Edge Above Rail		Platform Edge from Rail	
	Minimum distance based on 40hm/h	Minimum	Minimum	Height	Tolerance	Offset	Tolerance
P1	3353mm	33.0m	3100mm	290mm	± 3mm	700mm	± 5mm
P2	3353mm	33.0m	3100mm	290mm	± 3mm	700mm	± 5mm
P3 – Double Sided	7235mm	33.0m	4800mm	290mm	± 3mm	700mm	± 5mm
P3 – Central Offset	5935mm	66.0m	4800mm	290mm	± 3mm	700mm	± 5mm
E1	3800mm	33.0m	3100mm	290mm	± 3mm	700mm	± 5mm
E2-A	3353mm	33.0m	3100mm	290mm	± 3mm	700mm	± 5mm

Type	Track Centres	Length	Width	Platform Edge Above Rail		Platform Edge from Rail	
	Minimum distance based on 40km/h	Minimum	Minimum	Height	Tolerance	Offset	Tolerance
E2-B	3353mm	33.0m	3100mm	290mm	± 3mm	700mm	± 5mm
E2-C	3800mm	33.0m	3100mm	290mm	± 3mm	700mm	± 5mm

4.3.1.8 The designer shall assess the applicable increase to Track Centres for road speeds above 40km/h for category E1 and E2-C platforms.

4.3.1.9 The designer shall so far as is reasonably practicable, design the platform to minimise encroachment into the adjacent traffic lane, avoid removing trees and vegetation and minimise the need to relocate tram network and other authority's infrastructure assets.

4.3.1.10 The longitudinal gradient of the tram stop platform parallel to track shall be level over the full length of the platform, with an absolute maximum grade no steeper than 1 in 40 subject to Yarra Trams acceptance.

Information: The context of tram stops in a roadway environment may impose local grading issues, since trams often operate on varying grades of up to 7.5 per cent (1 in 13.3), these conditions may require waiver application for deviations.

4.3.1.11 The longitudinal vertical grade alignment of the platform shall remain constant along the full length of the platform.

4.3.1.12 The cross fall of the tram stop platform shall be between 1 in 100 and 1 in 40, measured perpendicular to the front edge of the platform.

4.3.1.13 Cross fall on platforms shall be directed away from tram tracks, towards the centre or rear non-tram facing edge of platform.

4.3.1.14 Platform clearances from tram tracks shall comply with standard drawing STD_T9000 Tramway Structure Gauge.

4.3.1.15 The design should avoid locating tram stops over road bridges, so far as is reasonably practicable.

Information: Where this cannot be avoided the designer will be required to consult with the bridge authority and confirm that the loading does not impact on the ability to operate all fleet, particularly low floor articulated fleet.

4.3.1.16 Tram stops shall be located outside of vertical curves.

4.3.1.17 Where tram stops are designed to be located opposite each other or staggered in such a way that constrains road traffic opposite passing trams the tram track centres along the platforms in a shared roadway shall be no less than 3800mm.

4.3.1.18 Tram stop track geometry, including transitions on approach and departure of tram stops shall be designed in accordance with the Yarra Trams Tram Track Design Standard.

4.3.1.19 The width of the pedestrian footpath parallel and adjacent to the E2C Easy Access stop platform, as per APPENDIX B – TYPES OF PLATFORM TRAM STOPS of this standard, shall ensure pedestrian safety and DDA compliance.

4.3.2 Pedestrian Refuge

4.3.2.1 Tram stops shall include the provision of pedestrian refuge areas and or fenced crib crossings so far as is reasonably practicable.

4.3.2.2 The minimum length of a pedestrian refuge for a platform stop shall be 2270mm, to ensure persons using a wheelchair or a mobility aid can manoeuvre through a 90 degree turn out of the refuge on to the road pedestrian crossing.

4.3.2.3 Where a tram stop access point is located directly at a signalised pedestrian crossing, a pedestrian refuge will not be required.

4.3.2.4 The configuration of a pedestrian refuge area may be defined by a combination arrangement of existing pedestrian crossings, line markings and or crib fencing.

4.3.2.5 The cross fall of a pedestrian refuge and or crib crossing shall match the cross fall of the existing road pavement, not exceeding the maximum gradient of 1 in 40.

4.3.2.6 The design of crib crossings shall be offset to guide pedestrians to turn and face the direction of oncoming trams at unsignalised tram crossings before crossing the tram tracks.

4.3.3 Pedestrian Crossings

4.3.3.1 Where no crossings exist between the footpath and platform, the tram stop design shall include new pedestrian crossings linking the platform up to the footpath kerb, to comply with road authority and DSAPT (2002) requirements.

4.3.3.2 Where required, existing pedestrian crossings shall be upgraded to comply with road authority and DSAPT (2002) requirements.

4.3.3.3 Where pedestrian operated signals are required, these will be specified in the Yarra Trams systems requirements specification and shall comply with VicRoads Traffic Engineering Manual - Volume 2.

4.3.3.4 Pedestrian crossings provided at platforms shall be complete with signage and line marking in compliance with the requirements provided in the VicRoads Traffic Engineering Manual - Volume 2.

4.3.4 Protection Barriers

4.3.4.1 Tram stop protection shall be designed in accordance with crash protection requirements of VicRoads Road Design Notes: RDN 3-02, RDN 3-03, RDN 3-05, RDN 3-06 and RDN 6-04.

Information: These Road Design Notes provide guidelines for crash protection at accessible and or easy access type tram stops for different design speed limits.

4.3.4.2 Tram stop designers shall ensure application of crash protection guidelines is based on the highest speed as determined by the local prevailing speed and or the posted speed.

4.3.4.3 Where posted speeds are in the range of 60 km/h to 80 km/h, only steel guard fence, Type F concrete barriers, and or vertical face concrete barriers shall be permitted.

4.3.4.4 Crash protection barriers shall be designed to be unobtrusive, minimising the encroachment of the platform into adjacent traffic lane so far as reasonably practicable.

4.3.4.5 Where F Type and or Vertical Face concrete barriers are used for protection of platform rear edge, concrete barriers facing oncoming traffic shall be protected from errant vehicle impact using either steel guard fence or an impact attenuator.

4.3.4.6 Where impact attenuators are used, these should 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.

4.3.4.7 Impact attenuators shall be located clear of all platform structures to ensure correct operation in the event of errant vehicle impact.

4.4 Tram Stop Fixtures

4.4.1 General

4.4.1.1 The location of Tram Stop Fixtures shall be position minimize obstruction to passenger movement and amenity.

4.4.1.2 The location of Tram Stop Fixtures shall be located such that it will not facilitate climbing to a higher structure.

4.4.1.3 The material used on Tram Stop Fixtures shall be made from stainless steel.

4.4.2 Fit-Out

4.4.2.1 The tram stop design shall include provision for all fixtures, furniture and fittings as specified in the Yarra Trams system requirement specification.

Information: These may include but are not limited to: tram flag pole and timetable case; fencing; handrails on ramps and steps; rubbish bins, TGSIs; shelter seating; general signage and; passenger Information displays.

4.4.2.2 Any fixtures provided on the platform shall avoid the need for maintainers to encroach into the road environment to complete maintenance activities.

4.4.2.3 Any fixtures provided on the platform shall be clear of access paths and avoid hazard introduction for platform users so far as is reasonably practicable.

4.4.2.4 Tram stop fixtures which can be climbed shall be located clear of shelters or other accessible infrastructure to prevent general public gaining unauthorised access to the shelter roof area.

4.4.2.5 Tram stop fixtures including fencing shall be located clear of the tramway structure gauge as per drawing STD_T9000.

4.4.2.6 Tram stop fixtures shall be secured with Chemset bolts, or similar approved holding down systems.

4.4.2.7 The design and or placement of permanent fixtures on tram stops should consider recommendations from the Australia-New Zealand Counter-Terrorism Committee: Hostile Vehicle Guidelines for Crowded Places, to better protect the public and Yarra Trams' passengers.

4.4.2.8 The design and or placement of permanent fixtures on tram stops should consider recommendations from the Australia-New Zealand Counter-Terrorism Committee: Improvised Explosive Device (IED) Guidelines for Crowded Places, to better protect the public and Yarra Trams' passengers.

4.4.2.9 The tram stop design shall consider installation of fixtures provided in Table 4 - Tram Stop Fixture Requirements, in accordance with the Yarra Trams system requirements specification.

Table 4 - Tram Stop Fixture Requirements

Fixture	Provisions
Shelters with seating and snapper frame	Shelters can be differing length variants, to be specified by Yarra Trams
Real-Time Information Systems	PA Speakers, Audio Buttons, PIDs, micro PIDs and or a combination of these to be specified by Yarra Trams
Tram Stop Identification	All tram stops must include either a flag pole or a totem for identification and information purposes
Security	CCTV provision will be specified by Yarra Trams
Fencing	Galvanised Steel or Stainless Steel specified by Yarra Trams
Bins	Provision to be specified by Yarra Trams
Storage/Lockers	Provision to be specified by Yarra Trams

4.4.3 Shelters

4.4.3.1 Tram stops shall include the provision of minimum one shelter per platform, located within 10m of the designated wheelchair boarding point, so far as is reasonably practicable.

Information: Platforms directly opposite of each other should be provided with shelters on both platforms to avoid passengers having to cross tram tracks, to seek shelter on the opposite platform.

4.4.3.2 Shelters should be designed to ensure at least 50% of the total area under the canopy, remains dry for the 95th percentile rain event as determined by the last 20 years of local historical data.

4.4.3.3 Shelters and shelter panel fastening systems shall be engineering certified with reference to drawings provided by the designer for Yarra Trams acceptance.

4.4.3.4 A minimum clearance of 1800mm shall be provided between the leading edge of the shelter and the front edge of platform coping, excluding the canopy overhang.

4.4.3.5 The front edge of the shelter canopy shall be located a minimum of 1120mm away from the running edge of the track rail.

4.4.3.6 Where the platform is 3100mm and wider, the shelter return shall have a maximum width of 1100mm, measured from the centerline of the shelter post.

4.4.3.7 Shelters shall consider the inclusion of an advertising panel complete with lighting, used for displaying of passenger information and or community related campaigns.

4.4.3.8 Advertising panels shall consider design of side opening gas-strut hinged doors for accessing of advertising material.

4.4.3.9 Any advertising provided to tram stops shall be vertical placed parallel to the direction of traffic, located to minimise visual distraction to drivers, so far as is reasonably practicable.

Information: Advertising shelters may be provided where this is allowed under Local Government planning requirements; the advertising material is suitable, placed parallel to the direction of traffic, and minimise driver distraction.

4.4.3.10 Shelters shall use etched glazing to deter vandalism of glass surfaces.

4.4.3.11 A shelter shall include seating for a minimum of two people.

4.4.3.12 A shelter shall include a minimum of two allocated spaces, available for passengers using wheelchairs and or mobility aids.

4.4.3.13 The shelter frame shall have a colour luminance contrast of at least 30 per cent with the platform surface.

4.4.3.14 Shelters shall include Lighting.

4.4.3.15 Shelters shall include the provision of a lockable power isolation switch, secured for access by authorised personnel only, to ensure power to shelter equipment can be isolated for cleaning and or maintenance activities without having to access the tram stop electrical switchboard cabinet.

4.4.4 Seating

4.4.4.1 Seating shall be installed at accessible heights in accordance with DSAPT (2002), including clearance space under the seat for feet, assisting in rising from the seat in accordance with AS 1428.2 (1992).

4.4.4.2 Priority seats shall include contrasting colour armrests at a DSAPT (2002) compliant height on both sides, with a minimum luminance contrast of 30 per cent to the background, assisting the vision impaired in locating the seat.

4.4.4.3 Where seating is provided, a minimum of two seats or 5% of the total seats provided at the tram stop in each direction of travel shall be designated priority seats.

4.4.4.4 Priority seating shall be positioned towards the departing end of the platform.

4.4.4.5 Seating shall be provided on tram stops that are more than 60m in length and or where specified in the Yarra Trams system requirements specification.

4.4.5 Signage

4.4.5.1 Road and pedestrian related signs shall be in accordance with VicRoads Traffic Engineering Manual

- Volume 2.

4.4.5.2 Any non-standard signage not listed in the VicRoads Traffic Engineering Manual - Volume 2 shall be designed and confirmed with input from an accessibility audit or integrated into the PTV Master Style Guide.

