

[Back to Main Index](#)

Cross-Sections and Headroom

December 2000

Summary :

This Standard sets out the dimensional requirements for road cross-sections for national roads including motorways. It covers the requirements on the open road and at structures, but not in tunnels. It also gives requirements for headroom at structures.

Note:

The layout and format of this Standard are modelled closely on the UK Highways Agency's Standard TD 27/96. Wherever practicable, paragraph and figure numbering follows that of TD 27/96.

VOLUME 6 ROAD GEOMETRY
SECTION 1 LINKS

PART 2

NRA TD 27/00

CROSS-SECTIONS AND HEADROOM

Contents

Chapter

1. Introduction
 2. Design Principles
 3. Cross-Sections on Open Roads
 4. Cross-Sections at Structures
 5. Headroom at Structures
 6. References
 7. Enquiries
- Annex A Cross-Sections for Non-National Roads (As Part of a National Road Scheme)

1. INTRODUCTION

General

1.1 This Standard outlines the design principles and factors which should be considered by designers in selecting road cross-sections and headroom. The process of design is described together with an approach to developing options.

1.2 (Not used).

Scope

1.3 This Standard gives details of the cross-sections and headroom clearances to be used for national roads, including motorways, both on open roads and at structures.

1.4 This Standard is not applicable to road tunnels.

1.5 For details of pedestrian and cycle subway dimensions see TD 36 (DMRB 6.3.1), for footbridges see BD 29 (DMRB 2.2). Advice on equestrian subways and for agricultural crossings is given in TA 57 (DMRB 6.3).

Implementation

1.5A This Standard should be used forthwith for all schemes for the construction and/or improvement of national roads. The Standard should be applied to the design of schemes already being prepared unless, in the opinion of the National Roads Authority, application would result in significant additional expense or delay progress. In such cases, Design Organisations should confirm the application of this Standard to particular schemes with the National Roads Authority.

1.5B For the application of this Standard to side roads which are improved or diverted as part of a national road scheme, see Paragraphs 3.2 and 4.4.

1.6 If this Standard is to be used for the design of local road schemes (non-national roads), the Designer should agree with the relevant Road Authority the extent to which the document is appropriate in any particular situation.

Definitions

1.7 For the definitions of the general road terms used in this Standard such as components of the road (central reserve, verge, hard shoulder, and hard strip, etc.) see BS 6100: Subsection 2.4.1.

1.8 Particular terms used in this Standard are defined as follows:

All-purpose road: - A road for the use of all classes of traffic (e.g. not a motorway).

Bridge Length: - is the length of bridge parapet. Long underbridges are those exceeding 100m.

Bridleway: - Road (surfaced or unsurfaced) for use on foot or horseback.

Central reserve: - The area which separates the carriageways of a dual carriageway road. Note that this includes any offside hard strips.

Connector Road: - A collective term for slip roads, interchange links and loop roads.

Cross-section: - The road cross-section incorporates all elements between the boundaries including carriageways, the central reserve, separation zones, hard shoulders, hard strips, verges including any footway, cycle track or bridleway, cutting or embankment slopes, berms and work space. All dimensions are measured square to the line of the road (see Figures 5 to 7 and Tables 2 to 5).

Cycle Lane: - A separate part of the carriageway for use by pedal cycles.

Cycle Track: - A separate part of a road for use only by pedal cycles and by pedestrians where permitted.

D2AP: - Dual two-lane all-purpose road (i.e. a dual carriageway with two traffic lanes in each direction).

D2M: - Dual two-lane motorway.

Interchange: - A grade separated junction that provides free flow of traffic from one mainline carriageway to another.

Interchange Link: - Refer to TD 22 (DMRB 6.2.1).

Loops: - Refer to TD 22 (DMRB 6.2.1).

Mainline: - The carriageway carrying the main flow of traffic (generally traffic passing straight through a junction or interchange).

Maintained Headroom: - The minimum headroom which shall be preserved at all times.

New Construction Headroom: - The headroom which includes an allowance for resurfacing.

Overbridge: - A bridge that spans the road under consideration.

Pedestrian Access Provision: - That part of the verge on all-purpose roads provided to enable pedestrian movement through or over a structure.

Road Tunnel: - A road tunnel enclosed for a length of 150m or more. A shorter enclosed length is an overbridge.

Roads: Urban and Rural: - An Urban Road is a road which is in a built-up area and has either a single carriageway with a speed limit of 40mph or less, or has a dual carriageway (including motorways) with a speed limit of 50mph or less. All other roads are Rural Roads.

S2: - Two-lane single carriageway road with lane widths of up to about 3.65m (i.e. a Standard Single Carriageway or a Reduced Single Carriageway).

Slip Road: - Refer to TD 22 (DMRB 6.2.1).

Subway: - Underground passageway or tunnel for use by pedestrians, cyclists and sometimes equestrians.

Underbridge: - A bridge that carries the road under consideration.

Verge: - The part of a road cross-section alongside a carriageway but not including embankment or cutting slopes. Note that this includes any hard strips but not hard shoulders.

Work Space: -The strip of land between the top of cutting or toe of embankment and the road boundary.

WS2: - Two-lane wide single carriageway road, normally with lane widths of 5.0m (i.e. Wide Single Carriageway).

Mandatory Sections

1.9 Sections of this document which form part of the standards the National Roads Authority expects in design are highlighted by being contained in boxes. These are the sections with which the Design Organisation must comply or must have agreed a suitable Departure from Standard with the National Roads Authority. The remainder of the document contains advice and enlargement which is commended to designers for their consideration.

Relaxations within Standard

1.10 In difficult circumstances, the Designer may relax a standard set out in this document to that relating to the next lowest design speed step. Refer to NRA TD 9 (NRA DMRB 6.1.1). The Designer shall record the fact that a Relaxation has been used in the design and the corresponding reasons for its use. The record shall be endorsed by the Design Organisation's senior engineer responsible for the scheme. The Design Organisation shall report all Relaxations incorporated into the design as part of the project report at the end of each project management phase (refer to the National Roads Project Management Guidelines).

Departures from Standards

1.11 In exceptional situations, the National Roads Authority may be prepared to agree to a Departure from Standard where the standard, including permitted Relaxations, is not realistically achievable. Design Organisations faced by such situations and wishing to consider pursuing this course shall discuss any such option at an early stage in design with the National Roads Authority. Proposals to adopt Departures from Standard must be submitted by the Design Organisation to the National Roads Authority and formal approval received BEFORE incorporation into a design layout.

2. DESIGN PRINCIPLES

General

2.1 This section describes the principles to be followed when designing road cross-sections for new and improved all-purpose national roads and motorways. The underlying principle is that designers are given the maximum choice, so that there is flexibility to develop layout options that will meet the National Roads Authority's objectives.

2.2 Designers should balance considerations of safety, environmental impact, cost, buildability of the road elements, operation and maintenance. Where there are options for heights or widths, the selection process should include due consideration of these factors and any other design constraints.

Range of Choice

2.3 The widths of paved elements of the cross-section, i.e. running lanes, hard shoulders and hard strips, vary between different types of road. Dimensions have been selected on the basis of research, experience in Ireland and the United Kingdom, and comparison with other countries' standards, in order to give new and improved roads that maximise safety and are operationally efficient and cost effective. The designer is not given choices over the widths of running lanes, hard shoulders and hard strips for a particular type of road.

2.4 The designer does, however, have some flexibility over the width of work space, berms, side slopes, verges and central reserves, although a reduction of verge or central reserve width below desirable minimum will require a Relaxation.

2.5 The verge width on either side of the paved area may be a factor affecting the severity of accidents where vehicles run off the carriageway. Research has indicated that only a small proportion of injury accidents, perhaps 2% or 3% in open country, would be avoided if verges were to be doubled in width. Consequently, safety aspects will not normally be a factor when choosing a verge width greater than the desirable width, provided visibility requirements are met. Details of when to provide safety fences or safety

barriers in verges and central reserves to protect against collisions between vehicles and roadside objects or features are given in TD 19 (NRA DMRB 2.2).

2.6 The width between the back of the verge and the road boundary will depend on the terrain, the need to accommodate environmental mitigation measures, the engineering or geotechnical measures used to accommodate changes in ground levels, and any need to include differing types and widths of drain and other services in the work space.

Environmental Aspects

2.7 Environmental aspects may affect elements of the cross-section.

Design Process

2.8 For the purposes of developing initial layouts, the designer's objective should be to determine the appropriate width for the road cross-section, and any variation in width required. Features included in the cross-section can affect the choice of width. To assist the designer Table 1 lists features that commonly occur within the road. The table also lists the Standards, Advice Notes and other documents that contain further details. Some features, safety fences for example, can have a significant effect on the cross-section width whilst other features, road signs for example, are usually accommodated within the side slopes and work space.

2.9 The preferred locations for features in verges and the central reserve may often coincide or overlap, and the designer should be aware of the potential for such conflicts. Generally, there is far more below the surface of verges and central reserves than is apparent on the surface, and some underground features must be readily accessible for routine maintenance purposes. Engineering solutions can usually be designed to overcome conflicts where space is limited, but these may increase costs. The sizes and extents of features above and below ground in the verge and central reserve of rural roads can vary widely. Therefore, details are best designed individually for each situation.

Other Features Within the Road Cross-section

2.10 In addition to the features listed in Table 1, there are other items that frequently occur within the road. A checklist of the most common of these is as follows:

Bridleways
Cycle Tracks
Culverts
Fencing
Footways
Foundations
Geotechnical Monitoring Equipment
Geotextiles
Hardstandings
Landscaping
Communications Equipment
Overbridges
Apparatus of Utility Companies and other Authorities
Subways
Tracks for Equestrians
Underbridges
Weather Monitoring Equipment.

