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# **VicRoads Supplement to the Austroads Guide to Road Design**

## **Part 4 – Intersections & Crossings - General**

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**NOTE:**

**This VicRoads Supplement must be read in conjunction with the Austroads Guide to Road Design.**

**Reference to any VicRoads or other documentation refers to the latest version as publicly available on VicRoads website or other external source.**

# VicRoads Supplement to the Austroads Guide to Road Design Updates Record

## Part 4 – Intersections & Crossings - General

Rev. No. Date Released	Section/s Update	Description of Revision	Authorised By
Rev. 1.0 July 2010	First Edition	Development of Supplement	ED – Network & Asset Planning
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Rev. 2.0 July 2011	Section 10.4 Add Appendix VA	Vertical clearance clarification	Principal Advisor – Road Design, Traffic & Standards
Rev. 2.1 Jan 2012	Section 10.2 Appendix VA	Assessment of Passive Railway Level Crossing - Sight Distance guidance	Principal Advisor – Road Design, Traffic & Standards
Rev. 2.2 Dec 2012	Various Figure V10.1	General edits Change in direction $\geq$ sign	Principal Advisor – Road Design, Traffic & Standards

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This VicRoads Supplement has been developed by VicRoads Technical Services and authorised by the Executive Director – Policy and Programs.

The VicRoads Supplement to the Austroads Guide to Road Design provides additional information, clarification or jurisdiction specific design information and procedures which may be used on works financed wholly or in part by funds from VicRoads beyond that outlined in the Austroads Guide to Road Design guides.

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## References

AGRD – Austroads Guide to Road Design

GTEP – Guide to Traffic Engineering Practice (superseded)

VRD/RDG – VicRoads Road Design Guidelines (superseded)

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- Victorian Rail Industry Operations Group Standards (2004). Structural Gauge Envelopes – Minimum clearances for Infrastructure adjacent to the Railway.



## 1.0 Introduction

### 1.1 Purpose

VicRoads has no supplementary comments for this section.

### 1.2 Scope of this Part

VicRoads has no supplementary comments for this section.

### 1.3 Road Safety

VicRoads has no supplementary comments for this section.

### 1.4 Design Criteria in Part 4

Refer to *VicRoads Supplement to AGRD Part 2* for further information regarding the application of Extended Design Domain criteria in Victoria.

### 1.5 Road Design Objectives

VicRoads has no supplementary comments for this section.

### 1.6 Other Considerations

#### 1.6.1 Pavement Markings and Signs

##### Substitute Information

*VicRoads Traffic Engineering Manual (TEM) Volume 2 – Signs and Markings* shall be used as the primary reference for pavement markings and signs in Victoria.

## 2.0 Types of Intersections

### 2.1 General

VicRoads has no supplementary comments for this section.

### 2.2 Basic Forms of Intersection

VicRoads has no supplementary comments for this section.

### 2.3 Specific Types of Intersections

##### Additional Information

Further information is available for the selection of roundabout and signalised control in *VicRoads Traffic Management Note (TMN) 22: Roundabouts and Traffic Signals – Guidelines for the Selection of Intersection Control* (VicRoads, 2005).

## 3.0 Road Design Considerations for Intersections

### 3.1 General

VicRoads has no supplementary comments for this section.

## 3.2 Road Users

### Table 3.2: Considerations for road users in intersection design

##### Clarification / Additional Information

*Pedestrians* – The AGRD recommends avoiding staged crossings wherever practicable. In a number of circumstances, staged crossings are desirable.

*Bus Drivers* – Consider limited vision for drivers when considering locations with required lane changing / merging, especially on the far side of the vehicle from the driver.

*Tram Drivers* – Consider limited vision for drivers when considering locations with required lane changing / merging.

*Motorcyclists (not included in table)* – Limit the use of excessive painted areas.

Avoid treatments that can result in the build up of debris where motorcycles would potentially be turning. Avoid longitudinal grooving in intersections and on curves.

Refer also to *Austroads Guide to Traffic Management (AGTM) Part 6, Table 3.3* and *VicRoads Supplement to AGRD Part 6* for additional motorcyclist considerations.

## 3.3 Provision for Large/Special Vehicles

##### Additional Information

Designers should clarify if intersections on major arterial routes need to cater for High Productivity Freight Vehicles prior to the commencement of functional design. VicRoads Heavy Vehicle Policy Section can be consulted regarding possible routes for these vehicles.

### 3.4 Topography and Land Availability

VicRoads has no supplementary comments for this section.

### 3.5 Environment and Heritage

VicRoads has no supplementary comments for this section.

### 3.6 Physical Constraints

##### Additional Information

Also consider existing and possible future access conditions.

### 3.7 Occupational Health and Safety

VicRoads has no supplementary comments for this section.

## 4.0 Design Process

### 4.1 General

#### Figure 4.1

##### Additional Information

In the "Basic Data" input box, consider Operating Speed as well as the Speed Limit.

### 4.2 Basic Data for Design

#### Additional Information

Various warrants for Victorian conditions along with additional considerations are provided in *VicRoads TEM Volume 1*.

Further information is available for the selection of roundabout and signalised control in *VicRoads TMN 22* (VicRoads, 2005).

#### Table 4.1

##### Additional Information

For the "What Function" section, refer also to *AGTM Part 4: Network Management, Section 4.1*.

### 4.3 Location of Intersections

#### Additional Information

*VicRoads Access Management Policy* (VicRoads, 2006) provides further guidance regarding desirable intersection location/spacing.

VicRoads may determine the appropriate degree of access according to the road classification and/or local constraints.

### 4.4 Design Speed

VicRoads has no supplementary comments for this section.

### 4.5 Road Cross-section

#### 4.5.2 Traffic Lanes - General

##### Clarification

Victorian practice is to measure lane widths to the LINE of kerb.

#### 4.5.2 Traffic Lanes – Lane Widths

##### Substitute Information

The distance of 5.0m between kerbs is an absolute minimum, not desirable minimum.

## 5.0 Design Vehicle

### 5.1 General

#### Additional Information

Additional consideration for turning movements includes adequate clearances to other vehicles' turning paths within the intersection.

### 5.2 Design vehicle

#### Additional Information

Appropriate design vehicles should be clarified with VicRoads prior to the commencement of functional design.

Restricted access vehicles (25m long) – Placement of pits and road furniture at arterial road to arterial road intersections and along designated truck routes shall not obstruct turning of the restricted access vehicle. This vehicle may be permitted to intrude into adjacent traffic lanes, and may be provided with fully mountable paved areas behind the face of kerb.

More than one design vehicle may govern design of a particular intersection. For example, on roundabouts the swept width may be designed to suit a semi-trailer and the area adjacent to the outer kerb designed to provide clearance for the front overhang of a bus. Drainage pits, road furniture and extent of full depth pavement are generally located to provide clear passage for a 25m restricted access truck.

Large over dimensional (OD) vehicles generally have all-wheel steering which enables them to negotiate alignments designed for 19m prime mover and semi-trailers. Therefore, unless there is an extraordinary OD vehicle specified, the 19m prime mover and semi-trailer may be used as the design vehicle for OD routes.

Designers should clarify if intersections on major arterial routes need to cater for High Productivity Freight Vehicles prior to the commencement of functional design. VicRoads Heavy Vehicle Policy Section can be consulted regarding possible routes for these vehicles.

### 5.3 Checking Vehicles

VicRoads has no supplementary comments for this section.

### 5.4 Restricted Access Vehicles

VicRoads has no supplementary comments for this section.

### 5.5 Visibility from Vehicles

VicRoads has no supplementary comments for this section.

### 5.6 Design Vehicle Swept Path

#### 5.6.2 Radius of Turn

##### Alternative Information

Preference for turn radii within intersections is to utilise the available turning templates for 5-15km/h as appropriate. Table V5.1 provides alternative minimum turning radii for design turn speeds.

**Table V5.1: Minimum Radii for Turns within Intersections  
(from RDG Figure 2.4.3(a))**

	Car Speed km/h	Minimum Radii (m)							
		Superelevation (m/m)							
		0.06	0.05	0.04	0.03	0.02	+0.01	0	-0.02
Turns Within Intersections	16	6	6	6	6	6	7	7	8
	18	7	7	8	8	8	8	8	10
	20	9	9	9	9	10	10	10	12
	22	11	11	11	11	12	12	12	14
	24	12	13	13	13	14	14	15	17
	26	15	15	15	16	16	17	17	20
	28	17	17	18	18	19	19	20	23
	30	19	20	20	21	21	22	23	60

**Notes:**

1. This table shows car speeds. Trucks generally travel slower on curves than cars (see *AGRD Part 3, Table 4.3*). On low radius curves within intersections, trucks can become unstable and roll. *AGRD Part 4A, Appendix C* provides details of speeds and turning radii for trucks within intersections. *VicRoads Supplement to AGRD Part 4A, Section 2.2* (from RDG Appendix 2.4E) provides details of maximum adverse crossfall at intersections.
2. Adverse crossfall on through traffic lanes should be avoided. Adverse crossfall where unavoidable shall be 0.025 m/m desirable to 0.020 m/m. maximum.
3. On downhill grades, steeper than 2 per cent the effect of adverse crossfall increases (see *AGRD Part 4, Section 7.8*). Adverse crossfall further reduces the safe speed for turning vehicles within intersections. The maximum vector slope shall not exceed 5 per cent (refer *VicRoads Supplement to AGRD Part 4A, Section 2.2* (from RDG Appendix 2.4E).
4. On low and intermediate speed roads, curves located at the end of straights must be compatible with the operating speed.
5. The curve radii shown are minimum figures. Whenever possible, designers should adopt larger radii. Minimum radii should not be used on the approaches to intersections where braking occurs.
6. Where speeds on left turn slip lanes at intersections can exceed 30 km/h, radii and adverse superelevation (if present) should be read from the lower part of the table.

## 6.0 Public Transport at Intersections

### 6.1 General

VicRoads has no supplementary comments for this section.

### 6.2 Design Vehicle

VicRoads has no supplementary comments for this section.

### 6.3 Bus Facilities

#### 6.3.1 Bus Lanes

##### Additional Information

A bus lane on an approach without a left turn slip lane (which caters for a through movement) must not be located to the left of a general traffic lane used by left turning vehicles. A bus (undertaking a through movement) can share a left turn lane with other vehicles to gain priority, or have an exclusive lane provided to the right of a left turn lane. Refer to VicRoads Bus Priority Guidelines for further information.