4.4.5.3 Where clear glazing is provided, glazing shall include visual indicators with a minimum 30 per cent contrasting luminance, to avoid mistaking glass for openings in accordance with AS 1428.1 (2009).

4.4.5.4 Clear glazing visual indicators shall be in the form of a horizontal banner not less than 75mm wide, affixed between 900mm and 1000mm above finished floor level in accordance with AS 1428.1 (2009).

4.4.5.5 For shelters with clear glazing, the contrasting colour banner affixed to glass panels should be built into the glass, to be vandal and graffiti resistant.

4.4.5.6 Tram stop signage shall comply with requirements of the PTV Master Style Guide, DSAPT (2002), Australian Standards and Yarra Trams systems requirements specification.

4.4.5.7 Tram stop platform signage shall comply with STD_T6104 and requirements of the Yarra Trams system requirements specification.

Information: Standard drawing STD_T6104 details line marking, warning signage and pavement markers for a typical tram stop platform.

4.4.5.8 Signage shall be mounted not to obstruct the flow of passengers at a tram stop so far as is reasonably practicable.

4.4.5.9 Signage shall be mounted not to obstruct sight lines between road users and pedestrians crossing the road at tram stops so far as is reasonably practicable.

4.4.5.10 Road signage layouts, including safety zones and parking signage shall be prepared in consultation with the Department of Transport.

4.4.5.11 Signs shall be located so that they are clearly visible, provided at changes of direction and wherever directional decisions are made in accordance with AS 1428.2 (1992).

4.4.5.12 Signs shall be installed between 1400mm and 1600mm above finished floor level in accordance with AS 1428.2 (1992).

4.4.5.13 Where signs can be temporarily obscured, they shall be installed at no less than 2000mm above finished floor level in accordance with AS 1428.2 (1992).

4.4.5.14 Directional signs shall be visible from boarding points.

4.4.5.15 Where CCTV surveillance is installed at tram stops, signage shall be provided to indicate CCTV operates in this area in accordance with the Surveillance Devices Act 1999 s7.

4.4.5.16 Tram platform stops shall include the provision of a totem at the departure end of the platform closest to tram stopping position, placed adjacent and perpendicular to the platform fence in agreement with Yarra Trams.

Information: Totems contain specific route timetable, map and tram stop identification information, therefore should be clearly visible when entering the platform.

4.4.5.17 Where a tram stop is subject to low patronage of less than 1500 embarkments and disembarkments per day, is located on two or less passing routes, has no train connectivity and is prone to vandalism, the tram stop shall include the provision of a flag post instead of a totem.

4.4.5.18 Where priority seats are provided, any DSAPT (2002) specific and critical warning signage should be visible from the priority seating position.

4.4.5.19 Signs identifying priority seating shall be provided on trams stops directly over the seating location.

4.4.5.20 Signage indicating direction of the accessible path platform entry shall be clearly visible from both the platform and the approach pathway.

4.4.6 Line Marking

4.4.6.1 Tram stop platform line marking shall comply with STD_T6104 and requirements of the Yarra Trams system requirements specification.

Information: Standard drawing STD_T6104 details line marking, warning signage and pavement markers for a typical tram stop platform.

4.4.6.2 Additional stop line marking shall be provided for platforms where the tram stopping position tolerance is less than 4m.

4.4.6.3 Line markings for roadways and vehicle parking shall be designed in accordance with VicRoads Traffic Engineering Manual - Volume 2 and local council requirements.

4.4.6.4 The designer shall submit line marking drawings for roadways and vehicle parking arrangements for Yarra Trams review and approval.

4.4.6.5 Where vehicles travel past the tram facing side of the platform, the platform should include the provision of delineation markings along the platform's edge to highlight its presence, so far as is reasonably practicable.

4.4.7 Fencing

4.4.7.1 The rear of platforms where access is not intended by pedestrians shall be fenced.

Information: Provision of rear of platform fencing will result in improved safety against risk of falls from platform and or shelters where glass panels have been damaged.

4.4.7.2 The ends of platforms where access is not intended by pedestrians shall be fitted with a fence return barrier.

4.4.7.3 Where there is a potential for inappropriate pedestrian movement or wrong side door opening, the provision of a central fence located between the two tram tracks should be considered to mitigate the risks.

4.4.7.4 Central fence shall be used only when track centres are greater than 4m.

4.4.7.5 If adopted, central fences shall be frangible in nature and clearly visible to road users (especially emergency service vehicles).

4.4.7.6 The fencing design shall be compliant to STD_XXXXXX.

4.4.7.7 Fencing shall be positioned to guide pedestrians to dedicated crossings, preventing access across step changes in elevation so far as is reasonably practicable.

4.4.7.8 Fencings adopted at the Tram Stop that breaches the minimal structure guage in areas likely to have unauthorised pedestrian movement shall be designed to minimize injury.

Information: An example of this would be the trackside access ramp pedestrian fences at the entrance and exit of the tram platform.

4.5 Tram Stop Services

4.5.1 General

4.5.1.1 All fixtures requiring power supply and or OCMS connectivity shall be segregated, installed in dedicated service conduits and pits.

4.5.1.2 Any transfer of services between platforms, across roads and or tram tracks shall be approved by Yarra Trams.

4.5.1.3 Any transfer of services shall be undertaken using thrust boring or trench-less technology by an approved VicRoads contractor.

4.5.1.4 Any transfer of tram service conduits from one platform to another, or across road pavements shall have a cover of 1200mm.

4.5.2 Operational Control Management System

4.5.2.1 Underground OCMS conduits shall comply with AS/ACIF S009, all other relevant VicTrack requirements, Australian Standards, the requirements of Telstra, and relevant local authorities.

4.5.2.2 Where OCMS conduits are terminated below the platform finished floor level, conduits shall be marked with a brass plaque set into the pavement surface.

4.5.2.3 OCMS cabling shall be segregated from other services in accordance with minimum requirements of AS/ACIF S009.

4.5.2.4 OCMS cables shall be fed through the right post of tram stop shelters, when facing the shelter from the tram tracks where possible .

4.5.2.5 Tram stops shall include a minimum 50mm diameter conduit connected from the nearest Telstra communications pit to the tram stop OCMS cabinet.

4.5.2.6 Tram stops shall include a minimum 50mm diameter conduit between the tram stop electrical switchboard cabinet and the OCMS cabinet.

4.5.2.7 Tram stops shall include minimum two 50mm diameter conduits between the OCMS cabinet and

the adjacent OCMS distribution pit.

4.5.2.8 Adjacent tram stop platforms shall include a minimum 100mm diameter conduit connected between the main tram stop OCMS distribution pit to an OCMS pit on the adjacent platform.

4.5.2.9 Tram stops shall include a minimum 100mm diameter conduit across the full length of each platform terminating into an OCMS pit at the opposite end.

Information: Intermediate pits may be required depending on the overall length of the platform and the location of shelters as well as other OCMS connected fixtures on the platform.

4.5.2.10 Each of the closest overhead wire poles located at either end of the tram stop and or opposing sides of the roadway shall include a minimum 50mm conduit connected from its adjacent OCMS pit to the closest OCMS pit located on the tram stop platform.

Information: The OCMS conduits connecting the closest set of overhead wire poles to the platform will enable future proofing of tram stops for security camera fit-outs.

4.5.2.11 The tram stop shall include a minimum 20mm diameter underground conduit from the audio button unit to the footing of the OCMS containing shelter post closest to the shelter mounted Passenger Information Display (PID).

4.5.2.12 The tram stop shall include a self-contained fit for purpose IP rated OCMS cabinet located adjacent to the electrical switchboard cabinet.

Information: There is to be no direct internal access between the electrical and OCMS cabinets.

4.5.3 Electrical

4.5.3.1 The tram stop shall include a fit for purpose IP rated electrical switchboard cabinet installed on a plinth for earthing and connection of platform electrical equipment.

4.5.3.2 The tram stop electrical switchboard cabinet shall be located within the platform area as far as reasonably practicable, at a location agreed in consultation with Yarra Trams.

4.5.3.3 The switchboard cabinet shall incorporate provision for metering enclosure if necessary.

4.5.3.4 Design and construction of the tram stop electrical equipment shall comply with the requirements of AS/NZS 3000.

4.5.3.5 The installation of tram stop electrical equipment shall comply with STD_T6109.

4.5.3.6 The wiring shall comply with wiring regulation standards XXXXXX

4.5.3.7 The communications system and wiring must be adequately separated from electrical and power wiring and equipment in accordance with communication standard XXXXXXX (Darren Young).

4.5.3.8 The tram stop electrical supply shall be a minimum of 40A direct metered digital display unit from an existing power source in accordance with supply authority requirements.

4.5.3.9 The switchboard circuit for a 40A installation shall be compliant to STD_T6109. For digital panel, the switchboard panel shall be upgraded to provide for the 80A required, and appropriate circuit breakers provided.

4.5.3.10 The tram stop electrical supply shall be a minimum of 80A direct metered digital display unit from an existing power source in accordance with supply authority requirements on tram stops that are likely to have digital advertising panels installed.

Information: The peak current draw of dynamic digital advertising panels can be as high as 60A outside normal operating conditions. Tram stops nominated to include additional electrical equipment such as dynamic digital advertising panels would therefore require electrical supply in excess of 40A. Detailed load analysis conducted by designers will need to determine final electrical supply demand for each tram stop.

4.5.3.11 Where electrical conduits are terminated below the platform finished floor level, conduits shall be marked with a brass plaque set into the pavement surface.

4.5.3.12 The brass plaque installed in 4.5.3.11 shall not present as a tripping hazard.

4.5.3.13 Underground electrical conduits shall comply with Australian Standards, the requirements of the Electricity Distributor, and other relevant local authorities.

4.5.3.14 Electrical power cables shall be fed through the left post of tram stop shelters, when facing the shelter from the tram tracks.

4.5.3.15 Communications cables shall not be installed in the same post as the electrical power cables in clause 4.5.3.14.

4.5.3.16 Tram stops shall include a minimum 100mm diameter conduit connected from the main point of power supply to the tram stop electrical switchboard cabinet.

4.5.3.17 Adjacent tram stop platforms shall include a minimum 100mm diameter conduit connected from the tram stop electrical switchboard cabinet to an electrical distribution pit on the adjacent platform.

4.5.3.18 Tram stops shall include a minimum 100mm diameter conduit across the length of the platform terminating into a power distribution pit on the opposite end.

Information: Intermediate pits may be required depending on the overall length of the platform and the location of shelters as well as other powered fixtures on the platform, required to be powered.

4.5.3.19 Tram stops shall include minimum 32mm diameter conduits installed from the nearest electrical cabinet and or pit to each of the powered fixtures located on the platform.

4.5.3.20 All electrical equipment that must be maintained shall include safe and lockable isolation switch adjacent to the maintenance site.

4.5.4 Lighting

4.5.4.1 Where possible, the use and enhancement of public lighting shall be considered before additional lighting is introduced to the Tram Stop Platform region.

4.5.4.2 Lighting provided to pedestrian crossings shall meet the requirements of VicRoads Traffic Engineering Manual - Volume 1 and category PX3 of AS 1158.

4.5.4.3 General tram stop area and access path lighting levels shall meet the requirements of category P6 of AS 1158.

Information: Lower levels of lighting for general tram stop area and access path takes into consideration the safety of public driver vision as well as neighbourhood comfort.

4.5.4.4 General tram stop shelter lighting levels shall meet the illuminance requirements of AS 1428.2.

4.5.4.5 Tram stop lighting shall consist of fixed lights arranged to flood a given area continuously and uniformly with overlapping, so far as is reasonably practicable.

4.5.4.6 When moving between tram stop areas of differing lighting levels, luminance variation shall be gradual to allow comfortable vision adjustment, so far as is reasonably practicable.

4.5.4.7 Tram stop lighting shall be orientated downwards to minimise unwanted reflection and glare across the platform and into the neighbouring road environment, so far as is reasonably practicable.

4.5.4.8 Tram stop lighting shall be automatically controlled to operate during night time and match operation thresholds within the existing road lighting environment, to be agreed in consultation with VicRoads and Yarra Trams.

4.5.4.9 The minimum lighting levels required to meet the Yarra Trams security performance criteria shall be in accordance with Table 5 - Tram Stop Security Lighting Requirements.

