
VOLUME 6 ROAD GEOMETRY
SECTION 1 LINKS

PART 4

TD 70/08

DESIGN OF WIDE SINGLE 2+1 ROADS

SUMMARY

This Standard sets out the design requirements for Wide Single 2+1 roads.

INSTRUCTIONS FOR USE

1. Remove Contents pages from Volume 6 and insert new Contents pages for Volume 6 dated August 2008.
2. Insert the new Standard TD 70/08 into Volume 6 Section 1.
3. Please archive this sheet as appropriate.

Note: A quarterly index with a full set of Volume Contents Pages is available separately from The Stationery Office Ltd.



THE HIGHWAYS AGENCY



TRANSPORT SCOTLAND



Llywodraeth Cynulliad Cymru
Welsh Assembly Government

WELSH ASSEMBLY GOVERNMENT
LLYWODRAETH CYNULLIAD CYMRU



THE DEPARTMENT FOR REGIONAL DEVELOPMENT
NORTHERN IRELAND

Design of Wide Single 2+1 Roads

Summary: This Standard sets out the design requirements for Wide Single 2+1 roads.

REGISTRATION OF AMENDMENTS

Amend No	Page No	Signature & Date of incorporation of amendments	Amend No	Page No	Signature & Date of incorporation of amendments

REGISTRATION OF AMENDMENTS

Amend No	Page No	Signature & Date of incorporation of amendments	Amend No	Page No	Signature & Date of incorporation of amendments

VOLUME 6 ROAD GEOMETRY
SECTION 1 LINKS

PART 4

TD 70/08

DESIGN OF WIDE SINGLE 2+1 ROADS

Contents

Chapter

1. Introduction
2. Design Principles
3. Geometric Standards
4. Junctions
5. Traffic Signs and Road Markings
6. Road Users' Specific Requirements
7. Economics
8. References
9. Enquiries

Appendix A Traffic Signs and Road Markings
(Sample Layouts)

1. INTRODUCTION

General

1.1 A Wide Single 2+1 (WS2+1) road consists of two lanes of travel in one direction and a single lane in the opposite direction. This provides overtaking opportunities in the two lane direction, while overtaking in the single lane direction is prohibited.

Scope

1.2 This Standard applies to single carriageway trunk roads in rural areas. **TD 9 (DMRB 6.1.1)** is to be used to derive the design speed and the associated values for geometric design.

1.3 This Standard also provides guidance on the design and implementation of Differential Acceleration Lanes, a form of WS2+1 road.

1.4 This Standard is not applicable to climbing lanes. For guidance on the design of climbing lanes refer to **TD 9 (DMRB 6.1.1)**.

Implementation

1.5 This Standard must be used forthwith for the procurement of Trunk Road Works at any stage from conception through design to completion of construction except where the procurement of such works has reached a stage at which (in the opinion of the Overseeing Organisation) use of this Standard would result in significant additional expense or delay progress (in which case the decision must be recorded in accordance with the Overseeing Organisation's procedure).

Definitions

1.6 The terminology used in this Standard follows the definitions contained in BS 6100: Subsection 2.4.1, where possible.

1.7 Terms relevant to this particular Standard are defined below:

Changeover: A carriageway layout which effects a change in the designated use of the middle lane of a WS2+1 road from one direction of traffic to the opposite direction.

Climbing Lane: An additional lane added to a single or dual carriageway in order to improve capacity and/or safety because of the presence of a steep gradient.

Conflicting Changeover: A changeover where the vehicles using the middle lane are travelling towards each other.

Differential Acceleration Lane (DAL): A WS2+1 road on which the overtaking lane is provided for traffic accelerating away from a roundabout to cater for the differential acceleration between vehicles.

Non-Conflicting Changeover: A changeover where the vehicles using the middle lane are travelling away from each other.

Overtaking Lane Section: That section of a WS2+1 road on which two lanes are provided in one direction to facilitate overtaking, with the opposing traffic confined to one lane. Refer to Figures 2/1 and 2/2.

Single Lane Section: That section of a WS2+1 road on which traffic is confined to a single lane running parallel to an overtaking lane section in the opposite direction. Refer to Figures 2/1 and 2/2.

Wide Single Carriageway (WS2): A wide single carriageway road with one lane in each direction.

Wide Single 2+1 (WS2+1): A wide single carriageway road with two lanes of travel in one direction and a single lane in the opposite direction.

WS2+1 Interface: The interface between a WS2+1 road and a two-lane single carriageway road.

Mandatory Sections

1.8 Mandatory sections of this document are contained in boxes. The Design Organisation must comply with these sections or obtain approval to adopt a Departure from Standard from the Overseeing Organisation. The remainder of the document contains advice and explanation, which is commended to users.

1.11 The legislation referred to in this document may, in some instances, have a specific Northern Ireland equivalent. For schemes in Northern Ireland the designer should refer to the Overseeing Organisation for advice.

Relaxations

1.9 In difficult circumstances Relaxations may be introduced at the discretion of the Design Organisation, having regard to all relevant local factors, but only where specifically permitted by this Standard. Careful consideration must be given to layout options incorporating Relaxations, having weighed the benefits and any potential disbenefits. Particular attention must be given to the safety aspects (including operation, maintenance, construction and demolition) and the environmental and monetary benefits/ disbenefits that would result from the use of Relaxations. The consideration process must be recorded. The preferred option must be compared against options that would meet full standards.

Departures From Standard

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

2. DESIGN PRINCIPLES

Application

2.1 To promote journey time reliability on long distance single carriageway roads, provision of a WS2+1 road can be a more effective solution than other single carriageway road options at flows of up to 25,000 Annual Average Daily Traffic (AADT). However, factors such as number of accesses, junction spacing, grade separation and gradient can have a significant impact, so the feasibility of a WS2+1 road must be examined on a scheme by scheme basis.

2.2 Minor side roads and accesses are to be stopped up and alternative arrangements made, for example through the provision of collector roads. In all cases the question of access to new WS2+1 roads is to be discussed with the Overseeing Organisation during route preparation (see paragraphs 4.1 and 4.2).

2.3 Where existing single carriageway or wide single carriageway roads have problems with platooning and a lack of overtaking opportunity, it may be appropriate to improve the road by converting it to a WS2+1 configuration. Maintenance reconstruction can be the catalyst for such improvement.

2.4 The overtaking lane section should be of sufficient length to disperse platoons of traffic but not so long as to cause driver frustration in the single lane section. The length of an overtaking lane section will also be a function of the topography, road geometry and location of junctions.

2.5 Where WS2+1 roads are of sufficient length they should incorporate “changeover” sections to alternate the overtaking lane in each direction of travel (see paragraphs 3.6 to 3.10), as illustrated in Figure 2/1.

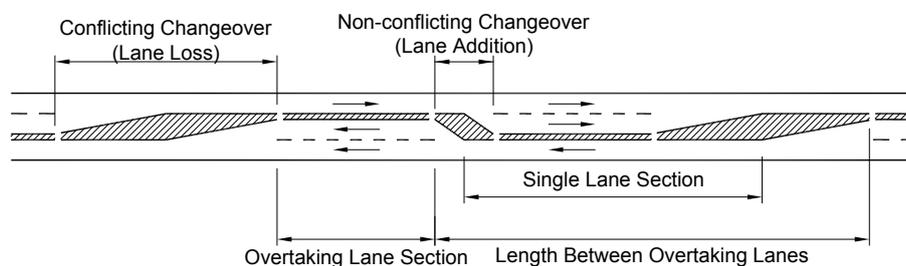


Figure 2/1: Typical Layout of a WS2+1 Road with Changeovers

2.6 Individual sections of WS2+1 road providing overtaking opportunities in one direction (i.e. without changeovers) may be introduced within standard S2 or WS2 roads. In such cases adequate overtaking opportunity should also be available in the opposite direction as part of a route strategy. This may be achieved by the provision of additional WS2+1 sections in close proximity, as illustrated in Figure 2/2.

2.8 Where a WS2+1 road occurs in close proximity to a dual carriageway road it must be separated by a minimum length of 2 kilometres of single carriageway road. Direct interfaces between WS2+1 roads and dual carriageways are only permitted at roundabouts.

2.7 The implementation of a WS2+1 road should always be viewed in the context of the overall route strategy to ensure the driver is not confronted with numerous types of road layout.