Visibility

2.11 On curved alignments and approaches to junctions, it may be necessary to widen the cross-section, particularly verges and central reserves, to ensure that drivers and other road users can see the appropriate distances, and that the layout meets the visibility requirements. Refer to NRA TD 9 (NRA DMRB 6.1.1).

(Note: Figures 1 to 4 not used).

FEATURE	STANDARD, ADVICE OR GUIDANCE	TITLE
Agricultural Cattle/Horse Crossings	<i>TA 56 (DMRB 8.2)</i>	<i>Hazardous Cattle Crossings; Use of Flashing Amber Lights</i>
	<i>TA 57 (DMRB 6.3)</i>	<i>Roadside Features</i>
Animal Tunnels	<i>HA 59 (DMRB 10.1.5)</i>	<i>Nature Conservation</i>
Anti-Dazzle Fences	<i>TA 57 (DMRB 6.3)</i>	<i>Roadside Features</i>
Arrester Beds	<i>TA 57 (DMRB 6.3)</i>	<i>Roadside Features</i>
Drains	(RCD)	Road Construction Details (Volume 4 of NRA Manual of Contract Documents for Road Works)
	HD 33 (DMRB 4.2.3)	Surface and Sub-surface Drainage Systems for Highways
	<i>HA 37 (DMRB 4.2)</i>	<i>Hydraulic Design of Road Edge Surface Water Channels</i>
Footbridges	BD 29 (DMRB 2.2)	Design Criteria for Footbridges
Sign/Signal Gantries	BD 51 (DMRB 2.2.4)	Design Criteria for Portal and Cantilever Sign/Signal Gantries
Kerbing	(RCD)	Road Construction Details (Volume 4 of NRA Manual of Contract Documents for Road Works)
	<i>TA 57 (DMRB 6.3)</i>	<i>Roadside Features</i>
Lay-bys	<i>TA 69 (DMRB 2.2.1)</i>	<i>Location and Layout of Lay-Bys</i>
Lighting Columns	BS 5489 Part 1	Road Lighting: Guide to General Principles
	BD 26 (DMRB 2.2.1)	Design of Lighting Columns
	TD 30 (DMRB 8.3)	Design of Road Lighting for All-Purpose Trunk Roads
	BS 5649 / IS EN 40	Lighting Columns
	TD 34 (DMRB 8.3)	Design of Road Lighting for Motorway Trunk Roads

Note: Advice Notes, indicated in italics, have not formally been implemented for use in Ireland. However, they may provide useful background information.

(Continued)

Table 1 : Features Commonly Occurring in the Road Cross-section

(Continued)

FEATURE	STANDARD, ADVICE OR GUIDANCE	TITLE
Loop Detectors	HD 20 (DMRB 9.3.1)	Loop Detectors for Motorways
Traffic Control and Communications	(RCD)	Road Construction Details
Delineator Posts	(TSM)	Traffic Signs Manual
Parapets	BS 6779 Parts 1, 2 & 3	Highway parapets for bridges and other structures
	BD 52 (DMRB 2.3.3)	The Design of Highway Bridge Parapets
Pedestrian Guardrails	BS 7818	Specification for Pedestrian Restraint Systems in Metal
	<i>TA 57 (DMRB 6.3)</i>	<i>Roadside Features</i>
	<i>BA 48 (DMRB 2.2.2)</i>	<i>Pedestrian Protection at Headwalls, Wing Walls and Retaining Walls</i>
Garda Observation Platforms	<i>TA 66 (DMRB 6.3.2)</i>	<i>Police Observation Platforms on Motorways</i>
Services	(RCD)	Road Construction Details (Volume 4 of NRA Manual of Contract Documents for Road Works)
Signs	(TSM)	Traffic Signs Manual
Slope Strengthening	<i>HA 44 (DMRB 4.1.1)</i>	<i>Earthworks: Design and Preparation of Contract Documents</i>
Traffic Signals	TD 50 (DMRB 6.2)	The Geometric Layout of Signal-Controlled Junctions and Signalised Roundabouts
Vehicle Safety Fences/ Safety Barriers	TD 19 (DMRB 2.2)	Safety Fences and Barriers

Note: Advice Notes, indicated in italics, have not formally been implemented for use in Ireland. However, they may provide useful background information.

Table 1 : Features Commonly Occurring in the Road Cross-section (Continued)

3. CROSS-SECTIONS ON OPEN ROADS

General

3.1 Figures 5 to 12 show the locations of the elements within the road cross-section and Tables 2 to 5 give detailed dimensions for each element. The information covers most types of national road, including rural motorways, rural all-purpose roads, urban motorways and urban all-purpose dual carriageway roads, together with associated interchange links, loops and on and off slip roads.

3.1A Wide Dual Carriageway and Wide Motorway cross-sections will normally be used only where adjacent lengths of road are of equivalent cross-section. The use of these cross-sections shall be agreed with the National Roads Authority in each case.

3.2 The cross-section of a side road, which is not a national road and is diverted or improved on-line as part of a national road scheme, should be agreed with the National Roads Authority and the relevant Road Authority. A suggested cross-section is illustrated in Annex A.

Pavement Width

3.3 The width of the paved elements of the cross-section, i.e. carriageways, hard shoulders and hard strips, shall normally be in accordance with the requirements of this Standard. Any reduction or increase in the width of these elements is a Departure from Standard, unless the increase results from the requirements of Paragraph 3.6.

Traffic Lane Widths

3.4 Traffic lane widths shall be as detailed in Figures 5 to 7.

3.5 Information on the start and finish of climbing lanes incorporated into single and dual carriageway roads can be found in NRA TD 9 (NRA DMRB 6.1.1).

3.6 Traffic lanes shall be widened on curves of low radius to allow for the swept path of long vehicles. See NRA TD 9 (NRA DMRB 6.1.1) and TD 42 (DMRB 6.2.6).

Changes of Carriageway Edge Treatment

3.7 Where slip roads, interchange links and loop roads join or leave main carriageways, the edge detail may change from hard shoulder to hard strip or carriageway edge.

3.8 Transitions between different edge details should take place over the length of the taper.

3.9 (Not used).

3.10 See TD 22 (DMRB 6.2.1) for layouts of merges and diverges.

Work Space, Side Slope, Verge and Central Reserve Widths

3.11 Work space and side slope widths should be chosen to match the local situation. For verges and central reserves, however, the widths given in Tables 2 to 5 should be the first option considered, although other dimensions may be used in circumstances where this would be preferable. These circumstances might range from a need to minimise landtake to a requirement to accommodate a large amount of equipment and features in a location where land is not so limited.

3.12 The use of a verge or central reserve width greater than the desirable width is not a Relaxation or Departure. Reference should be made to TD 42 (DMRB 6.2.6) for guidance on widening the central reserve at major/minor junctions on dual carriageway all-purpose roads.

3.13 There may be benefits in using dimensions less than the desirable widths for verges or central reserves, and these cases shall be regarded as Relaxations. The requirements of other Standards may limit the scope for width reductions. For example, space may be needed for roadside features and the safety fences to protect them.

3.14 Variations of verge and central reserve widths in close succession should be avoided. The designer should consider how the scheme will integrate with adjacent highway sections and the route as a whole.

3.15 Provision for pedestrians and cyclists should be made where a local need has been identified. The width and location of such provision should have the agreement of both the local Road Authority and the National Roads Authority.

Urban Areas

3.16 All purpose roads in urban areas should be provided with raised verges and footways with the widths given in Table 1A.

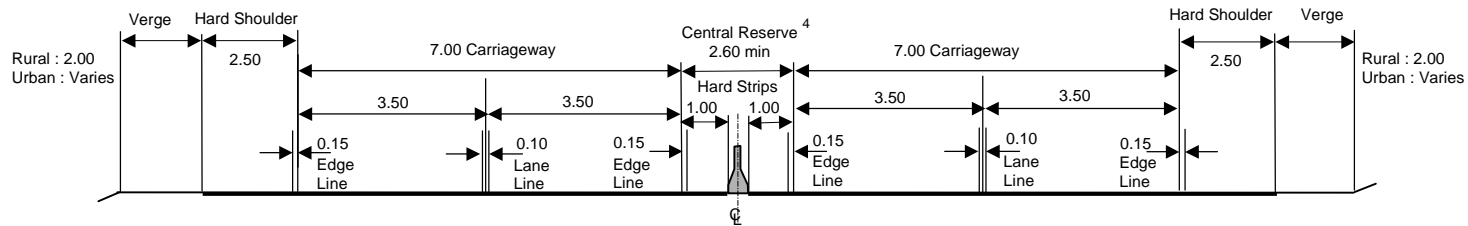
3.17 In urban areas there may be numerous items of street furniture within the highway cross-section.

3.18 See NRA TD 9 (NRA DMRB 6.1.1) and Roads and Traffic in Urban Areas for further advice on designing urban single and dual carriageway roads.