Table 5 - Tram Stop Security Lighting Requirements

Lighting Area	Minimum Average Horizontal Illuminance (LUX)
Tram Stop Site Boundary	2
Safety Sensitive Areas	4
Tram Vehicle Entry/Exit Points	10
Pedestrian Entry/Exit Points	20
Area under Tram Shelter	150
Tram stop area and access path	20

4.5.4.10 Light fixtures should be placed as high as possible to reduce the risk of tampering.

4.5.4.11 Where light fixtures cannot be mounted at a height located out of person's reach, vandal resistant housings shall be provided to these light fixtures.

4.5.4.12 Tram stops shall be illuminated to support CCTV surveillance, whilst avoiding light spill on neighbouring communities and residents so far as is reasonably practicable.

4.5.4.13 Safety and Security lighting shall have a white output (high RA value), configured to enhance CCTV surveillance.

Information: The following characteristics contribute to the design and selection of lighting for security measures: lighting intensity levels; maximum light-to-dark ratio; scene reflectance; daylight-to-darkness transitions; selected CCTV cameras spectral response; cold-start and re-strike times; and effects of environmental conditions where lighting systems are installed.

4.5.4.14 For critical tram stop areas, instantaneous lighting with a backup power source should be considered.

4.5.4.15 Where LED lighting is provided, the lighting colour temperature shall not exceed 4000K.

4.5.4.16 Tram stop LUX lighting levels shall be verified using fit for purpose equipment, suitable for measuring the light spectrum emitted by the light source.

Information: There are variations in the light spectrum emitted by LED as opposed to sodium lighting, LUX meters should be selected to ensure they can measure the specific light spectrum of the light source being assessed.

4.5.4.17 Static and dynamic (digital) advertising panels shall have a maximum luminance not exceeding 3500 Nits, unless otherwise approved by local authority and Yarra Trams.

4.5.4.18 Position of dynamic (digital) advertising panels shall be placed in a manner that does not distract tram drivers or road vehicles drivers.

4.5.4.19 Tram stop lighting shall be designed to use low energy alternatives in accordance with the Building Code of Australia or as approved by Yarra Trams and Department of Transport.

4.5.5 Earthing and Bonding

4.5.5.1 Tram stop bonding design strategy shall consider the Yarra Trams Bonding Application Guide, document no.: BAG_21_06_2017.

4.5.5.2 Tram stop earthing, and bonding design shall consider the typical arrangement details provided in standard drawing STD_T6110.

4.5.5.3 Electrical bonding conductors shall be provided for all conductive tram stop fixtures nominated in the Yarra Trams systems requirements specification.

Information: Bonding conductors are to connect the secondary earth bars to all extraneous conductive parts to form an equipotential zone. Extraneous conductive parts include: shelters, fence posts, poles and all unearthed built-in metallic objects on the platform.

4.5.5.4 The minimum size of earthing and bonding conductors for tram stop fixtures shall be 120mm².

4.5.5.5 The bonding conductors shall be black in colour, unobtrusive and designed to be safe from tripping.

4.5.5.6 All electrically conductive tram stop fixtures not designed to carry electricity shall be connected to the central bonding earth bar located in the tram stop electrical switchboard cabinet.

4.5.5.7 The primary earthing conductor to an earth spike shall be installed off-platform area, in the general vicinity of the tram stop electrical cabinet, at least 2m from any point of secondary earthing system,

tram stop conductive structures and rail.

Information: The earth spike installation location chosen will ensure that the spike does not strike underground assets and allows for maintenance access.

4.5.5.8 If a tram stop has no electrical supply cabinet, the primary earth spike shall be located more than 2m clear of any electrically conductive fixture within the equipotential zone.

4.5.5.9 The central bonding earth bar shall be connected to the negative DC rail of the tram system, in accordance with STD_T6110, where track is replaced at the same time, the bonding system shall be installed in the same excavation to minimise disruption to the track.

4.5.5.10 All structural steel reinforcing shall be provided with an electrical earth by means of suitable tie wire and connections into the tram stop earthing system.

4.5.5.11 The tram stop earthing and bonding strategy shall include a separate design for OCMS connectivity in accordance with requirements of Austel and Telstra.

4.5.6 Access Pits

4.5.6.1 Pit covers provided to tram stops shall be either ACO light duty recessed solid bottom 'Lock and Seal' or galvanised mild steel with locking bolt type units.

4.5.6.2 Tram stop pit covers should match the surrounding platform surface finish.

4.5.6.3 Pits and covers located in the road reserve shall be in accordance with Department of Transport requirements.

4.5.6.4 Each pit shall be labelled with a brass plaque attached to the top of the pit indicating its contents in accordance with Australian Standards.

4.5.6.5 Pits shall be installed outside of pedestrian main access path areas.

4.5.6.6 Pits and conduits shall be placed at along the back section of the platform.

4.5.6.7 Pits shall be installed as close to the rear fence of the platform as possible, and orientated for maintenance accessibility.

4.5.7 Real Time Passenger Information

4.5.7.1 Real time information equipment shall be provided at trams stops with high passenger movements and places of significance aligned to the DoT Movement and Place framework as advised by Yarra Trams.

4.5.7.2 Where real time information equipment such as PIDs, micro PIDs, audio buttons and or PA Speakers are provided at tram stops, these shall be installed on purpose built mounting brackets which integrate the equipment into the surrounding infrastructure.

4.5.7.3 Passenger information displays shall be installed on either the platform shelter canopy or a dedicated pole clear of the tramway structure gauge as per standard drawing STD_T9000 Rev A.

Information: When choosing to mount passenger information display units on shelters, these may be positioned on either the trailing end of the primary shelter canopy or embedded in the shelter itself.

4.5.7.4 A post mounted audio button unit shall be provided at tram stops where at least one passenger information display (PID) is installed, located at the main accessible tram stop entry point and installed at a height compliant with DSAPT (2002).

4.5.7.5 Audio equipment shall be installed to maximise and direct the effective coverage area of the sound field towards shelters and platform departure areas, ensuring minimisation of ambient noise and reverberation interference.

4.5.8 Card Vending Machines (CVM)

4.5.8.1 Provision of Card Vending Machines (CVM) and or Quick Top-up Machines (QTM) shall be specified by Yarra Trams in consultation with PTV.

4.5.8.2 Where a Card Vending Machine (CVM) and or Quick Top-up Machine (QTM) is provided, peripheral equipment including racks and antennas supporting the system shall be installed under the seating inside a shelter.

4.5.8.3 Card Vending Machine (CVM) and or Quick Top-up Machine placement shall meet the requirements of DSAPT.

4.5.8.4 Where a Card Vending machine is provided it should be located under a shelter, central to the platform.

4.5.8.5 Where a Quick Top-up machine is provided it should be located closest to the main platform entry, with the highest passenger traffic.

4.5.8.6 The tram stop platform shall include electrical and OCMS conduit provisions for Card Vending Machine (CVM) and or Quick Top-up Machine system connectivity.

4.5.8.7 The Card Vending Machine and or Quick Top-up machine shall be connected to the nearest OCMS pit by a 50mm diameter OCMS conduit with large radius bends to facilitate fiber optic cable installations.

4.5.9 Drainage

4.5.9.1 The tram stop designer shall confirm stormwater runoff from the tram stop is captured by existing stormwater drainage pits.

4.5.9.2 The tram stop designer shall confirm the construction of the tram stop does not affect existing overland flow paths and does not overload the existing stormwater drainage system.

4.5.9.3 Where required the tram stop designer shall ensure additional drainage structures are designed to mitigate effects of overloading the existing stormwater drainage system.

Information: Standard flat roof shelters on tram stops do not require gutters and downpipes for the control of storm water runoff.

4.5.9.4 Storm water drainage shall be designed in accordance with the VicRoads Supplement to Austroads

Guide for Road Design Part 5: Drainage.

5 RELATED LEGISLATION & DOCUMENTS

The Works shall in general be carried out in accordance with the current revisions of the standard drawings, specifications and codes of practice specifically noted in this standard or on drawings.

Where Australian, British, or American standard specifications, rules, or codes of practice are referred to, such reference shall be taken to include the issue, revision and or amendment which results in the better user outcome being achieved. It shall be the Contractor's responsibility to ascertain the existence of such amendments and supplements.

Name	Document number	Reference / Compliance
Disability Discrimination Act 1992	N/A	Full Compliance
Disability Standards for Accessible Public Transport	DSAPT (2002)	Full Compliance
Network Technical Standard – Public Transport Precincts	PTV-NTS-002	Full Compliance
Structural Design Actions	AS 1170	Full Compliance
Design for access and mobility – Part 1: General requirements for access - New building work	AS 1428.1 (2009)	Full Compliance
Design for access and mobility – Part 2: Enhanced and Additional Requirements-Buildings and Facilities	AS 1428.2 (1992)	Full Compliance
Design for access and mobility – Part 4.1 Means to assist the orientation of people with vision impairment	AS 1428.4.1 (2009)	Full Compliance
Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings	AS 2312.1	Reference
Electrical Installations (Wiring Rules)	AS/NZS 3000	Full Compliance
Electrical installations - Verification guidelines	AS/NZS 3017	Full Compliance
Approval and test specification – General requirements for electrical equipment	AS/NZS 3100	Full Compliance
Approval and test specification – Residual current devices (Current-operated earth-leakage devices)	AS/NZS 3190	Full Compliance
Concrete Structures	AS 3600	Full Compliance
Steel Structures	AS 4100	Full Compliance
Control of obtrusive effects of outdoor lighting	AS 4282	Reference
Slip resistance classification of new pedestrian surface materials	AS 4586	Full Compliance
Grid Connections of Energy Systems via Inverters	AS 4777	Reference

Name	Document number	Reference / Compliance
Installation of photovoltaic (PV) arrays	AS 5033	Reference
Residual current operated circuit-breakers with integral overcurrent protection	AS/NZS 61009.1	Full Compliance
Austroads Guide to Road Design Part 1: Introduction to Road Design	AGRD01	Reference
Austroads Guide to Road Design Part 2: Design Considerations	AGRD02	Reference
Austroads Guide to Road Design Part 3: Geometric Design	AGRD03	Reference
Austroads Guide to Road Design Part 4: Intersections and Crossings – General	AGRD04	Reference
Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections	AGRD04A	Reference
Austroads Guide to Road Design Part 4B: Roundabouts	AGRD04B	Reference
Austroads Guide to Road Design Part 4C: Interchanges	AGRD04C	Reference
Austroads Guide to Road Design Part 5: Drainage – General and Hydrology Considerations	AGRD05	Reference
Austroads Guide to Road Design Part 5: Drainage – Road Surface, Networks, Basins and Subsurface	AGRD05A	Reference
Austroads Guide to Road Design Part 5: Drainage – Open Channels, Culverts and Floodways	AGRD05B	Reference
Austroads Guide to Road Design Part 6: Roadside Design, Safety and Barriers	AGRD06	Reference
Austroads Guide to Road Design Part 6A: Pedestrian and Cyclist Paths	AGRD06A	Reference
Austroads Guide to Road Design Part 6B: Roadside Environment	AGRD06B	Reference
Austroads Guide to Road Design Part 7: Geotechnical Investigation and Design	AGRD07	Reference
Austroads Guide to Road Design Part 8: Process and Documentation	AGRD08	Reference
Australia-New Zealand Counter-Terrorism Committee: Improvised Explosive Device (IED) Guidelines for Crowded Places	N/A	Reference

Name	Document number	Reference / Compliance
Australia-New Zealand Counter-Terrorism Committee: Hostile Vehicle Guidelines for Crowded Places	N/A	Reference
Department of Environment, Land, Water and Planning - Urban Design Guidelines for Victoria	N/A	Reference
VicRoads Supplement to AGRD01: Introduction to Road Design	N/A	Reference
VicRoads Supplement to AGRD02: Design Considerations	N/A	Reference
VicRoads Supplement to AGRD03: Geometric Design	N/A	Reference
VicRoads Supplement to AGRD04: Intersections & Crossings General	N/A	Reference
VicRoads Supplement to AGRD04A: Unsignalised & Signalised Intersections	N/A	Reference
VicRoads Supplement to AGRD04B: Roundabouts	N/A	Reference
VicRoads Supplement to AGRD04C: Interchanges	N/A	Reference
VicRoads Supplement to AGRD05: Drainage Design	N/A	Reference
VicRoads Supplement to AGRD06: Roadside Design, Safety & Barriers	N/A	Reference
VicRoads Supplement to AGRD06A: Pedestrian & Cyclist Paths	N/A	Reference
VicRoads Supplement to AGRD06B: Roadside Environment	N/A	Reference
VicRoads Supplement to AGRD07: Geotechnical Investigation & Design	N/A	Reference
VicRoads Supplement to AGRD08: Process & Documentation	N/A	Reference
VicRoads Traffic Engineering Manual - Volume 1	N/A	Reference
VicRoads Traffic Engineering Manual - Volume 2	N/A	Reference
VicRoads Traffic Engineering Manual - Volume 3	N/A	Reference
VicRoads Road Design Note 03-02: Accessible Tram Stops in Medians	RDN 03-02	Reference
VicRoads Road Design Note 03-03: Accessible Tram Stops in Safety Zones	RDN 03-03	Reference