2.9 Permitted junction locations are given in paragraph 4.1.

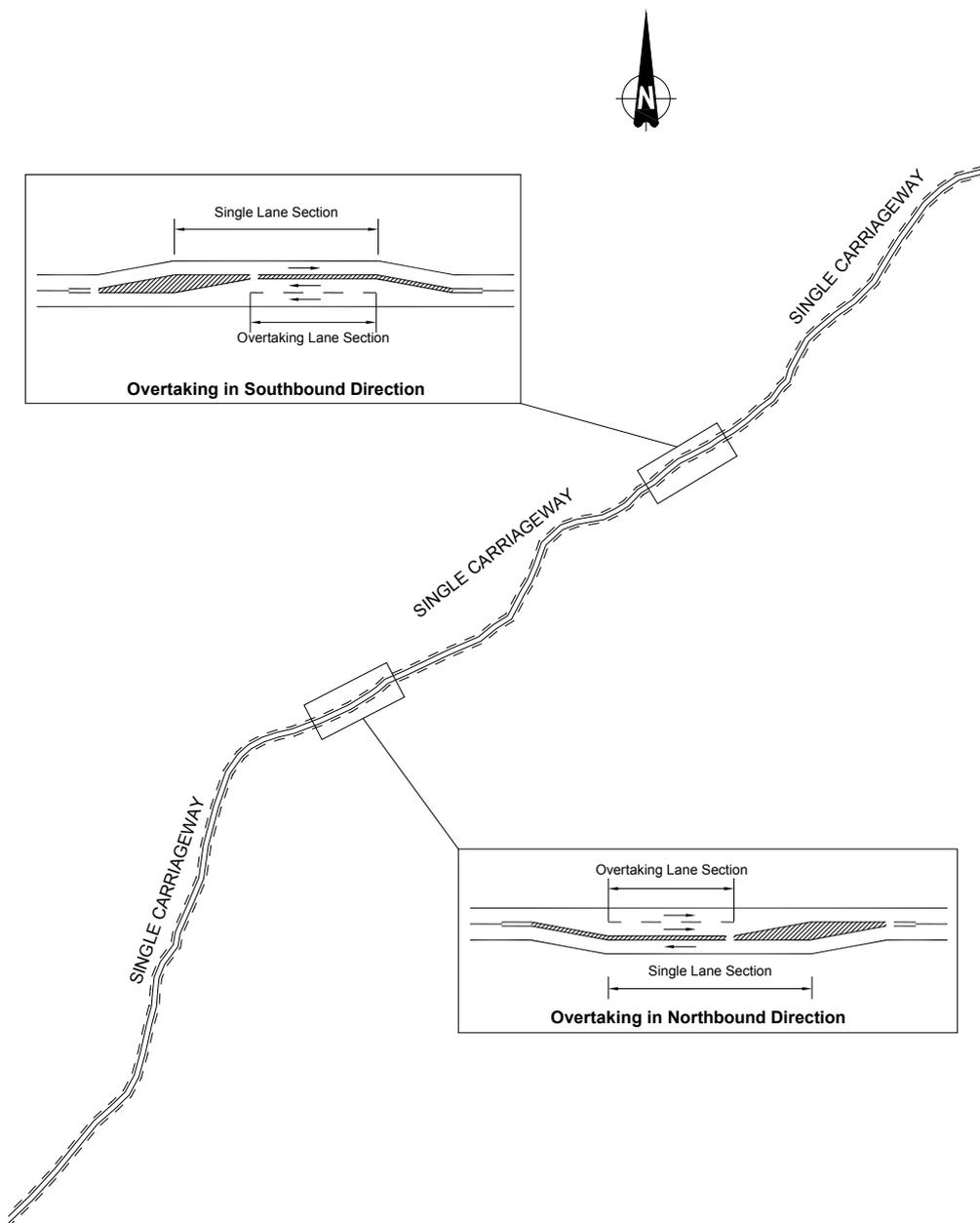


Figure 2/2: Individual Sections of WS2+1 Road Providing Overtaking Opportunities in One Direction

Design Speed

2.10 The requirements for the selection of Design Speeds of single carriageway roads are set out in **TD 9 (DMRB 6.1.1)**.

2.11 Careful consideration is required where a WS2+1 road terminates. The same standards of horizontal and vertical alignment and visibility that apply to the WS2+1 road should normally be applied to that length of two lane single carriageway road that is within 1.5 times Desirable Minimum Stopping Sight Distance of the WS2+1 interface.

Alignment

2.12 Standards for the alignment of WS2+1 roads should be as defined for single carriageway roads in **TD 9 (DMRB 6.1.1)**. Where the WS2+1 road cross-section is applied to an existing single carriageway road, the use of Band C curves is permitted as a Relaxation, provided that Desirable Minimum Stopping Sight Distance is achieved.

Construction and Maintenance

2.13 Where sections of WS2+1 road are constructed on the existing line of an S2 or WS2 road, it is important that the pavement joints are considered as part of the design process. The longitudinal joint positions should be part of the iterative process in considering the design options. Reference should be made to DMRB Volume 7 and to the Specification for Highway Works, contained in the Manual of Contract Documents for Highway Works (MCHW).

2.14 Where existing drainage infrastructure is intended to be utilised, the Design Organisation should review the capacity of the road drainage network.

2.15 Design Organisations must consider maintenance issues on a scheme by scheme basis. The application of this Standard does not obviate the need for such considerations. The Design Organisation must compile a statement of scheme specific maintenance and health and safety issues ensuring that all maintenance activities are considered. The Design Organisation must consult with the Maintaining Organisation/Operator when compiling this statement. This paragraph does not relieve Design Organisations of their statutory health and safety responsibilities.

2.16 Design Organisations should refer to current Overseeing Organisation and Maintaining Organisation practice on temporary traffic management operations.

3. GEOMETRIC STANDARDS

Cross-Section

3.1 Cross-sectional elements of WS2+1 roads must be in accordance with Figure 3/1. Lane widths are measured from the trafficked side of carriageway edge lines and the double white line and from the mid-point of lane lines.

3.2 At restricted locations, for example at an existing overbridge, the cross-section may be reduced to omit the overtaking lane. To maintain the character of the road the double white line system should be continued through the restricted location. Figure 3/2 illustrates recommended layouts where the overtaking lane is omitted.

NOTES

1. Double white line to be TSRGD Diagram 1013.1B to incorporate differential coloured surfacing (red in Scotland and Northern Ireland). White lines to be 150mm wide.

