

**Design of
Low Flow Single
Carriageway Roads**

V5.0

November 2009

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Summary:

This Interim Advice Note sets out the design requirements for the design of Low Flow Single Carriageway Roads by reference to the other standards of the NRA DMRB and introducing particular requirements for these road types

NRA IAN 01/09

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1 INTRODUCTION

Design Standards

1.1 This Interim Advice Note applies to major improvement works being carried out on Rural National roads with a Design Year traffic flow of less than 5,000 AADT. It may also be adopted for use on Regional and Local roads.

1.2 The full application of the current NRA DMRB Standards on these low traffic flow roads would result in extensive realignment schemes that could not be justified on environmental or economic grounds. Many of these low-flow roads are located in rugged and scenic terrain of high amenity value for tourism. Equally many of the routes pass through, or adjacent to, areas of special designation, such as special areas of conservation, National Heritage Areas or Special Protection Areas. Implementation of the full NRA DMRB standards would result in excessively high alignment standards that could cause very significant negative impacts on the surrounding areas.

1.3 This Interim Advice Note introduces the new Type 3 Single Carriageway into the NRA menu of road types. It is intended to extend the range of suitable road cross-sections available and to suit the low traffic flows on some sections of the national road network

Definitions

1.4 For the definitions of the general road terms used in this Interim Advice Note, such as components of the road (central reserve, verge, hard shoulder and hard strip, etc.), see BS 6100: Subsection 2.4.1 and NRA TD 9. In addition, the following particular terms are used:

Type 1 Single Carriageway:- A 7.3m wide Single Carriageway, with Hard Shoulders, for use on National Secondary Routes with Design Year Traffic Flows above 8,600 AADT.

Type 2 Single Carriageway:- A 7.0m wide Single Carriageway, with Hard Strips, for use on National Roads with Design Year Traffic Flows below 8,600 AADT.

Type 3 Single Carriageway:- A 6.0m wide Single Carriageway, with Hard Strips, for use on National Roads with Design Year Traffic Flows below 5,000 AADT.

Implementation

1.5 This Interim Advice Note shall be used for the design of all lengths of rural road improvements on national road schemes where it has been agreed with the National Roads Authority that the road is to be designed as a Type 3 Single Carriageway.

1.6 This Interim Advice Note sets out the design requirements for the design of Low Flow Single Carriageway Roads by reference to NRA TD 9 and NRA TD27 and introducing particular requirements for these road types.

1.7 If this Interim Advice Note is to be used for the design of non-national road schemes, the designer should agree with the relevant Road Authority the extent to which the document is appropriate in any particular situation.

Interpretation

1.8 The design of Type 3 Single Carriageway shall be in accordance with the other standards of the NRA DMRB as amended and supplemented by this Interim Advice Note.

Mandatory Sections

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 Standards with the National Roads Authority. The remainder of the document contains advice and enlargement which is commended to Design Organisations for their consideration.

2 AMENDMENTS TO NRA TD9

Introduction

2.1 Page 0/2, Definition for S2:

Delete Definition for S2 and replace with new definition for S2:

S2:- Two lane single carriageway road with lane widths of up to 3.65m (i.e. a Type 1 Single Carriageway, Type 2 Single Carriageway or Type 3 Single Carriageway.)

Design Speed

2.2 Page 1/2, Paragraph 1.7:

After Paragraph 1.7 insert new Paragraph 1.7A

1.7A For Type 3 Single Carriageway Roads, the desirable Design Speed shall be 85km/h. A lower design speed may be adopted as a relaxation in environmentally sensitive locations or in difficult terrain.

Sight Distance

2.3 Page 2/1, Paragraph 2.5:

After Paragraph 2.5 insert new Paragraph 2.5A

2.5A For Type 3 Single Carriageway Roads, the proportion of the route which is considered to provide overtaking opportunities may include all sections where the visibility available to overtaking vehicles exceeds 250m. It is anticipated that a warning centre line will be introduced in the new Department of Transport Traffic Signs Manual (TSM), as detailed in Chapter 4 of NRA IAN 01/08. Following the introduction of this warning line marking into the TSM, this warning line should be provided on sections where the available visibility is between 250m and FOSD. Overtaking shall not be permitted on sections of road with Junctions.

Horizontal Alignment

2.4 Page 3/2, Paragraph 3.4:

After Paragraph 3.4 insert new Paragraphs 3.4A

3.4A For Type 2 and Type 3 Single Carriageway Roads, the limit of 2 Design Speed steps, referred to in Paragraph 3.4 above, may be extended to 3 Design Speed Steps and 4 Design Speed steps respectively.