Name	Document number	Reference / Compliance
VicRoads Road Design Note 03-05: Accessible central island platform stops (CIPS) for trams in mixed traffic	RDN 03-05	Reference
VicRoads Road Design Note 03-06: Easy Access Stops (EAS) – Trafficable Platforms for Trams in Mixed Traffic	RDN 03-06	Reference
VicRoads Road Design Note 06-04: Accepted Safety Barrier Products	RDN 06-04	Reference
VicRoads Standard Drawing: TC-1003 – Typical Layouts For Pedestrian Operated Signals	TC-1003	Reference
VicRoads Standard Specification: Section 407 – Hot Mix Asphalt	N/A	Reference
Yarra Trams Bonding Application Guide	BAG 21_06_2017	Reference
Yarra Trams Safety in Design Procedure	SS-021-PR-0001	Full Compliance
Yarra Trams Manage Design Procedure	CE-021-PR-0006	Full Compliance
Yarra Trams Deviation from Standards Procedure	CE-021-PR-0004	Full Compliance
Yarra Trams Engineering Design Authority Procedure	CE-021-PR-0019	Full Compliance
Platform and Offside Fence Details - Face Sheet and Notes	STD_T6000	Full Compliance
Platform and Offside Fence Details - Sheet 1	STD_T6001	Full Compliance
Platform and Offside Fence Details - Sheet 2	STD_T6002	Full Compliance
Galvanised Fence - Notes and Drawing Index	STD_T6003	Full Compliance
Galvanised Fence - Vertical Flat Bar Panel Fence Plan and Elevation	STD_T6004	Full Compliance
Galvanised Fence - Vertical Flat Bar Panel Fence Ramp and Handrail Details	STD_T6005	Full Compliance
Galvanised Fence - Vertical Flat Bar Panel Fence Connection Details	STD_T6006	Full Compliance
Galvanised Fence - Post and Handrail Fence Plan and Elevation	STD_T6007	Full Compliance
Galvanised Fence - Post and Handrail Fence Ramp and Handrail Details	STD_T6008	Full Compliance
Galvanised Fence - Post and Handrail Fence Connection Details	STD_T6009	Full Compliance

Name	Document number	Reference / Compliance
Tram Platforms - General Notes	STD_T6100	Full Compliance
Tram Platforms - Concrete Slab Footing Details	STD_T6101	Full Compliance
Tram Platforms - Footing Details Adshel Shelters	STD_T6102	Full Compliance
Tram Platforms - Paving Details	STD_T6103	Full Compliance
Typical Platform Safety Signage and Line marking	STD_T6104	Full Compliance
Offset Central Platform Typical Layout Type P3.2	STD_T6105	Full Compliance
Central Platform Typical Layout Type P3.1	STD_T6106	Full Compliance
Side Platform Standard Layout	STD_T6107	Full Compliance
Voltage Clamp Design Positive Distribution Details	STD_T6109	Full Compliance
Voltage Clamp Design Earthing and Bonding Details	STD_T6110	Full Compliance
Platform Kerbing Standard	STD_T6111	Full Compliance
Off-Platform Meter Cabinet Concrete Slab	STD_T6112	Full Compliance
Galvanised Fence Vertical Bar/Post and Handrail Fence Audio Bollard Details	STD_T6113	Full Compliance
Stainless Steel Fence Audio Bollard Details	STD_T6114	Full Compliance
Transmittal Sheet Generic Design - Superstops	DETAIL_C1050	Reference
CVM Plinth Plinth Dimensions Only	DETAIL_C1051	Reference
CVM Plinth Sections Showing Equipment General Arrangement	DETAIL_C1052	Reference
CVM Plinth Parts List	DETAIL_C1053	Reference
Base K Detail Tram Superstops CVM Installation	DETAIL_C1054	Reference
Base L Detail Tram Superstops SEM Installation	DETAIL_C1055	Reference
CVM Plinth & SEM Base Track Earthing Bond Connections at Tram Stops	DETAIL_C1056	Reference
SEM Base Modification Required For Earth Bonds	DETAIL_C1057	Reference
CVM Plinth Earth Bond Arrangement	DETAIL_C1058	Reference
Tram Platforms Existing Typical Earthing Schematic & Details	DETAIL_C1059	Reference
Tram Platforms Existing Typical Electrical Schematic & Distribution Details	DETAIL_C1060	Reference
Connection To Antenna JC Decaux Type Shelter	DETAIL_C1061	Reference
Connection To Antenna Adshel Type Shelter	DETAIL_C1062	Reference
Connection To Antenna Yarra Trams Shelter	DETAIL_C1064	Reference

Name	Document number	Reference / Compliance
NTS Equipment Clearance Layouts	DETAIL_C1065	Reference
Superstop NTS Generic Layout Transmittal Sheet and Layout Locality Plan	DETAIL_C1070	Reference
Superstop NTS Generic Layout Communications Schematic Diagram	DETAIL_C1071	Reference
Superstop NTS Generic Layout Power Schematic Diagram	DETAIL_C1072	Reference
Superstop NTS Generic Layout Earthing Diagram	DETAIL_C1073	Reference
Superstop NTS Generic Layout Electrical & Communications Interconnections - General Arrangement	DETAIL_C1074	Reference
Superstop NTS Generic Layout Electrical & Communications Services Site Plan, Legend & Notes	DETAIL_C1075	Reference
Superstop NTS Generic Layout Electrical & Communications Services Set Out Diagram and Notes	DETAIL_C1076	Reference
Superstop NTS Generic Layout Electrical & Communications Services Conduit Plan	DETAIL_C1077	Reference

DOCUMENT VERSION CONTROL

Version History	Date	Detail
1.0	12 Mar 2020	Original approved issue
1.01	17 Mar 2020	Error correction in table 3 and minor amendments
1.02	24/02/2022	Minor updated document category

APPENDIX A – DEFINITIONS & ABBREVIATIONS

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

Word	Definition
Accessible	Describes sites that seek to eliminate discrimination against people with disabilities by facilitating their movement
Access Path	A continuous accessible path that provides access to and from a conveyance, facility, building or service

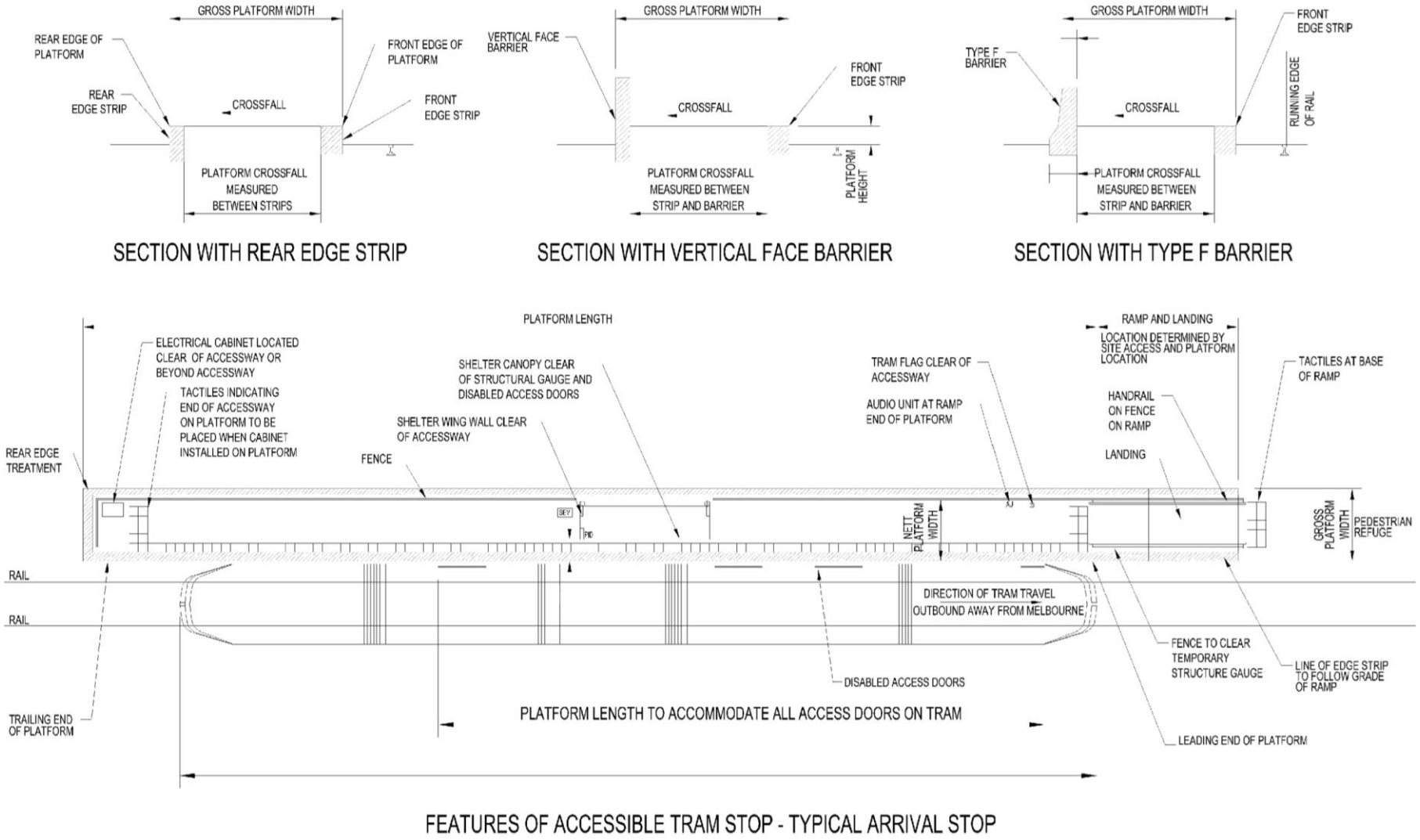
Word	Definition
Accessible Tram Stop	A tram stop that has been designed and constructed in consideration of minimum requirements of DSAPT and the DDA, so it can be used by people with disabilities
AHRC	Australian Human Rights Commission
Approach Side Stop	A tram stop located on the approach side of an intersection, that is conventionally, prior to the traffic lights.
Concept Design Scheme	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
Crash Protection	Barriers, bollards and or end of line planter boxes to protect people in cars and passengers at tram stops from being injured in the event of a vehicle collision into a tram stop
CVM	Card Vending Machine used for dispensing and or recharging of Myki cards
Departure Side Stop	A tram stop located on the departure side of an intersection, that is conventionally, after the traffic lights
Design Speed	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.
Designer	The organisation / consultant contracted to undertake the design and documentation for a tram stop
DBYD	Dial Before You Dig
Easy Access Stop	Tram stop platform at grade with trafficable road way between tracks and footpath
Front Edge of Platform	The platform edge parallel to the rails, which is nearer the rails and adjacent to the trams when stopped
System Requirements Specification	A list of agreed site-specific requirements for a proposed tram stop design which is signed off by Yarra Trams.
Handover Package	The data set that specifies the scope of work for the design of an accessible tram stop
Inbound	Tram direction of travel towards the Melbourne CBD
Inclusive Design	Inclusive design is a process of designing, building, managing and populating places and space that ensures they work for as many people as possible, not just some groups. It takes into account people with specific mobility, dexterity, sensory and communication impairments; learning disabilities; continence needs; and people whose mental well-being should be supported by a thoughtfully crafted and managed environment.
Intersection Stop	A tram stop located at a road intersection