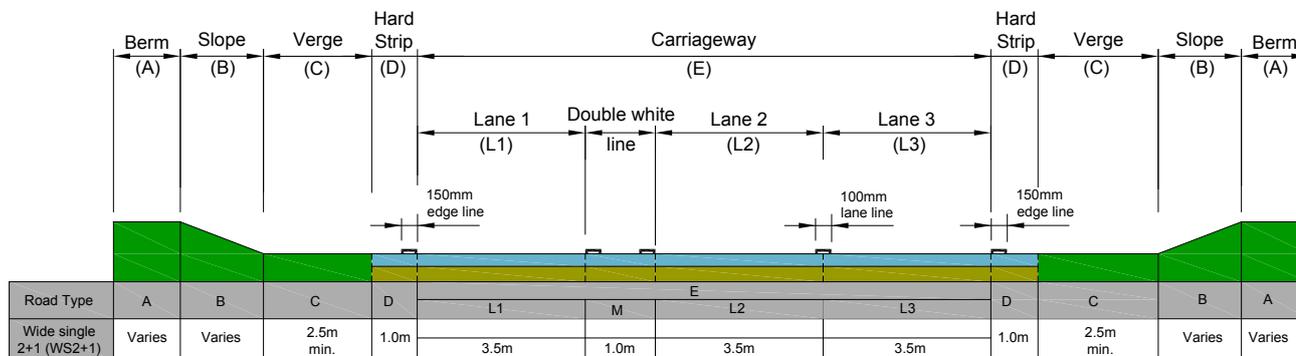


Figure 3/1: Cross-section Width for WS2+1 Roads

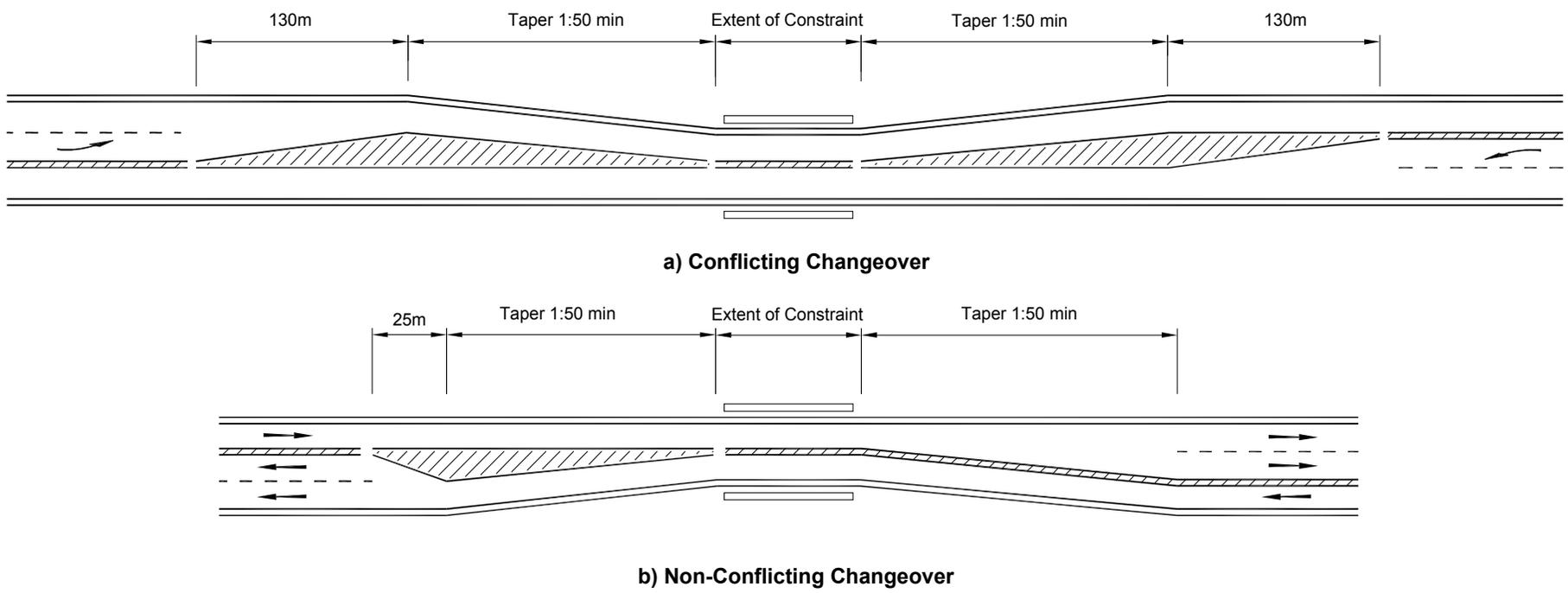


Figure 3/2: Removal of Overtaking Lane at Restricted Locations

3.3 The road crown must be located within the double white lines and not within traffic lanes.

3.5 The desirable maximum overtaking lane section length is 1500 metres. Relaxations are permitted up to a maximum length of 2000 metres.

Lengths of Overtaking Lane Sections

3.4 The desirable minimum overtaking lane section length is 800 metres (see Figures 2/1 and 2/2). A length of between 600 and 800 metres is permitted as a Relaxation. (For Differential Acceleration Lane lengths see paragraph 4.9.)

Changeovers

3.6 The two principal types of changeover are shown in Figure 3/3.

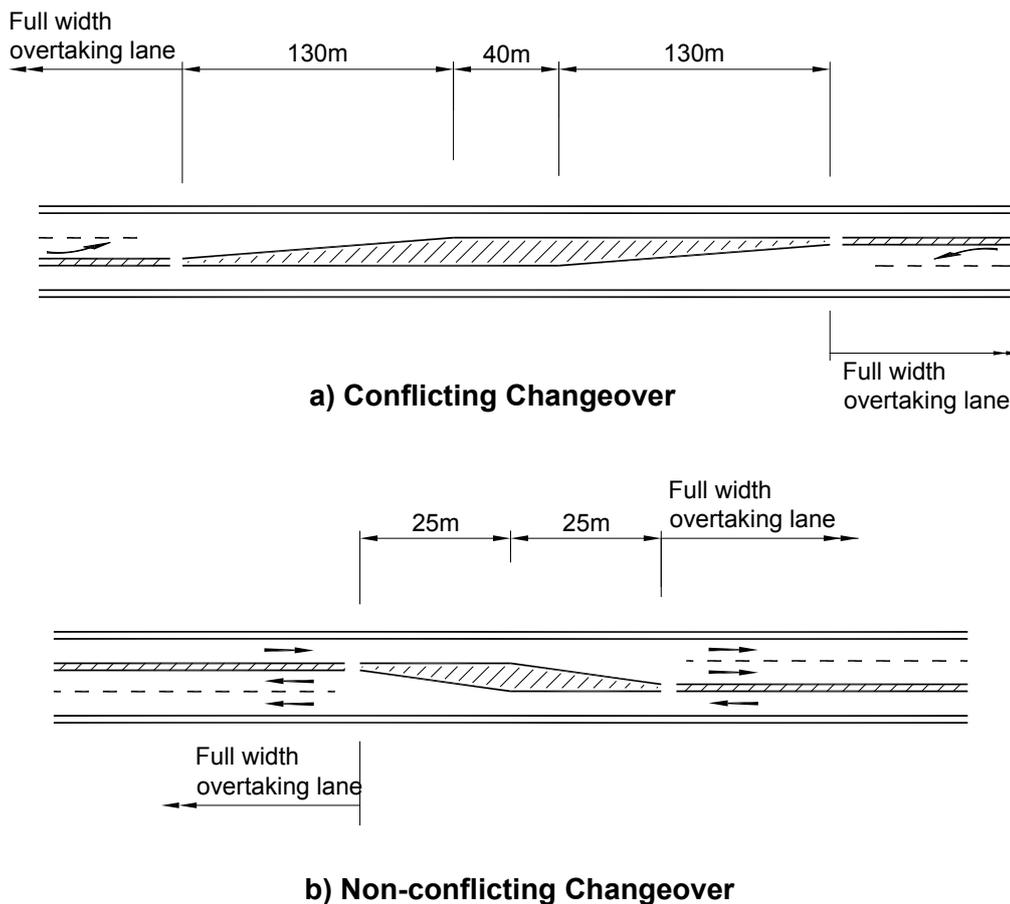


Figure 3/3: Dimensions of Changeovers

3.7 Where junctions are incorporated in changeovers refer to Chapter 4.

3.8 Where changeovers are remote from junctions they must be in accordance with the layouts shown in Figure 3/3.

3.9 Conflicting changeovers must not be located where the curve radius is Band C or below, as defined in **TD 9 (DMRB 6.1.1)**.

3.10 Desirable Minimum Stopping Sight Distance must be provided on the immediate approach to and through all changeovers. For the purposes of this Standard the immediate approach to a changeover is that length of carriageway from a point 1.5 times the Desirable Minimum Stopping Sight Distance upstream of the start of the changeover taper.

WS2+1 Interfaces

3.11 WS2+1 interfaces must not coincide with horizontal curves less than Desirable Minimum radius.

3.12 The layout at the start of a section of WS2+1 road should encourage drivers to follow the nearside channel. The preferred layout is achieved by widening to the right-hand side, as shown in Figure 3/4(a). Where physical constraints require widening to the left-hand side, road markings must be introduced to guide traffic into the left hand lane, as shown in Figure 3/4(b).

3.13 The layout for a WS2+1 interface where the WS2+1 road commences on a single lane section is shown in Figure 3/4(c).

3.14 WS2+1 roads may link directly with climbing lanes. The variation in carriageway width at such locations must be applied at a minimum taper of 1 in 50.