Vertical Alignment

2.5 Page 4/1, Paragraphs 4.1 & 4.2:

Delete Paragraphs 4.1 & 4.2 and replace with new Paragraphs 4.1 & 4.2

4.1 Maximum Gradients: The Desirable Maximum gradient for design shall be:

	<u>Desirable Max Grade</u>
Motorways and Type 1 Dual Carriageways	3%
Type 2 & 3 Dual Carriageways	4%
Type 1 & 2 Single Carriageways:	
National and Regional Roads	5%
Local Roads	6%
Type 3 Single Carriageways	6%

4.2 Effects of Steep Gradients: In hilly terrain the adoption of gradients steeper than Desirable Maximum could make significant savings in construction or environmental costs, but would also result in higher user costs, i.e. by delays, fuel and accidents. Slightly steeper gradients are, therefore, permitted as Relaxations. There is, however, a progressive decrease in safety with increasingly steeper gradients. Departures from Standards will, therefore, be required for any proposals to adopt gradients steeper than the following:

	<u>Max Grade with Relaxation</u>
Motorways and Type 2 Dual Carriageways	4%
Type 2 & 3 Dual Carriageways	5%
Type 1 & 2 Single Carriageways:	
National and Regional Roads	6%
Local Roads	8%
Type 3 Single Carriageways	7%

Introduction to Coordinated Link Design

2.6 Page 6/2, Table 4: Recommended Rural Road layouts
Delete Table 4 and replace with new Table 4

Table 4: Recommended Rural Road Layouts

Type of Road ¹	Capacity (AADT) for Level of Service D	Edge Treatment	Access Treatment	Junction Treatment at Minor Road	Junction Treatment at Major Road
Type 3 Single (6.0m) Carriageway S2	5,000	0.5m hard strips. Cycleways where required	Minimise number of accesses to avoid standing vehicles and concentrate turning movements.	Simple priority junctions.	Priority junctions, with ghost islands where necessary.
Type 2 Single (7.0m) Carriageway S2	8,600	0.5m hard strips. Cycleways where required	Minimise number of accesses to avoid standing vehicles and concentrate turning movements.	Priority junctions, with ghost islands where necessary.	Ghost islands
Type 1 Single (7.3m) Carriageway S2	11,600	2.5m hard shoulders	Minimise number of accesses to avoid standing vehicles and concentrate turning movements.	Priority junctions, with ghost islands where necessary.	Ghost islands or roundabouts ²
Type 3 Dual ³ (7.0m + 3.5m) Primarily for retro fit projects	14,000	1.0m hard strips.	Minimise the number of accesses to avoid standing vehicles and concentrate turning movements.	Restricted number of left in/left out or ghost priority junctions.	Priority junctions or at-grade roundabouts.
Type 2 Dual ³ Dual * 2 Lane Carriageways. (2x7.0m)	20,000	0.5m hard strips Cycleways where required	Left in / Left out	No gaps in the central reserve.	At-grade roundabouts and compact grade separation
Type 1 Dual Dual 2 Lane Carriageways (2x7.0m)	38,100	2.5m hard shoulders	Left in / Left out	No gaps in the central reserve.	Left in / Left out and grade separation.
Standard Motorway 2 Lane (7.0m) (D2M)	44,100	2.5m hard shoulders	Motorway Regulations	No gaps in the central reserve.	Motorway standards Full-grade separation.
Wide Motorway 2 Lane (7.5m) (D2M)	55,500	3m hard shoulders	Motorway Regulations	No gaps in the central reserve	Motorway standards Full-grade separation.

- Notes:
1. For details of the standard road cross-sections, see NRA TD 27
 2. Single lane dualling may be appropriate in some situations, but would be a Relaxation (see TD 42).
 3. See NRA TD 10 'Type 2 and Type 3 Dual Carriageways'
 4. Cycleways provided for use by pedestrians and cyclists

Single Two-Lane Carriageway Roads – National and Regional Roads

2.7 Page 7/2, Paragraph 7.9:

After Paragraph 7.9 insert new Paragraph 7.9A

7.9A For Type 3 Single Carriageway Roads, overtaking sections include all sections where the visibility available to overtaking vehicles exceeds 250m. See Paragraph 2.5A.

2.8 Page 7/7, Table 7: Overtaking Value

Delete Table 7 and replace with new Table 7

Table 7: Overtaking Value

Rural Road Type	Overtaking Value
Type 2 & 3 Single Carriageway	15%
Type 1 Single Carriageway	30%

2.9 Page 7/7, Paragraph 7.20:

After Paragraph 7.20 insert new Paragraph 7.20A

7.20A For Type 2 and Type 3 Single Carriageway Roads, overtaking opportunities should be provided on average at 1.5km intervals to allow vehicles to pass slow moving vehicles. Where achievement of this reduced overtaking interval is heavily constrained, consideration may be given to the alternative provision of discrete passing bays similar to the NRA TD10 Type 3 Dual Carriageway requirement.