Word	Definition
Kerb Ramp	A short access path ramp not steeper than 1 in 8, and not longer than 1520mm, attached to a kerb
Kerb Access Stop	Stops where passengers wait on the footpath and may cross a roadway before boarding a tram
Landing	A resting area at the top and bottom of a ramp
Leading End	The tram departure end of a platform
Luminance Contrast	The variation in the amount of light reflected from one surface as compared to another reference surface in the surrounding area.
LRV	Light Rail Vehicle
Median Stop	A level access tram platform stop located in a roadway median, reservation or a grassed reservation
Mid-block Stop	A tram stop at locations other than a road intersection
Municipal Footpath Network	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
Near-side Loading	The tram stop platform is located to the left of the tracks when looking in the direction of travel
Off-side Loading	The tram stop platform is located to the right of the tracks when looking in the direction of travel
Prevailing Speed	85th percentile vehicle speed as measured at a particular location
Outbound	Tram direction of travel away from the Melbourne CBD
Pair of Stops	A platform structure on each of the inbound and outbound tram tracks at one location
Path of Travel	The alignment taken along a path, landing, ramp, walkway or other space used for circulation
Pedestrian Refuge	A protected area, at road level, at the foot of the ramp
Platform Stop	Stops with a dedicated elevated area protected from traffic for passengers to move on and off trams, separated from the footpath via controlled access point(s) (e.g. pedestrian signals or zebra crossings)
Platform Cross Fall	The gradient of the platform measured from the front coping to the back coping
Platform Height	The vertical distance between the nearest rail head plane and the front edge of the platform
Platform Length	The length of structure of a uniform height above the rail, that is available for tram access and egress

Word	Definition
Platform Size	The area of the tram stop, raised above the tram tracks, that provides level access to trams
Platform Width - gross	The overall horizontal distance, perpendicular to the front edge of the platform, to the rear edge of the platform and including any road protection measures installed
Platform Width - nett	The clear horizontal distance, perpendicular to the front edge of the platform to the platform side face of the rear fence
Posted Speed	Maximum legally enforced speed a motorist may travel on a section of road
PTV	Public Transport Victoria
Rail Head	Top surface of tram track
Ramp	An inclined access way that connects the designated accessible end(s) 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
Ramp Length	The horizontal distance from the end of the platform to the beginning of the pedestrian refuge at pavement level or intermediate landing
Right of Way	Operating environment in which tram travel includes: 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. 3. Median/Parkway/Light Rail - 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).
Road Safety Auditor	Road Safety Auditors, prequalified by VicRoads, provide audit works impacting roads from a safety perspective.
Running Edge of Rail	The inside vertical face of the rail head that provides the contact point with the wheel flange of the tram
Signalised Pedestrian Access	Traffic light triggered by a pedestrian to stop road traffic and permit safe access to the tram stop
Step Ramp	A short access path ramp not steeper than 1 in 10, and not longer than 1900mm
Tactile Ground Surface Indicators	Surface mounted markers placed to assist people who are vision-impaired with their orientation. Truncated cone shaped TGSIs are used to warn of hazards and bar shaped TGSIs are used for directional guidance

Word	Definition
TfV	Transport for Victoria is a statutory office of the Department of Transport responsible for coordination and planning of all transport systems in Victoria
Tram Operator	The tram arrival end of a platform
Tram Stop	A designated area for picking up and setting down tram passengers
TSV	Transport Safety Victoria is the independent agency under the Department of Transport responsible for rail, bus and marine safety in the State of Victoria
Universal Design	The designing of products and spaces so they can be used by the widest range of people possible. Takes into account the full range of human diversity including physical, perceptual and cognitive abilities as well as different body sizes and shapes. See http://universaldesign.ie/What-is-Universal-Design/The-7-Principles/ for further information.
Walkway	An access path with a gradient not steeper than 1 in 20

Figure 1: Illustration of Definitions



APPENDIX B – TYPES OF PLATFORM TRAM STOPS

Descriptions

Type	Description	Reference
	Platform Access Stops	
P1	*Single Face Platforms* Tram passengers board and alight from free standing platforms, with 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. 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. Platform lengths may need to be doubled depending on the patronage levels and number of routes operating at the stop. Single Face Platforms require pedestrian access from the footpath to the platform by a signalised crossing or a pedestrian crossing. A DSAPT compliant ramp access located at least on one end but Single Face Platforms may be designed with ramps at each end or with steps at the alternate access end (with the accessible end signed). Track or overhead electrical supply wires do not generally require change.	Figure 2 Figure 3 STD_T6107
P2	*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. 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 4
P3	*Centre Island Platforms (CIPS)* Tram passengers' board and alight from a wide double-sided island platform constructed between relocated tram tracks with access in both directions simultaneously. Where patronage levels are high, or the fit- out includes more than basic seating and shelter provision, additional platform width may be required. Refer to table 3: Typical Platform Geometry Parameters for preferred platform widths.	Figure 5 Figure 6 STD_T6106 STD_T6105

Type	Description	Reference
	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 dedicated pedestrian crossing must provide a safe pathway from the footpath to the platform. Track and overhead electrical supply wires and poles must be relocated. Track curves on approach and departure shall not reduce operational speed below 40km/h and when travelling through unoccupied platforms, while maintaining smooth passenger travel in the transition zones, so far as is reasonably practicable. These platforms may be located mid-block or at arrival or departure side of an intersection. There are two types of CIPS: Double sided (STD_T6106) Double sided platforms are wider and allow tram loading to take place from both sides of the platform opposite each other. The Double-Faced Island Platforms are particularly suited to locations where patronage tends to peak in one direction. Central offset (STD_T6105) in some cases, construction of double side stop requires a reduction in available road width similar to single sided face platform. To minimise the reduction of the road width a modified version of the CIPS can be applied reducing the platform width and extending the platform length. This creates the equivalent of two single face platforms in sequence with pedestrian loading provided on the off side.	
	Easy Access Stops	
E1	*Kerb Extension Platform (Kerb Access Stop-KATS)* 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. There is no vehicular trafficable lane immediately behind the back of the platform and traffic follows the tram. This type of stop is generally used in low traffic environment when there is only one dedicated traffic lane on each side of the tram line. Two lanes of traffic may merge into one lane and back again into two lanes. In terms of safety this treatment is an ideal solution as tram passengers access the footpath without crossing the road. This platform option is however not suitable for roads which carry high volumes of traffic requiring more than a single lane as it can create congestion and in turn delays to tram services. Kerb Extension Platforms accommodate larger numbers of passengers as required on occasions.	Figure 7

Type	Description	Reference
	For footpath accessible stops this solution is preferred (over easy access stops) as it reduces the interaction between passengers and road vehicles. These platforms are generally located mid-block as positioning it at the intersection could restrict the capacity of the road. 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. It is also possible to provide bike lane alongside the front of the kerb extension platform in constrained road environment.	
E2	*Shared Zone Platforms (Trafficable Platforms, Easy Access Stop-EAS)* 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 or crossing 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 is required to stop for tram boarding and alighting in the same manner as kerb side tram stop. This type of platform design occupies less road space and allows traffic flow to be maintained on narrow roads. There are three variations of this type of stop design in a shared road way: Type E2A- Platform Shared Roadway (e.g. Clive Plaza in St Kilda) In this arrangement a standard side tram platform is provided alongside the tram tracks. The roadway at the back of platform is ramped and raised, constructed to be at the same level as the footpath and platform. Direct passenger access is provided between the footpath and tram platform area, with footpath, roadway and platform area delineated by bollards Pedestrian access to the platform can either be provided through pedestrian crossing or the roadway designated as shared pedestrian & traffic with traffic speed restricted to 10 km/h Type E2B- Commuter Shared Roadway (e.g. McArthur Street) In this platform arrangement the roadway at the tram stop area is raised to provide level access from the footpath to the platform, hence level loading to trams. All traffic travels in left lane clear of tram tracks over the raised shared roadway area and stops for boarding/alighting of passengers in the same way as the kerb side tram stop. The length of the approach and departure ramps at either side of the raised roadway can be varied depending on road speed limit required. Type E2A and E2B (EAS) platform can be constructed with no requirements to change track position. Type E2C-Easy Access Stop - (e.g. Bridge Road)	Figure 8 Figure 9 Figure 10

Type	Description	Reference
	This platform arrangement is similar to type E2B however traffic is permitted to travel in the kerbside lane over the EAS as well as along the tram tracks to the right of the raised roadway. This platform design also includes the use of bollards to stop vehicles from straddling on platform edges. This platform design enables traffic carrying capacity to be maintained on roads were construction of other type of platforms options would otherwise impact adversely on traffic queues and congestion which in turn would result in delaying the efficient operation of tram services.	

Illustrations

Figure 2: TYPE P1 –– Typical Arrangement for Single Face Platform

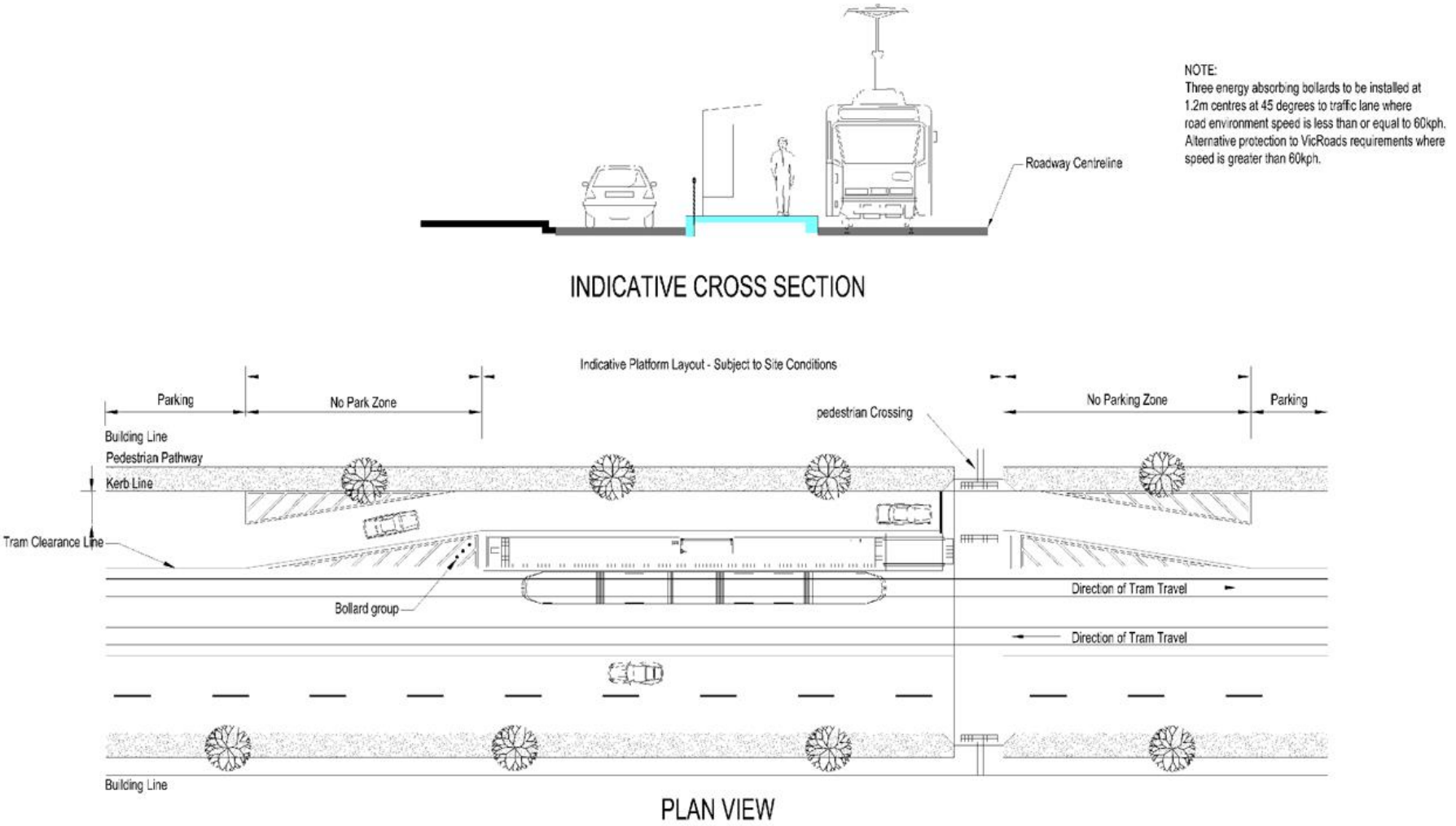
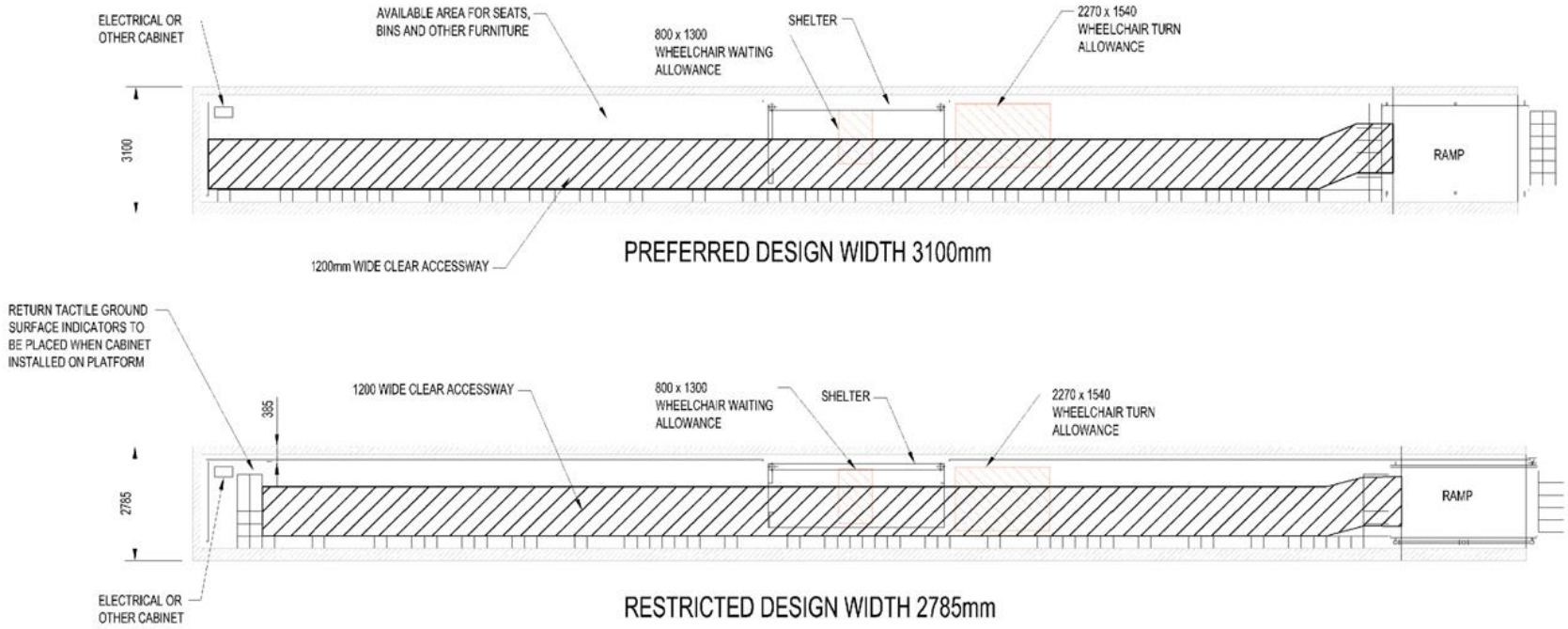


