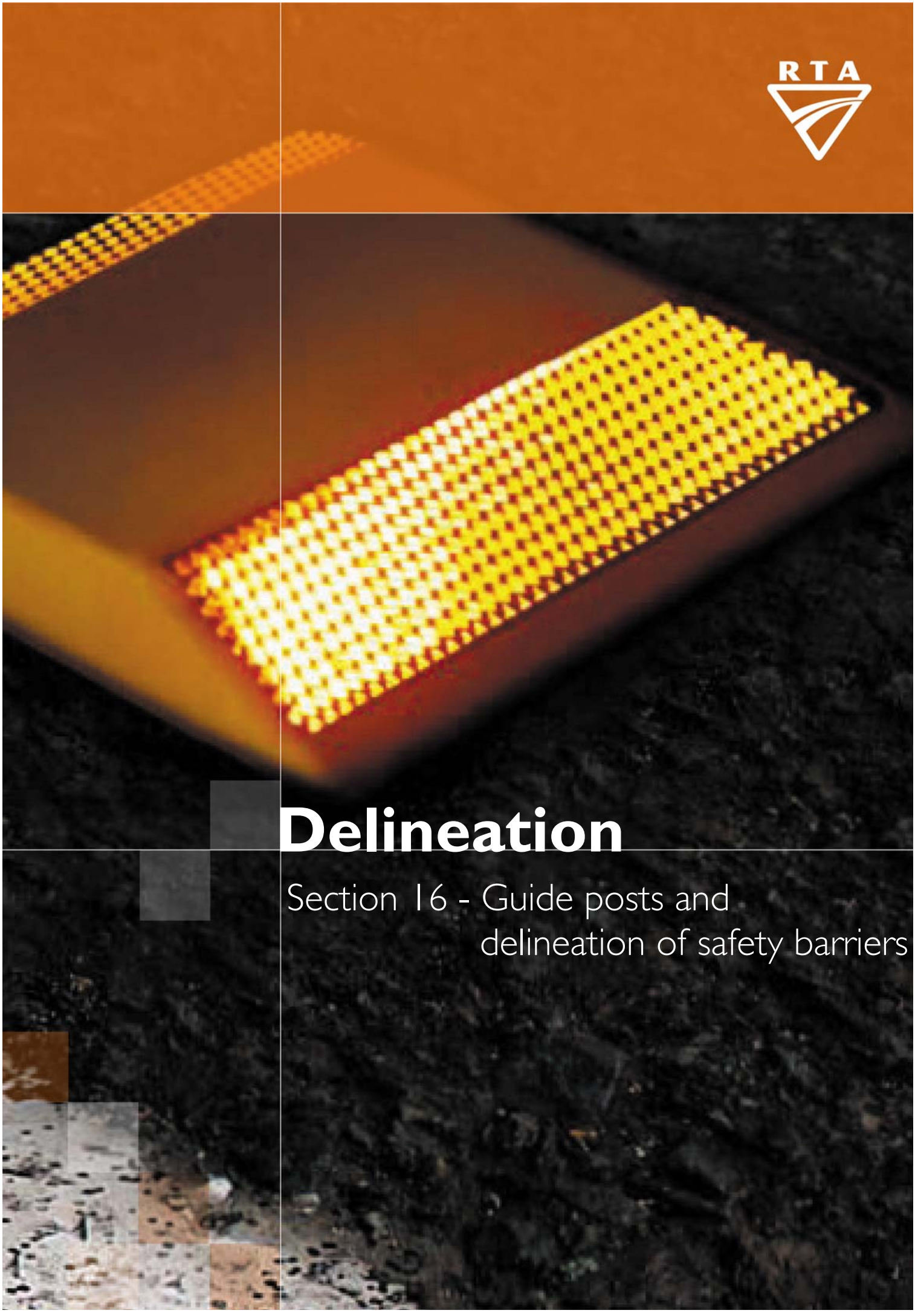


Delineation

Section 16 - Guide posts and delineation of safety barriers

The delineation guidelines have been developed to assist in designing and maintaining a quality delineation system.

The guidelines are to comprise 19 sections and an appendix. These are initially being released individually and in no specific order. The sections which are to be released are as follows:

Part	Title
Section 1	Introduction
Section 2	Delineation principles
Section 3	Pavement markings
Section 4	Longitudinal markings
Section 5	Enhanced longitudinal markings
Section 6	Transverse markings
Section 7	Transverse markings - Pedestrian facilities
Section 8	Diagonal and chevron markings
Section 9	Messages on pavements
Section 10	Pavement arrows
Section 11	Pavement markings at roundabouts
Section 12	Pavement markings for bicycle facilities
Section 13	Pavement markings for kerbside parking restrictions
Section 14	Maintenance of pavement markings
Section 15	Raised pavement markers
Section 16	Guide posts and delineation of safety barriers
Section 17	Alignment signs and markers
Section 18	Delineation systems
Section 19	Delineation management and audit
Appendix A	Locating and setting out of dividing (barrier) lines

To determine which sections are currently available go to:

www.rta.nsw.gov.au/doingbusinesswithus/downloads/technicalmanuals/delineation_dl1.html

The information contained in the various parts is intended to be used as a guide to good practice. Discretion and judgement should be exercised in the light of the many factors that may influence the choice of delineation devices in any situation. The guidelines make reference, where relevant, to current Australian Standards and are intended to supplement and otherwise assist in their interpretation and application.

Delineation

Section 16

GUIDE POSTS & DELINEATION OF SAFETY BARRIERS

Special Note:

As from 17 January 2011, the RTA is adopting the Austroads Guides (Guide to Traffic Management) and Australian Standards (AS 1742, 1743 & 2890) as its primary technical references.

An RTA Supplement has been developed for each Part of the Guide to Traffic Management and relevant Australian Standard. The Supplements document any **mandatory** RTA practice and any complementary guidelines which need to be considered.

The RTA Supplements **must** be referred to prior to using any reference material.

This RTA document is a complementary guideline. Therefore if any conflict arises, the RTA Supplements, the Austroads Guides and the Australian Standards are to prevail.