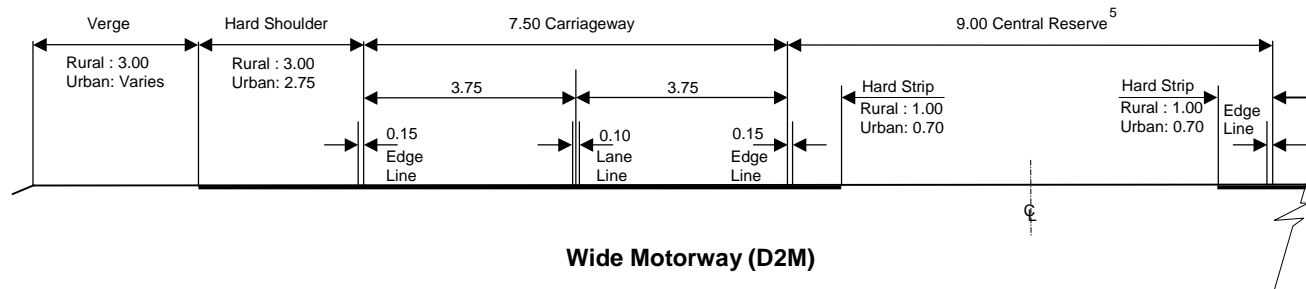
Pedestrian Usage	Overall Verge Width	Footway Width
Regular	3.00m min	1.65m min
Occasional	2.50m min	1.50m min

Note: Regular Usage occurs where there is a clearly defined local need with a predicted maximum flow of 25 or more pedestrians per hour, or footways are provided on contiguous sections.

Table 1A : Verge and Footway Widths on Urban Roads



Standard Motorway (D2M)



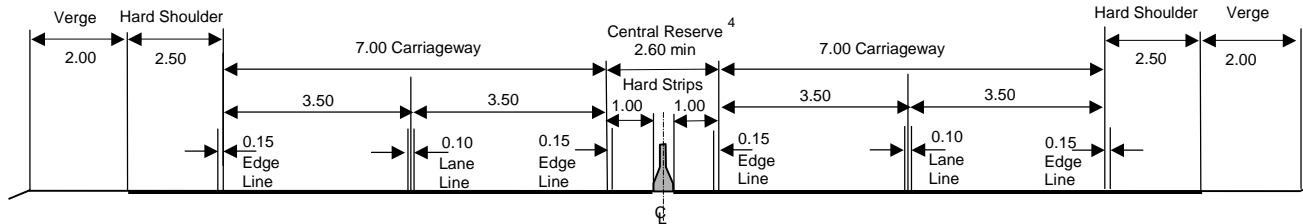
Wide Motorway (D2M)

Notes

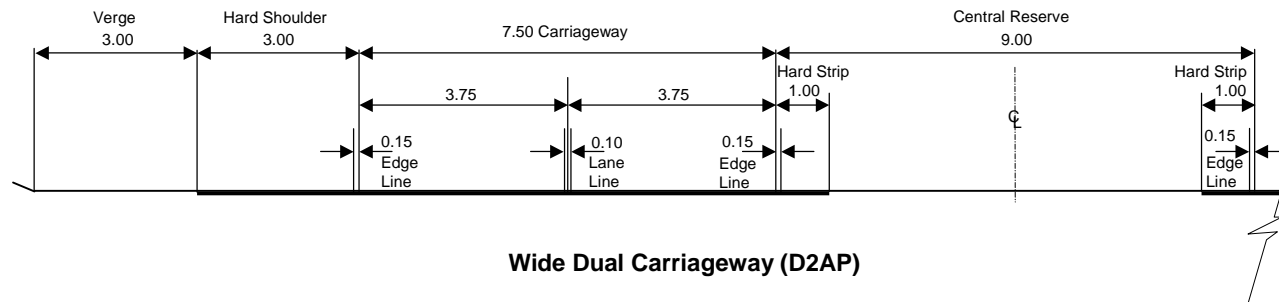
1. All dimensions are in metres.
2. See Tables 2 and 4 for dimensions of cross-section elements.
3. For details of road markings see the Traffic Signs Manual.
4. Width of central reserve for a Standard Motorway is determined by the type of safety fence or barrier; see TD 19 (DMRB 2.2). It is suggested that a width of 3.00m be assumed for preliminary designs.
5. Central reserve for a wide Motorway is 16.00m wide where provision is made for future widening to dual three lanes.

FIGURE 5

**LANE WIDTHS AND CARRIAGEWAY MARKINGS:
RURAL AND URBAN MOTORWAYS (MAINLINE)**



Standard Dual Carriageway (D2AP)

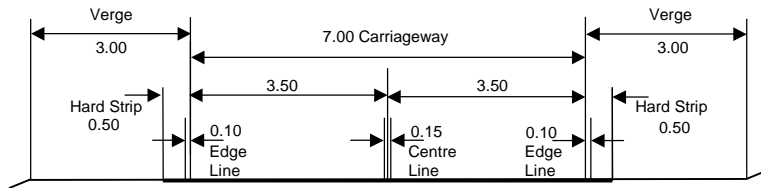


Wide Dual Carriageway (D2AP)

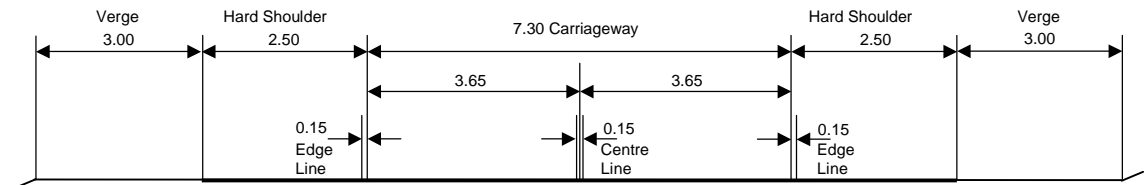
Notes

1. All dimensions are in metres.
2. See Table 3 for dimensions of cross-section elements
3. For details of road markings see the Traffic Signs Manual.
4. Width of central reserve for a Standard Dual Carriageway is determined by the type of safety fence or barrier: see TD 19 (DMRB 2.2). It is suggested that a width of 3.00m be assumed for preliminary designs.

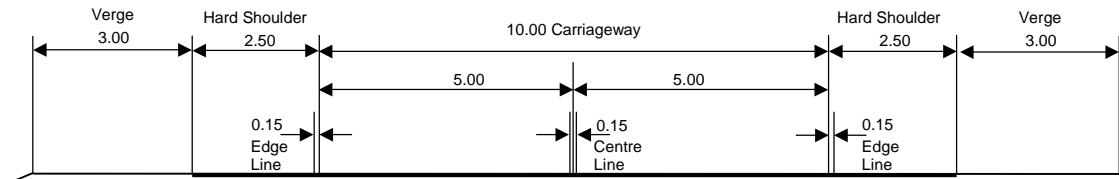
FIGURE 6
LANE WIDTHS AND CARRIAGEWAY MARKINGS:
RURAL ALL-PURPOSE ROADS (MAINLINE)



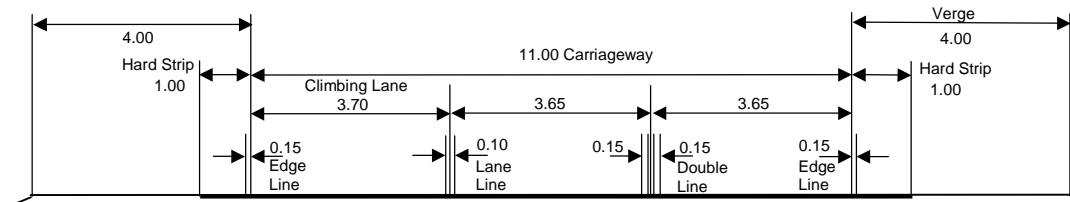
Reduced Single Carriageway (S2)



Standard Single Carriageway (S2)



Wide Single Carriageway (WS2)

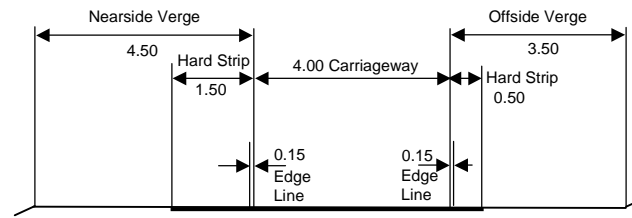


Climbing Lane Section on Standard S2

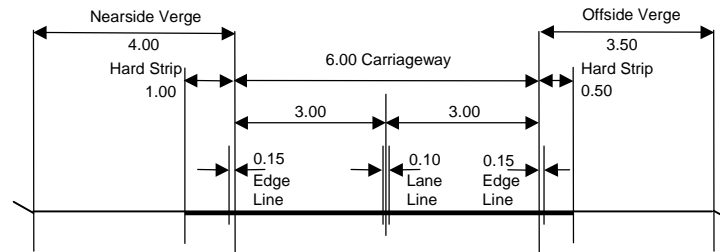
Notes

1. All dimensions are in metres.
2. See Table 3 for dimensions of cross-section elements
3. For details of road markings see the Traffic Signs Manual.
4. For lane widths of climbing lane sections on WS2 and reduced S2 see NRA TD9 (NRA DMRB 6.1.1).

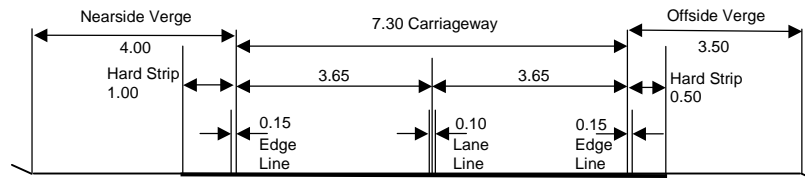
FIGURE 6A
LANE WIDTHS AND CARRIAGEWAY MARKINGS:
RURAL ALL-PURPOSE ROADS (MAINLINE)



Slip Roads, Interchange Links and Loops : 1 Lane



Diverge Slip Roads Only : 2 Lane



Slip Roads, Interchange Links And Loops : 2 Lane

FIGURE 7
LANE WIDTHS AND CARRIAGEWAY MARKINGS:
RURAL MOTORWAY AND ALL-PURPOSE SLIP ROADS,
INTERCHANGE LINKS AND LOOPS

Notes

1. All dimensions are in metres.
2. See Tables 2 and 3 for dimensions of cross-section elements.
3. For details of road markings see the Traffic Signs Manual.