Figure 3: Typical Arrangement for Single Face Platform Widths



Note: Restricted Design width of 2785mm would require a Deviation of Engineering Standard request

Figure 4: Typical Arrangement for Type P2 Median Platform

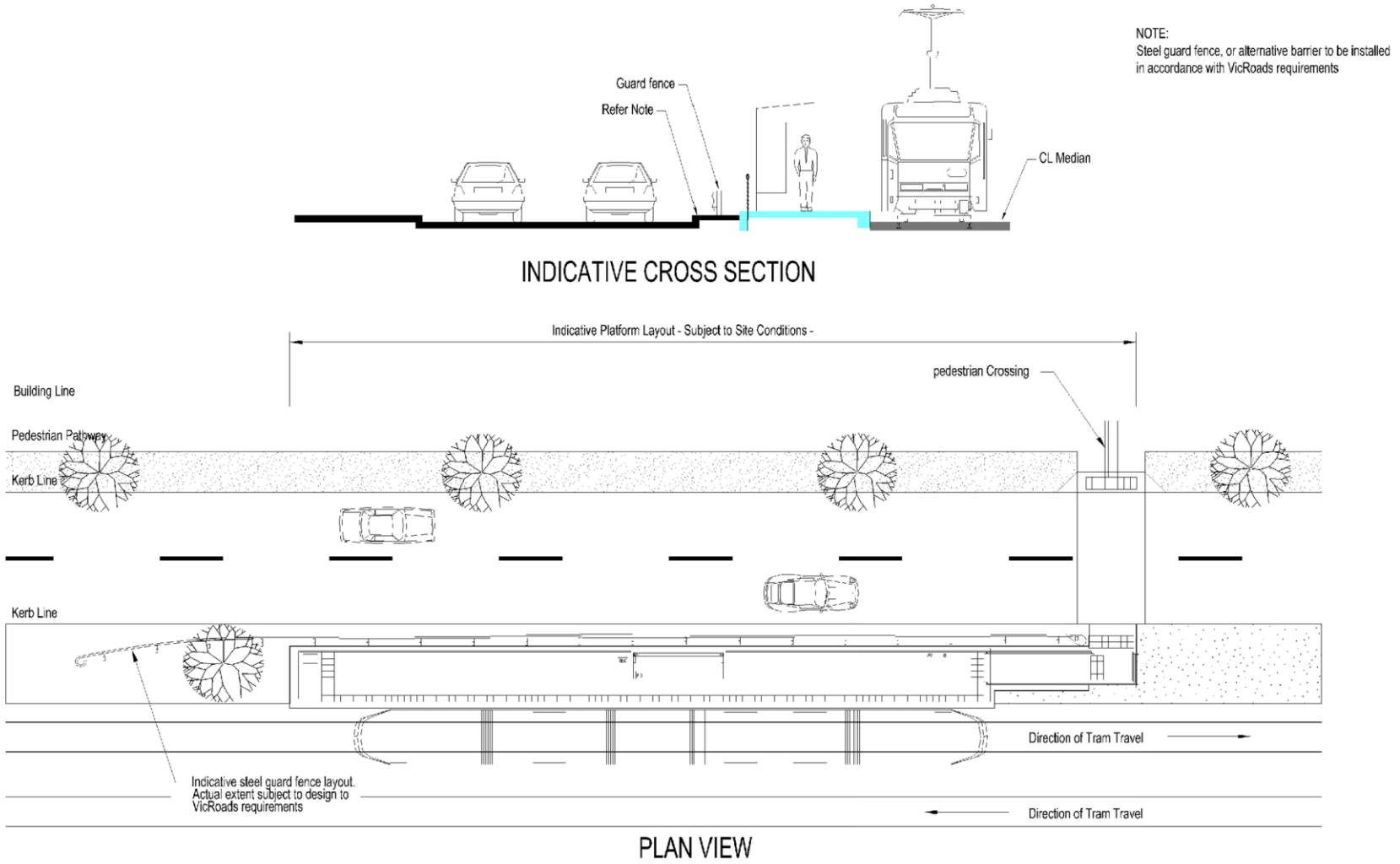


Figure 5: Typical Arrangement for Type P3 Island Platforms (Double Sided)

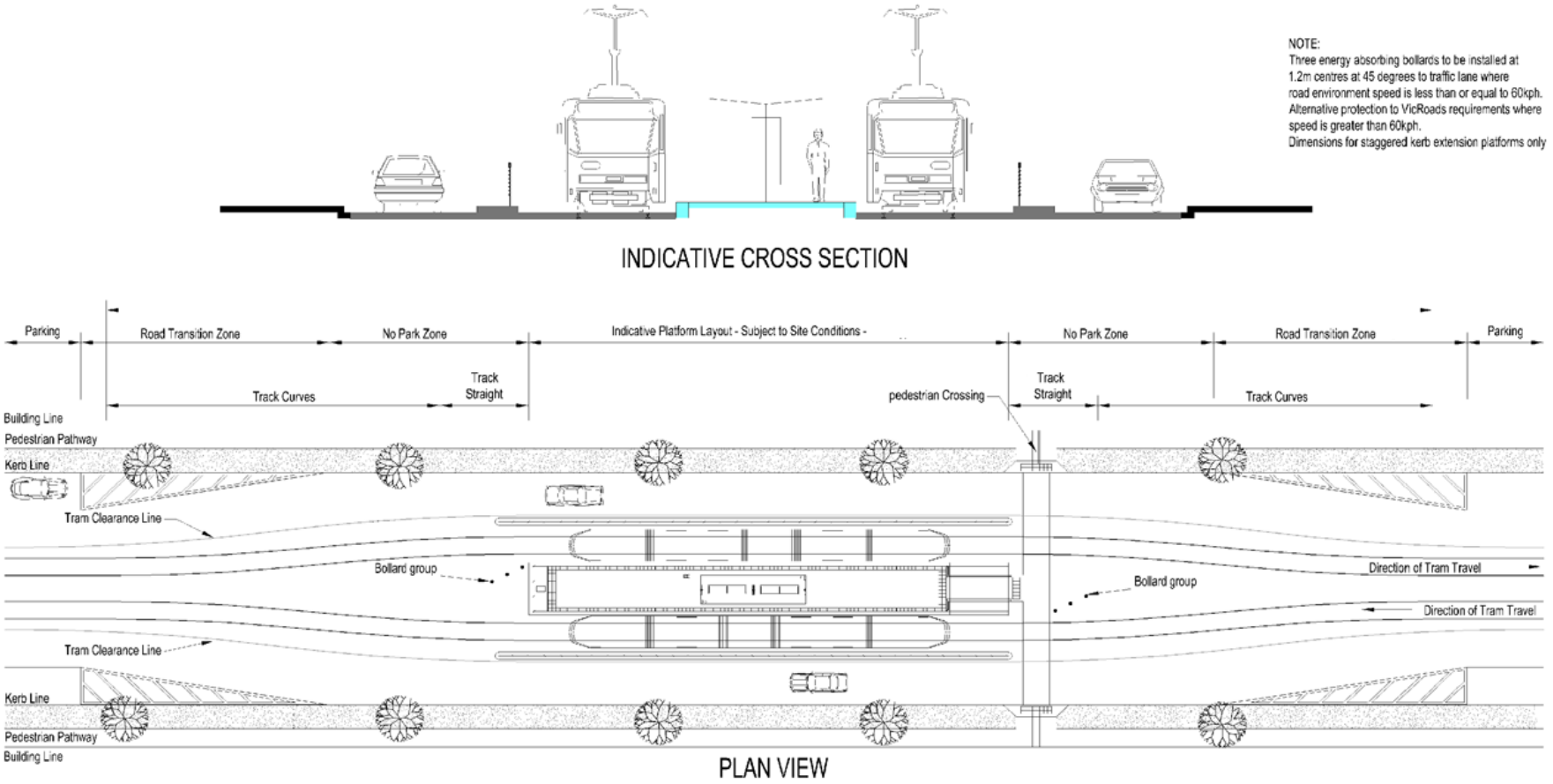


Figure 6: Typical Arrangement for Type P3 Island Platforms (Central Offset)