#### 6.3.1 Bus Lanes Table 6.1 – Note 1

**Note 1:** Based on four seconds of travel time for the bus driver to observe traffic in the adjacent lane in order to accept a gap plus the taper length (see Note 2) ~~and is measured from the pedestrian crosswalk across the intersection departure.~~

##### Clarification Information

Replace Note 1 with:

**Note 1:** Based on four seconds of travel time for the bus driver to observe traffic in the adjacent lane in order to accept a gap plus the taper length (see Note 2) and is measured from the pedestrian crosswalk across the intersection departure or similar location on the intersection departure if no crosswalk is present.

### Figure 6.5: Wide kerbside bus lane

#### Substitute Information

The 35m taper at the start of the wide kerbside lane is very short, especially for the >3.5m lateral shift. The taper length shall be based on lateral shift length for unexpected lane termination with lateral shift rate of 0.6m/s.

### Figure 6.6: Separate bus lane and bicycle lane treatment

#### Substitute Information

The 35m taper at the start of the exclusive lanes is very short, especially for the >3.5m lateral shift. The taper length shall be based on lateral shift length for unexpected lane termination with lateral shift rate of 0.6m/s.

### 6.3.3 Bus Facilities in Medians

#### Additional Information

If considering bus facilities in a median, detailed analysis should be undertaken to determine the possible excessive delays that may occur for buses when entering and/or exiting the median facility. If the median facility can only be provided over limited lengths, the delays in accessing the median facility may negate the benefits provided by the priority measure(s).

### 6.3.4 Bus Stops – Location

#### Additional Information

... a number of factors should be considered, such as:

- whether it is reasonable and safe for pedestrians to access the stop at the proposed location - this could depend on pedestrian demand, pedestrian types and desire lines
- the requirement to provide facilities that meet DDA requirements with respect to access, manoeuvring space, grades etc.

#### Substitute Information

For information and requirements for locating bus stops and associated infrastructure refer to *VicRoads Bus Stop Guidelines* (VicRoads, 2006) and *VicRoads Shoulder Bus Stop Guidelines* (VicRoads, 2007).

Bus bays should not be combined with acceleration/deceleration lanes.

### 6.3.4 Bus Stops – Geometric Design

#### Substitute Information

For information and requirements for locating bus stops layout refer to *VicRoads Bus Stop Guidelines* and *VicRoads Shoulder Bus Stop Guidelines* available on VicRoads website.

### 6.3.4 Bus Stops – Bus stop layout

#### Additional Information

Guidance on bus stop layouts and TGSI treatments is provided in *VicRoads Bus Stop Guidelines* (VicRoads, 2006) and *VicRoads TEM Volume 1, Section 4 – Appendix 2*.

## 6.4 Tram Facilities

### 6.4.2 Tram Lanes

#### Substitute Information

Tram lane signing and marking is specified in *VicRoads TEM, Volume 2 – Section 16* and *VicRoads Tram Priority Guidelines*.

### 6.4.3 Tram Stops

#### Additional Information

Refer to *Road Design Notes (RDN) 3-02 and 3-03* available on VicRoads website.

## 6.5 Taxi Ranks

Refer to VicRoads Taxi Rank Guidelines available on VicRoads website.

## 6.6 Proximity of Public Transport Reservations to Intersections

#### Additional Information

Where limited queue storage between an intersection and a crossing could present a risk of blocking (especially in built up, urban areas), control systems that provide adequate clearance time of the storage area based on the detection of approaching public transport vehicles should be considered.

## 7.0 Property Access & Median Openings

### 7.1 General

#### Additional Information

Refer to VicRoads Access Management Policies.

### 7.2 Property Access

#### 7.2.1 Access Spacing and Proximity of Driveways to Intersections – Access spacing

#### Additional Information

Refer to VicRoads Access Management Policies.

#### 7.2.2 Urban Roads

#### Additional Information

Vehicles clearances should also be considered as outlined in the *AGRD Part 3, Section 8.2.5 – Vehicle Clearances*.



### Additional Information

#### **Urban Driveways**

There are generally two cases:

- (a) footpath close to the property boundary, or
- (b) footpath abutting the kerb.

The layout for driveways for these two cases is shown on Figure V7.1(b) and Figure V7.1(c). The width of the driveway across the border may have to be increased where the access road is less than 7m wide and on-street parking is permitted.

Factors affecting the driveway vertical design are:

- (a) the differences in levels across the border
- (b) the width of the border
- (c) the location and slope of the footpath
- (d) the type of kerb and channel
- (e) the crossfall of the road
- (f) the ground clearance of the design vehicle.

The more usual cases are shown on Figures V7.1(c) and Figure V7.1(d). The profiles of driveway designs beyond the normal limits should be checked using scale silhouettes of design cars, to ensure that long front or rear overhangs would not touch the proposed surface. The relative grade change within the driveway desirably should not exceed 12 per cent, and shall not exceed 16 per cent.

It is noted that minimum vehicle clearance requirements for driveways are specified in *AGRD Part 3, Section 8.2.5*.

#### Urban Entrances:

- (b) Conditions applying to commercial entrances are set out in VicRoads Statutory Planning Guidelines.

#### **7.2.3 Rural Roads**

##### Alternative / Substitute Information

Appropriate consultation is required with Road Authorities (state or local) and land owners to determine access needs. Refer to *VicRoads Standard Drawings for Roadworks SD2064, SD2065 and SD2066* for typical driveway arrangements applicable for rural roads.

## **7.3 Median Openings**

### **7.3.1 General**

#### Additional Information

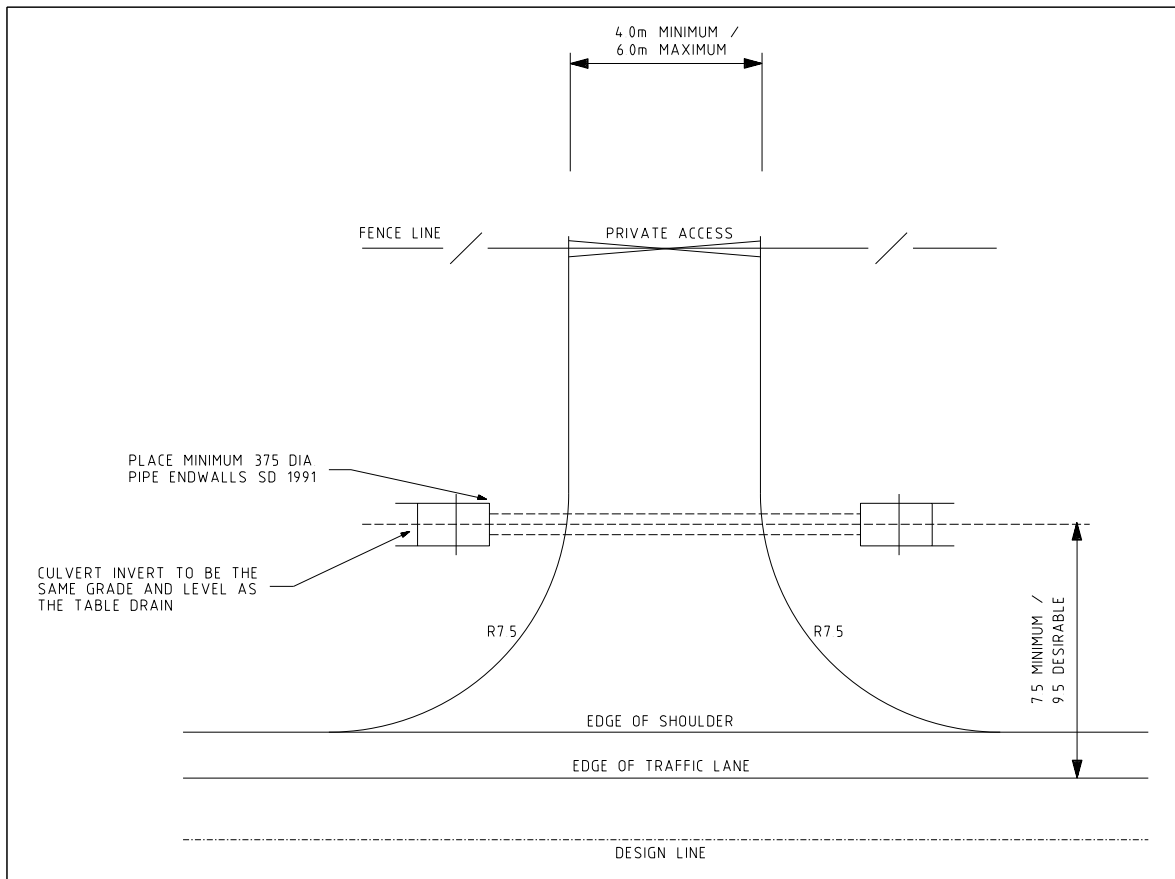
On freeways or other facilities with grade separated interchanges, median crossings for emergency vehicles may be provided up to 500 metres from the end of acceleration tapers. The general spacing of emergency median crossings is dependent on interchange spacing and would normally only be required for spacings greater than 2km in urban areas and 5km in rural areas.

In some cases in rural areas, emergency gates and median crossings may be required for fire fighting access to the adjacent State Forest.

Where continuous median barriers exist, provision will generally have to be made for removable sections of barrier to allow access for emergency vehicles.