The RTA Supplements are located on the RTA website at www.rta.nsw.gov.au

Roads and Traffic Authority
www.rta.nsw.gov.au

VERSION: 1.0
ISSUED: February 2010

APPROVED BY:

SIGNED	**SIGNED**
Phil Margison General Manager Traffic Management	Michael de Roos General Manager Safer Roads

AUTHORISED FOR USE BY:

SIGNED

Peter Collins
Director
Network Management

© 2009 Roads and Traffic Authority NSW

Extracts from these guidelines may be reproduced providing the subject is kept in context and the source is acknowledged.

Every effort has been made to supply complete and accurate information. However RTA, NSW assumes no responsibility for its use.

All trade name references herein are either trademarks or registered trademarks of their respective companies.

For policy and technical enquiries regarding these guidelines please contact:

Traffic Management Branch
Email: technical_directions_publication@rta.nsw.gov.au

To access electronic copies of these and other guidelines go to:

www.rta.nsw.gov.au/doingbusinesswithus/downloads/technicalmanuals/technicalmanuals_dl1.html

For the latest amendments (if any) to these guidelines go to:

www.rta.nsw.gov.au/doingbusinesswithus/downloads/technicalmanuals/delineation_dl1.html

ISBN 978-1-921242-89-2 (Electronic only)
RTA/Pub. 08.091

Contents

16.1 General principles 16-1
16.1.1 Purpose 16-1

16.2 Types 16-1
16.2.1 Specifications 16-1
16.2.2 Selection 16-3
16.2.3 Delineators 16-3

16.3 Application of guide posts 16-7
16.3.1 Warrants for use 16-7
16.3.2 Lateral placement and height 16-8
16.3.3 Spacing of guide posts 16-8
16.3.4 Delineation of hazards and road narrowing 16-11
16.3.5 Maintenance of guide posts 16-12

16.4 Delineation of guard fence and bridge rails 16-12
16.4.1 Spacing of delineators 16-12

16.5 Delineation of wire rope safety barrier (WRSB) 16-14
16.5.1 General 16-14
16.5.2 Colour of posts 16-14
16.5.2 Treatment 16-15

16.6 Delineation of concrete safety barriers 16-16
16.6.1 General 16-16
16.6.2 Purpose 16-17
16.6.3 Treatment 16-17
16.6.4 Safety barrier is located more than 4m from nearest edge 16-18

16.7 Extraneous delineation 16-20

This page intentionally left blank

16.1 General principles

16.1.1 Purpose

Guide posts are a simple and an effective form of long range delineation, which conveys information of the road alignment.

Guide posts outline the edges of the roadway to indicate the lateral limits of the safe trafficable way and indicate the alignment of the road ahead, especially at horizontal and vertical curves. Under some circumstances they also provide a gauge to assess available sight distance.

The major advantages of guide posts are:

(a) They are observable far ahead (particularly in poor visibility conditions)

(b) They can be observed even when the pavement has become obscured because of vertical or horizontal curves

(c) They are not subject to traffic wear

(d) They do not become covered by water, snow, or sand which can obscure the pavement markings (although the reflector may become dirty)

(e) They are located on the near side of the driver away from the glare of opposing vehicle headlights

16.2 Types

16.2.1 Specifications

RTA specifications 3411, Supply of Guide Posts - Timber and 3412, Supply of Guide Posts - Non Timber contains the technical specifications and approved types of guide posts. RTA Specification R131 is the QA road construction specification covering the installation of the guide posts. The followings types of guide posts are specified in these specifications:

(a) **Timber guide posts** – 100 mm x 50 mm (nominal) cross section, painted white.

(b) **Flexible guide posts** – This type of guide post deflects when impacted by a vehicle and then returns to a vertical position, without maintenance intervention. They are 100 mm wide, white and use plastic, rubber or similar material.

(c) **Semi flexible guide posts** – This type of guide post fails by bending when impacted by a vehicle, and can be straightened with maintenance intervention. They are 100 mm wide, white and use plastic, metal or other material.

(d) **Rigid guide posts** – This type either fractures or remains intact, but does not remain vertical, when impacted by a vehicle. They are 100 mm wide, white and made of metal or a non-timber material.

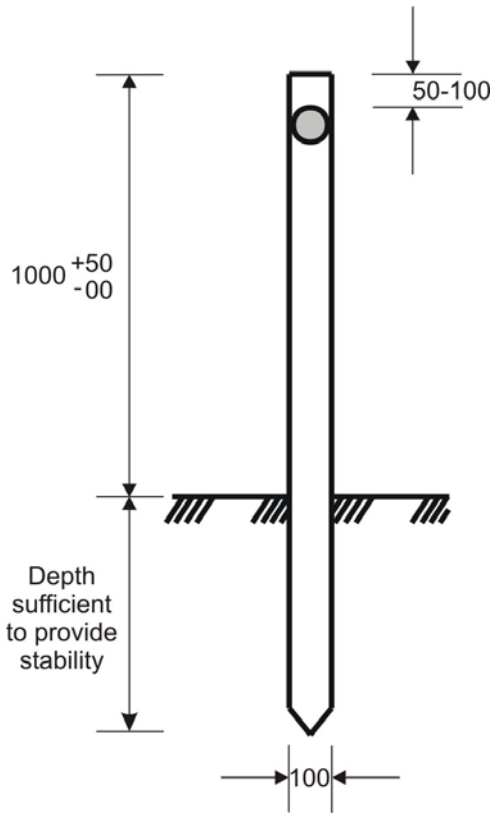


Figure 16.1: Typical Guide Post

16.2.2 Selection

Guide posts should respond in a safe manner when struck, and not present a further danger in their damaged condition. The RTA encourages the use of guide posts made of recycled products, provided they meet the specifications. Consider the following points when selecting the type of guide post to be used in a given situation:

(a) Flexible guide posts or guide posts with a hinged arrangement at ground level should be used in situations where guide posts are likely to be struck by vehicles, for example, tight curves and where shoulders are narrow. Flexible guide posts or guide posts with a hinged arrangement at ground level should also be used on roads which experience significant volumes of motor cycles or bicycles.

(b) Timber or semi-flexible guide posts may be used in situations where guide posts are unlikely to be struck by vehicles. Use of rigid guide posts should be avoided.

(c) In zones with regular pedestrian traffic, delineators (refer to section 16.2.3 for details) made from reflective sheeting should be provided. Corner cube delineators are prone to vandalism and should not be used in this situation. Specification RTA 3412 prohibits the use of corner cube delineators, on flexible or semi-flexible guide posts. The corner cube delineators can be damaged by vehicular impact.