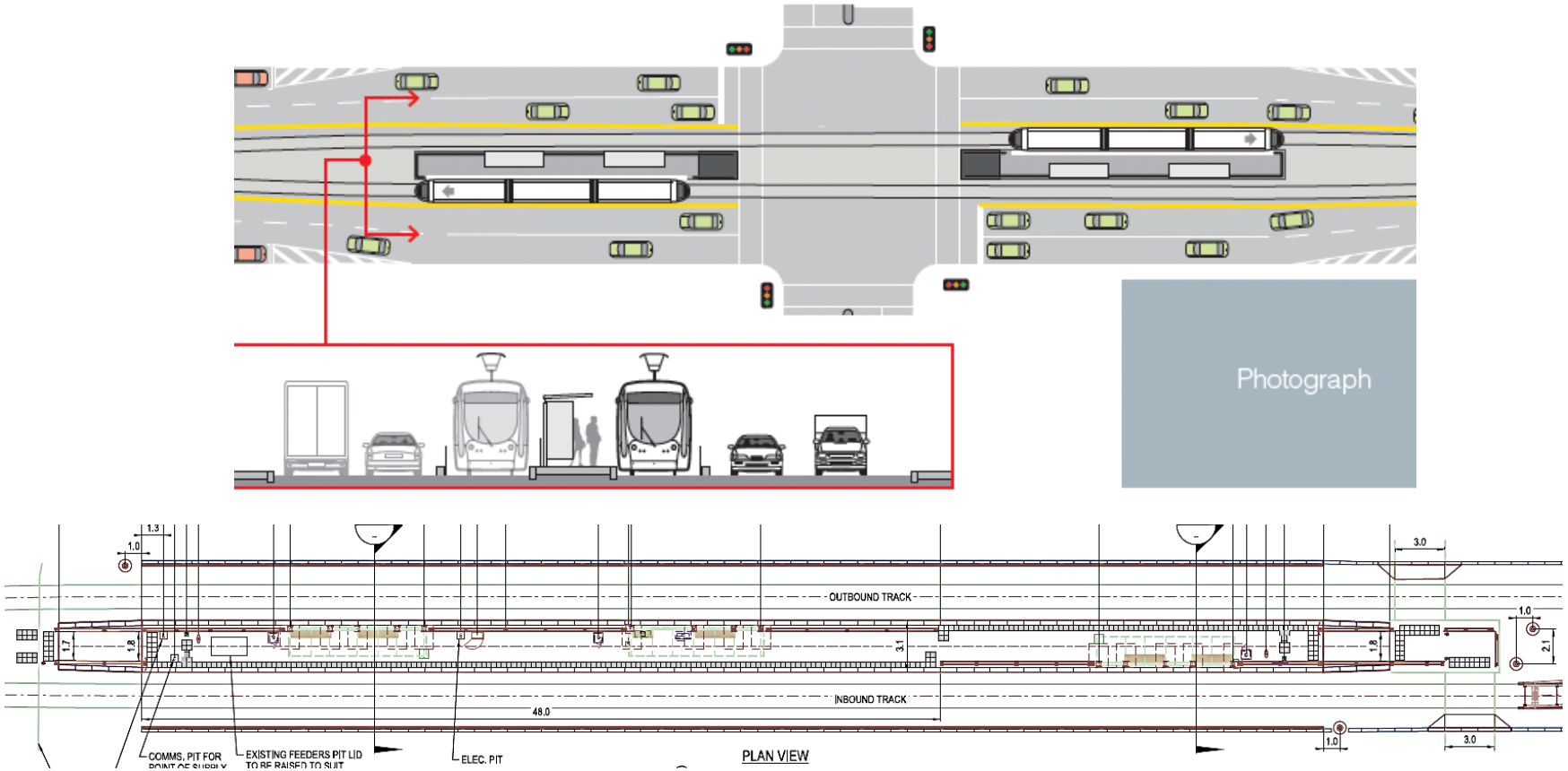


Figure 7: Typical Arrangement for Type E1 Kerb Extension Platform

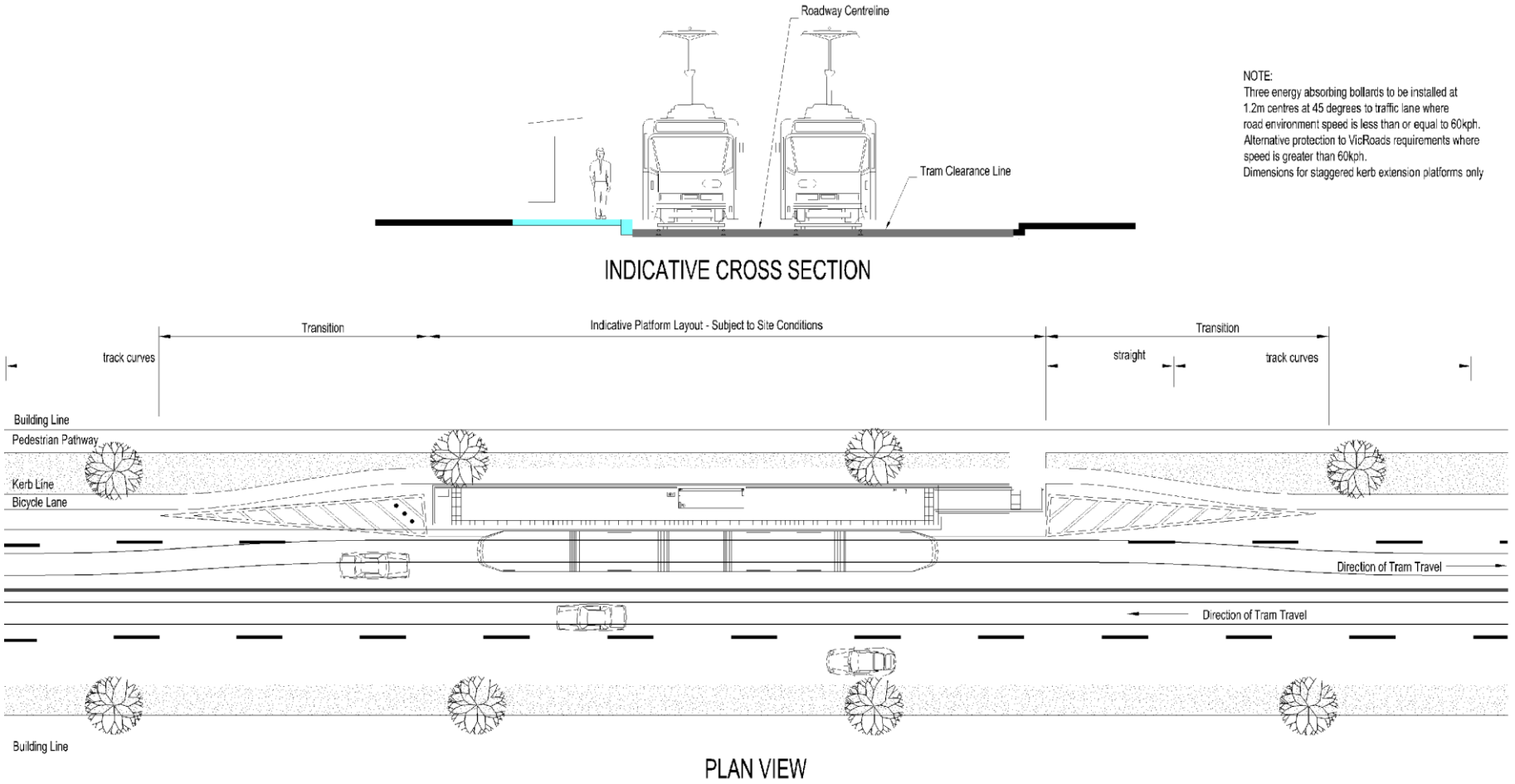


Figure 8: Typical Arrangement for Type E2A Platform Shared Roadway

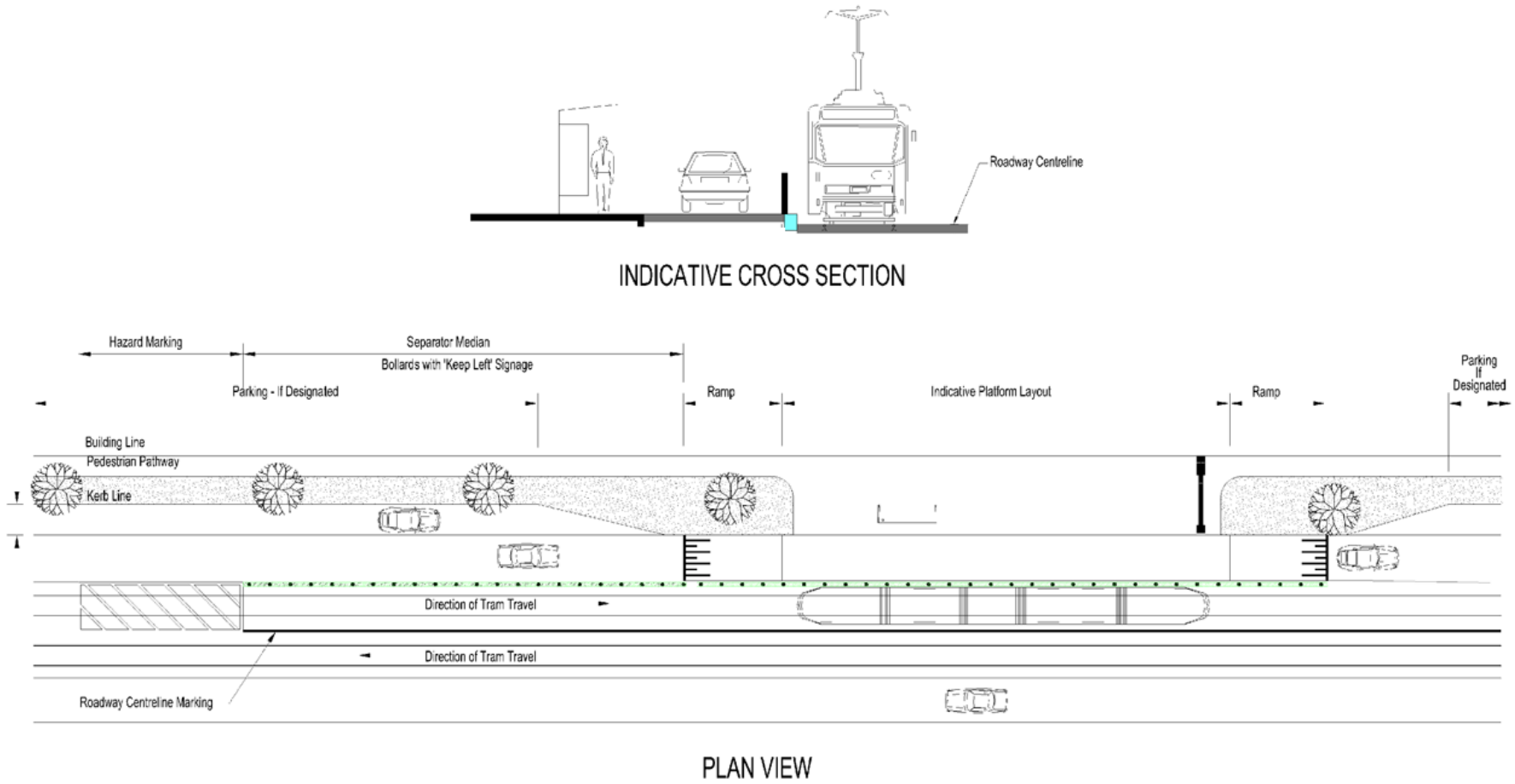


Figure 9: Typical Arrangement for Type E2B - Commuter Shared Roadway

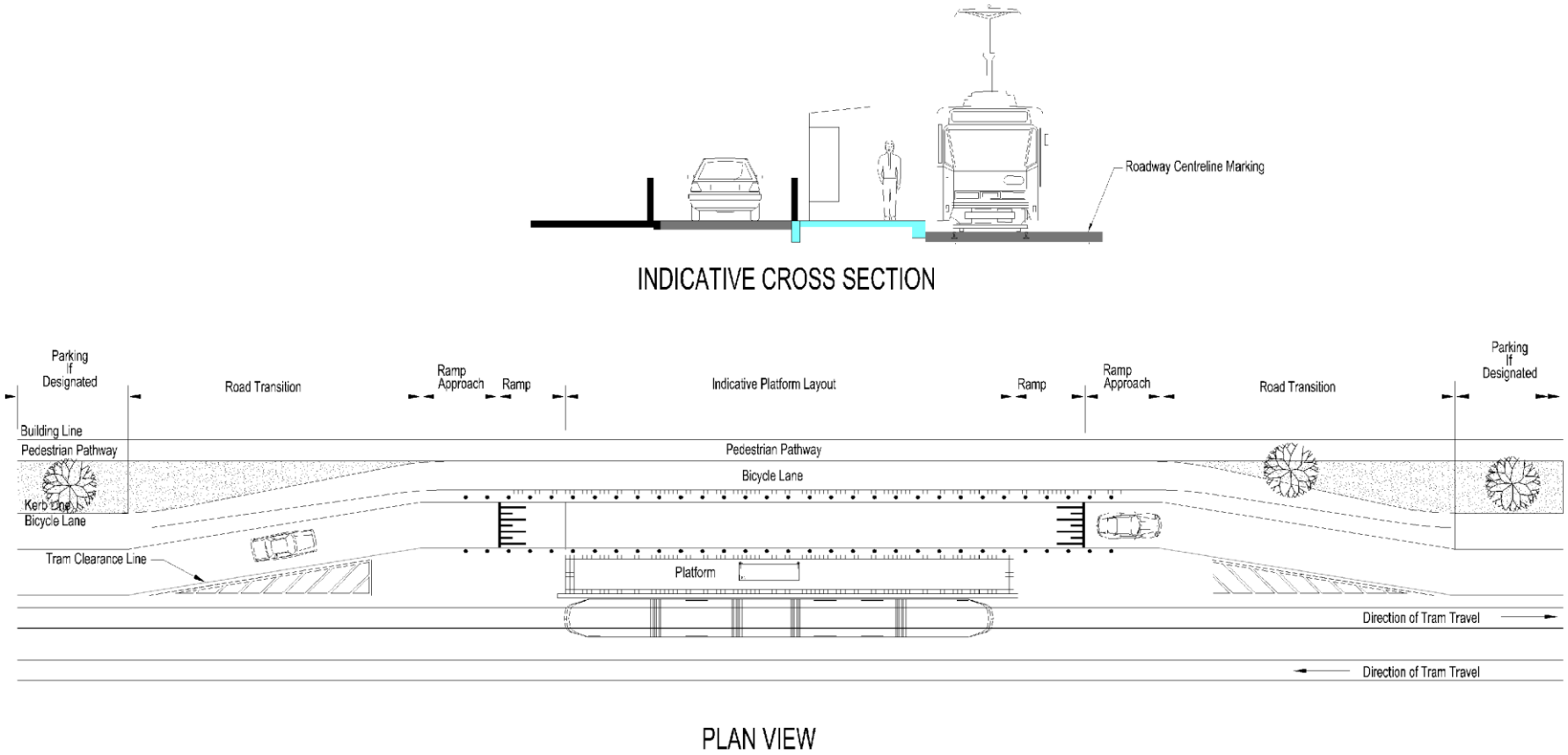
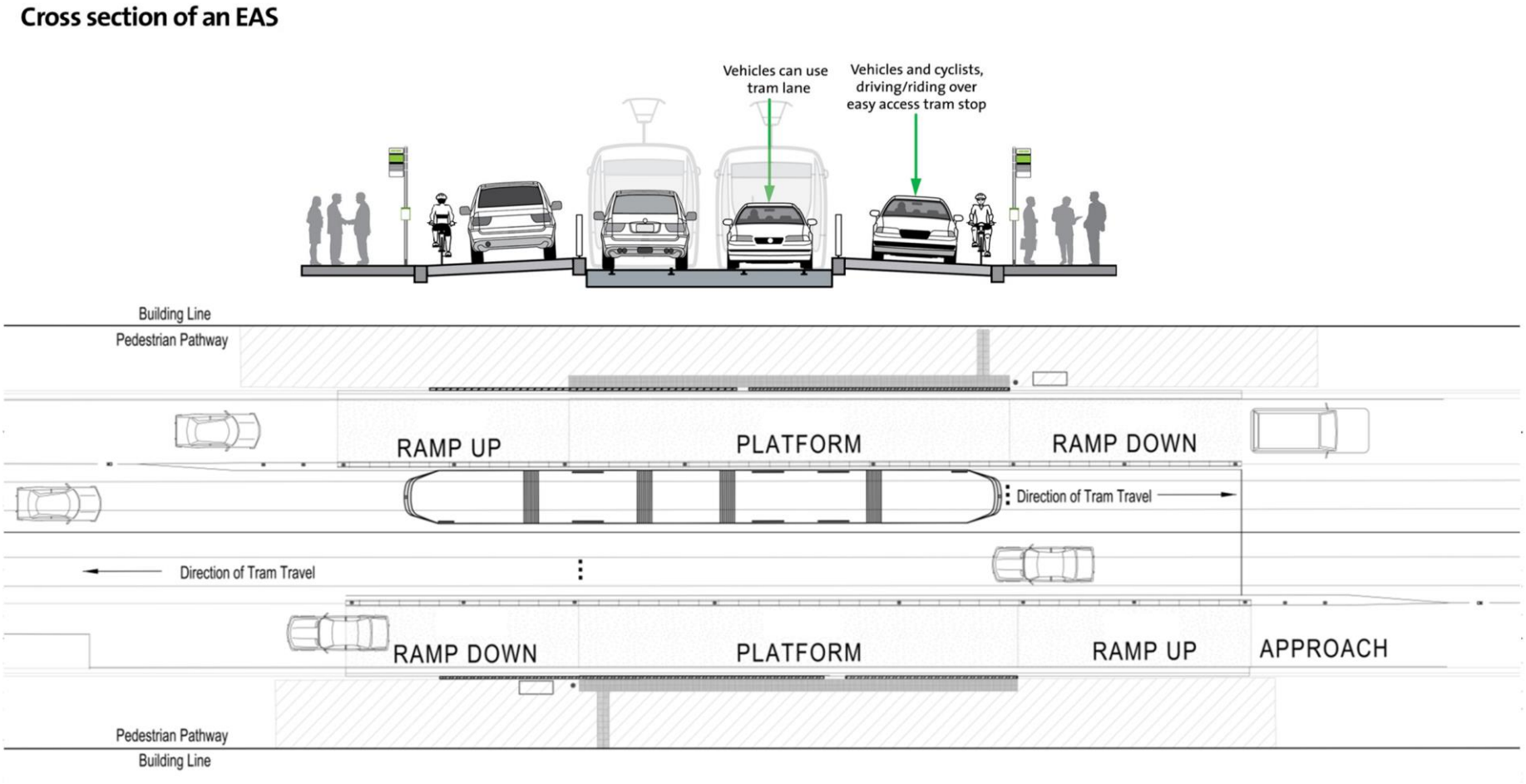


Figure 10: Typical Arrangement for Type E2C – Easy Access Stop



APPENDIX C – DESIGN DELIVERABLES

C1 System Requirements Specification

A system requirements specification shall be issued by Yarra Trams to record tram stop design criteria, in accordance with client requirements. It shall be prepared using information agreed in the systems design phase to inform the preliminary design phase, identifying site-specific requirements.

C2 Preliminary Design Phase

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

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

- Tram stop accessibility requirements;
- Tram stop geometric requirements;
- Tram stop reference platform types;
- Tram stop fit-out requirements;
- Safety in design principles.

C2.1 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.

C2.2 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) and in accordance with PTV DMS standards. 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 locations;
- 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.

C2.3 Platform Scheme Cross Sections

Once the platform and crash protection arrangements have been prepared for a particular tram stop, the designer shall prepare cross sections, unless there is substantial change in grade as follows:

- at each end of the platform;
- at the bottom of the ramps;
- 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.

C2.4 Platform Scheme Illustrations

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

C2.5 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 PTV PASS Assets database.

C3 Detailed Design Phase

Following the assembly of the preliminary design package, a preliminary design review meeting; led by Yarra Trams, shall be convened. The purpose of the meeting is to endorse the preliminary design for a single or a group of trams stops and authorise commencement of the detailed design phase. The detailed design phase shall not commence until the preliminary design scheme has been accepted by Yarra Trams.

The preliminary design handover package shall include, at a minimum:

- Final Preliminary Design Scheme;
- Final Functional Specification;
- Preliminary Road Safety and Accessibility Compliance Audit Reports (RSACAR) and the designer's response;
- Traffic Impact Assessment report;
- Services Report;
- Planning Report;
- Preliminary design risk register;
- Other data relevant for detailed design input.

The preliminary design scheme, plus additional information in the preliminary design handover package, shall be submitted to the Municipal Council for information and agreement.

The detailed design scheme is the data set that specifies scope of work for the construction works. Following the assembly of the detailed design package, a detailed design review meeting; led by Yarra Trams, shall be convened. The purpose of the meeting is to endorse the detailed design for a single or a group of trams stops and authorise commencement of the construction works. Construction works shall not commence until the detailed design scheme has been accepted by Yarra Trams.

Any changes to the detailed design data set, such as changes to the endorsed final detailed design scheme or system requirements specification shall be subject to PTV and Yarra Trams agreement.

C4 Design Reporting

The following investigations and reporting provide additional input into the development of the preliminary and detailed design phases.

C4.1 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 and or provision of advertising on platforms. Local authorities and Heritage Victoria must be consulted for preliminary assessment of site applicable overlays, including vegetation protection overlays.

C4.2 Traffic Impact Assessment

Where the preliminary design identifies tram stop design will affect the operation of adjacent traffic lanes and roads, a Traffic Impact Assessment shall be undertaken to determine the requirements for mitigating works.

The objectives of the Traffic Impact Assessment are:

- To assess any change to the level of service resulting from the introduction of the platform and the functionality of the existing road;
- Consider provision of allocated parking spaces for regular car users, maintenance and emergency vehicles;
- Ensure impact on existing traffic flow is avoided or minimised, including the preservation of minimum turning circles for existing road users and any restrictions which the introduction of a tram stop may impose.

Mitigating works required 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' Guide to Road Design (AGRD) and relevant VicRoads Supplements to the AGRD.