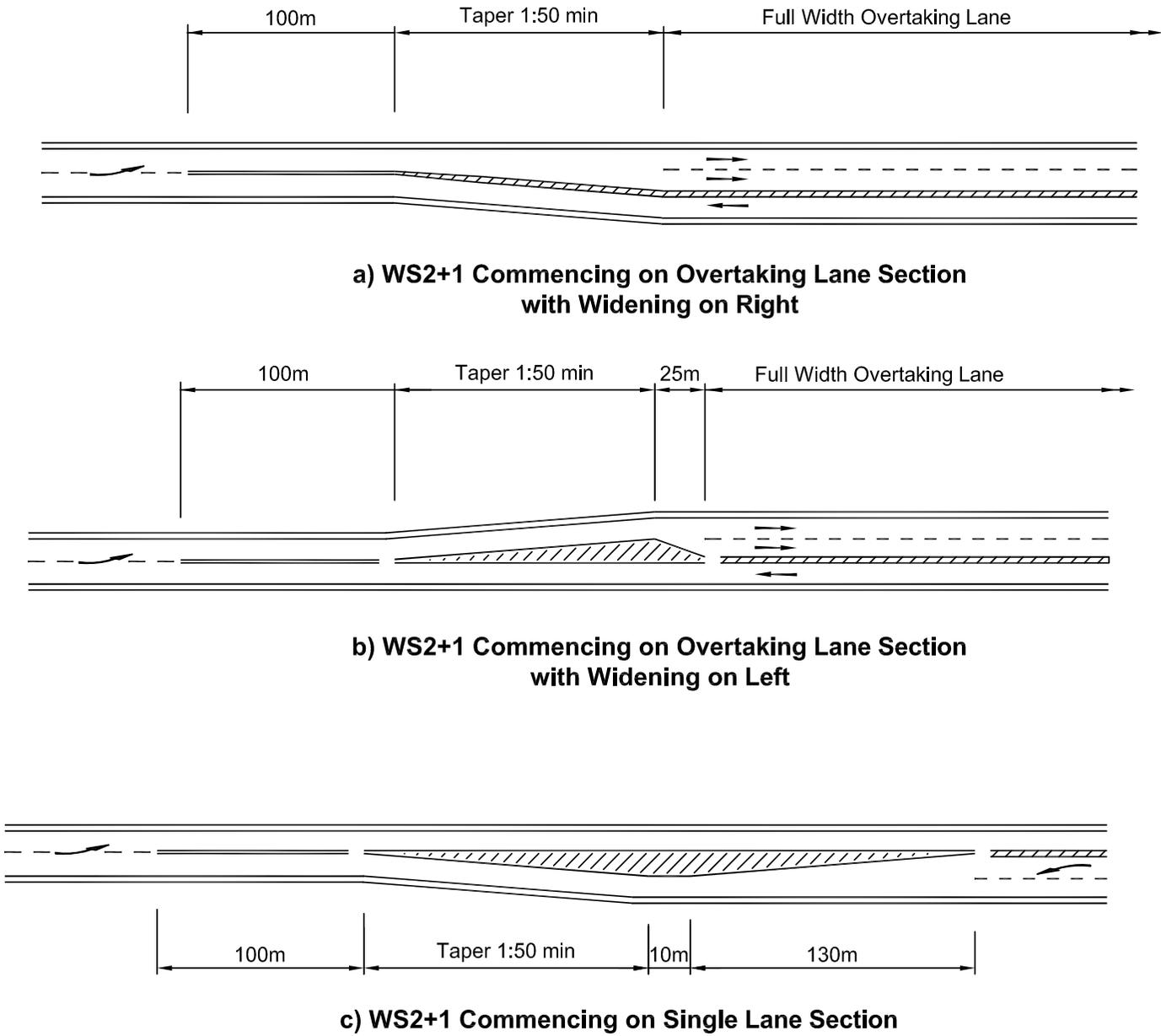


Figure 3/4: WS2+1 Interfaces

4. JUNCTIONS

General

4.1 Junctions and accesses require careful consideration with respect to their locations on a WS2+1 road. Junctions and accesses must only be located at changeovers, at WS2+1 interfaces or on the S2 or WS2 road at least 500 metres from that point where the road cross-section returns to S2 or WS2.

4.2 WS2+1 roads must be designed to minimise the number of junctions. This may be achieved by connecting side roads and accesses to a collector road running parallel to the WS2+1 road. The collector road junction with the trunk road should be located as described in paragraph 4.1.

4.3 Designers should aim to provide a junction strategy incorporating layouts that have consistent standards. Therefore the number of different junction types should be minimised.

4.4 Left-in/left-out junctions must not be provided on WS2+1 roads except where incorporated within grade separated junctions as described in paragraphs 4.13 to 4.18.

Priority Junctions

4.5 Priority junctions may be used to facilitate a changeover of overtaking lanes or the interface between WS2+1 roads and two-lane single carriageway roads. This is shown diagrammatically in Figures 4/1 and 4/2.

4.6 An additional fourth lane for right turning vehicles must not be provided on WS2+1 roads. At major/minor priority junctions the middle lane must be dedicated to right-turning traffic, with a single lane provided in each direction through the junction. Priority junction layouts must be in accordance with the geometric standards of **TD 42 (DMRB 6.2.6)**, and to the layouts illustrated in Figures 4/1 and 4/2. Simple junctions must not be provided on WS2+1 roads.

Roundabouts

4.7 Roundabouts are appropriate for junctions on WS2+1 roads. They must be designed in accordance with the requirements of **TD 16 (DMRB 6.2.3)**. Overtaking lane sections may start directly at the exit from the roundabout.

4.8 Differential Acceleration Lanes (DALs) may be provided on the exit from roundabouts to enable vehicles leaving the roundabout to overtake slower vehicles.

4.9 DALs must have a minimum length of 250 metres. Desirable Minimum Stopping Sight Distance must be provided throughout the full length of a DAL.

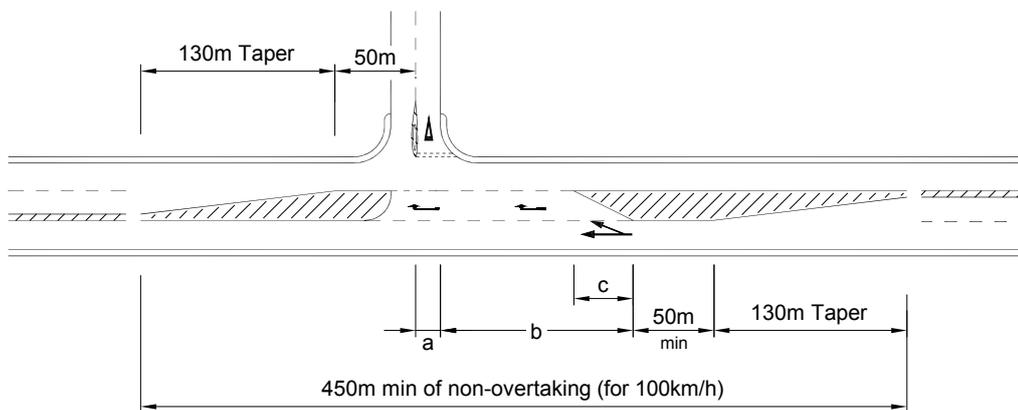
4.10 The appropriate length of a DAL should be assessed on the basis of site conditions. Factors affecting the optimum length of a DAL include predicted traffic volumes and composition, design speed, sight distance and gradient.

4.11 DALs must be laid out as shown in Figure 4/3. The DAL cross-section must be in accordance with Figure 3/1.

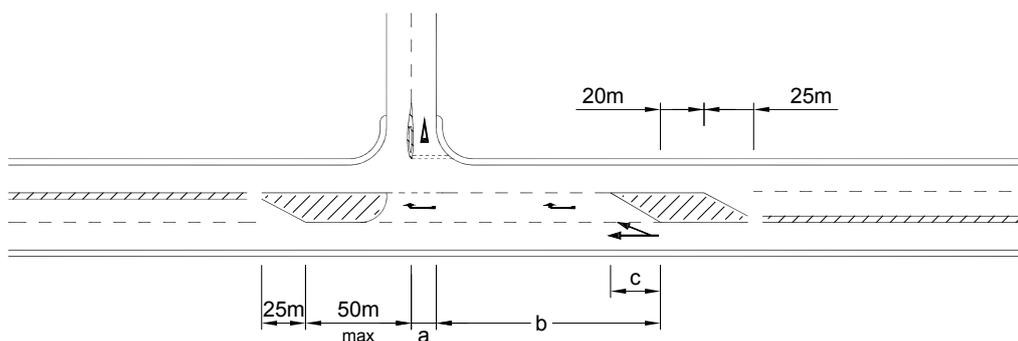
4.12 Junctions and accesses must not be located on DALs, their associated tapers or within 500 metres of the end of the taper.