16.2.3 Delineators

Delineators are small retro-reflectors or panels of retro-reflective material which are attached to guide posts, guard fence, bridge end posts, or similar supports and concrete safety barriers, to provide a coherent pattern of delineation of the edges of the carriageway as an aid to night driving. In the case of guide posts they are attached at a distance between 50 mm and 100 mm from the top of the post to the top of the delineator so that one retro-reflector is visible per guide post from either direction of traffic.

(a) Mounting plates are used for the attachment of delineators to guard fence, bridge rails, concrete safety barriers, and bridge end posts. Mounting plates are used so that delineators protrude above the top line of these devices. They should be located so as to be, approximately, at uniform grade with guide posts (i.e. between 900-

1000 mm above the ground) and conform to the spacing and colour specified for guide posts.

(b) All Wire Rope Safety barriers (WRSB) systems shall have retro-reflective material attached to the top of the post. Refer to Section 16.5 for details.

(c) Figure 16.2 to Figure 16.4 show typical delineator bracket and mounting arrangements on guard fence and safety barriers.

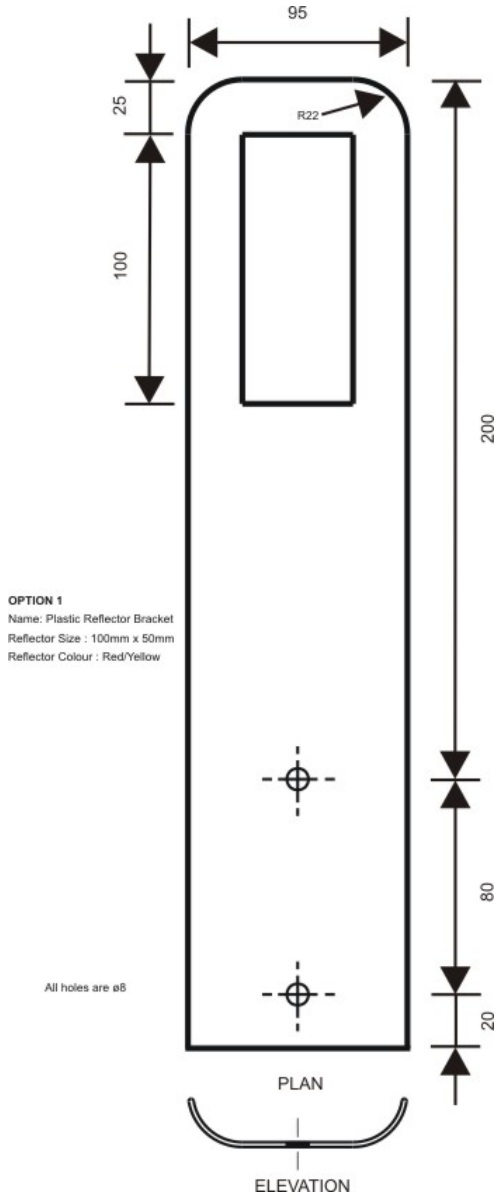
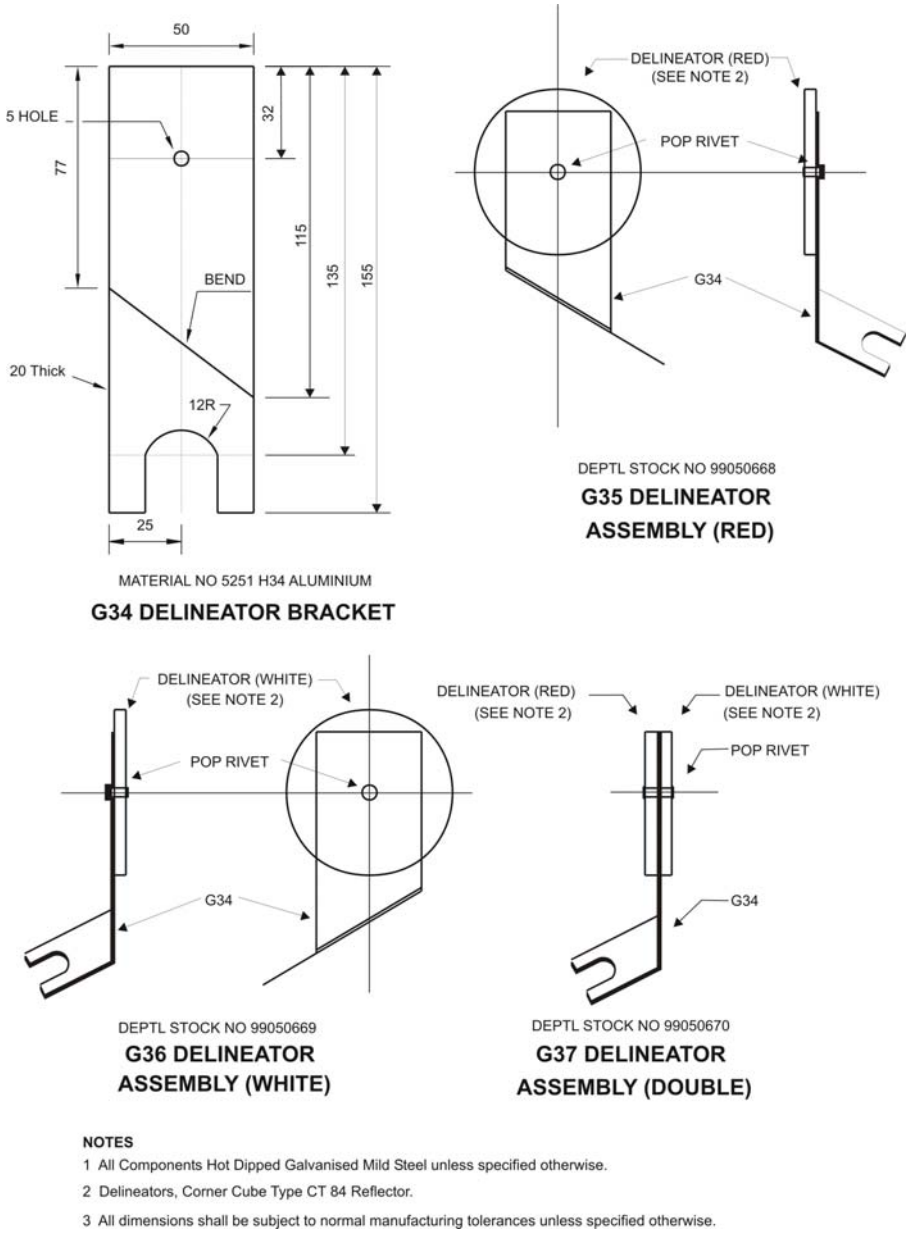