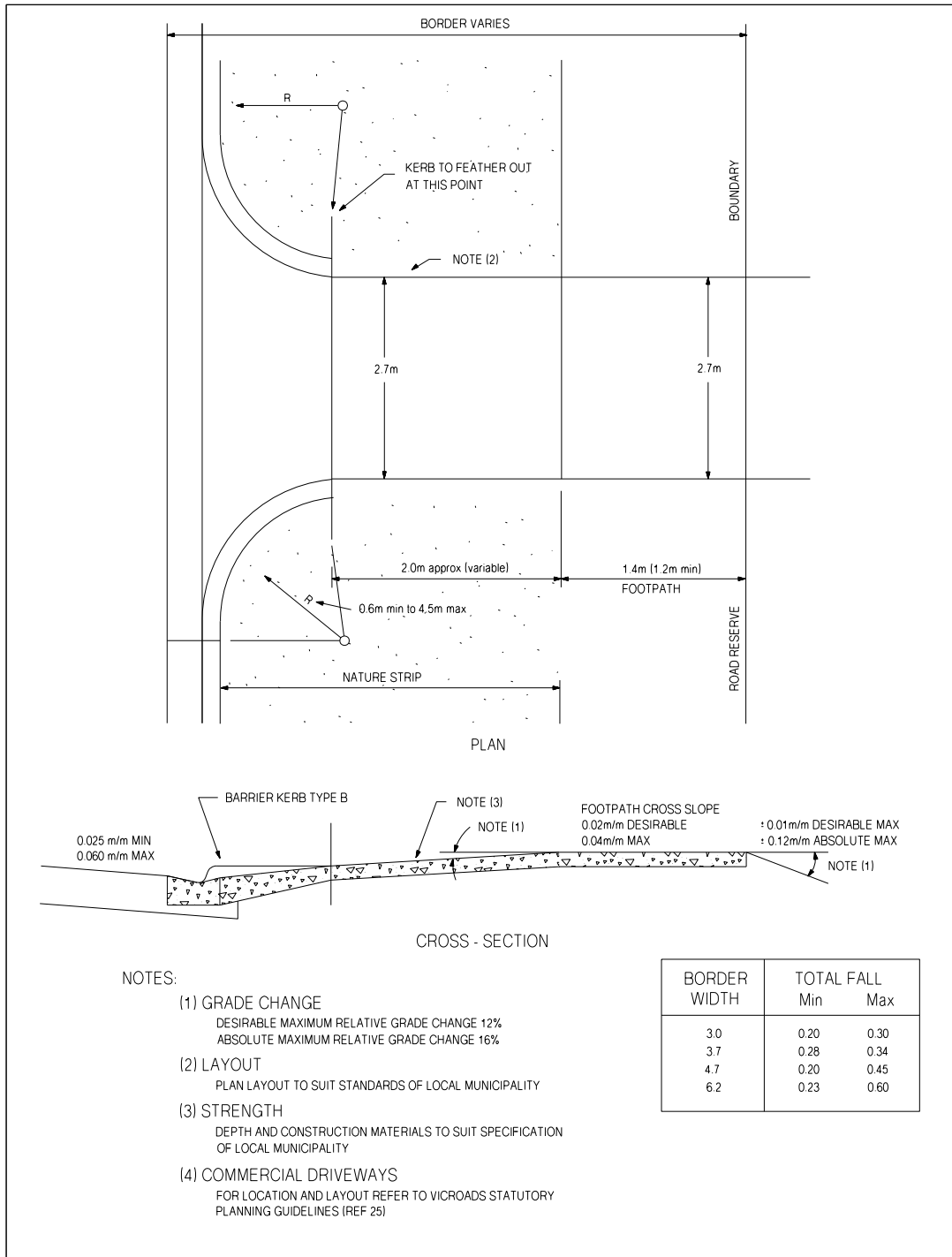
Refer also to *VicRoads Supplement to AGRD Part 4C, Section 17.0 – Other Considerations, Emergency Service Access*.

**Figure V7.1(a): Typical Rural Driveway  
(from RDG Figure 3.11.2(a))**



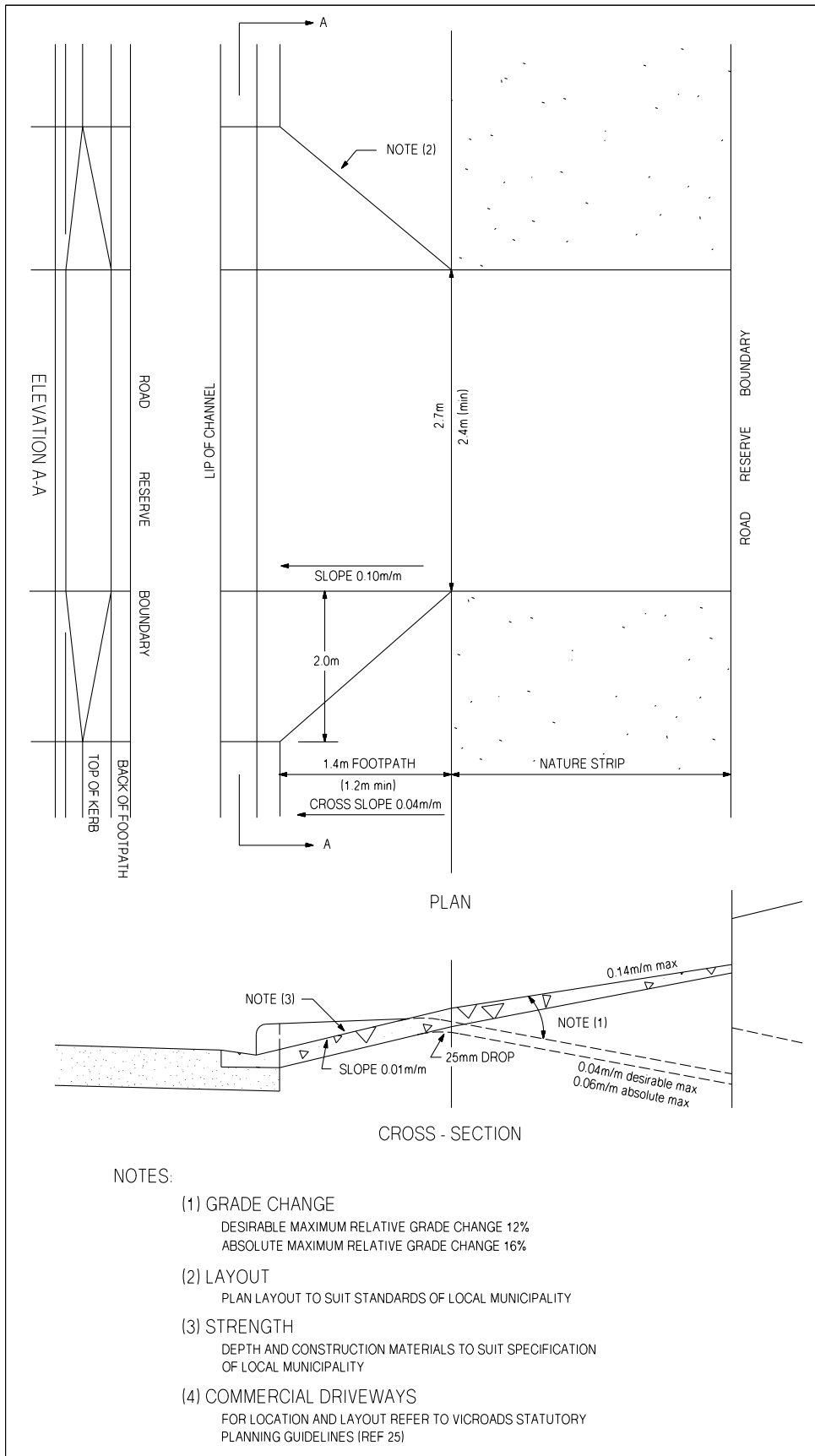
**Figure V7.1(b): Private Driveways  
(from RDG Figure 3.11.2(b))**

Typical design for footpath near property boundary



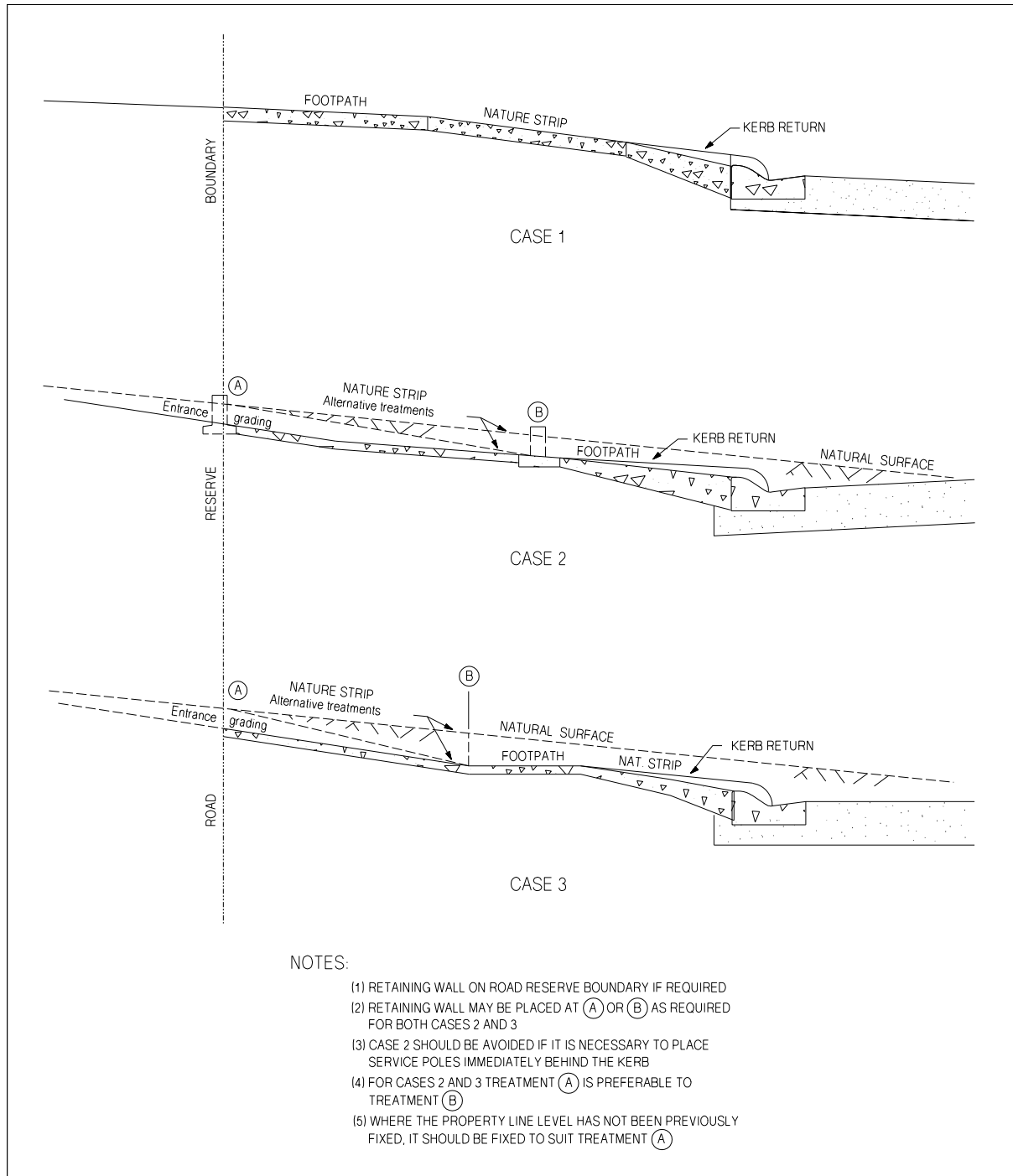
**Figure V7.1(c): Private Driveways  
(from RDG Figure 3.11.2(c))**