NOTES:

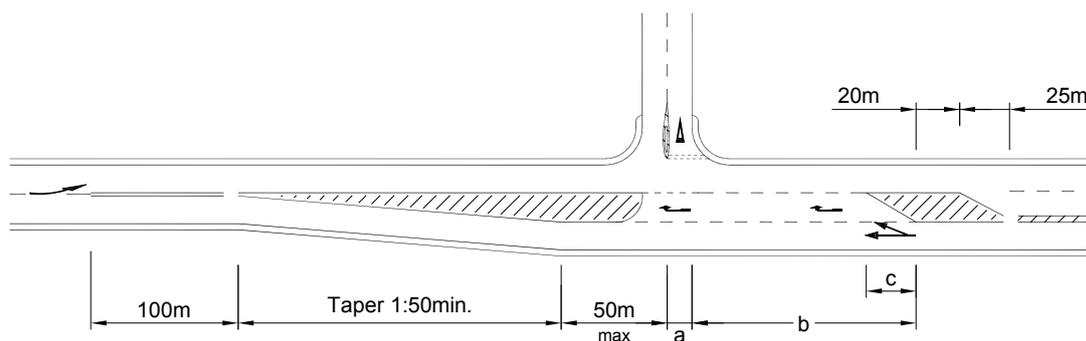
- a = Turning Length (+ Queuing Length if required)
- b = Deceleration Length
- c = Direct Taper Length
- Lengths a, b and c to be determined from TD 42



a) Conflicting Layout



b) Non-conflicting Layout

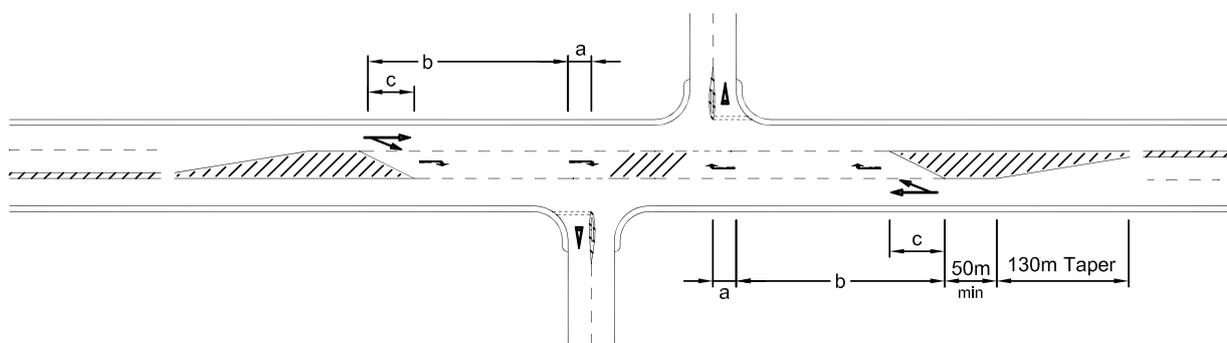


c) WS2+1 Interface

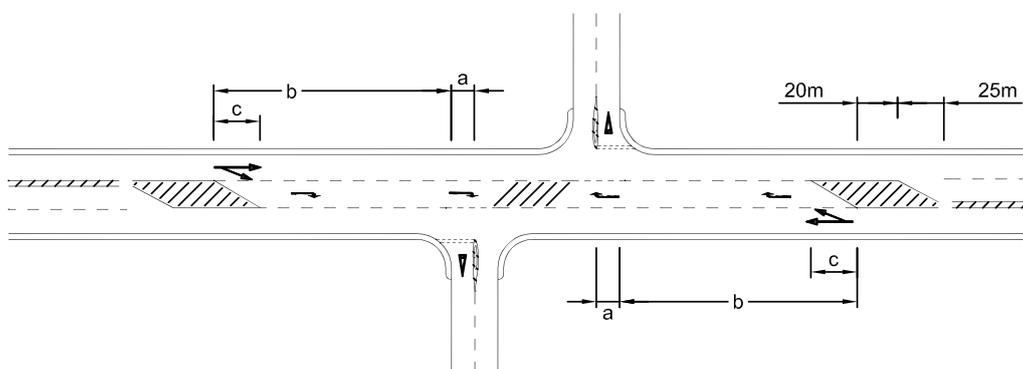
Figure 4/1: Priority Junction Layouts at Changeovers and WS2+1 Interfaces

NOTES:

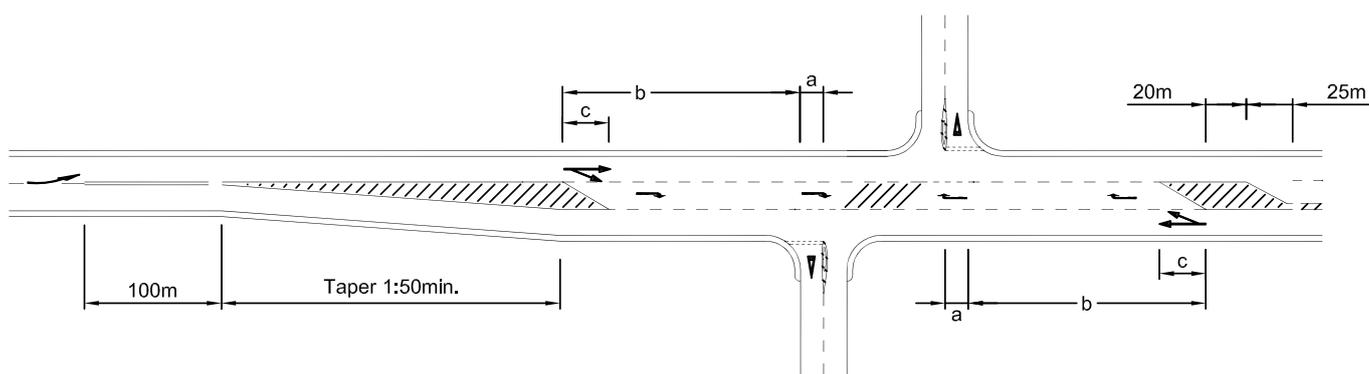
a = Turning Length (+ Queuing Length if required)
 b = Deceleration Length
 c = Direct Taper Length
 Lengths a, b and c to be determined from TD42