3 AMENDMENTS TO NRA TD27

Introduction

3.1 Page 2, Definition for S2:

Delete Definition for S2 and replace with new definition for S2:

S2:- Two lane single carriageway road with lane widths of between 3.0m and 3.65m (i.e. a Type 1 Single Carriageway, Type 2 Single Carriageway or Type 3 Single Carriageway.)

Cross-Sections on Open Roads

3.2 Page 11, Paragraph 3.30

After Paragraph 3.30 insert new Paragraph 3.30A

3.30A For Type 3 Single Carriageway Roads, the verge width is dependent on terrain, safety barriers, accesses and Non-Motorised User (NMU) requirements. If cycleways are provided they shall be for the combined use of pedestrians and cyclists. Recommended verge widths are:

Normal Verge Width = 2.0m

Normal Verge Width = 2.5m (at Safety Barriers)

Normal Verge Width = 3.0m (at accesses)

Absolute Minimum Verge = 1.1m (as a relaxation with no NMU demand)

Varies = when there is NMU demand

3.3 Page 13 Paragraph 3.58

After Paragraph 3.58 insert new paragraph 3.59

Resurfacing Operations

3.59 The Type 3 Single Carriageway cross section requires a road closure to facilitate surface dressing or HRA chipping operations. Where no diversion route is available, a Thin Surface Course system should be specified to facilitate surfacing operations under traffic management.

3.4 Page 15, Table 3;

Delete Table 3: Rural All-purpose Roads and replace with new Table 3

**Table 3 : Rural All-Purpose Roads
Dimensions of Cross-Section Elements
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							
Type 3 Single (S2)	1.1 ¹⁰ to 3.0	0.50	-	6.00	-	-	-
Type 2 Single (S2)	3.00	0.50	-	7.00	-	-	-
Type 1 Single (S2)	3.00	-	2.50	7.30	-	-	-
Type 3 Dual Carriageway	3.00 ⁶	0.50 min	-	7.00 (2-Lane) 3.50 (1 Lane)	0.50	- ³	1.50
Type 2 Dual Carriageway (D2AP)	3.00 ⁶	0.50	-	7.00	0.50	- ³	1.50
Type 1 Dual Carriageway (D2AP)	2.00	-	2.50	7.00	1.00	- ³	2.60 ⁵
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 minimum values: any reduction is a Departure.
 2. Carriageway, hard shoulder and hard strip dimensions are fixed values: any alternative is a Departure except for increases in those dimensions marked minimum.
 3. For details of offside verges at divided structures, see 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 Type 1 Dual Carriageway is determined by the type of safety barrier. See NRA TD 19. It is suggested that a width of 3.00m be assumed for preliminary designs.
 6. The nearside verges on a Type 2 and Type 3 Dual Carriageways shall include hard standings with a minimum width of 1.0m for pedestrian usage.
 7. For guidance on selection of slip roads and interchange link and loop roads, see TD 22.
 8. All dimensions are in metres.
 9. For graphic representation of these cross-sections, refer to NRA Road Construction Details 000 Series.
 10. The use of verge width of 1.1m is a relaxation where there is no requirement for a cycleway. See Paragraph 3.30A

4 RECOMENDATIONS FOR TRAFFIC SIGNS AND ROAD MARKINGS.

Directional Information Signs .

- 4.1 For Type 3 Single Carriageway Roads with a design Speed of 85 km/h, the letter size and siting details should be as per TSM Table A2.1 (iv) Other dual and single carriageway roads on National Routes.
- 4.2 For Type 3 Single Carriageway Roads with a design Speed of 70 km/h or less or in environmentally sensitive locations, the letter size and siting details may be reduced as per TSM Table A2.1 (v) Other Roads.

Road Markings, Studs and Delineators

It is anticipated that a warning line with the following details will be introduced in the new Department of Transport Traffic Signs Manual (TSM). Once available, this line type should be used for Type 3 Single Carriageway Roads where the forward sight visibility is greater than 250m but less than FOSD, the following Warning Line road marking shall be used.

Marking	Mark (mm)	Gap (mm)	Width (mm)	Stud Spacing (mm)	Use
	4000	2000	150	6000*	For use on Type 3 Single Carriageway Roads where overtaking length available >250m but <FOSD

5 REFERENCES

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

Department of Transport. *Traffic Signs Manual*. DoT, Dublin, 2008. [Note: the Traffic Signs Manual published by the Department of the Environment in 1996 is currently being revised. The revised manual is due for publication in June 2008. The signs and road markings described in this Interim Advice Note are in accordance with the October 2007 draft of the revised manual.]