Typical design for footpath abutting kerb



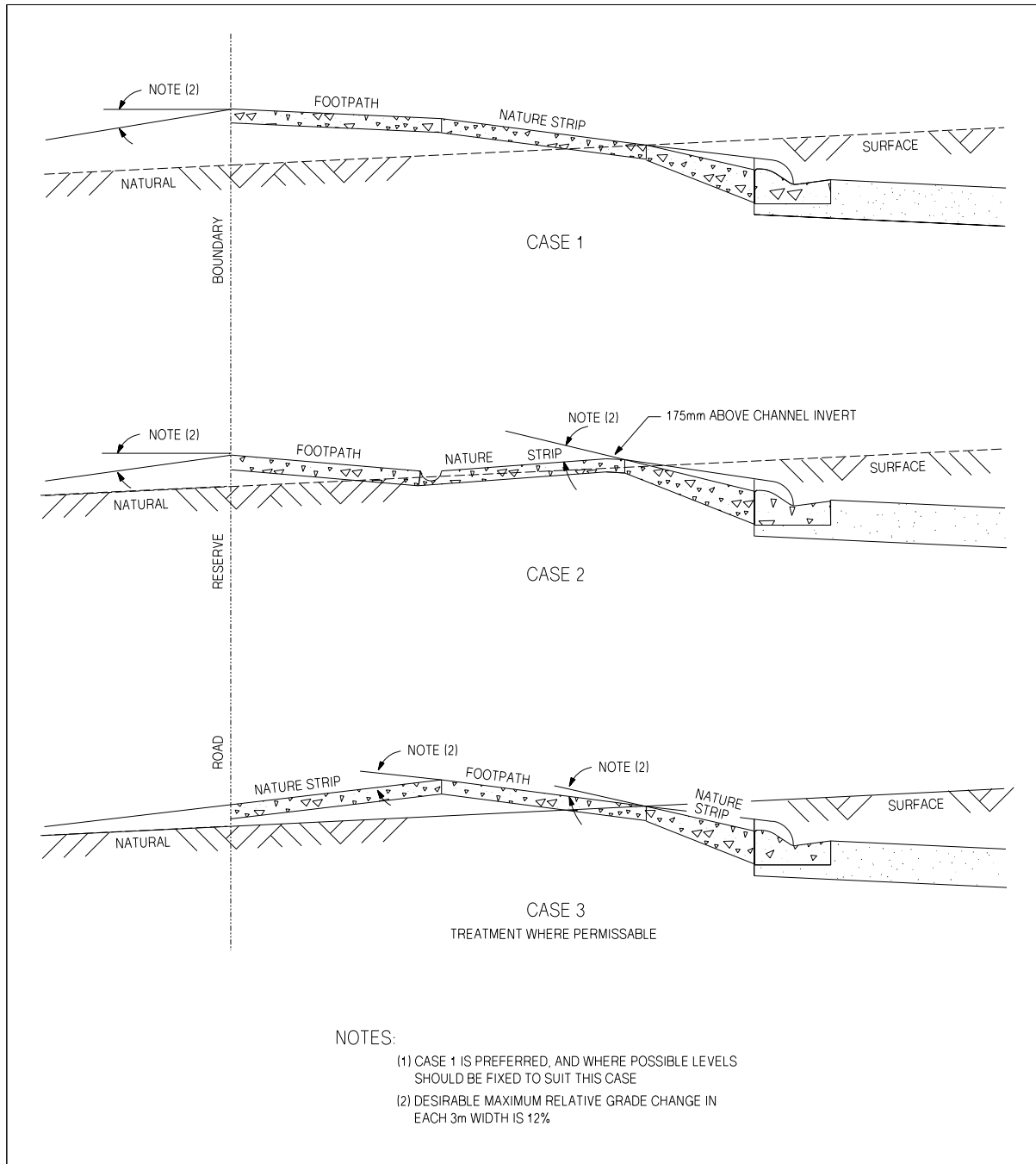
**Figure V7.1(d): Private Driveways  
(from RDG Figure 3.11.2(d))**

Typical cross sections where natural surface at road reserve boundary is above top of kerb



**Figure V7.1(e): Private Driveways  
(from RDG Figure 3.11.2(e))**

Typical cross sections where natural surface at road reserve boundary is below top of kerb



## 8.0 Pedestrian Crossings

### 8.1 Introduction

#### 8.1.1 General

##### Additional Information

The Victorian reference for planning, warrants and design of pedestrian crossing is *VicRoads TEM Volume 1, Section 4*.

## 8.2 Mid-block Crossings on Roads

### **Table 8.1: Crossing features and considerations – Crossing width Clarification Information**

*A marked crosswalk at a mid-block signalised pedestrian or children's crossing should not be less than 3.0m between the lines.*

It is noted that AS1742.10 shows a 2.4m minimum width in Figures 3-6. In accordance with *VicRoads TEM Volume 1*, the minimum width of a midblock crossing in Victoria is 3.0m.

## Table 8.1: Crossing features and considerations – Stopline location

### Substitute Information

Refer to *VicRoads TEM Volume 1, Section 4* for stopline locations at mid-block crossings.

### Additional Information

Grade separated facilities are not addressed. Refer to *VicRoads TEM Volume 1, Section 4* for volume warrants for grade separated pedestrian facilities.

## 8.2.2 General Crossing Treatments

### Substitute Information

Refer to *VicRoads TEM Volume 1, Section 4* for installation guidance and detailed design provisions.

## Figure 8.1: An example of a pedestrian refuge

### Clarification

Dimension "Y" extents shown in the figure differs from that shown in *VicRoads TEM Volume 1 – Figure 4.11* but same figures are provided.

Current AS 1742.10 (2009) does not provide tables for "A", "X" and "Y" dimensions.

Dimensions and associated values shown in *VicRoads TEM Volume 1* shall be used.

## 8.2.2 General Crossing Treatments – Staged crossing of a median

### Additional Information

**Note:** The first paragraph in this section is better related to *AGRD Part 4, Section 8.2.3 Time Separated (Controlled Traffic) Facilities*. However, the principles for median width and stagger arrangements apply to signalised and unsignalised crossings.

Consideration should also be given to the number of lanes being crossed on each carriageway, as the greater the number of lanes, the greater clearance times are required at signal controlled facilities - especially where staging in the median cannot be provided.

## 8.2.2 General Crossing Treatments – Footpath kerb extension

### Additional Information

Unnecessary road furniture and vegetation should be avoided on kerb extensions to maintain sightlines between drivers and pedestrians.

## 8.2.3 Time Separated (Controlled Traffic) Facilities

### Additional Information

For Victorian warrants and further considerations, refer to *VicRoads TEM Volume 1, Section 4*.

### Clarification

In Victoria, the provision of PUFFIN crossings is preferred to PELICAN crossings. They are similar in appearance and operation to standard signalised crossings and the cost of the detection technology required for PUFFIN operation is marginal. *VicRoads TEM Volume 1, Section 4* specifies inappropriate locations for PELICAN crossings.

## 8.2.4 Kerb Ramps for Pedestrians

### Additional Information

Some guidance on the selection of kerb ramps and TGSI treatments is provided in *VicRoads TEM Volume 1, Section 4 – Appendix 2*.

Refer also to *RDN 6-06: Guidelines for the Placement of Tactile Ground Surface Indicators* available on VicRoads website.

## 9.0 Cyclist Crossings

### Clarification

Reference should be made to *VicRoads TEM* and *VicRoads Cycle Notes* for further guidance regarding cyclist crossings.

### Clarification

There are a number of figures and clauses that refer to the use of green coloured surface treatment. The use of coloured pavement is for on-road bicycle lanes in locations where there are potential conflicts with motorised vehicles crossing the bicycle lane. Refer to *VicRoads Cycle Note No. 14: Coloured Surface Treatments for Bicycle Lanes* for guidance.

## 9.1 Introduction

*VicRoads* has no supplementary comments for this section.

## 9.2 Unsignalised Crossings

### 9.2.3 Refuges away from Intersections

#### Additional Information

Holding rails provided for cyclists to remain mounted while stationary should be frangible. Holding rail assemblies must not present a spearing hazard to motorists.

### 9.2.5 Cyclist Priority Treatment at Path Crossings of Low Volumes Streets

#### Additional Information

Reference should be made to *VicRoads TEM* and *VicRoads Cycle Notes* for further guidance regarding cyclist crossings.

## 9.3 Signalised Mid-block Crossings

*VicRoads* has no supplementary comments for this section.

## 9.4 Cyclist Crossings at Signalised Intersection

VicRoads has no supplementary comments for this section.

## 9.5 Kerb Ramps for Cycling

VicRoads has no supplementary comments for this section.

## 9.6 Paths Crossings of Side Roads

VicRoads has no supplementary comments for this section.

## 9.7 Path Terminals

VicRoads has no supplementary comments for this section.

## 9.8 Intersections between Off-road Shared Use Paths

### Figure 9.10: Bicycle crossing not bent-out at side street

#### Additional Information

The warning sign for bicycle on the off-road path is not a conventional layout. The movement with the vertical shaft on the sign should apply to the user to who the warning applies. The sign shown should not be used.

## 10.0 Rail Crossings

### 10.1 General

#### Additional Information

Refer to the Victorian Rail Industry Operations Group Standards on the Victorian Department of Transport website, more specifically *Structural Gauge Envelopes – Minimum clearances for infrastructure adjacent to the Railway* (DPT, 2004) for further information regarding rail crossing design.

#### New Crossings

With regard to the provision of railway crossings, "The design of transport routes must provide for grade separation at railway crossings except with the approval of the Minister for Transport." (*Victorian Planning Scheme, 2006 and DOT, 2008*). This does not include crossings required as part of duplication works where a level crossing already exists.

#### Rural Crossing Approaches

Rumble strips are generally provided on sealed roads at the approaches to passive rail level crossings on high speed roads (>80km/h).

### 10.2 Sight Distance

VicRoads has developed additional information to assist in assessing some of the issues associated with passive railway level

crossings and acceptable treatment options; this is provided in Appendix VA.

Appendix VA should be read in conjunction with *Australian Standard AS1742.7 - 2007 Manual of Uniform Traffic Control Devices Part 7: Railway Crossings*.

### 10.3 Horizontal Alignment

VicRoads has no supplementary comments for this section.

### 10.4 Vertical Alignment

#### Additional Information

#### (from RDG 2.9.3.2)

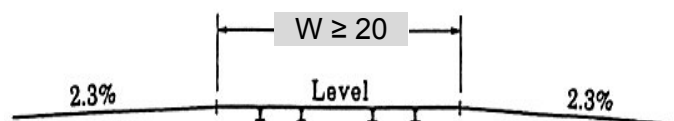
#### (a) Road Grading

While it would be preferred that the road grading be smooth at the level crossing, this is rarely possible except in very flat terrain. Usually the railway grading will become a control on the road. There may be discontinuities and graphical grading will be required across the railway tracks.