Figure 16.2: Typical delineation unit on guard fence



NOTES

1 All Components Hot Dipped Galvanised Mild Steel unless specified otherwise.

2 Delineators, Corner Cube Type CT 84 Reflector.

3 All dimensions shall be subject to normal manufacturing tolerances unless specified otherwise.

Figure 16.3: Alternative delineator units on guard fence

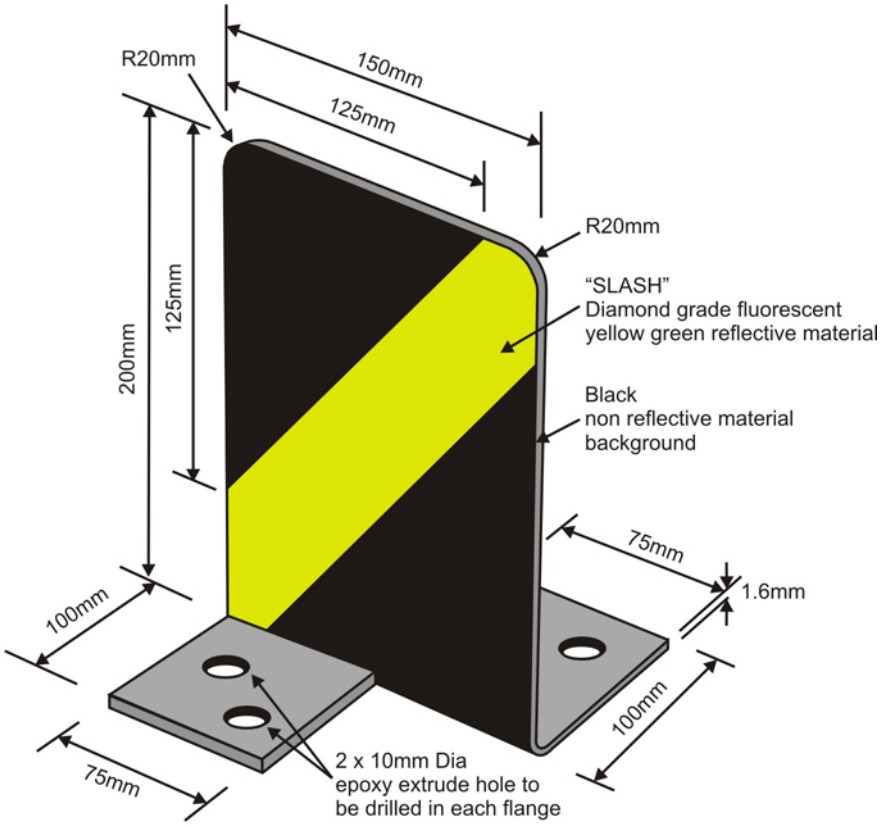


Figure 16.4: Delineator unit for concrete safety fence

16.2.3.1 Colour of retro-reflectors

Retro-reflector units on guide posts, bridge rails, safety barriers, and bridge end posts shall be arranged so that the drivers approaching from either direction will see only:

(a) Red retro-reflectors on the nearside

(b) White retro-reflectors on the offside on two-way carriageways

(c) Yellow retro-reflectors on the offside on one-way carriageways and on the medians separating traffic in opposing directions on two-way carriageways

(Yellow reflectors are specified on the right (off) side of one-way carriageways for consistency with established practice with raised pavement markers).

16.2.3.2 Performance requirements

RTA Specifications 3411 and 3412 specify that retro-reflectors shall be either Type A (i.e. 85 mm diameter corner cube reflectors) complying with AS 1906.2 and with a minimum of 6 segments, or Class 1A reflective sheeting complying with AS 1906.1. In the case of Class 1A sheeting the specified minimum area is 10,000 mm^2 in a circular, oval or rectangular configuration. Where an oval or rectangular configuration is used, a minimum width of 50 mm is specified.

These two options have similar photometric output, and factors influencing the choice between Type A and Class 1A retro-reflectors on a project include:

(a) Desirability for consistency within a route, or along a section of road

(b) Likelihood of being hit, noting that corner cube reflectors, are more susceptible to damage by a vehicle or vandalism

(c) Reflective sheeting requires regular cleaning

(d) Price, adjusted for life expectancy (cost effectiveness)

(e) There may be specific circumstances (e.g. to enhance visibility of animals) where the use of retro-reflectors of lower luminance may be desirable

16.3 Application of guide posts

16.3.1 Warrants for use

16.3.1.1 Rural roads

Guide posts delineate the edge of the road formation and assist the road user by indicating the alignment of road ahead. Guide posts should, therefore, be provided on all rural divided and undivided roads.

16.3.1.2 Urban roads

Guide posts are normally not provided on urban roads that are well lit. However, they may be provided on unlit urban roads (kerbed or un-kerbed) with poor alignment or inadequate edge delineation.

16.3.1.3 Freeways

Guide posts should be installed on rural freeways. They are not usually required on inner urban freeways that are well lit and have carriageway edges well defined by other means. Where urban freeways begin to have similar characteristics as rural freeways, guide posts should be provided.

16.3.2 Lateral placement and height

(a) Guide posts should be located at or near the edge of formation so that they are not less than 1.2 m and no more than 4 m from the edge of the pavement. If located on a kerbed road, guide posts should be positioned approximately 600 mm behind the face of the kerb. Wherever practicable the distance from the pavement edge to the guide post should be a consistent width throughout the posted section.

(b) Guide posts should be set to a height of approximately 1 m (Figure 16.1). On curves they should be located at a constant distance from the edge of the pavement so as to form a smooth line around the curve, and if there are irregularities in the shoulder contours the posts should be set into the ground so that the top is on a smooth grade.

16.3.3 Spacing of guide posts

(a) *Straight sections* – guide posts are usually positioned every 150 m on straight sections, with posts positioned in pairs, one on each side of the formation. The spacing may be reduced to 60 m in areas subject to frequent fogs, or increased to 200 m on roads consisting of long straights in flat terrain and carrying less than 1500 vpd.