Table 2
Dimensions of Cross-Section Elements for
Rural Motorways
Including Slip Roads, Interchange Links and Loops

	Nearside			Carriageway ²	Offside		Central Reserve ^{1,4}
	Verge ^{1,4}	Hard Strip ²	Hard Shoulder ²		Hard Strip ²	Verge ^{1,4}	
MAINLINES							
Standard Motorway (D2M)	2.00		2.50	7.00	1.00	-	2.60 min ⁵
Wide Motorway (D2M)	3.00	-	3.00	7.50	1.00	- ³	9.00
Wide Motorway (D2M) (with provision for extra lane)	3.00	-	3.00	7.50	1.00	- ³	16.00
SLIP ROADS, INTERCHANGE LINKS AND LOOPS: MERGES AND DIVERGES							
1 Lane	4.50	1.50	-	4.00	0.50	3.50	-
2 Lane	4.00	1.00	-	7.30	0.50	3.50	-
SLIP ROADS: DIVERGE ONLY							
2 Lane	4.00	1.00	-	6.00	0.50	3.50	-

- Notes:
1. Verge and central reserve dimensions are desirable values: any reduction is a Relaxation.
 2. Carriageway, hard shoulder and hard strip dimensions are fixed values: any alternative is a Departure.
 3. For details of offside verges at divided structures, see Paragraph 4.12 and Table 6.
 4. Where a hard strip is present, the corresponding verge or central reserve dimension includes the hard strip. However, where a hard shoulder is present, the corresponding verge dimension does not include the hard shoulder.
 5. Width of central reserve on Standard Motorway is determined by the type of safety fence or barrier. See TD 19 (DMRB 2.2). It is suggested that a width of 3.00m be assumed for preliminary designs.
 6. For guidance on selection of slip roads and interchange link and loop roads, see TD 22 (DMRB 6.2.1).
 7. All dimensions are in metres.

Table 3
Dimensions of Cross-Section Elements for
Rural All-Purpose Roads
Including Slip Roads, Interchange Links and Loops

	Nearside			Carriageway ²	Offside		Central Reserve ^{1,4}
	Verge ^{1,4}	Hard Strip ²	Hard Shoulder ²		Hard Strip ²	Verge ^{1,4}	
MAINLINES							
Reduced Single (S2)	3.00	0.50	-	7.00	-	-	-
Standard Single (S2)	3.00	-	2.50	7.30	-	-	-
Wide Single (WS2)	3.00	-	2.50	10.00	-	-	-
Standard Dual Carriageway (D2AP)	2.00	-	2.50	7.00	1.00	- ³	2.60 min ⁵
Wide Dual Carriageway (D2AP)	3.00	-	3.00	7.50	1.00	- ³	9.00
SLIP ROADS, INTERCHANGE LINKS AND LOOPS: MERGES AND DIVERGES							
1 Lane	4.50	1.50	-	4.00	0.50	3.50	-
2 Lane	4.00	1.00	-	7.30	0.50	3.50	-
SLIP ROADS: DIVERGE ONLY							
2 Lane	4.00	1.00	-	6.00	0.50	3.50	-

- Notes:
1. Verge and central reserve dimensions are desirable values: any reduction is a Relaxation.
 2. Carriageway, hard shoulder and hard strip dimensions are fixed values: any alternative is a Departure.
 3. For details of offside verges at divided structures, see Paragraph 4.12 and Table 6.
 4. Where a hard strip is present, the corresponding verge or central reserve dimension includes the hard strip. However, where a hard shoulder is present, the corresponding verge dimension does not include the hard shoulder.
 5. Width of central reserve on Standard Dual Carriageway is determined by the type of safety fence or barrier. See TD 19 (DMRB 2.2). It is suggested that a width of 3.00m be assumed for preliminary designs.
 6. For guidance on selection of slip roads and interchange link and loop roads, see TD 22 (DMRB 6.2.1).
 7. All dimensions are in metres.

Table 4
Dimensions of Cross-Section Elements for
Urban Motorways
Including Slip Roads, Interchange Links and Loops

Motorways up to 85km/h Design Speed	Nearside			Carriageway ²	Offside		Central Reserve ^{1,4}
	Verge	Hard Strip ²	Hard Shoulder ²		Hard Strip ²	Verge	
MAINLINES Standard Motorway (D2UM)	Varies	-	2.50 ³	7.00	1.00	- ⁶	2.60 min ⁵
SLIP ROADS, INTERCHANGE LINKS AND LOOPS: MERGES AND DIVERGES							
1 Lane	Varies	1.50	-	4.00	0.50	Varies	-
2 Lane	Varies	1.00	-	7.30	0.50	Varies	-
SLIP ROADS: DIVERGE ONLY							
2 Lane	Varies	1.00	-	6.00	0.50	Varies	-

- Notes:
1. Central reserve dimensions are desirable values: any reduction is a Relaxation.
 2. Carriageway and hard strip dimensions are fixed values: any alternative is a Departure.
 3. In difficult and restricted areas, where due consideration has been given to the maintenance requirements, the hard shoulder width may exceptionally be Relaxed to 2.0m. Any other changes of width are a Departure.
 4. The central reserve dimension includes the offside hard strip.
 5. Width of central reserve is determined by the type of safety fence or barrier. See TD 19 (DMRB 2.2). It is suggested that a width of 3.00m be assumed for preliminary designs.
 6. For details of offside verges at divided structures, see Paragraph 4.12 and Table 6.
 7. For guidance on selection of slip roads and interchange link and loop roads, see TD 22 (DMRB 6.2.1).
 8. All dimensions are in metres.

Table 5
Dimensions of Cross-Section Elements for
Urban All-Purpose Dual Carriageway Roads
Including Slip Roads, Interchange Links and Loops

All-Purpose Roads Up to 85km/h	Nearside			Carriageway ²	Offside		Central Reserve ¹
	Verge ³	Hard Strip ²	Hard Shoulder ²		Hard Strip ²	Verge ³	
MAINLINES							
Dual 2 Lane (D2AP)							
With CR Lighting Cols	Varies	-	-	7.50	-	- ⁴	2.60
No CR Lighting Cols	Varies	-	-	7.50	-	- ⁴	1.80
Dual 3 Lane (D3AP)							
With CR Lighting Cols	Varies	-	-	11.25	-	- ⁴	2.60
No CR Lighting Cols	Varies	-	-	11.25	-	- ⁴	1.80
SLIP ROADS, INTERCHANGE LINKS AND LOOPS: MERGES AND DIVERGES							
1 Lane	Varies	1.50	-	4.00	0.50	Varies	-
2 Lane	Varies	1.00	-	7.30	-	Varies	-
SLIP ROADS: DIVERGE ONLY							
2 Lane	Varies	1.00	-	6.00	-	Varies	-

- Notes:
1. Central reserve dimensions are desirable values: any reduction is a Relaxation.
 2. Carriageway, hard shoulder and hard strip dimensions are fixed values: any alternative is a Departure.
 3. Verge width shall be determined to take account of the uses and clearances required. See also Table 1A.
 4. For details of offside verges at divided structures, see Paragraph 4.12 and Table 6.
 5. For guidance on selection of slip roads and interchange link and loop roads, see TD 22 (DMRB 6.2.1).
 6. All dimensions are in metres.

4. CROSS-SECTIONS AT STRUCTURES

General

4.1 The cross-sections detailed in Figures 8 to 12 and Table 6 assume a straight horizontal alignment of the carriageway. If this is not the case the verges and central reserve may require widening to give the stopping sight distances required in accordance with NRA TD 9 (NRA DMRB 6.1.1).

4.2 Variations of cross-section provision at bridges in close succession shall be avoided except where sight distance requirements dictate otherwise. The verge and central reserve widths appropriate for the longest structure shall be used. Individual cases shall be treated on their merits.

4.3 The requirements of this Standard are not applicable to road tunnels.

Non-National Side Roads

4.4 The cross-section at a structure of a side road, which is not a national road and is diverted or improved on-line as part of a national road scheme, should be agreed with the National Roads Authority and the relevant Road Authority. See Annex A for general guidance.

Traffic Lane Widths

4.5 Lane widths shall be maintained through or over a structures.

4.6 (Not used).

Hard Shoulders and Hard Strips

4.7 Where hard shoulders or hard strips are provided adjacent to the edges of the carriageway they shall be continued at the same width through or over the structure.

Central Reserves

4.8 The width of central reserve applicable to the adjacent open road section should be continued through or over the structure, except in the case of long underbridges, where the width may be reduced to a minimum of 2.6m.

Verges at Underbridges and Overbridges

4.9 In planning the overall width required, consideration should be given to the space necessary for structural elements of the bridge, including: foundations, items such as bridge joints, drainage runs, electrical equipment and services, and safety fences or safety barriers. Consideration should also be given to maintenance operation needs.