The minimum standard on high speed roads, and the desirable standard on other roads, is that the road shall not be more than 75mm above, nor more than 150mm below the projection of the top of the rail pair at a distance of 10m from the nearest rail.

The minimum standard on intermediate and low speed roads shall be to meet the clearance diagram for a low loader as shown on Figure V10.1 that is, maximum grade change in each 20m is 2.3 per cent.

**Figure V10.1: Low Loader Clearance Diagram at Level Crossing (from RDG Figure 2.9.3.2)**



#### Correction

Width distance changed from  $W \leq 20$  to  $W \geq 20$ .

#### (b) Relative Levels of Road and Rails

The maximum level difference between rail and road when the track is below the road level is 10mm. This control applies to both high and low speed roads and is related to self cleaning of the channel.

On high speed roads, the rail level should not protrude above the surface, although this may not always be achievable. The maximum permissible protrusion above the road surface is 10 mm on any road.



Where it is necessary to achieve additional grade on the road, one option is to provide a cant (crossfall) between the rails. However, reference must be made to the responsible rail authority to determine the feasibility of developing cant between the tracks and the estimated cost of track works.

#### **10.4.1 Road Grading**

##### Additional Information

Note that *AGRD Part 4, Figure 10.6* has a typographical error: the diagram contains two areas identified by "A"; the second "A" (right-most) should be "B".

#### **10.5 Cross-section**

VicRoads has no supplementary comments for this section.

#### **10.6 Pedestrians and Cyclists**

VicRoads has no supplementary comments for this section.

### **References, Tables and Figures**

VicRoads has no supplementary comments for this section.

### **Appendices**

#### **Appendix A.1 Access Spacing**

Refer to VicRoads Access Management Policies for further information.

### **Commentaries**

#### **Commentary 7 Warrants & Guides**

The Victorian reference for planning, warrants and design of pedestrian crossings is *VicRoads TEM Volume 1, Section 4*.

## Appendix VA

### Assessment of Passive Level Crossings

#### A1.0 Introduction

The assessment of sight distance at some passive level crossings is not straight forward due to the orientation of the road and rail crossing or the proximity of the level crossing to a nearby intersection.

This Appendix should be read as a supplementary guide to the *Australian Standard AS1742.7 - 2007 Manual of Uniform Traffic Control Devices Part 7: Railway Crossings* and is not intended to override these Standards. This Appendix is to assist in the interpretation and implementation of the Australian Standard.

This Appendix has been developed to assist in assessing some of the issues at railway level crossings and also offer possible treatment options for different scenarios:

##### A1.1 General Assessment of Passive Level Crossings (Refer to Section A2.0)

A key objective of this section is to provide guidance on the degree to which sight triangles should be kept clear of obstructions. This is an issue that has been raised in discussions on a number of occasions with a range of views on the appropriate treatment options.

The proposed assessment process is user subjective and needs to be read in conjunction with the Australian Standards and adapted to take into account any local variances.

##### A1.2 Acute Angled Crossings (Refer to Section A3.0)

Where the angle between the railway line and the approach road is acute the viewing angle for a driver (particularly the driver of a truck) who is either approaching the crossing or stopped at the crossing becomes a significant issue at such crossings.

##### A1.3 Traffic Turning from a Nearby Intersection (Refer to Section A4.0)

For intersections close to a level crossing, issues may arise at these locations where a vehicle is turning from the intersecting road towards the level crossing (note that "short stacking" is also an issue at such sites but this Appendix does not address this particular matter).

#### A2.0 General Assessment of Passive Level Crossings

##### A2.1 Introduction

The purpose of this section is to assist with the assessment process for sight distance at passive rail level crossings.

##### A2.2 Key Issues

At passive level crossings the decision on the type of control to be adopted (i.e. stop or give way) is primarily based on the ability of a driver of a vehicle approaching a level crossing to be able to see a train, react and stop, if required, in order to avoid a collision. If the sight distance on the approach to a crossing is not sufficient, a STOP sign should generally be installed.

The sight distance requirements are based on sight triangles as illustrated in Figure VA2.1. Section A2.3 provides information relating to sight distance standards.

While the assessment of the adequacy of sight distance may seem straight forward, the question arises as to whether sight triangles should be completely clear of objects that may affect the ability of a driver to see an approaching train or whether a degree of obstruction is acceptable. Whilst it may be desirable to keep the sight triangles completely clear of obstructions, this is unlikely to be always achievable in practice. Judgement will therefore often need to be applied when deciding whether the degree of obstruction is tolerable. This section has been prepared to assist with the decision making process.

##### A2.3 Design Standards

Standards relating to sight distance at passive level crossings are specified in *AS1742.7 – Part 7, Clause 4.2*.

For the selection of signs and placement of linemarking please refer to *VicRoads Traffic Engineering Manual (TEM) Volume 1 (Chapter 11 - Railway Level Crossings) and Volume 2, Section 8.10 and Section 9.5*.

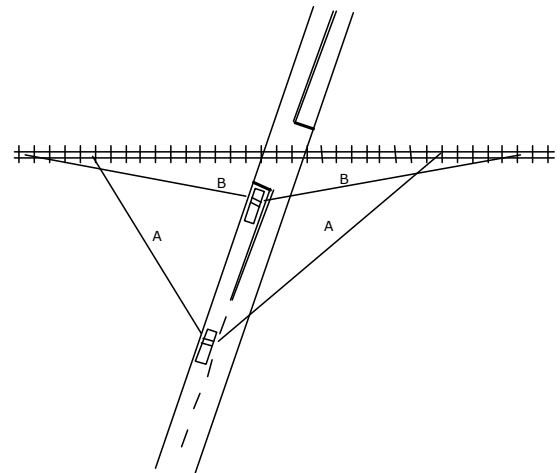
The use of GIVE WAY and STOP signs is based on the sight distance available to a driver of a vehicle approaching a level crossing and/or stopped at a level crossing. The sight triangles for both give way and stop control are illustrated in Figure VA2.1.

For give way control, triangle A of Figure VA2.1, a driver approaching a level crossing must be able to detect an approaching train from a point that allows the driver to react and bring a vehicle to a stop in order to avoid a collision with the train. If there is no train within the limits of triangle A, the driver will be able to continue and safely cross and clear the level crossing.

At crossings controlled by either GIVE WAY or STOP signs, a driver must have sufficient sight distance along the train line from the stop position in order to be able to start moving, cross the level crossing and be clear before the arrival of a train, refer to triangle B of Figure VA2.1.

Appendix D of AS1742.7 provides details of how to calculate the required sight distances.

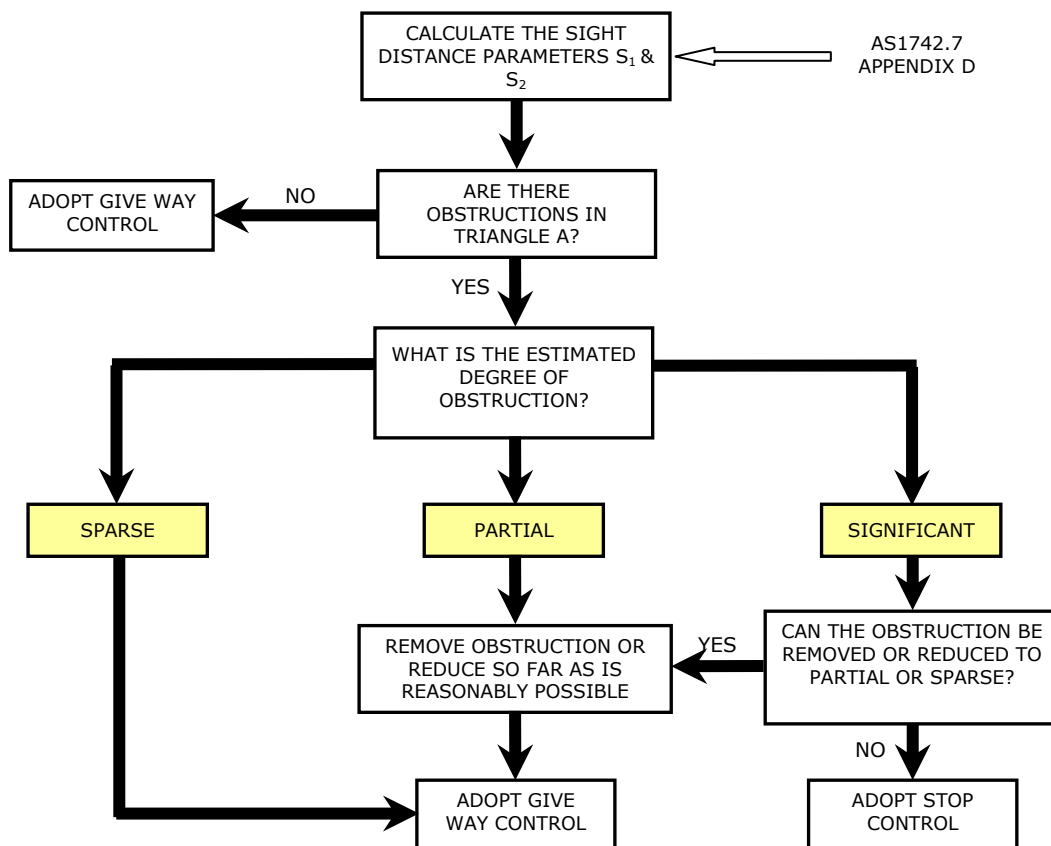
**Figure VA2.1: Sight Triangles for Give Way and Stop Control**



### A2.4 Approach Sight Distance

The flow chart in Figure VA2.2 illustrates the process to assess the sight distance on the approach to a passive level crossing in order to determine whether give way or stop control is appropriate.

**Figure VA2.2: Assessment of Sight Distance on the Approach to a Passive Level Crossing**



**Note:** Sight distance from the give way/stop line must also be assessed (refer to Figure VA2.3)

**A2.4.1 Sight Distance Parameters (refer also to AGRD Part 4 – Section 10.3)**

Sight triangle A, refer to Figure VA2.1, is established by calculating S1 and S2 as set out in AS1742.7 - Appendix D. S1 is the minimum distance, measured along the road from the nearest track, from which a driver must be able to see an approaching train in order to be able to react and stop, if necessary, before reaching the crossing. S2 is the minimum distance that a train must be from the level crossing so that a vehicle at a distance of S1 from the crossing is able to continue at speed and safely clear the crossing ahead of the train.