(b) *Curves* – guide post on curves should provide the driver with a clear impression of the direction, extent and sharpness of the curve. The system should be free of gaps and spacing or height irregularities that may affect the smoothness of the pattern. The installation of such posts should be checked at night to ensure that these objectives are met.

Guide posts are positioned so that at least two pairs of delineators (the nearest being not less than 40 m ahead of the vehicle) are fully visible at all times.

The spacing of guide posts on curves should be calculated as explained below:

(a) Obtain the radius of the circular portion of the curve. Where the radius of the curve is not available from records, it may be determined approximately by measuring the middle ordinate offset from a chord of known length using either the edge of the pavement or a marked longitudinal line as a guide (Figure 16.5).

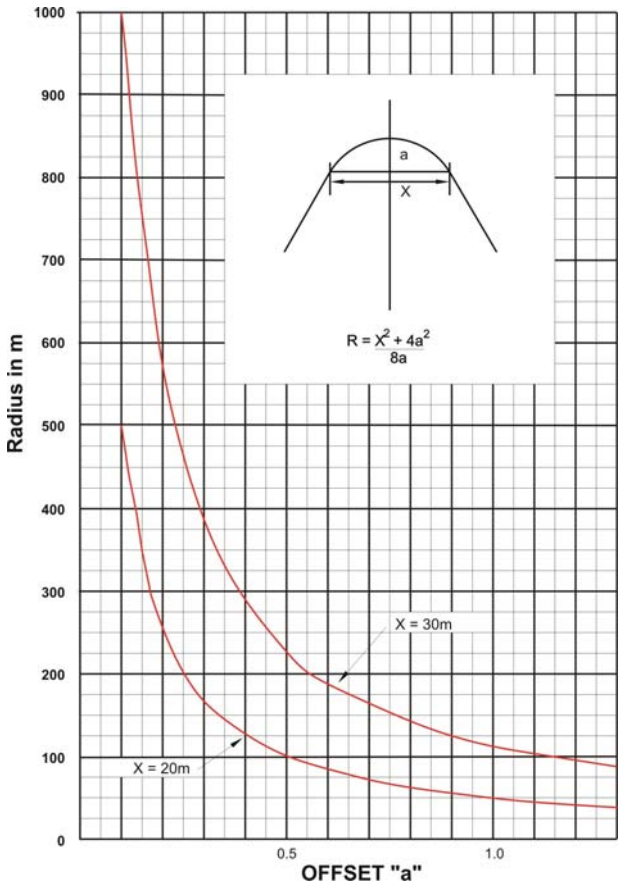


Figure 16.5: Calculation of Radius

(b) Locate the first post on the outside of the curve at the point where the centre-line-shift from the approach-straight is 0.5 m (transition or plain circular curves). This point can be estimated by eye where plans are unavailable.

(c) Continue spacing around outside curve in accordance with the spacing given in Table 16.1, terminating at the point at the far end of the curve that is nearest to the point where the 0.5 centre line shift occurs as in (b) above for the opposite approach.

(d) Locate a post on the inside of the curve opposite both the first and last post on the outside of the curve. Locate intermediate posts on the inside of the curve in accordance with Table 16.1 ensuring that as far as practicable each inside post is opposite an outside post.

(e) Locate a further pair of posts (one on each side of the road) at each end of the curve at a spacing equal to twice the outside–of–curve spacing, (Table 16.1) in advance of (or beyond) the first and last posts previously located.

(f) Where a side road or private entrance enters on the back of a curve, or a culvert headwall is located adjacent, the spacing may need to be adjusted or extra posts installed to ensure that a gap is not left in the delineation pattern which may confuse drivers.

Curve radius	Spacing (m)	
	On outside curve	On inside curve
< 100	6	12
100 - 199	10	20
200 - 299	15	30
300 - 399	20	40
400 - 599	30	60
600 - 699	40	60
800 - 1999	60	60
1200 - 2000	90	90
> 2000 including straights	150	150

Table 16.1: Spacing of posts on curves (including spacing of delineators on guard fence)

NOTES:

1) Where the radius of an existing curve is not available from records, it may be determined approximately as given in Section 16.3.3 (b).

2) On safety barriers, spacing should be adjusted, if necessary, to the nearest multiple of post spacing.

3) A post on the inside of a curve is to be placed opposite a post on the outside of a curve wherever practicable.

4) Reduce spacing to 60 m in areas subject to fog.

5) The spacings in this table are based on approximates of the following formulae:

   Curve radii up to 150m $S=0.03r+5$

   Curve radii above 150m $S=0.06r$

   Where S = spacing, r = radius of curve

6) Crests and cuttings – where crests have a straight alignment, guide posts are positioned so that at least two pairs of delineators (the nearest being not less than 40 m ahead of the vehicle) are fully visible at all times. On crests within horizontal curves, this

requirement is combined with those outlined above in spacing stipulation's for curves. Guide posts are always continued through cuttings to provide continuity of delineation.

7) Bridges and culverts – where a safety barrier or a hand rail is not provided and the structure is at least the full formation width, posts are erected in the following manner:

   (a) At structures 5 m or more in length, four posts – one at each end of the headwall or kerbing, plus additional pairs of posts at spacings of 10 m maximum for structures longer than 10 m

   (b) At structures less than 5 m in length, two posts – one on each nearside approach end of headwall or kerbing

   (c) At all pipe and single cell box culverts, one post at each headwall

16.3.4 Delineation of hazards and road narrowing

The spacing of guide posts over the transition at road narrowings and at hazards within the road formation should be in accordance with Figure 16.6.