4.10 On all-purpose road overbridges, underbridges, elevated roads and viaducts, the nearside verge will need to provide a clear width for pedestrian access. The width can be varied depending upon the overall length of the structure and the likely pedestrian flows as indicated in Paragraphs 4.10A to 4.13C. Provision may also need to be made for pedal cyclists.

4.10A **Regular** pedestrian usage on an all-purpose road occurs where there is a clearly defined local need with a predicted maximum flow of more than 25 pedestrians per hour and/or footways are provided, or are to be provided, on contiguous sections of road. **Occasional** pedestrian usage occurs at other locations.

4.11 Verge widths may need to be increased to allow adequate visibility, particularly where a bridge is located on a horizontal curve.

Verges at Underbridges

4.12 On underbridges the part of the verge adjacent to the bridge parapet shall be raised with a maximum kerb height of 75mm. The widths given in Table 6 for the raised verge should be the first option considered. Any reduction in width shall be regarded as a Relaxation.

Road Type	Location	Pedestrian Usage (see Paragraph 4.10A)	Bridge Length m	Raised Verge Width m
Motorway	Nearside	-	All	0.60
	Offside	-	All	0.60
All-Purpose Road	Nearside	Regular	100	2.00
		Regular	> 100	1.50
Occasional		All	1.50	
	Offside	All	All	0.60

Table 6 : Verge Widths at Underbridges

Verges at Overbridges

4.13 At overbridges the verge width shall be not less than 2.0m and shall also comply with the following arrangements where applicable.

4.13A At overbridges where an abutment is adjacent to the carriageway:

- a) the distance from the edge of road pavement to the face of the abutment shall be not less than 4.50m.
- b) where there is regular pedestrian usage, a paved footway of 1.65m minimum clear width shall be provided on the nearside verge behind any safety fence.

4.13B At overbridges where a pier is adjacent to the carriageway:

- a) the distance from the edge of road pavement to the face of the pier shall be determined to suit the safety fence set-back and working width. Working width is the distance from the traffic face of the safety fence to the maximum dynamic deflected position of the fence after impact.

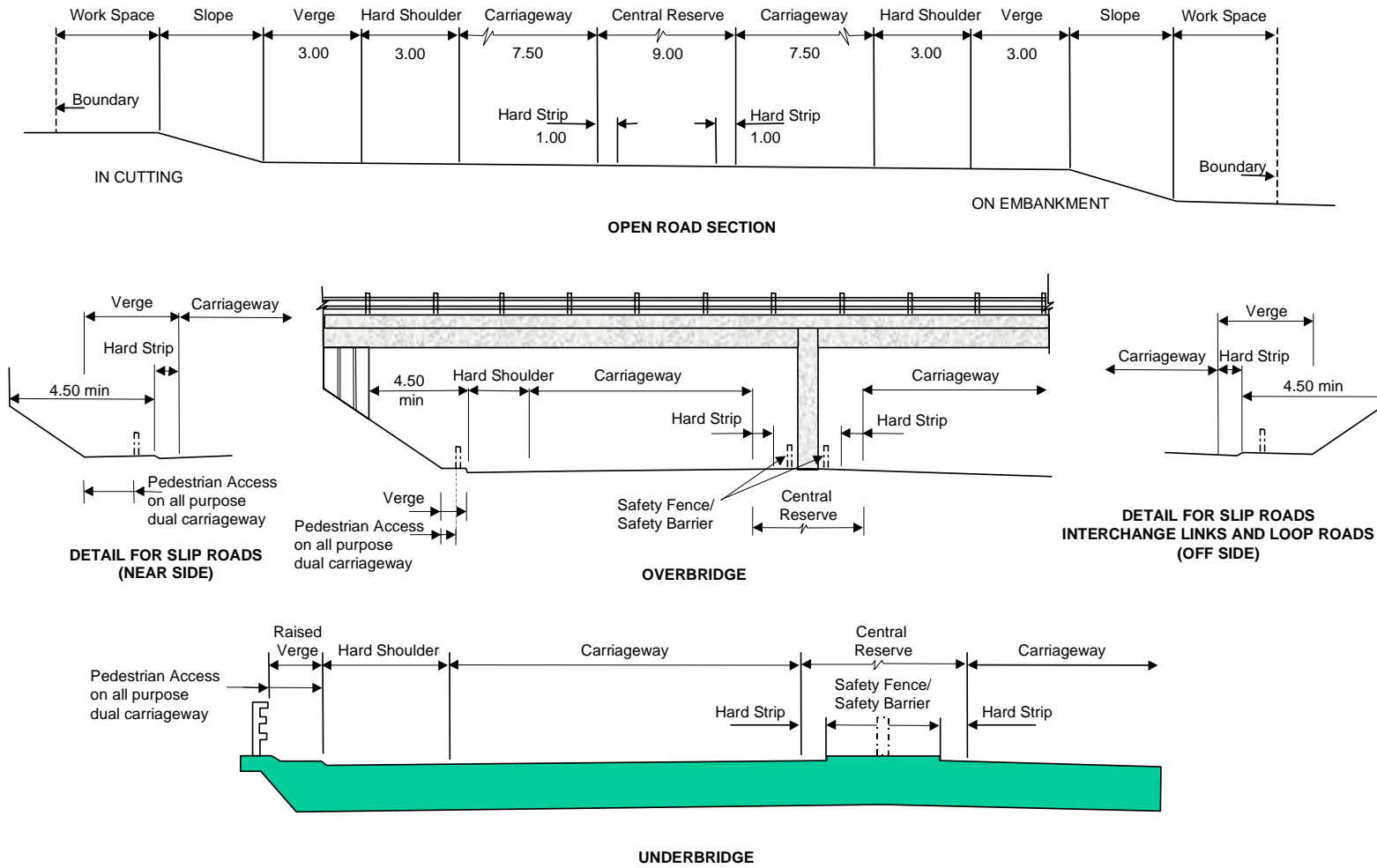
- b) where there is regular pedestrian usage, a paved footway of 1.65m minimum clear width shall be provided on the nearside through the span away from the main carriageway. In cuttings it may be necessary to introduce a small retaining wall alongside the footway, to avoid the need to widen the cutting.

4.13C Provision may also be needed for pedal cyclists, in which case this should normally be located alongside the footway.

Safety Fences, Safety Barriers and Bridge Parapets

4.14 Safety fences, safety barriers and bridge parapets shall be positioned in accordance with the requirements of TD 19 (DMRB 2.2) and BD 52 (DMRB 2.3.3).

(Table 7 not used).



NOTES:

1. See Figures 5 and 6 for lane widths, edge and lane line details.
2. See Tables 2 and 3 for dimensions of cross-sectional elements.
3. All dimensions are in metres.