**A2.4.2 Assessment of Obstructions in the Sight Triangle**

If the sight triangle is clear of obstructions, give way control may be adopted. If there are obstructions within the sight triangle, an assessment of the degree of obstruction is required. Three qualitative measures of the level of obstruction are to be used for the purpose of the assessment: sparse, partial and significant. Photographic examples of each level of obstruction are shown in Section A2.8 – Examples.

Buildings, other mass features and dense vegetation would generally be considered to be significant obstructions. Mature trees could be rated as anywhere between sparse and significant depending on the number and density.

**Sparse**

If the degree of obstruction is considered sparse, there is minimal risk that a driver will be unable to see an approaching train. Accordingly, give way control can be adopted without further action. However, it is always preferable to remove any obstructions if practical.

**Partial**

The sight triangle is partially obstructed if an approaching train can be readily seen despite the obstructions. In such cases, obstructions should be removed or reduced so far as is reasonably possible. Give way control can then be adopted.

**Significant**

If the level of obstruction in the sight triangle is deemed to be significant, give way control should only be used at the level crossing if the obstruction(s) can be removed completely or reduced to partial or sparse.

As the assessment of the level of obstruction is subjective, it should be conducted by a suitably experienced person(s). If there is any doubt about the level of obstruction, the higher level should be adopted.

Regardless of whether GIVE WAY or STOP sign control is adopted based on the sight distance on the approach to a level crossing, an assessment of the sight distance for a vehicle which has stopped at the level crossing should also be conducted as set out in the following section.

**A2.5 Sight Distance at the Give Way/Stop Line**

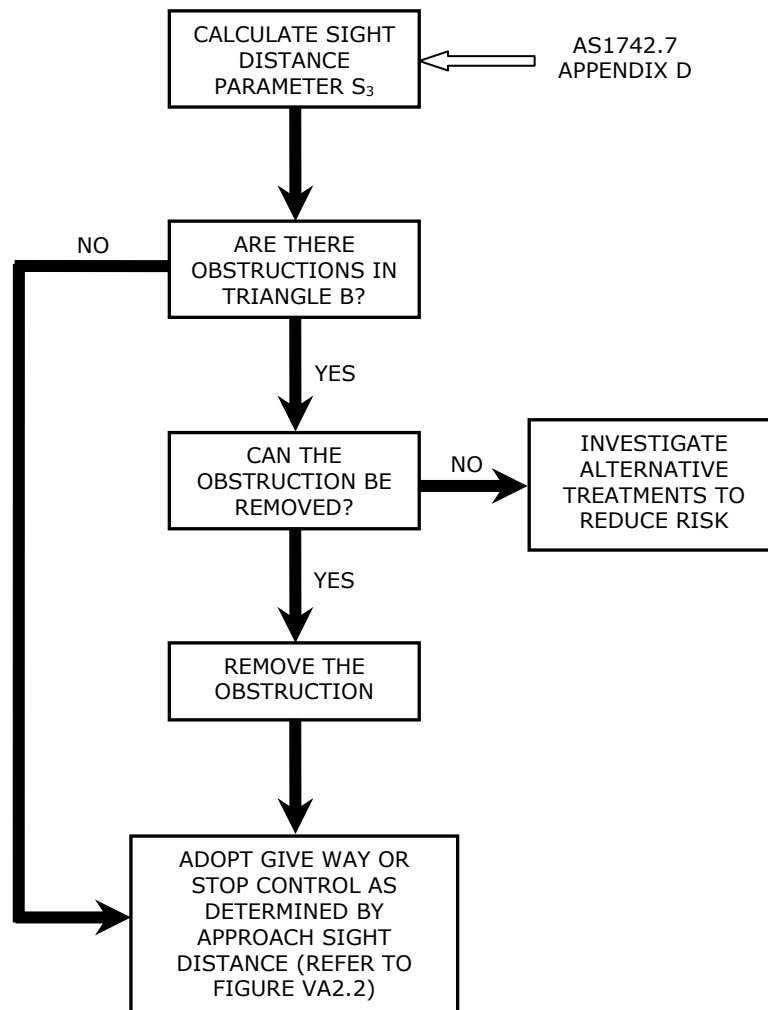
The flow chart in Figure VA2.4 illustrates the process to assess the sight distance for a vehicle that is stopped at the give way or stop line.

Sight triangle B, refer to Figure VA2.1, is defined by the distance from the nearest track to a vehicle at the give way or stop line and S3. S3 is the minimum distance that a train can be from the level crossing in order for the driver of a vehicle which has stopped at the crossing to react, accelerate and clear the crossing ahead of the train. The calculation of S3 is set out in AS1742.7, Appendix D.

In general, any object within the sight triangle, such as the bush in Figure VA2.3, other than a very narrow object such as a sign support, is likely to obstruct a driver's view of an approaching train. Priority should be given to completely removing any obstructions that fall within triangle B. If the sight triangle cannot be cleared of obstructions, alternative treatments to reduce risk should be investigated.

**Figure VA2.3: Obstruction in the Sight Triangle at the Stop Line**



**Figure VA2.4: Assessment of Sight Distance at the Give Way / Stop Line at a Passive Level Crossing**

## A2.6 Treatment Options

At passive level crossings where sight distance requirements in accordance with AS1742.7 cannot be achieved due to obstructions within the sight triangles, priority should be given to removing obstructions or reducing the degree of obstruction to an acceptable level. If this is not possible, other treatment options such as those outlined below should be considered.

### A2.6.1 Reduce the Speed Limit and / or the Train Speed

As S1, S2 and S3 are speed dependent, a reduction in the operational speeds of road traffic and/or trains may overcome sight distance deficiencies (because the sight triangle will be reduced in size) or reduce risk as far as is reasonably possible. However, it must be recognised that compliance with very

low speed limits by the majority of motorists is unlikely to be achieved. As a guide, speed limits in rural environments should not be less than 60 km/h. With regards to reducing the train speed, if the road authority considers this may be a potential treatment option, it should be referred to the relevant rail operator for their consideration.

### A2.6.2 Level Crossing Closure

Closure of the crossing could be considered where there is a practical alternative and safe traffic route.

### A2.6.3 Truck Bans

Banning of trucks or certain types of trucks (e.g. B-doubles) may be appropriate at passive level crossings where the sight distance standards can be met for other classes of vehicles. In particular, the sight distance required from the stop position for

large trucks (i.e. S3) is substantially greater than for cars and light vehicles. In addition, in the event of a crash the outcome is generally more severe when a truck is involved. Alternative routes should be available if truck bans are imposed.

#### **A2.6.4 Upgrade to Active Control**

Priority for upgrading from passive to active control is primarily based on ALCAM risk scores.

#### **A2.6.5 Low Cost Warning Device**

A low cost warning device may be ideally suited to passive level crossings at which minimum sight distance standards cannot be met, particularly from the give way/stop line. Any potential low cost warning devices need to be appropriately assessed and approved prior to use. These devices are currently being researched. This document will be updated if options become available.

### **A2.7 Other Considerations**

#### **A2.7.1 Sighting Angles**

In addition to sight distance provisions at passive level crossings, AS1742.7 - Appendix D, Clause D4 specifies limits on sighting angles on the approaches to level crossings controlled by GIVE WAY and STOP signs. These restrictions come into play when the angle between the rail line and the approach road is acute and are further discussed in Section A3.0 – Acute Angled Crossings.

#### **A2.7.2 Passive Level Crossings with a Nearby Intersection**

Where there is an intersection in close proximity to a passive level crossing specific consideration may need to be given to the sight distance available to traffic turning from the intersecting road and travelling toward the level crossing. This is further discussed in Section A4.0 – Traffic Turning from a Nearby Intersection.

### **A2.8 Photographic Examples of Degree of Obstruction**

#### **SPARSE**



**SPARSE**



**PARTIAL**



**PARTIAL**



**PARTIAL**



**PARTIAL**



**SIGNIFICANT**





**SIGNIFICANT**



**SIGNIFICANT**



**SIGNIFICANT**



## A3.0 Acute Angled Crossings

### A3.1 Introduction

This section sets out the issues and sighting requirements relating to traffic approaching a passive level crossing which is at an acute angle to the road. It also provides guidance on optional treatments to eliminate or reduce the risk at crossings where the standards relating to sighting angles cannot readily be met.

### A3.2 Key Issues

At level crossings where the angle between the road approach and the railway is acute, the ability of a driver to see an approaching train may be compromised. This is a significant issue for drivers of trucks as well as other vehicles which, by virtue of their design, restrict the drivers' angle of view.

The problem is more pronounced at crossings where the design speed of the train is greater than the design speed of the road vehicle, particularly where this speed differential is high. In such circumstances the train is effectively "catching up" to the road vehicle.

The use of STOP signs at angled crossings is not preferred because it can be difficult to meet sighting angle standards, even at crossings where the skew between the road and railway is relatively moderate.

### A3.3 Design Standards for Sighting Angles

AS1742.7 – Appendix D, Clause D4 specifies limitations on sighting angles at passive level crossings to avoid excessive head movement by drivers and to account for restrictions due to vehicle design (particularly trucks). Figure VA3.1 shows the sight triangles and sighting angles that apply on the approach to a passive level crossing and from the stop or give way position. AS1742.7 specifies the following maximum sighting angles.