a) Conflicting Layout



b) Non-conflicting Layout



c) WS2+1 Interface

Figure 4/2: Staggered Junction Layouts at Changeovers and WS2+1 Interfaces

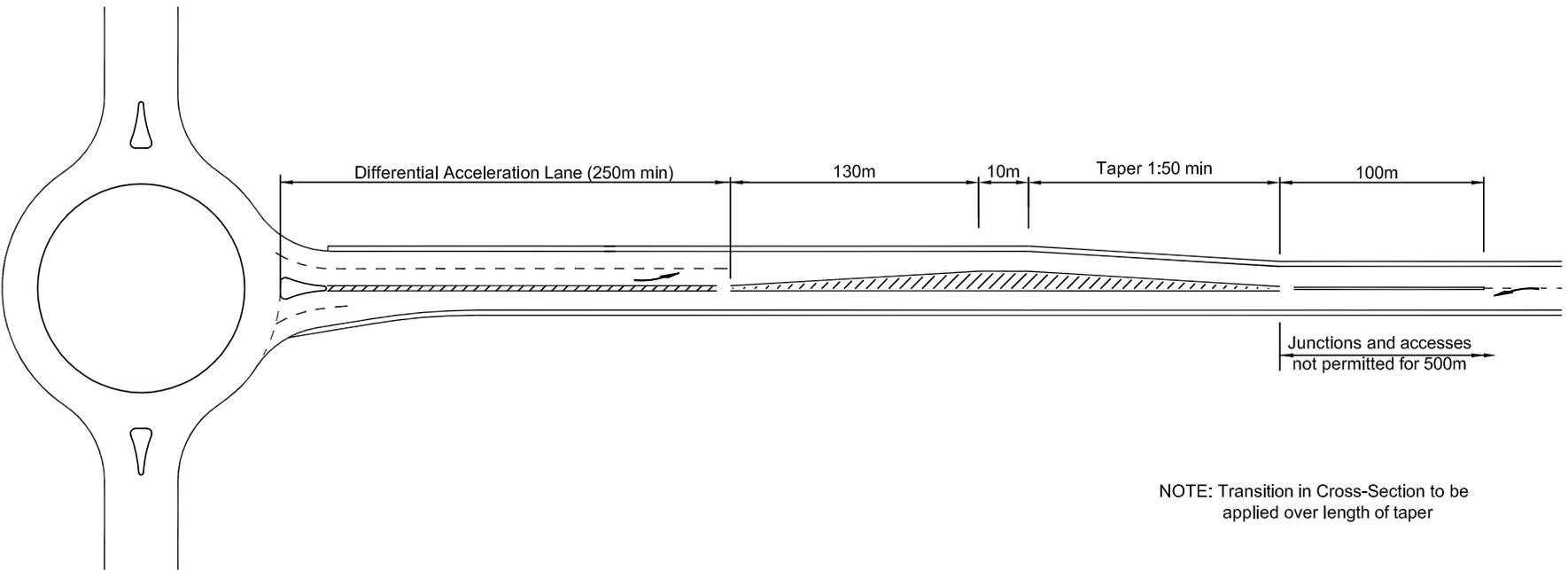


Figure 4/3: Layout of Differential Acceleration Lane

Grade Separated Junctions

4.13 The provision of at-grade priority junctions or roundabouts, located at changeovers and WS2+1 interfaces, will maintain the impression of a single carriageway road. However on WS2+1 roads with relatively high traffic flows, it may be appropriate to provide grade separated junctions. Designs involving grade separation on WS2+1 roads should be treated with caution.

4.14 Grade separated junctions on WS2+1 roads must be in the form of either Compact Grade Separated Junctions, as outlined in **TD 40 (DMRB 6.2.5)**, or Local Grade Separation, as outlined in **TD 42 (DMRB 6.2.6)**, with left-in/left-out at-grade connections to the mainline only.

4.15 Grade separated junctions on WS2+1 roads must only be sited at changeovers or WS2+1 interfaces.

4.16 At grade separated junctions a kerbed and paved central reserve must be provided. The central reserve is formed by terminating the overtaking lane section prior to the junction, so that one 3.5m lane runs in each direction through the junction. A layout is shown in Figure 4/4. Guidance on traffic signs and road markings is given in Appendix A.

4.17 The central reserve must extend for the length necessary to prevent right turns and not less than 50 metres to each side of the junction. U-turns must be prohibited on the WS2+1 road by means of a Traffic Regulation Order and appropriate signs must be provided at both ends of the physical island.

4.18 Merging tapers must not be provided at grade separated junctions on WS2+1 roads.

Lay-bys

4.19 Lay-bys on WS2+1 roads must be Type A layouts designed in accordance with the requirements of **TD 69 (DMRB 6.2.3)**. Lay-bys must be sited in accordance with Figure 4/5.

4.20 Lay-bys on WS2+1 roads must only be sited adjacent to the overtaking lane section.

4.21 Lay-bys must not be located within 375 metres of junctions, accesses, changeovers or WS2+1 interfaces.

4.22 Lay-bys must not be combined with junctions, accesses, changeovers or WS2+1 interfaces.

4.23 Where lay-bys are to be provided on WS2+1 roads, these should be sited in both directions of travel on adjacent overtaking lane sections to minimise the likelihood of right turns from the single lane.