FIGURE 8
CROSS SECTION ELEMENTS OF WIDE RURAL MOTORWAYS AND WIDE DUAL CARRIAGEWAYS

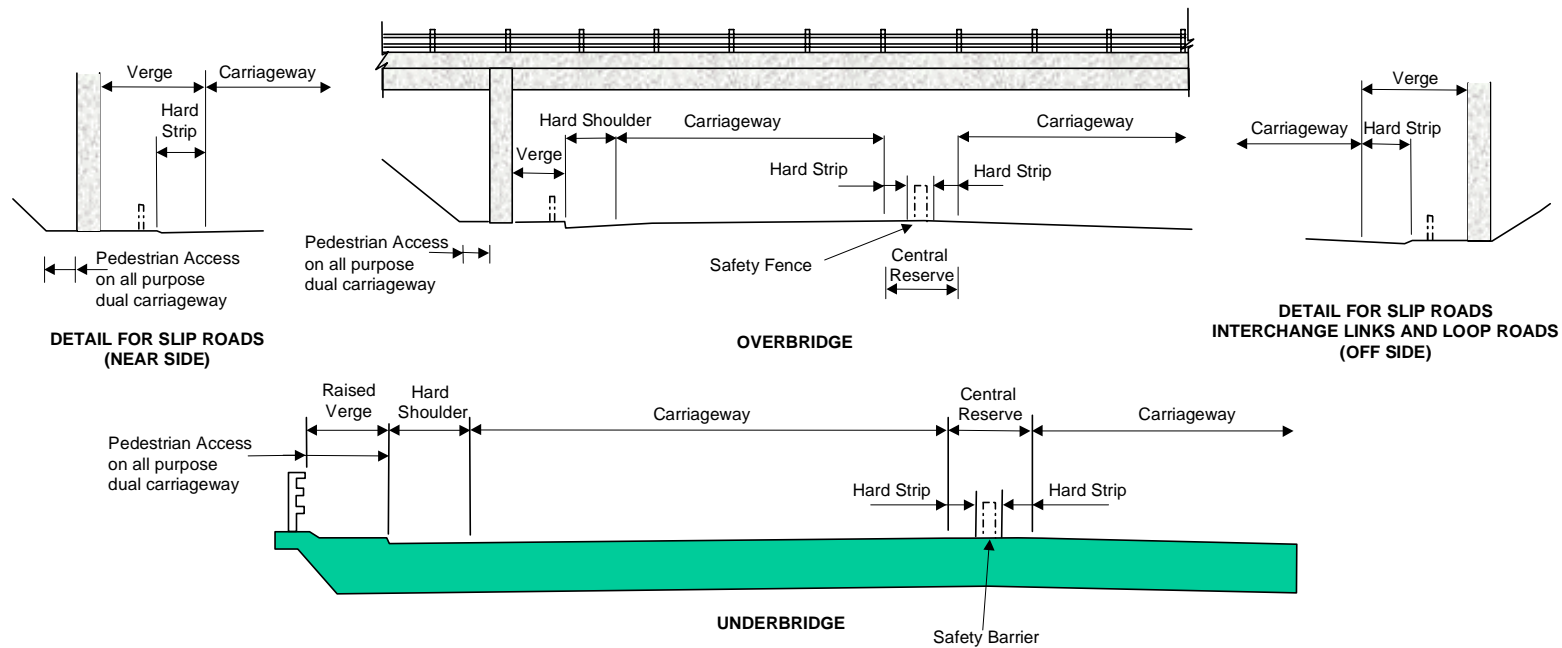
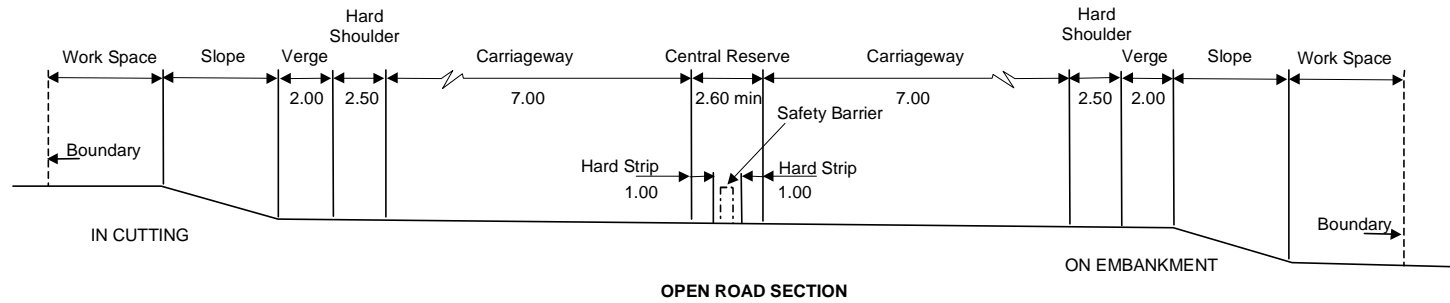
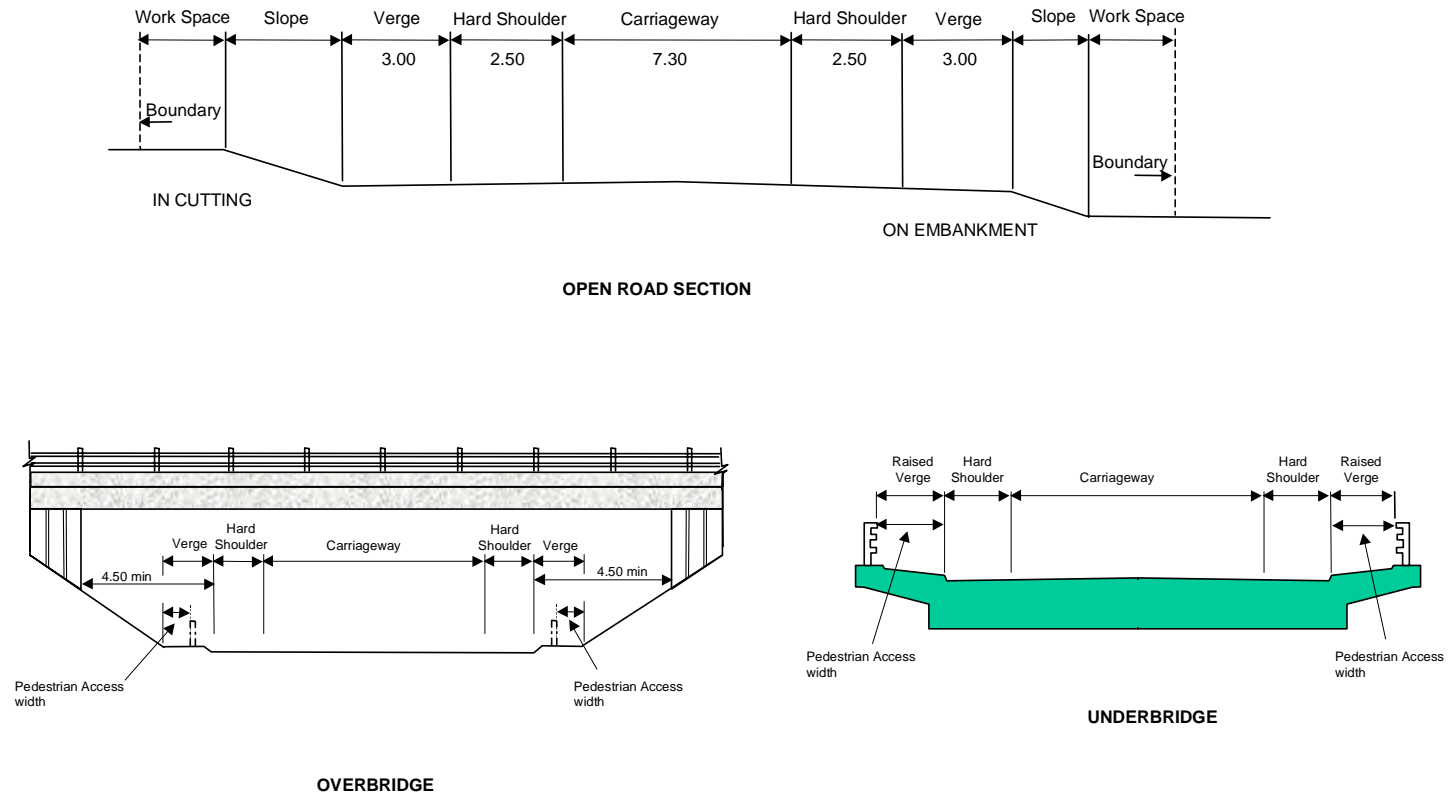


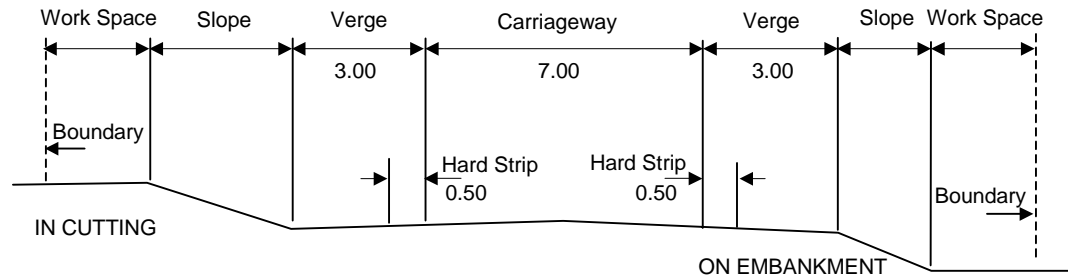
FIGURE 9
CROSS SECTION ELEMENTS OF RURAL STANDARD MOTORWAYS AND STANDARD DUAL CARRIAGEWAYS

- NOTES:
1. See Figures 5 and 6 for lane widths, edge and lane line details.
 2. See Tables 2 and 3 for dimensions of cross-sectional elements.
 3. All dimensions are in metres.

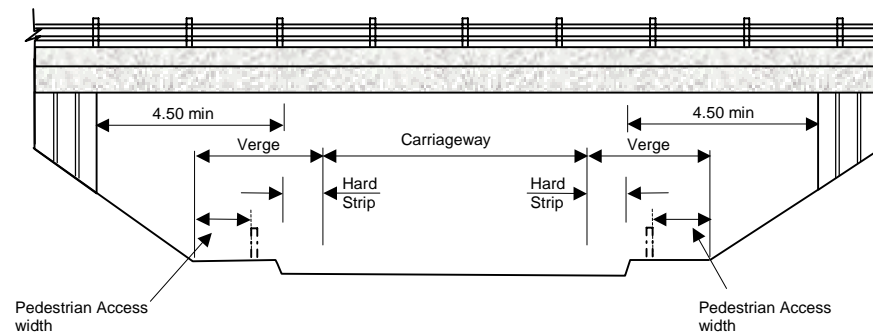


- NOTES:
1. See Figure 6A for lane widths, edge and lane line details.
 2. See Table 3 for dimensions of cross-sectional elements.
 3. All dimensions are in metres.