#### **A3.3.1 Approaching GIVE WAY sign controlled crossings (Triangle A)**

The maximum angles are:

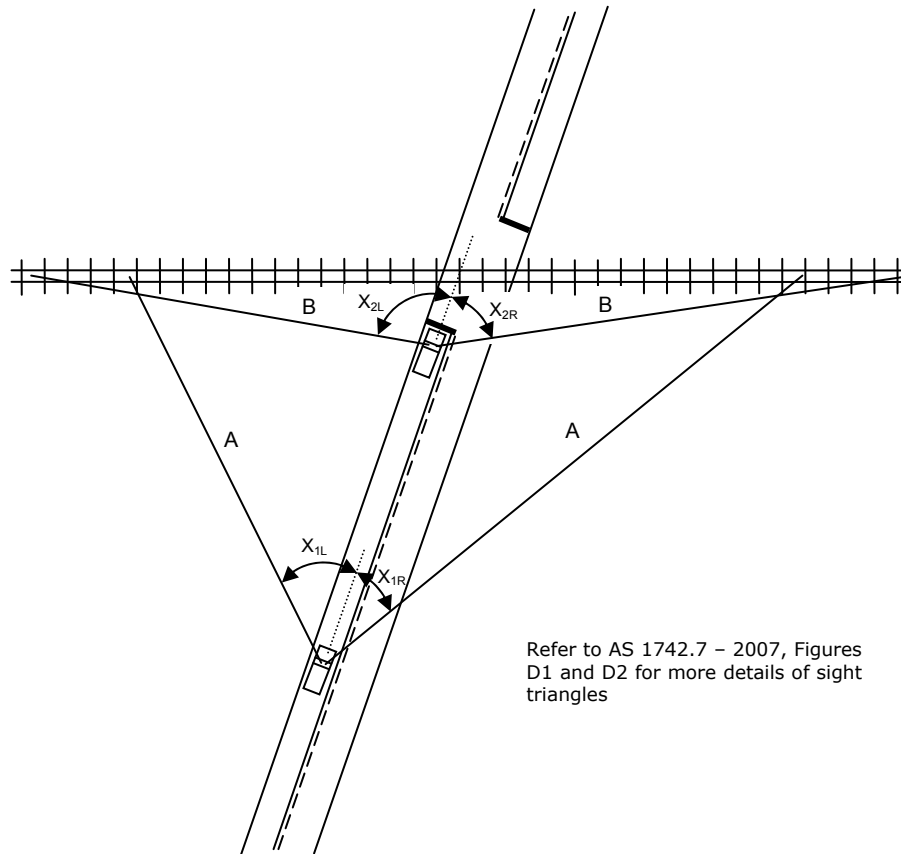
- (i) To the left (X1L) – 95 degrees; and
- (ii) To the right (X1R) – 110 degrees.

#### **A3.3.2 At the stop or give way line (Triangle B)**

The maximum angles are:

- (i) To the left (X2L) – 110 degrees; and
- (ii) To the right (X2R) – 140 degrees.

**Figure VA3.1: Approach and Stop Line Sight Triangles**



**Figure VA3.2: Angle between Road and Railway**

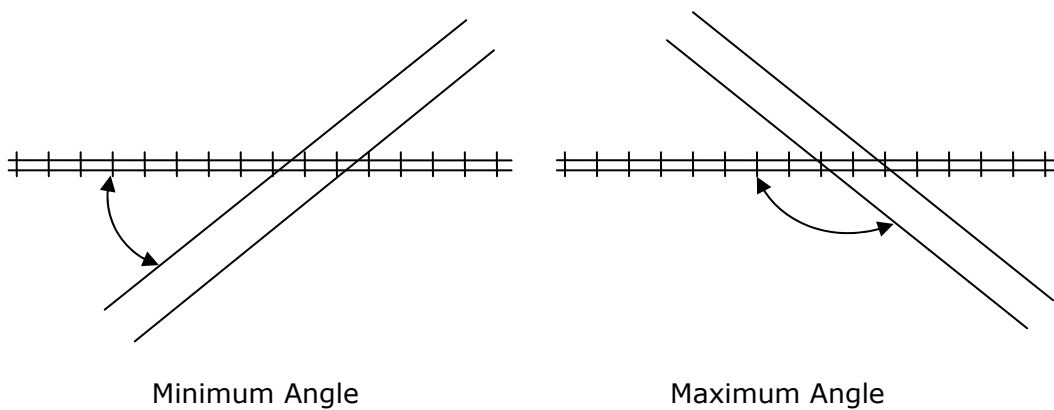


Table VA3.3 shows the acceptable range of angles between the road and railway, for different combinations of vehicle and train speeds, in order to comply with the above standards for approaches to GIVE WAY controlled level crossings. Figure VA3.2 shows the orientation of the road relative to the railway for minimum and maximum angles.

Table VA3.3 is based on a B-double on a two-lane, two-way sealed road on a level grade approaching a single track level crossing. The affects of approach grade and other geometric factors (road width, width between outer rails

etc.) generally result in only minor variations to the range of acceptable angles. However, if in doubt, the viewing angle should be checked using the specific geometric parameters that apply at the level crossing that is being assessed. The table is conservative for unsealed roads.

**Example**  
 Design speed of road vehicle = 80 km/h  
 Design speed of train = 100 km/h

Angle between the road and the railway = 60 degrees

From Table VA3.3, the range of acceptable angles between the road and railway for the given design speeds are between 42 degrees and 148 degrees. As the angle at the crossing

is 60 degrees, it complies with the standard for viewing angles for GIVE WAY control. However, it should be noted that the viewing angle for a vehicle which is stopped at the level crossing will be approx. 120 degrees, which exceeds the standard for the stop condition. This matter is discussed below.

**Table VA3.3: Minimum and Maximum Angles between Road/Railway for Give Way Control**

TRAIN SPEED (km/h)	SPEED OF ROAD VEHICLE (km/h)																	
	20		30		40		50		60		70		80		90		100	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
130	81	114	77	117	73	121	69	125	64	129	59	134	54	138	48	143	42	148
120	80	114	76	118	72	122	67	126	62	131	57	136	51	141	44	146	37	152
110	80	115	76	118	71	123	65	128	60	133	54	138	47	144	40	150	31	157
100	79	115	75	119	69	124	63	129	57	135	50	141	42	148	33	154	21	162
90	79	115	73	120	67	126	61	132	53	138	45	145	36	152	23	160	NO LIMITATIONS	
80	78	116	72	121	65	128	57	134	49	142	39	150	25	158				
70	77	117	70	123	62	130	53	138	42	147	28	156						
60	76	118	67	125	58	134	46	143	32	153								
50	74	120	64	128	51	138	36	150										
40	71	122	58	133	41	146												
30	65	126	47	141														
20	54	134																

**Note:** If there is a horizontal curve on the road approach, the values in the table relate to the angle between the tangent to the curve from the position of the vehicle (i.e. a distance S1 from the level crossing) and the railway line.

Regardless of whether a level crossing is controlled by a STOP or GIVE WAY sign, the maximum sighting angles for the stop condition should not be exceeded because of the need to provide for vehicles which have stopped for a passing train. Based on the sighting standards specified by AS1742.7, this means that angle between the road and railway should be no less than 70 degrees and no greater than 140 degrees. These limitations are more restrictive than the sighting angle requirements that relate to GIVE WAY control.

A comparison of the sight triangles shown in Figure VA3.1 illustrates the higher sighting angle from the stop line compared to that required on the approach to a GIVE WAY sign.

An examination of allowable crossing angles for the stop condition with those for GIVE WAY control (Table VA3.3) shows that the range for the latter is broader than the former. This is demonstrated in the case of the example presented above. For a vehicle design speed of 80 km/h and train design speed of 100 km/h, the minimum crossing angle for GIVE WAY control is 42 degrees, while the minimum for STOP control is 70 degrees. Furthermore, the maximum crossing angles are 149 degrees and 140 degrees for GIVE WAY and STOP control respectively. The implication is that it is likely that there will be some (possibly many) existing passive level crossings for which sighting angle standards for GIVE WAY control can be achieved, but the standard for the stop condition cannot (at least not without realigning the road at the level crossing, which may not be practical or cost-effective). This is generally not a problem at a single track level crossing, but increases the risk of crashes at multi-track passive level crossings.

## A3.4 Treatment Options

### A3.4.1 GIVE WAY Control

At acute angled crossings, GIVE WAY control is generally preferred to STOP control. Accordingly at such crossings every effort should be made to ensure that sight triangles on the approaches to the level crossing are kept clear so that GIVE WAY control can be used.

### A3.4.2 STOP Control

A STOP sign may be installed if the sighting angles do not exceed those specified by AS1742.7– Appendix D, Clause D4 (b). These sighting angles effectively mean that the angle between the road and railway should be within the range of 70 degrees and 140

degrees. STOP control should only be used at angled crossings outside this range if other treatments are impractical and only after thorough consideration of the risks.

### A3.4.3 Ban Trucks

If an alternative route is available, a truck ban could be considered. Trucks take longer to stop, and longer to accelerate and clear a level crossing. In addition, in the event of a crash the outcome is generally more severe when trucks are involved. Sighting angle problems can exacerbate the risks associated with trucks. However, it should be noted that the sight restrictions at acute angle crossings will also affect other vehicles, such as vans, which have design features that physically restrict the driver's viewing angle. Accordingly, treatment options that provide acceptable sighting angles are preferred.

### A3.4.4 Level Crossing Closure

Closure of the crossing could be considered where there is a practical alternative and safe traffic route.

### A3.4.5 Road Realignment

Road realignment to change the angle of the crossing is likely to be a realistic option if the cost is relatively low. Otherwise, upgrading to active control would be more cost-effective.

### A3.4.6 Reduce the Train Speed

Limiting the speed of trains through acute angled level crossings can overcome sighting angle issues on the approach to GIVE WAY controlled crossings. If the train design speed is equal to or less than the road vehicle design speed, sighting angles will generally not be a problem regardless of the crossing angle. With regards to reducing the train speed, if the road authority considers this may be a potential treatment option, it should be referred to the relevant rail operator for their consideration.

### A3.4.7 Upgrade to Active Control

Priority for upgrading from passive to active control will generally be based on Australian Level Crossing Assessment Tool (ALCAM) risk scores.

### A3.4.8 Low Cost Warning Device

A low cost warning device would be ideally suited to acute angle crossings at which other low cost treatments are not practical or effective in reducing risk. Any potential low cost warning devices need to appropriately assessed and approved prior to use. These devices are currently being researched. This document will be updated if options become available.

### A3.4.9 Provide a Larger Sight Triangle

At locations at which the crossing angle is outside the range shown in Table VA3.3, a sight triangle of a higher standard should be considered.

For example, at a site with a vehicle design speed of 80 km/h and train design speed of 100 km/h, a crossing at an angle of 38 degrees would not meet the sighting angle standards for a GIVE WAY sign. However, if a sight triangle based on a vehicle design speed of 90 km/h and a train design speed of 100 km/h can be achieved, a GIVE WAY sign would be acceptable as Table VA3.3 shows that the minimum crossing angle for this combination is 33 degrees.

Please note that in this example, the crossing angle would still be less than that required under the relevant section for sighting standards from the stop position as in AS1742.7.

This example does not suggest that in choosing to implement this option would mean the relevant Standards are being complied with.

Also, this example does not suggest that the speed limit should be increased. Rather, this example suggests that a sight triangle larger than the minimum standard for the design speeds could be provided to assist road safety.

Even if this option was chosen, implementation of this option would still not totally solve or eliminate the risks associated with an acute angled crossing. This option could possibly assist in enabling an earlier sighting of an approaching train and therefore possibly provide the driver with more time to make a decision about the need to stop. This option could be beneficial particularly to truck drivers who have a restricted angle of view.