C4.3 Road Safety Audit

Rather than 'checking for compliance', a road safety audit is 'checking fitness for purpose', assessing whether the road treatment is safe so far as is reasonably practicable. 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 a tram stop including any mitigating works.

The outputs of the audit should be reviewed by Yarra Trams, PTV, TfV, local council, TSV 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 road safety audit schedule shall comprise a minimum of three audits:

- Audit of the preliminary design;
- Audit of the detailed design;
- Audit of the constructed works.

The steps in the audit process shall be as follows:

1. The designer shall engage a Road Safety Auditor (RSA).
2. The designer shall provide background information, preliminary design schemes and drawings at an inception meeting with the auditor.
3. The RSA shall examine the background information, design data, and undertake a site visit.
4. The RSA shall prepare an audit report of the preliminary design and submit it to the designer compliant with Yarra Trams specific audit Terms of Reference.
5. The designer shall adopt RSA recommendations (in which case the preliminary design shall be modified accordingly) or justify to Yarra Trams reasons for rejecting RSA recommendations in accordance with the SFAIRP principle. The designer shall prepare a report for Yarra Trams specifying those recommendations that shall be included, and those not included in the updated preliminary design, for Yarra Trams approval.
6. The auditor shall prepare an audit report of the detailed design and submit it to the designer.
7. The designer shall adopt RSA recommendations (in which case the detailed design shall be modified accordingly) or justify to Yarra Trams reasons for rejecting RSA recommendations in accordance with the SFAIRP principle. The designer shall prepare a report for Yarra Trams specifying those recommendations that shall be included, and those not included in the updated detailed design, for Yarra Trams approval.
8. The auditor shall inspect the constructed works, prepare an audit report, and submit it to the designer.
9. The designer shall adopt RSA recommendations (in which case the constructed works shall be modified accordingly) or justify to Yarra Trams reasons for rejecting RSA recommendations in accordance with the SFAIRP principle. The designer shall prepare a report for Yarra Trams specifying those recommendations that shall be addressed, and those not to be addressed in the constructed works, for Yarra Trams approval.

C4.4 Accessibility Compliance Audit

Accessibility Audits of tram stops shall be undertaken by an ACAA (Association of Consultants in Access Australia) accredited auditor with demonstrated experience in assessment of rail environments. The audit shall identify non-compliances to DSAPT 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.

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, rather provide a workable solution to address the DSAPT non-compliances.

Where compliance cannot be achieved a waiver must be sought in accordance with the deviation from standards procedure.

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

- Audit of the preliminary design;
- Audit of the detailed design;

- Audit of the constructed works.

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

1. The designer shall appoint an Accessibility Auditor.
2. The designer shall provide background information, preliminary design schemes and drawings at an inception meeting with the Auditor.
3. The Auditor shall examine the background information, design data, and undertake a site visit.
4. The Auditor shall prepare an audit report of the preliminary 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.
5. The designer shall amend the design plans accordingly and prepare a report specifying any non-compliances remaining in the preliminary design.
6. 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.
7. The designer shall amend the design plans accordingly and prepare a report specifying any non-compliances remaining in the detailed design.
8. The auditor shall inspect the constructed works, prepare an audit report, and submit it to the designer. Any constructed component that does not meet DSAPT requirements needs to be satisfactorily addressed and solutions proposed.
9. The designer shall provide confirmation all of the DSAPT non-compliances have been satisfactorily addressed, including copies of PTV approved waivers against any remaining non-compliances.

C4.5 Risk Register

Management of risk for all activities shall be conducted within the life cycle of the works from inception to operation by the Tram Operator or relevant road authority.

In consideration of the duties of all stakeholders in relation to tram stop design, set out in the Occupational Health & Safety Act 2004 and Yarra Trams Safety in Design processes, all outcomes in consideration of safety issues are to be recorded in the Risk Register.