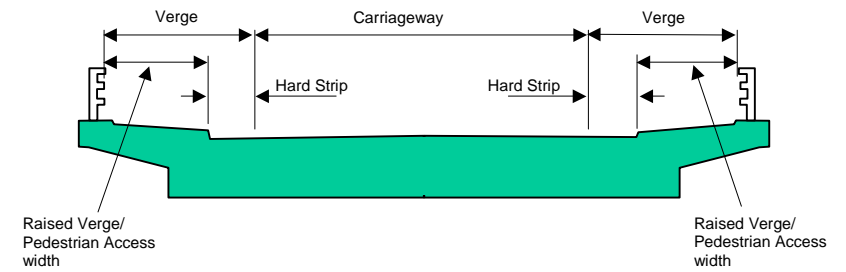
FIGURE 10
CROSS SECTION ELEMENTS OF RURAL STANDARD
SINGLE CARRIAGEWAY ROADS



OPEN ROAD SECTION



OVERBRIDGE



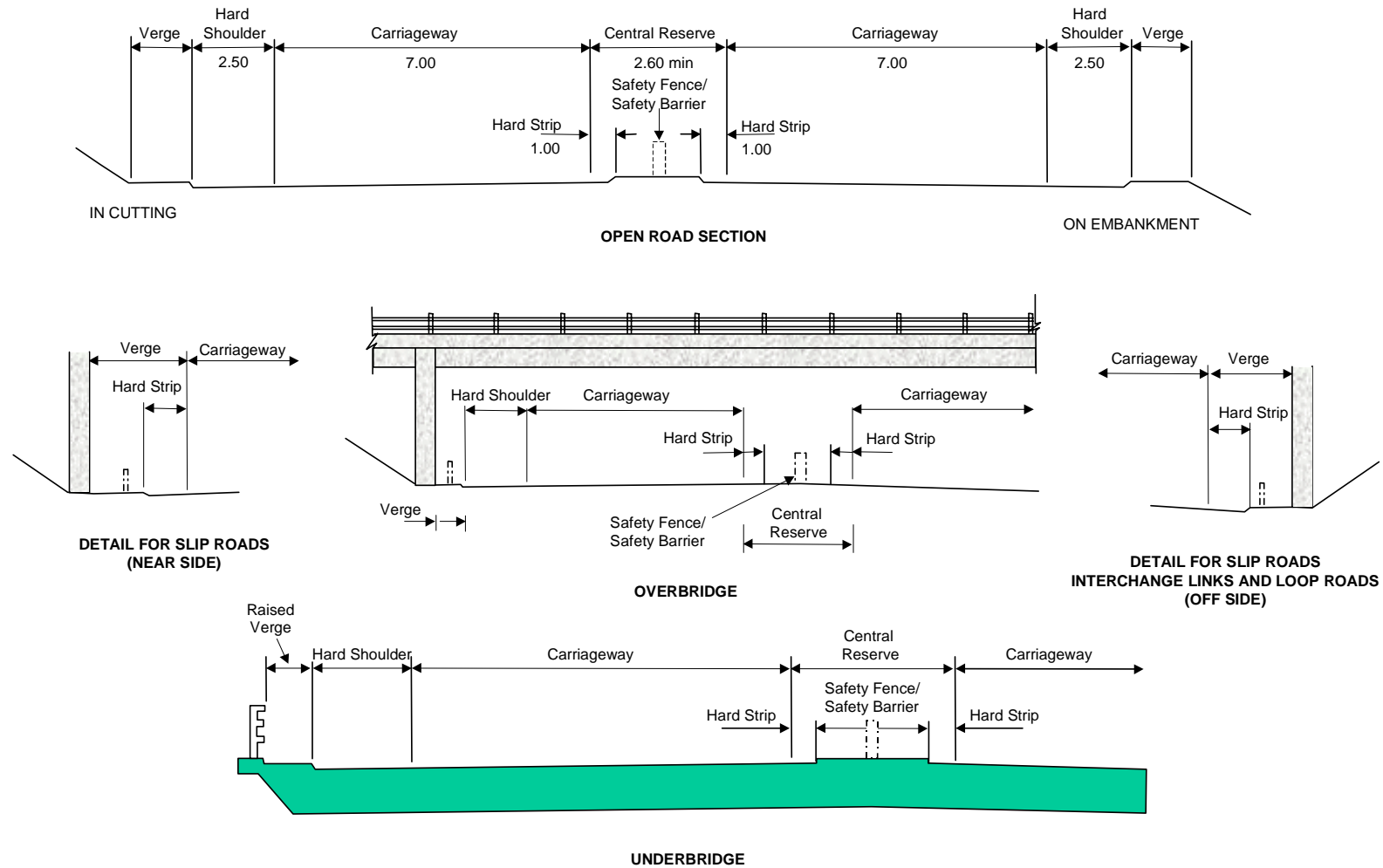
UNDERBRIDGE

NOTES:

1. See Figure 6A for lane widths, edge and lane line details.
2. See Table 3 for dimensions of cross-sectional elements.
3. All dimensions are in metres.

FIGURE 10A

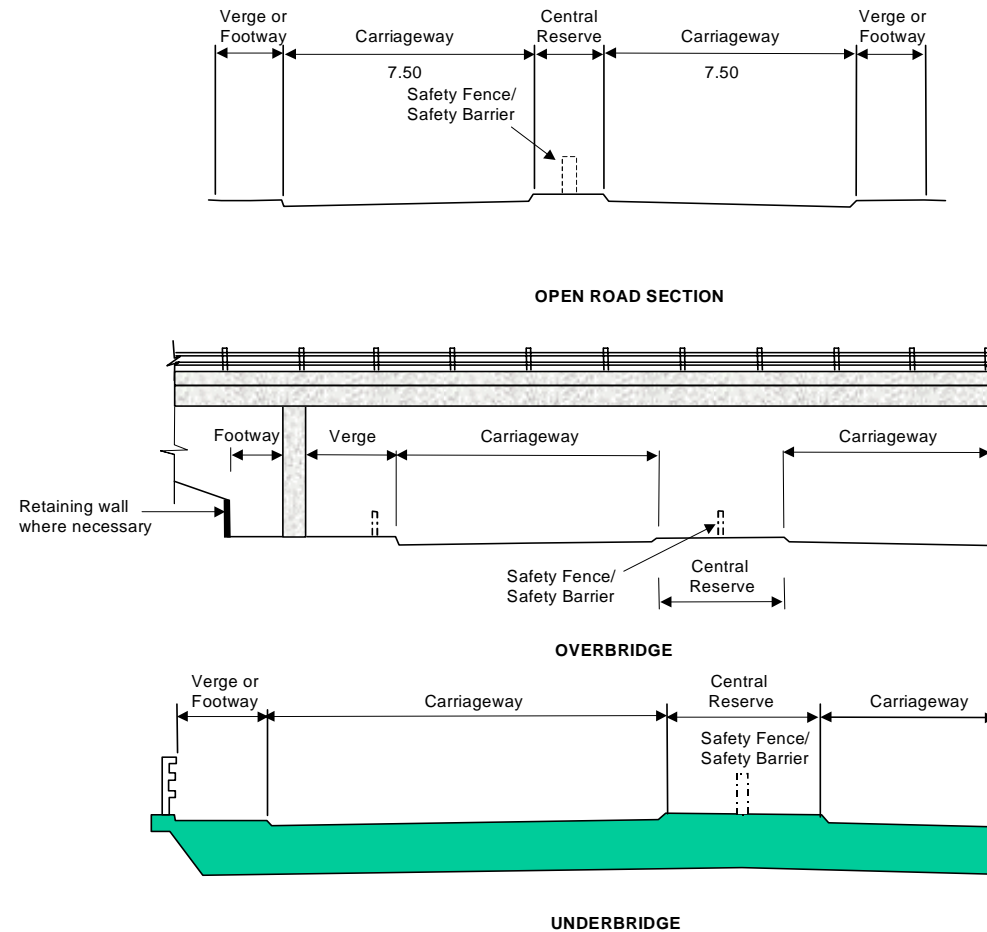
CROSS SECTION ELEMENTS OF RURAL REDUCED SINGLE CARRIAGEWAY ROADS



NOTES:

1. See Figure 5 for lane widths, edge and lane line details.
2. See Table 4 for dimensions of cross-sectional elements.
3. All dimensions are in metres.

FIGURE 11
CROSS SECTION ELEMENTS OF URBAN MOTORWAYS
(Up to 85kph Design Speed)



- NOTES:
1. See Table 5 for dimensions of cross-sectional elements.
2. All dimensions are in metres.

FIGURE 12

CROSS SECTION ELEMENTS OF URBAN ALL-PURPOSE DUAL CARRIAGEWAY ROADS

5. HEADROOM AT STRUCTURES

General

5.1 Dimensional standards are given in Table 8 for “new construction headroom” and “maintained headroom” at overbridges and at other structures over a road.

Type of Structure	New Construction Headroom (m)	Maintained Headroom (m)
Overbridges	5.30	5.03
Footbridges and Sign/Signal Gantries	5.70	5.41
Free Standing Temporary Structures	N/A	5.41
All Permanent Structures over High Load Routes	6.45	6.18

Table 8:
Standard Headroom At Structures

5.2 The headroom provision at underbridges shall be agreed with the relevant Road, Railway or Water Authority.

5.3 The headrooms given are the minimum; where it is economical and/or environmentally acceptable, greater headroom should be provided.

5.4 The requirements of this Standard are not applicable to road tunnels.

Dimensional Requirements

5.5 Headroom shall be measured at right-angles to the surfaces of the carriageway, hard shoulder, hard strip, verge or central reserve, at the point where it is a minimum.

5.6 The relevant standard headroom in Table 8 shall be provided:

- (a) Over the paved carriageway, hard shoulder or hard strip;
- (b) Over the full verge width, except where (e) applies;
- (c) Over the central reserve of a dual carriageway, except where (e) applies;
- (d) Between the carriageway and the pier or abutment face where such a support is located within 4.5m of the edge of the road pavement, except where (e) applies;
- (e) Up to the back of the working width of a safety fence, when installed (see Figure 13). The working width is the distance from the traffic face of the safety fence to the maximum deflected position of the fence after impact.

5.7 The headroom to be provided at a structure on a “high load route” shall be as given in Table 8.

5.8 The headroom standards for pedestrian subways and combined pedestrian/cycle subways are contained in TD 36 (DMRB 6.3.1). Guidance on the headroom requirement for equestrian usage is contained in TA 57 (DMRB 6.3).

5.9 (Not used.)

Compensation for Vertical Sag Curvature and Deflection

5.10 Where the road passing underneath a structure is on a sag curve, the headrooms in Table 8 shall be increased in accordance with Table 9. The sag radius is measured along the carriageway over a 25m chord.