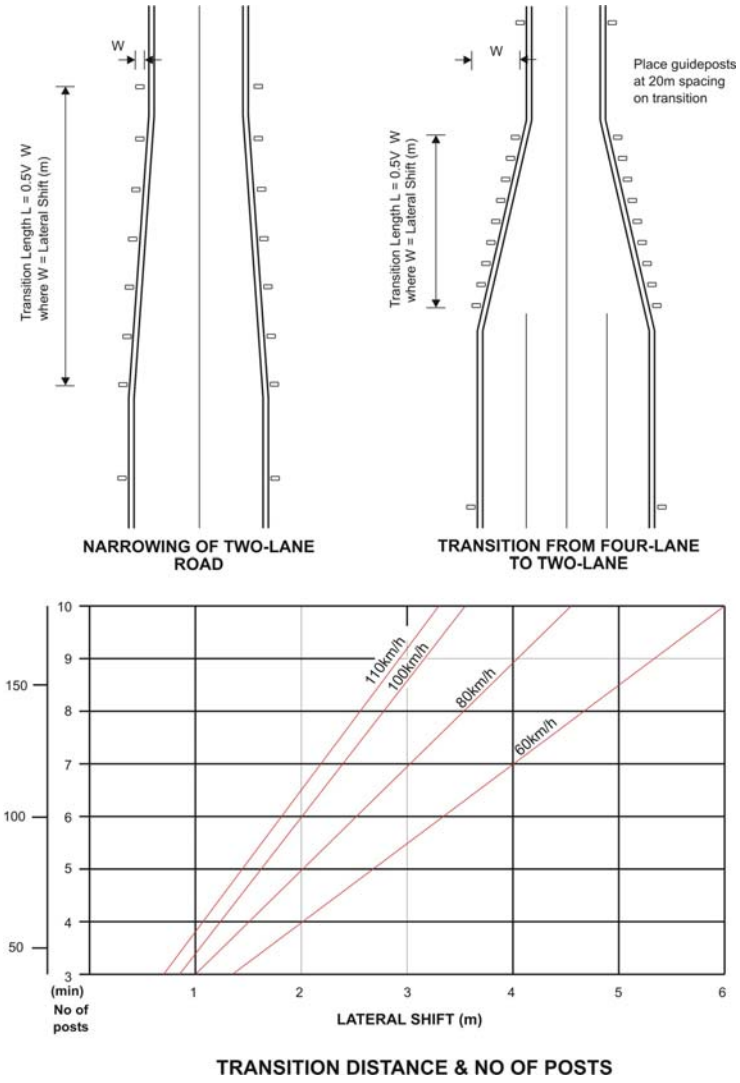


Figure 16.6: Guide Post at hazards and road narrowing

16.3.5 Maintenance of guide posts

Guide posts are highly susceptible to knock-downs, vandalism and theft. Bent or missing guideposts or delineators (retro-reflectors) should be promptly replaced.

Road splash, dirt or vegetation may also degrade the visibility of the guide posts and delineators. Maintenance practices should ensure the effectiveness of the units is retained.

16.4 Delineation of guard fence and bridge rails

16.4.1 Spacing of delineators

The spacing of delineators on guard fence, bridge rails and concrete safety barriers is described in Sections 16.4.1.1 and 16.4.1.2. It should be noted that the delineator is only provided where the guard fence, bridge rail or safety barrier is located not more than 4 m from the nearest edge of the running lane (and there is no reduction in pavement width).

16.4.1.1 On curves

Delineators are placed at the same spacing as given in Table 16.1, ensuring that there is a delineator at or within 5 m of the leading end of the safety barrier, discounting any flared section of the barrier.

Delineators are not placed on flared sections of steel rail safety barriers, however if the length of the area requires placement of a delineator, it should be attached to a flexible post to match the line of the adjacent delineation.

For motorcyclist safety, ensure that delineators are frangible and not sharp, and avoid adding protrusions.

16.4.1.2 On straight sections

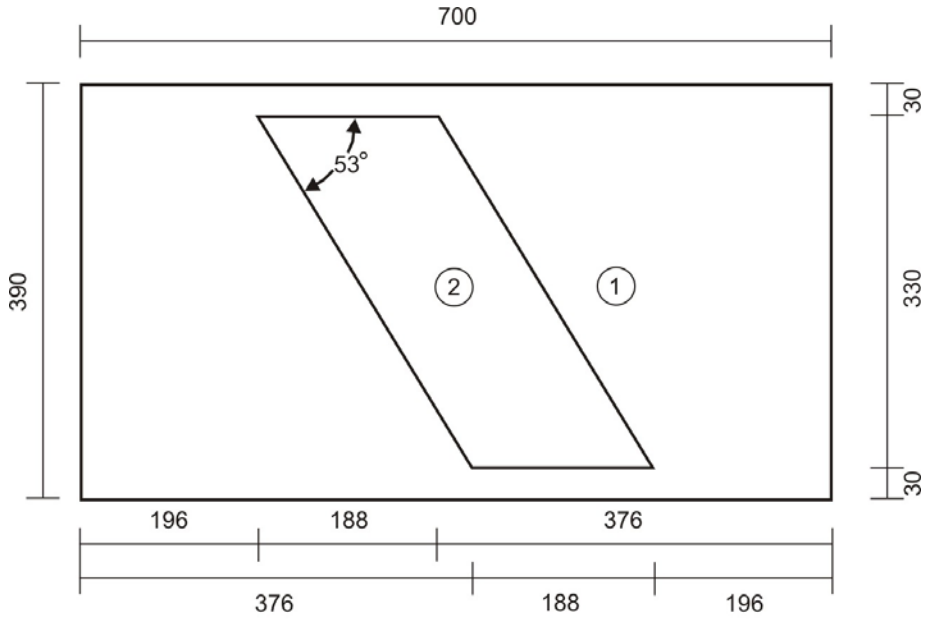
Delineators are spaced at 150 m, reducing it to 10 m where the installation results in narrowing of the nearest travel lane (e.g. on a narrow bridge) – see Section 16.3.4.

For motorcyclist safety, ensure that delineators are frangible and not sharp, and avoid adding protrusions.

On safety barrier ends with non flared crash attenuators, a delineator is placed on the terminal in accordance with the manufacturer's specification.

16.4.1.3 Steel rail safety barrier buffered end terminal and impact head delineation

Safety barrier terminals on high-speed rural highways may require delineation of buffered end terminals and/or impact heads. A delineator comprising of reflective sheeting, containing a black diagonal slash (non reflective) on a yellow background (class 1), may be used to delineate these ends. See Figure 16.7.



1. Class one reflective sheeting
2. Black (non-reflective) slash symbol

Figure 16.7: Bull Nose delineation (all dimension in mm)

It is preferable to maintain continuity of delineation. In some cases this may result in the continuation of guide posts between the edge of the carriageway and the bridge rail or safety barrier. In such cases reflectors shall not be attached to the bridge rail or safety barrier.