This option should be considered as a last alternative after the other suggested treatment options (which can provide a greater safety benefit) have been investigated.

## A4.0 Traffic Turning from a Nearby Intersection

### A4.1 Introduction

A number of potential safety issues exist at level crossings which are located in close proximity to an intersection. This section discusses the particular safety issues that relate to vehicles which are turning from a road adjacent to a railway line onto the road which intersects the railway line at a level crossing with passive control. Figure VA4.1 shows a typical layout. Guidance is provided on the use of GIVE WAY and STOP signs at level crossings that are close to an intersection, in addition to optional treatments to reduce the risk of crashes at such locations.

The assessment outlined does not apply when the intersection is a cross intersection where the road on which the level crossing is located has priority. In such situations the type of control at the level crossing will be primarily based on the sight distance that is available for traffic approaching the level crossing on the priority road.

### A4.2 Key Issues

Where vehicles turn at an intersection and travel towards a rail level crossing which is a short distance downstream, drivers may have difficulty detecting an approaching train. Prior to turning at the intersection, drivers of vehicles travelling parallel to the train line and in the same general direction as a train which is approaching the level crossing, may be unaware of the train because it is approaching from behind the vehicle. This is usually a more significant problem for drivers of vehicles such as trucks and vans which have restricted vision to the rear.

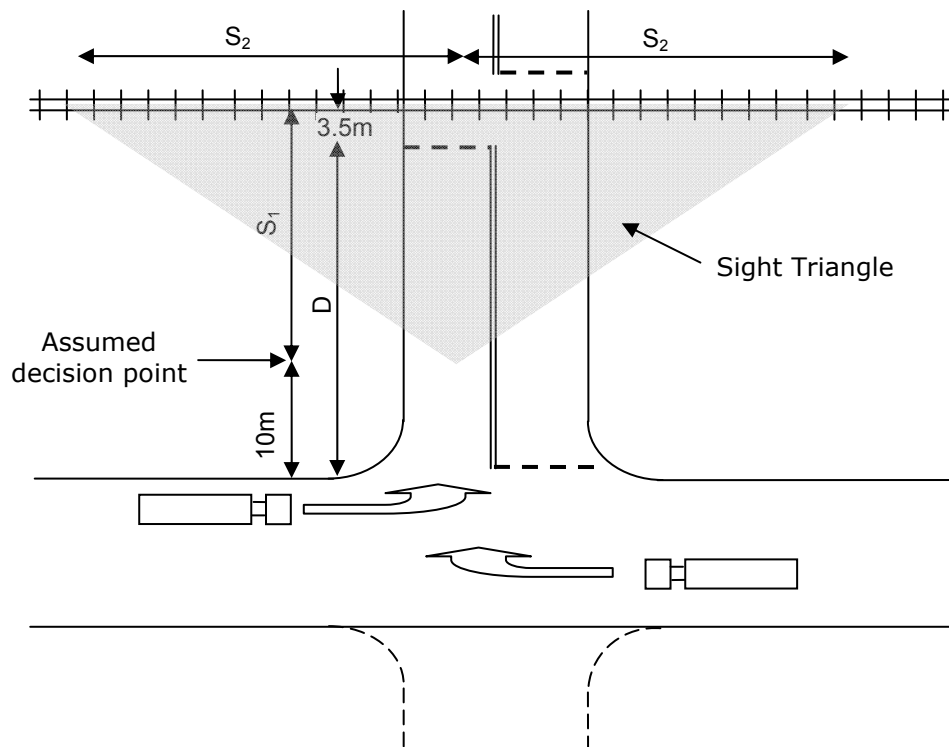
Under the circumstances described above, drivers are unlikely to be able to sight an approaching train until they have completed or substantially completed turning. This situation is generally more critical for a left turning vehicle than a right turning vehicle, although both movements must be considered.

Consideration also needs to be given to the implications of long vehicles encroaching into the intersection when required to stop at the level crossing.

At passive level crossings, a decision must be made on whether a GIVE WAY or STOP sign is appropriate and what, if any, other options are available or supporting measures should

be implemented to minimise the safety risk.

**Figure VA4.1: Typical layout of closely spaced level crossing and intersection**



### A4.3 Design Standards

Sight distance requirements at passive level crossings are set out in AS1742.7 – Appendix D.

#### A4.3.1 GIVE WAY CONTROL

For GIVE WAY control at the level crossing, the distance between the intersection and the level crossing should be sufficient for the driver of a turning vehicle to be in a position to look for an approaching train, react and be able to stop before reaching the crossing.

To determine the minimum distance between the intersection and the level crossing for GIVE WAY control, the following assumptions are made:

- The design vehicle is a B-double or semi-trailer (note: for the purposes of this calculation there is no difference between the stopping performance of a B-double and a semi-trailer based on AS1742.7);
- The turning speed of the design vehicle is 15 km/h;
- The decision point for the driver is 10 metres from the intersection (see Figure VA4.1). This allows the driver to negotiate the turn and have

straightened his vehicle sufficiently so that he is in a position to be able to scan for an approaching train;

- The sight triangle (based on a road vehicle speed of 15 km/h and the appropriate train speed) is clear or substantially clear of obstructions; and
- The clearance between the give way line and the nearest rail is 3.5 metres.

The value of  $S_1$  for a vehicle speed of 15 km/h is 23 metres (note that this distance can be used for both sealed and unsealed roads as well as different approach grades). Accordingly, the minimum distance between the intersection and the yield line at the level crossing (dimension "D" in Figure VA4.1) for GIVE WAY control is 29.5 metres (i.e.  $23.0 + 10.0 - 3.5$ ). It is suggested that this be rounded to 30 metres.

#### A4.3.2 STOP CONTROL

If  $D$  is less than 30 metres, a STOP sign may be appropriate. Whether a STOP sign is or is not appropriate depends on the safety implications due to long vehicles being unable to stop at the level crossing without partially or fully obstructing the intersection.

If  $D$  is less than 26 metres, a B-double will

not be able to stop at the level crossing without obstructing the intersection. In such circumstances the preferred option is to ban B-doubles. However, if the safety risk at the intersection due to the obstruction is low, B-doubles may be permitted. The risk may be acceptable if use of the route by B-doubles is low and the volume of traffic on the intersecting road is low to moderate.

If D is less than 19 metres a semi-trailer or other long vehicle may not be able to stop at the level crossing and remain clear of the intersection. In these cases, a length restriction may have to be imposed.

If D is less than 12.5 metres (the maximum length of a rigid truck) length restrictions are unlikely to be practical and alternative treatments should be considered. However, if alternative treatments are not viable or cost-effective, GIVE WAY control is preferred to STOP control when D is less than 12.5 metres. STOP control in these circumstances would result in an excessive number of

intersection obstructions and increase the risk of crashes.

#### A4.3.3 OTHER FACTORS

If the angle between the railway line and the road is such that the maximum sighting angle for a GIVE WAY sign and / or a STOP sign is exceeded (refer AS1742.7 – Appendix D, Clause D4), other options will need to be considered, refer to Section A3.0 – Acute Angled Crossings.

#### A4.4 Recommended Control at Passive Crossings

Table VA4.2 sets out the recommended control at passive level crossings that are close to intersections with a typical layout similar to that shown in Figure VA4.1. Table VA4.2 should be used in conjunction with *VicRoads TEM Volume 1, Chapter 11 - Railway Level Crossings and VicRoads TEM Volume 2 Section 8.10 and Section 9.5*, which deal with selection of signs and placement of linemarking at railway level crossings.

**Table VA4.2: Recommended Control at Passive Level Crossings close to an Intersection**

Distance between level crossing and intersection <sup>(1)</sup>	Recommended treatment	Comments
≥ 30 metres	GIVE WAY	If there are obstructions in the sight triangle, the need for STOP control should be considered in the usual way.
26 to 30 metres	STOP	Assumes that the sight distance at the stop line (i.e. S <sub>3</sub> ) is adequate. Consideration should be given to the need for a sign to be installed on the intersecting road to provide advance warning of the STOP sign at the level crossing.
19 to 26 metres	STOP and ban B-doubles	Assumes that the sight distance at stop line (i.e. S <sub>3</sub> ) is adequate. Consideration should be given to the need for a sign to be installed on the intersecting road to provide advance warning of the STOP sign at the level crossing. B-doubles may be permitted if the probability of conflicts at the intersection due to encroachment is low.
12.5 to 19 metres	STOP and implement length restriction	Assumes that the sight distance at stop line (i.e. S <sub>3</sub> ) is adequate. Consideration should be given to the need for a sign to be installed on the intersecting road to provide advance warning of the STOP sign at the level crossing. Length restrictions may not be necessary if the probability of conflicts at the intersection due to obstruction is low. If length restrictions are not practical (for example because there is no viable alternative routes), other treatments should be considered.
< 12.5 metres	GIVE WAY and investigate alternative treatments to reduce the risk	STOP control may be used if the probability of conflicts at the intersection due to obstruction is low.

Note(1) The distance is measured from the yield line at the level crossing to the edge of the nearest through traffic lane on the intersecting road (Figure VA4.1, dimension D)



## A4.5 Other Treatment Options

### A4.5.1 Level Crossing Closure

Closure of the crossing could be considered where there is a practical alternative traffic route.

### A4.5.2 Intersection Modifications

Where practical, modifications could be implemented to increase the distance between the level crossing and the intersection. In practice, however, there are likely to be few locations where this can be achieved in a cost-effective manner as the scope of the required roadworks is likely to be significant.

### A4.5.3 Upgrade to Active Control

Priority for upgrading from passive to active control will generally be based on ALCAM risk scores.

### A4.5.4 Low Cost Warning Device

A low cost warning device would be ideally suited to address issues at passive level crossings that are in close proximity to intersections. Any potential low cost warning devices need to be appropriately assessed and approved prior to use. These devices are currently being researched. This document will be updated if one becomes available.

## A4.6 Other Considerations

Where a level crossing and intersection are in close proximity, consideration also needs to be given to vehicles travelling in the opposite direction i.e. across the level crossing, towards the intersection. In order to keep the tracks clear and avoid a “short stacking” problem, there needs to be sufficient distance between the level crossing and the intersection to store the longest design vehicle.

At passive level crossings, the recommended treatments to address sight distance issues that are set out in Table VA4.2 will generally also address short stacking. However, if the treatment does not address short stacking, other treatment options should be considered. As a minimum, a short stacking warning sign (Sign No. W4-V107) should be installed in advance of the level crossing. These signs include information about the distance between the crossing and the intersection.