Sag Radius (m)	Additional Clearance (mm)
1000	80
1200	70
1500	55
2000	45
3000	25
6000	15
>6000	Nil

**Table 9:
Sag Radius Compensation**

5.11 Allowances shall be made for the deflection of structures. The minimum headroom shall be maintained for the serviceability limit state under the action of load combination 1 specified in BD 37 (DMRB 1.3).

Utilities Companies' and Other Authorities' Apparatus

5.12 Greater headroom than that determined from Paragraphs 5.1 to 5.11 may be required by a Utility Company or other Authority. Any increase in the headroom dimension shall be agreed with the National Roads Authority.

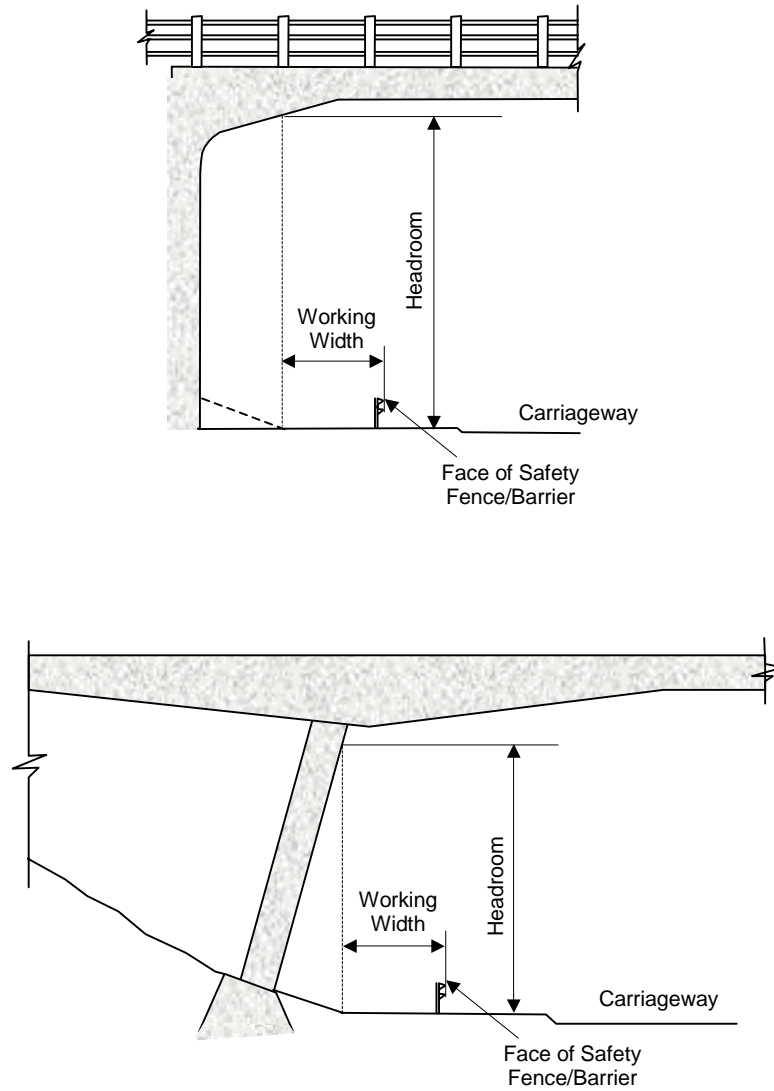


FIGURE 13

HEADROOM AT STRUCTURES

6. REFERENCES

6.1 Design Manual for Roads and Bridges (DMRB):

Volume 1 : Highway Structures : Approval Procedures and General Design:

BD 37 (DMRB 1.3) – Loads for Highway Bridges.

Volume 2 : Highway Structures : Design (Substructures and Special Structures) Materials:

BD 26 (DMRB 2.2.1) – Design of Lighting Columns.

BA 48 (DMRB 2.2.2) – Pedestrian Protection at Head Walls, Wing Walls and Retaining Walls.

BD 51 (DMRB 2.2.4) – Design Criteria for Portal and Cantilever Sign/Signal Gantries.

BD 29 (DMRB 2.2) - Design Criteria for Footbridges.

TD 19 (DMRB 2.2) - Safety Fences and Barriers.

BD 52 (DMRB 2.3.3) – The Design of Highway Bridge Parapets.

Volume 4 : Geotechnics and Drainage:

HA 44 (DMRB 4.1.1) – Earthworks : Design and Preparation of Contract Documents.

HD 33 (DMRB 4.2.3) – Surface and Sub-surface Drainage Systems for Highways.

HA 37 (DMRB 4.2) – Hydraulic Design of Road Edge Surface Water Channels.

Volume 6 : Road Geometry:

NRA TD9 (NRA DMRB 6.1.1) – Road Link Design.

TD 22 (DMRB 6.2.1) – Layout of Grade Separated Junctions.

TD 50 (DMRB 6.2.3) – The Geometric Layout of Signal-Controlled Junctions and Signalised Roundabouts.

TD 42 (DMRB 6.2.6) – Geometric Design of Major/Minor Priority Junctions.

TD 36 (DMRB 6.3.1) – Subways for Pedestrians and Pedal Cyclists. Layout and Dimensions.

TA 66 (DMRB 6.3.2) – Police Observation Platforms on Motorways.

TA 69 (DMRB 6.3.3) – The Location and Layout of Lay-bys.

TA 57 (DMRB 6.3) –Roadside Features.

Volume 8 :Traffic Signs and Lighting:

TA 56 (DMRB 8.2) – Hazardous Cattle Crossings : Use of Flashing Amber Lamps.

TD 30 (DMRB 8.3) – Design of Road Lighting for All-Purpose Trunk Roads.

TD 34 (DMRB 8.3) – Design of Road Lighting for Motorway Trunk Roads.

Volume 9 : Network - Traffic Control and Communications:

HD 20 (DMRB 9.3.1) – Loop Detectors for Motorways.

Volume 10 : Environmental Design:

HA 59 (DMRB 10.1.5) – Nature Conservation.

6.2 Other References

BS 5489 : Part 1, Road Lighting: Guide to the General Principles. British Standards Institution.

BS 5649 : Parts 1 – 7, Lighting Columns. British Standards Institution.

BS 6100 : Subsection 2.4.1, Glossary of Building and Civil Engineering Terms: Highway Engineering. British Standards Institution.

BS 6779 : Parts 1 – 3, Highway Parapets for Bridges and Other Structures. British Standards Institution.

BS 7818, Specification for Pedestrian Restraint Systems in Metal. British Standards Institution.

IS EN 40, Lighting Columns. National Standards Authority of Ireland.

NRA Manual of Contract Documents for Road Works, Volume 4: Road Construction Details. National Roads Authority.

Roads and Traffic in Urban Areas. The Stationery Office, London.

Traffic Signs Manual. Department of the Environment and Local Government.

National Roads Project Management Guidelines. National Roads Authority.

7. ENQUIRIES

7.1 All technical enquiries or comments on this Standard should be sent in writing to:

Head of Project Management and Engineering
National Roads Authority
St Martin's House
Waterloo Road
Dublin 4



.....
E O'CONNOR
Head of Project Management and Engineering

ANNEX A : CROSS-SECTIONS FOR NON-NATIONAL ROADS (AS PART OF A NATIONAL ROAD SCHEME)

A1 Figure A1 illustrates a suggested range of cross-sections for use on rural non-national roads which are diverted or improved on-line as part of a national road scheme. The use of these cross-sections should be agreed with the relevant Road Authority and the National Roads Authority in each case.

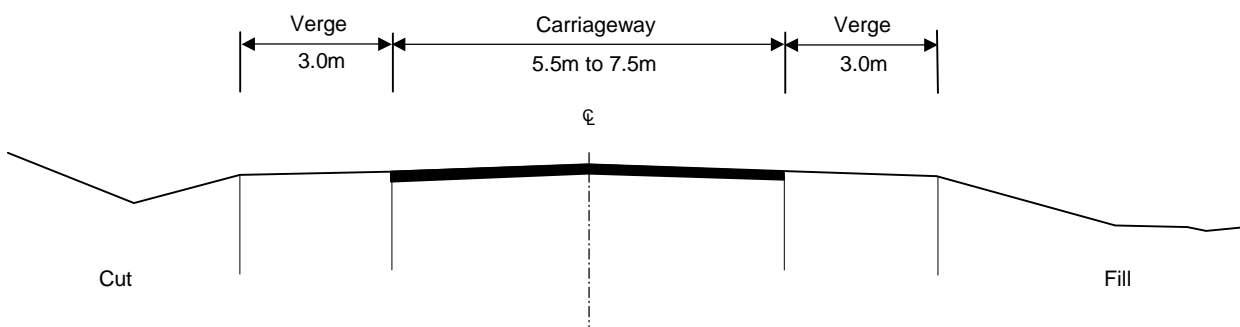


FIGURE A1

RURAL REGIONAL OR LOCAL ROAD

Verge Widths at Structures

- A2 A raised verge should normally be provided adjacent to the parapet at an underbridge or adjacent to the abutment or pier at an overbridge. It is recommended that the raised verge have a minimum width of 0.60m. Provision may also be needed on one or both verges for pedestrians and/or pedal cyclists.
- A3 The recommended minimum width of clear pedestrian access is 2.0m (included within the verge), except where the predicted two-way traffic flow is less than 2,500 vehicles Annual Average Daily Traffic and Occasional pedestrian usage is anticipated, when a width of 1.5m is recommended. Occasional pedestrian usage is defined in Paragraph 4.10A.