Where the bridge rail or safety barrier is more than 4 m from nearest edge of running lane:

(a) Delineators are not placed on the safety barrier but guide posts are continued along the edge of formation at the required spacing, (presented in Table 16.1)

(b) The buffered end or impact head of the safety barrier shall not be delineated

Where a bridge rail or safety barrier is installed and there is a reduction in pavement width by narrowing of the nearest travel lane (e.g. narrow bridge) delineators are placed on the rail or barrier at 20 m spacing. On the approach to the reduced pavement width, delineators are placed on the rail at 7.5 m spacing over 30 m. If the safety barrier on the approach is less than 30 m long, guide posts are provided to extend the delineation at 7.5 m spacing for the full 30 m.

16.5 Delineation of wire rope safety barrier (WRSB)

Wire Rope Safety Barrier has gained popularity as a median or edge barrier for the prevention of cross-median or run-off the road type accidents.

The visibility of wire rope safety barrier (WRSB) is an important issue.

16.5.1 General

WRSB are non-rigid systems comprising three or four tensioned wire ropes, supported on frangible posts. The posts normally sit in a concrete socket which allows them to be readily withdrawn. This means that after an impact, unusable posts can be replaced (subject to socket damage). Special connectors are available for attachment to bridge decks and similar areas where concrete sockets are inappropriate. End and intermediate anchor blocks are required to maintain tension in the ropes.

16.5.2 Colour of posts

WRSB in speed zones ≥ 80 km/h must be white (except in snow conditions). Other WRSB must have white posts if any of these conditions apply:

- Median installations less than 2.5 m from edge line defining the median separation
- Roadside installations less than 2.5 m from edge line
- Where a WRSB is located on a painted median

- Where a WRSB is located on the outside of a curve with a radius < 600 m
- Where there is a history of vehicles colliding with a safety barrier
- In areas prone to low visibility conditions such as fog
- For narrow or narrowing road formations such as approaches to and within bridges and tunnels
- Where there are no edge lines
- Where the shoulder is not sealed
- Where there is no street lighting

Non-white posts could be used in a low speed environment (eg 60km/h) in which white posts would not provide any delineation benefit (eg the posts are obscured by landscape plantings)

The posts must be yellow wherever yellow road markings are used because of snow conditions. WRSB systems shall have retro-reflective material attached to the top of the post. Refer to section 16.2.3.1 for retro-reflector colour requirements.

16.5.2 Treatment

Where guide posts would normally be required and a WRSB system is to be installed, instead of installing guide posts either in front or behind the barrier, post caps are to be marked with a 100 mm (wide) x 50 mm (high) Class 1A reflective tape. Post caps to be marked at suitable intervals based on post spacings to approximate 10 m intervals between markings.

Figure 16.8 illustrates delineation of the approaches to a Wire Rope Safety Barrier located in the centre of the road.

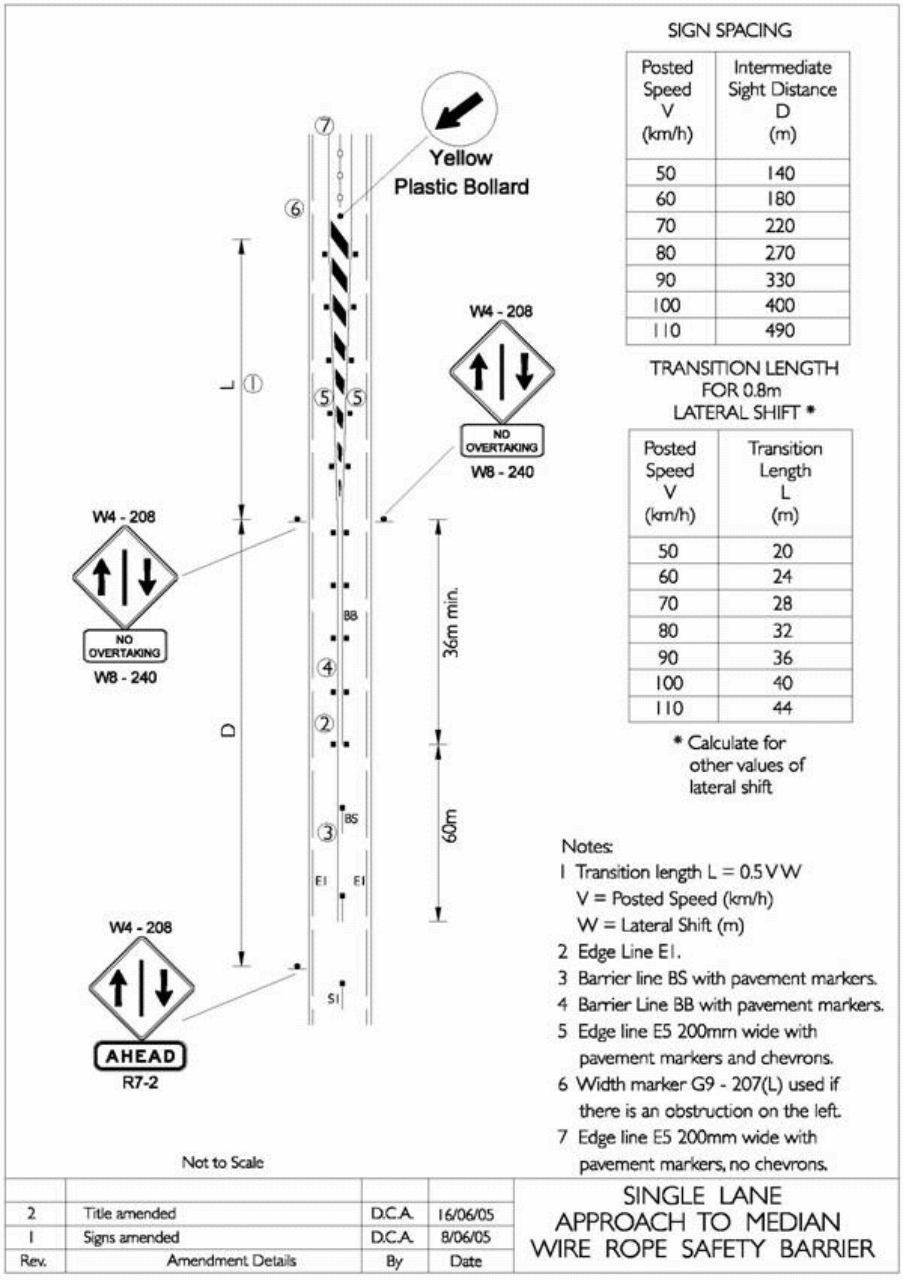


Figure 16.8: Wire Rope Safety Barrier

16.6 Delineation of concrete safety barriers

16.6.1 General

The visibility of concrete safety barriers (Type F as per Road Design Guide) is an important issue. Their composition provides little contrast with the roadway pavement, making them difficult to see at night, particularly in the rain, and under opposing headlight glare conditions.