National Roads Authority. NRA Design Manual for Roads and Bridges (NRA DMRB):

NRA TD 9 (NRA DMRB 6.1.1) – *Road Link Design*.

NRA TD 27 (NRA DMRB 6.1.2) – *Cross-Sections and Headroom*.

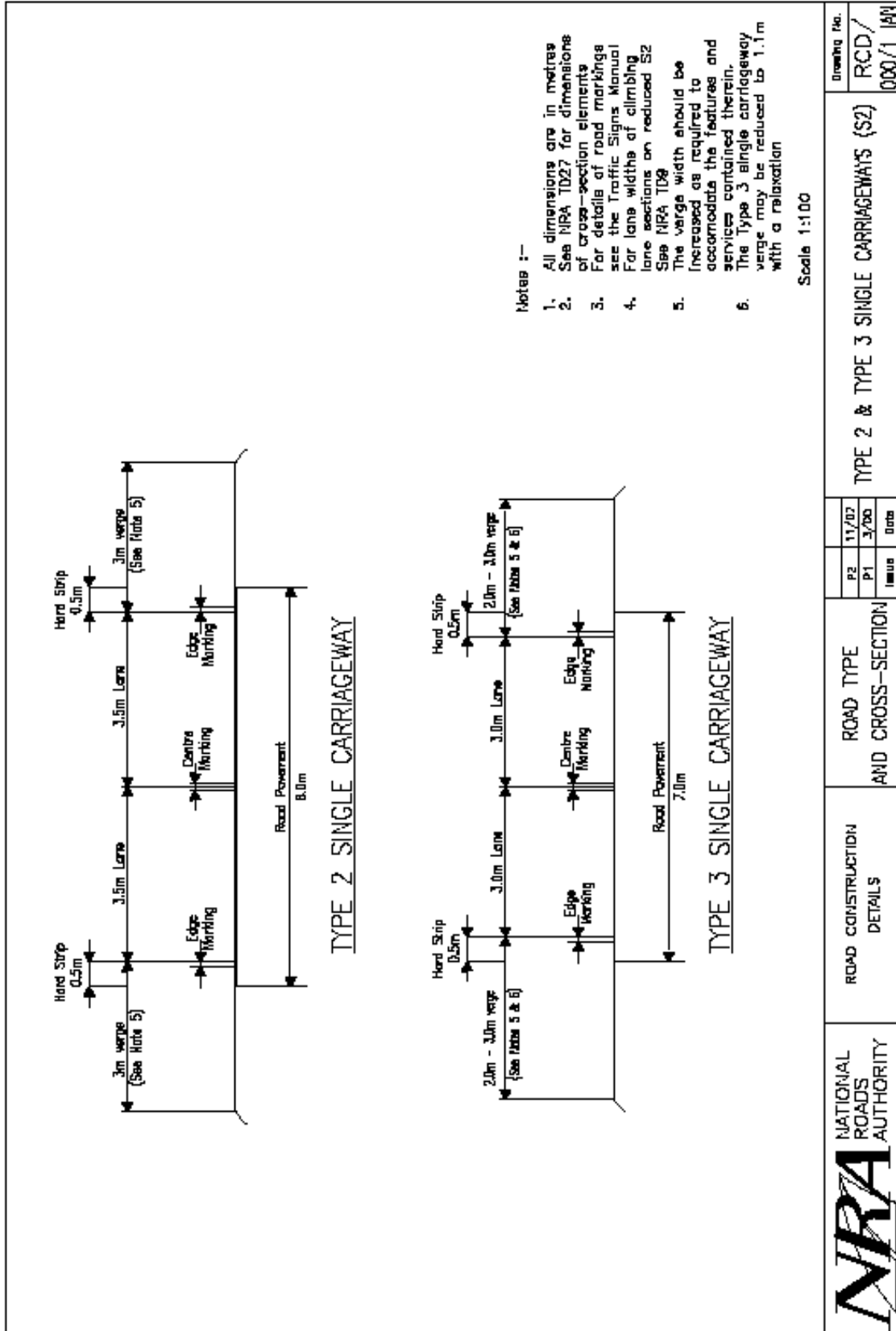
6 ENQUIRIES

5.1 All technical enquiries or comments on this Interim Advice Note should be sent in writing to:

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

.....
Tim Ahern
Head of Engineering

7 APPENDIX 1 : CROSS SECTIONS FOR TYPE 2 & TYPE 3 SINGLE CARRIAGEWAYS.



NRA NATIONAL ROADS AUTHORITY	ROAD CONSTRUCTION DETAILS	ROAD TYPE AND CROSS-SECTION		TYPE 2 & TYPE 3 SINGLE CARRIAGEWAYS (S2)	Drawing No. RCD/ 000/1 IAN
		P2	11/02		
		P1	3/00	Issue	Date