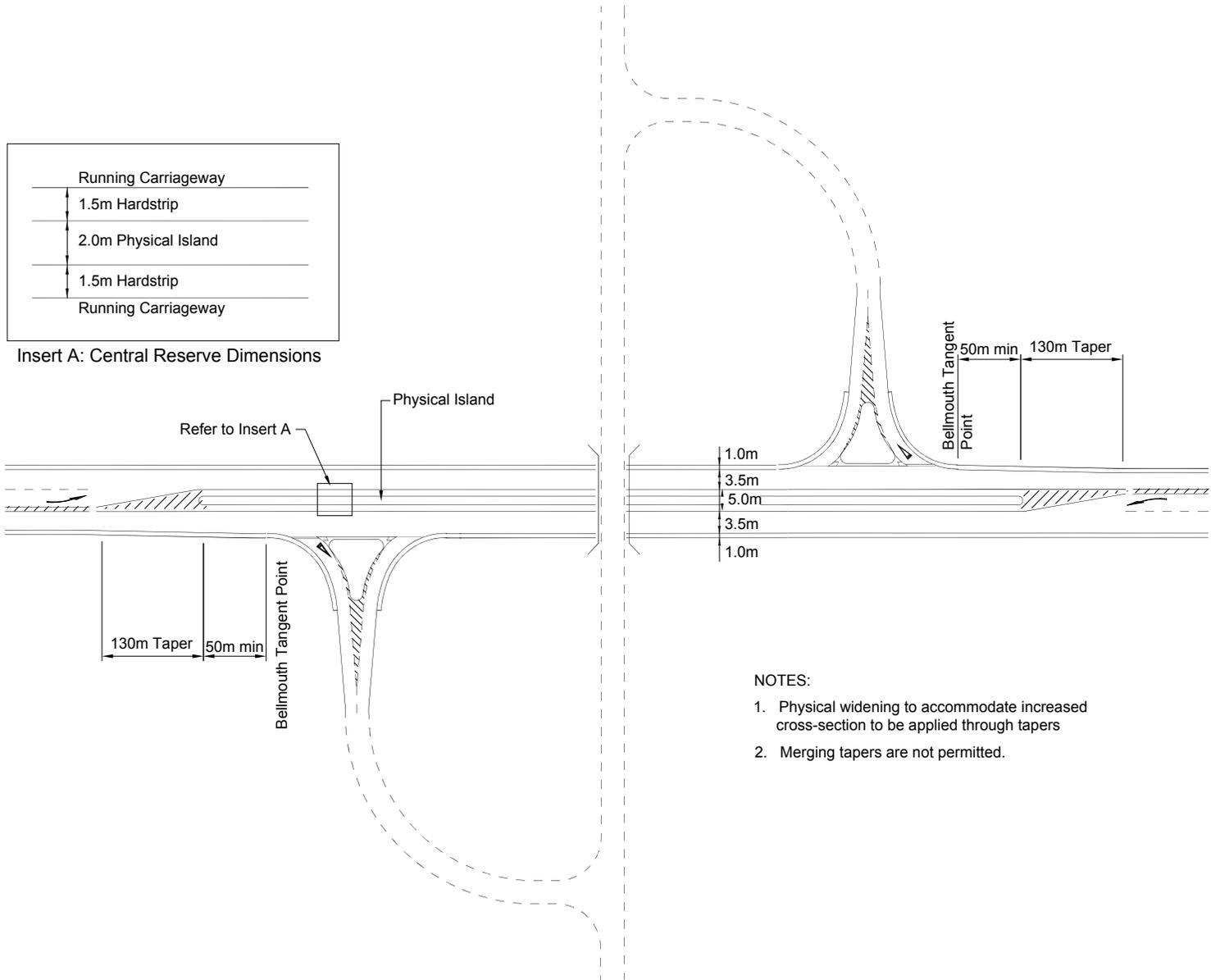


Figure 4/4: Dualling at Grade Separated Junctions

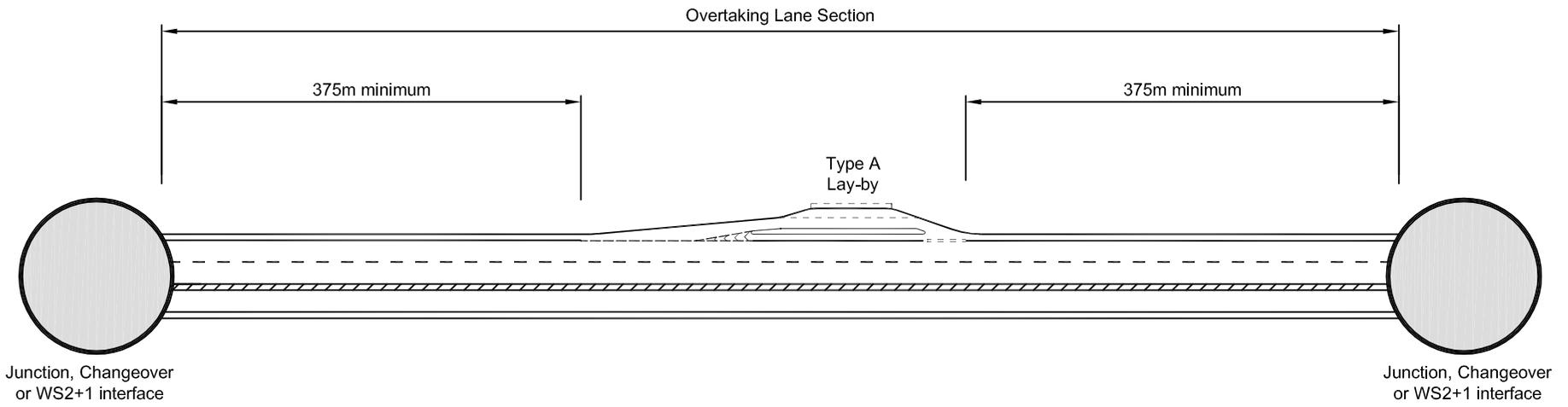


Figure 4/5: Siting of Lay-bys on WS2+1 Roads

5. TRAFFIC SIGNS AND ROAD MARKINGS

General

5.1 Statutory Requirements for signing and marking are contained in the current Traffic Signs Regulations and General Directions (TSRGD). The Traffic Signs Manual and other Department for Transport publications give advice on the correct use of signs and road markings.

5.2 Appendix A provides examples of WS2+1 signing and marking including additional non-prescribed signs that have been used successfully on trial WS2+1 roads. These require authorisation.

5.3 Advance information up to a distance of two miles prior to the start of the overtaking lane section may also be given by the use of the non-prescribed signs shown in Appendix A. These also require authorisation. These signs may be used to reduce frustration and encourage drivers to delay overtaking until the overtaking lane section is reached.

5.4 The double white line system separating the directions of flow on a WS2+1 road is to TSRGD Diagram 1013.1B. The width is 1.0 metre including white lines. It incorporates differential coloured surfacing. The white line is to be 150mm wide.

5.5 The maximum width of TSRGD Diagram 1013.1B is 1.2 metres. Authorisation is therefore required for the use of the road marking at changeovers, WS2+1 interfaces and junctions as illustrated in Appendix A (Figure A/6). A 1.0 metre gap must be left between the TSRGD Diagram 1013.1B and the non-prescribed road marking, for police enforcement purposes.

5.6 Where the road markings shown in TSRGD Diagram 1013.1B are placed, the studs should be fitted in pairs, within the width of each of the two lines, as shown in Appendix A (Figure A/6). When the studs are fitted in pairs, they should be uni-directional so that only the line of studs nearer to the driver is fitted with reflectors which can be seen by that driver.

5.7 At priority junctions, signs and road markings should be such that drivers do not confuse the right turning lane with the start of an overtaking lane section.

5.8 Signs to TSRGD Diagram 521, prescribed to indicate the resumption of two-way traffic at the end of a dual carriageway road, must not be used.

5.9 Design Organisations are advised that authorisation of the non-prescribed signs and road marking illustrated in the sample layouts may be subject to individual, route or national authorisation. Design Organisations should check the latest position with the relevant Overseeing Organisation.

6. ROAD USERS' SPECIFIC REQUIREMENTS

Introduction

6.1 This chapter gives guidance on provision for non-motorised users (NMUs) on WS2+1 roads. It considers the needs of pedestrians (including the disabled), cyclists and equestrians. It also considers the implications of WS2+1 roads on slow-moving vehicles.

Non-Motorised Users

6.2 During project appraisal and design involving WS2+1 roads, Design Organisations must determine and make adequate provision for any NMu requirements. Reference should be made to **TA 90 (DMRB 6.3.5)**, **TA 91 (DMRB 5.2.4)**, **HD 42 (DMRB 5.2.5)** and the Overseeing Organisation's policy regarding the Disability Discrimination Act (DDA).

6.3 The design should encourage NMUs to use routes segregated from the main carriageway. This may be achieved by:

- the provision of offline NMu facilities such as cycle tracks, bridleways, footpaths and footbridges/underpasses;
- the provision of NMu facilities within the road cross-section;
- appropriate signing of (and where appropriate, channelling towards) alternative routes.

Slow-Moving Vehicles

6.4 On WS2+1 roads the use of single lane sections by slow-moving vehicles (e.g. agricultural) could lead to driver frustration and traffic violations. By restricting access and making provision for a separate collector road this problem will be minimised.

6.5 Field accesses must not directly connect to WS2+1 roads.

6.6 Farm underpasses and accommodation tracks should be considered from an early stage in the design process.

7. ECONOMICS

Modelling

7.1 Traditional traffic assignment models, which are often referred to as “macroscopic” (since they operate on the principle of aggregate traffic flows and speed/flow relationships), cannot model the build up and dispersal of vehicle platoons essential for the economic assessment of a WS2+1 road.

7.2 In order to provide a realistic and robust economic assessment of the benefits of a WS2+1 road, traffic modelling must be undertaken using microsimulation.

7.3 Microsimulation provides:

- an accurate representation of platoon formation on the approach to a WS2+1 road through the use of detailed time-based traffic flow profiles by vehicle type and if necessary by origin/destination;
- the detailed modelling of individual vehicles and the interaction between faster and slower-moving vehicles during overtaking manoeuvres and in the formation of new platoons downstream of the dedicated overtaking section. This detailed modelling is able to provide the outputs for economic assessment including the quantification of downstream benefits.

Cost Benefit Analysis and Software

7.4 In economic terms, heavy vehicles do not benefit significantly from the provision of a section of WS2+1 on a single carriageway road. It is the light vehicles (i.e. cars and vans) that benefit most from the increased overtaking opportunities provided. In addition, the benefits of sections of WS2+1 road are felt not just over the length of the scheme but for several kilometres downstream.

7.5 The provision thus reduces frustration, makes overtaking easier and less stressful and permits improved average speed for light vehicles, assisting journey time reliability.

7.6 The quantum outputs from microsimulation are vehicle operating costs and time savings. The outputs must be separately analysed using an appropriate

economic assessment package of which there are currently two:

- **TUBA** (Transport Users Benefit Appraisal);
- **PEARS** (Program for the Economic Assessment of Road Schemes).

7.7 In the context of WS2+1 economic appraisals, TUBA employs an average vehicle speed for each Origin-Destination (OD) movement representative of the whole modelled period. In contrast, PEARs offers the refinement of calculating actual vehicle operating costs as it considers the operating cost of every vehicle making an OD movement. PEARs is a Transport Scotland program approved for use in Scotland. Its application elsewhere in the UK is subject to the approval of the appropriate Overseeing Organisation and the Department for Transport.

Accident Assessment

7.8 At present, neither TUBA nor PEARs calculates accident cost savings. Therefore a separate accident analysis is required. Generally, this analysis is undertaken using an ‘accident-only’ COBA (‘accident-only’ NESA in Scotland) model to determine the potential savings in accidents.

7.9 The treatment of accident and maintenance costs (see paragraph 7.10) on WS2+1 schemes is based on costs equivalent to those of a wide single carriageway. This approach is recommended for the modelling of WS2+1 schemes in the UK, whether using COBA or NESA.

Construction and Maintenance

7.10 An estimate of user costs during construction using the QUADRO program should also be undertaken if the WS2+1 improvement is to an existing road. Future maintenance costs and delays to users during maintenance should also be considered.