16.6.2 Purpose

Adequate barrier delineation treatments will provide drivers with a defined path during darkness and adverse weather conditions.

16.6.3 Treatment

Approaches to the concrete safety barrier shall have an energy absorbing crash terminal with proper delineation at the front. See Figure 16.11

Where the safety barrier is located, 4 m or less, from the nearest edge of the running lane, the standard delineation treatments will consist of:

16.6.3.1 Retro reflective unit (delineator) on top of the barrier

Retro-reflective units (delineators) are hard aluminium panels 1.6 mm thick (see Figure 16.4 for dimensions). A diagonal slash of Class 1A (diamond grade) Yellow-Green fluorescent reflective sheeting, is attached to both sides of the panel, on a black, non-reflective background. The direction of the diagonal slash would be forward if it is located on the right hand side of the traffic and if the barrier is located on the left hand side of the traffic, a backward slash is used.

The delineation unit is attached to the safety barrier at 20 m spacing to provide a coherent pattern of delineation. The delineators are mounted on the barrier as detailed in Figure 16.9.

16.6.3.2 Pavement marking alongside the safety barrier, situated in the median

An edge line (refer to Table 4.5 in Section 4.5) should be marked, alongside the safety barrier, situated in the median, at an offset of

(a) 1 m if 85th percentile speed is less than 90km/h

(b) 1.5 m if 85th percentile speed is between 90km/h and 100km/h

(c) 2 m for 85th percentile speed is 100 km/h or more

Yellow reflective raised pavement markers should be used at 12 m spacings to supplement the edge line.

16.6.3.3 Pavement marking alongside the safety barrier, situated on the left side

An edge line should be marked, alongside the safety barrier, on the left side, at an offset of:

(a) 1.5 m if the 85th percentile speed is 70km/h or less

(b) 2 m if the 85th percentile speed is between 70km/h and 90km/h

(c) 2.5 m if the 85th percentile is 90km/h or more

Red reflective markers should be used at 12 m spacing to supplement the edge line.

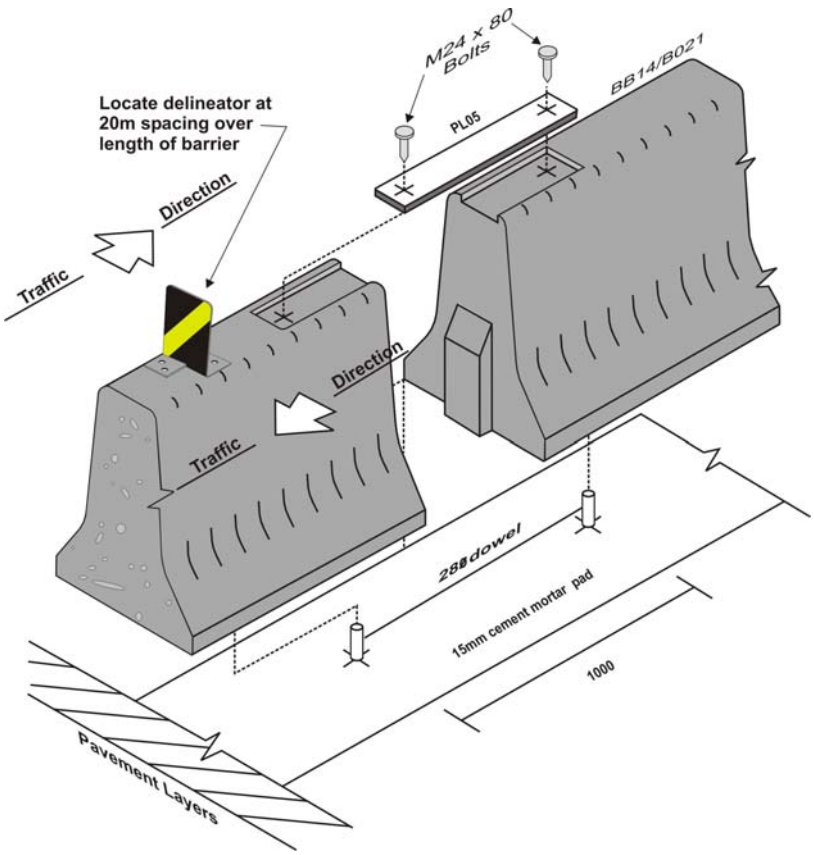


Figure 16.9: Connection Details

16.6.4 Safety barrier is located more than 4m from nearest edge

Where the safety barrier is located more than 4 m from nearest edge of a running lane, delineators are not placed on the safety barrier but guide posts are continued along the edge of formation at the required spacing.

Figure 16.10: Typical application of concrete barrier delineation

Figure 16.11: Delineation of crash terminal

16.7 Extraneous delineation

Effective route delineation is largely dependent on implementing clear delineation techniques in a consistent manner. The pattern, which is established by such techniques, assists in defining the alignment and layout of the road, providing drivers with additional cues about the road formation.

While controlled methods of delineation are beneficial to drivers extraneous delineators may upset the regularity and clarity of the pattern.

Examples of extraneous delineation include:

(a) Delineators on trees, poles, private driveway entrances etc

(b) Delineators on fixed objects close to the carriageway which should instead be treated with width markers

(c) Use of two or more delineators facing the same direction on any one post or bridge–end post

(d) Use of chevrons on the buffered end terminals of the steel beam safety barrier

(e) Use of guide posts for asset management purposes.

Note: These practices must not be used.

[Inside rear cover
– provided for double sided printing purposes only]

For further enquiries
www.rta.nsw.gov.au
13 22 13

Roads and Traffic Authority

March 2008
RTA/Pub. 08.091