8. REFERENCES

TD 9 (DMRB 6.1.1)	Highway Link Design
TD 16 (DMRB 6.2.3)	Geometric Design of Roundabouts
TD 27 (DMRB 6.1.2)	Cross-Sections and Headrooms
TD 40 (DMRB 6.2.5)	Layout of Compact Grade Separated Junctions
TD 42 (DMRB 6.2.6)	Geometric Design Of Major/Minor Priority Junctions
TA 46 (DMRB 5.1.3)	Traffic Flow Ranges for use in the Assessment of new Rural Roads
TD 69 (DMRB 6.3.3)	The Location and Layout of Lay-bys and Rest Areas
TA 79 (DMRB 5.1.3)	Traffic Capacity of Urban Roads
COBA (DMRB 13.1)	Cost Benefit Analysis
QUADRO (DMRB 14.1)	Queues and Delays at Roadworks
NESA (DMRB 15.1)	Economic Assessment of Road Schemes in Scotland
PEARS	Program for the Economic Assessment of Road Schemes
Traffic Signs Regulations and General Directions	
Traffic Signs Manual	
Highways Act 1980	
Roads (Scotland) Act 1984	

9. ENQUIRIES

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

Chief Highway Engineer
The Highways Agency
123 Buckingham Palace Road
London
SW1W 9HA

G CLARKE
Chief Highway Engineer

Director, Major Transport Infrastructure Projects
Transport Scotland
8th Floor, Buchanan House
58 Port Dundas Road
Glasgow
G4 0HF

A C McLAUGHLIN
Director, Major Transport Infrastructure
Projects

Chief Highway Engineer
Transport Wales
Welsh Assembly Government
Cathays Parks
Cardiff
CF10 3NQ

M J A PARKER
Chief Highway Engineer
Transport Wales

Director of Engineering
The Department for Regional Development
Roads Service
Clarence Court
10-18 Adelaide Street
Belfast
BT2 8GB

R J M CAIRNS
Director of Engineering

APPENDIX A TRAFFIC SIGNS AND ROAD MARKINGS (SAMPLE LAYOUTS)

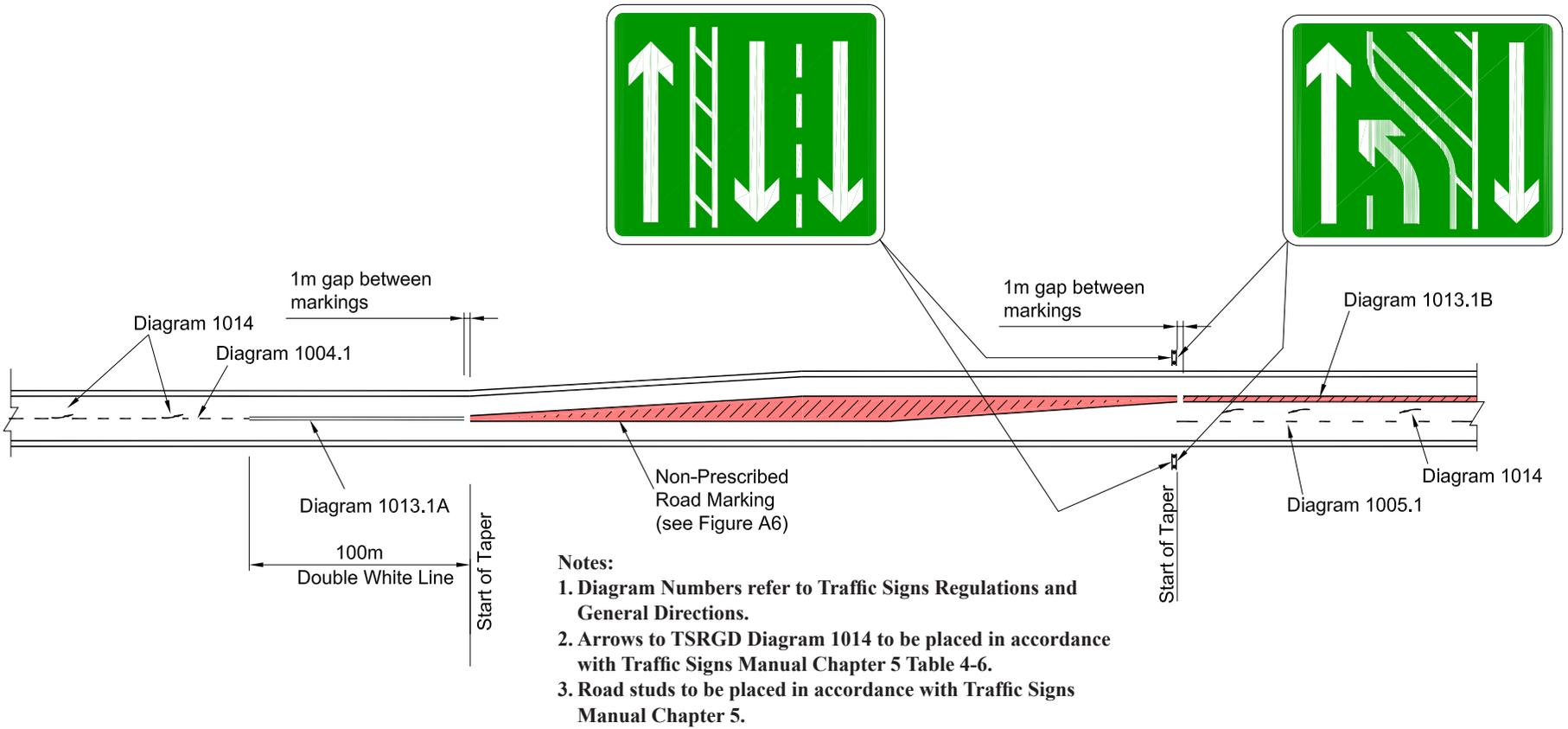
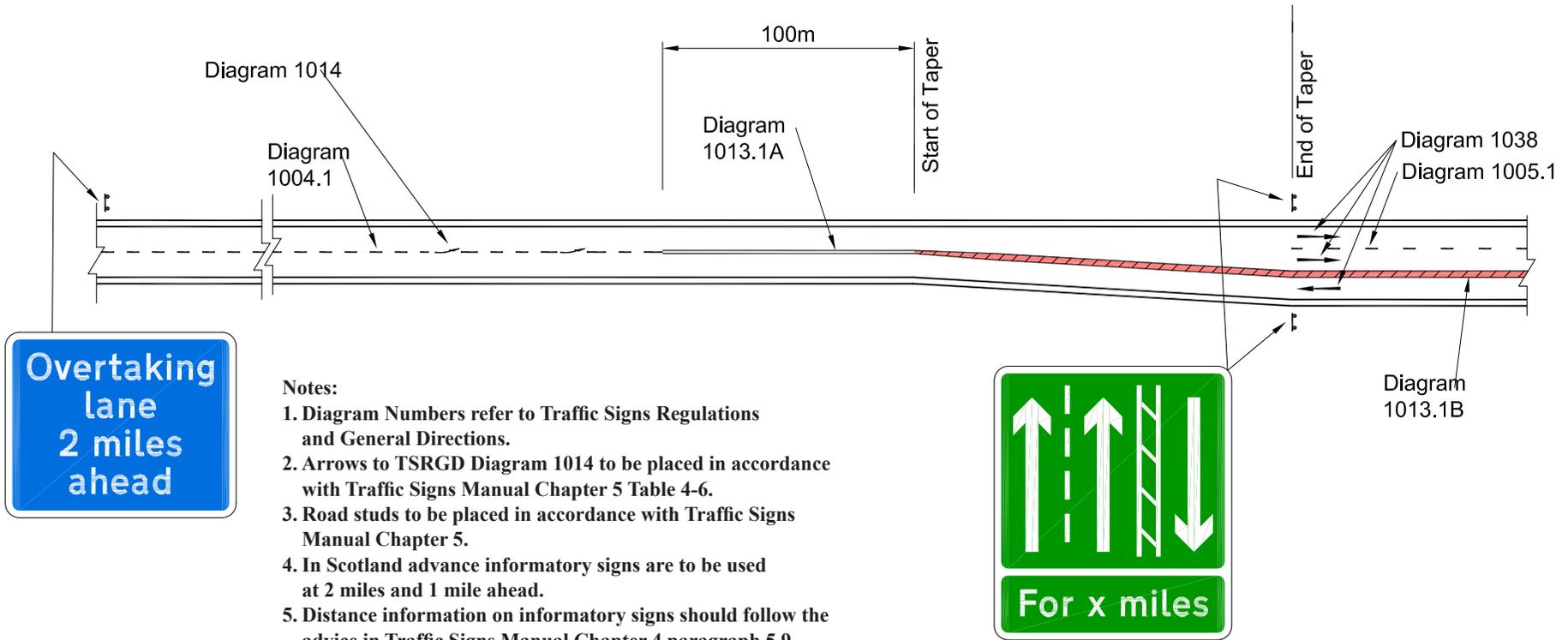


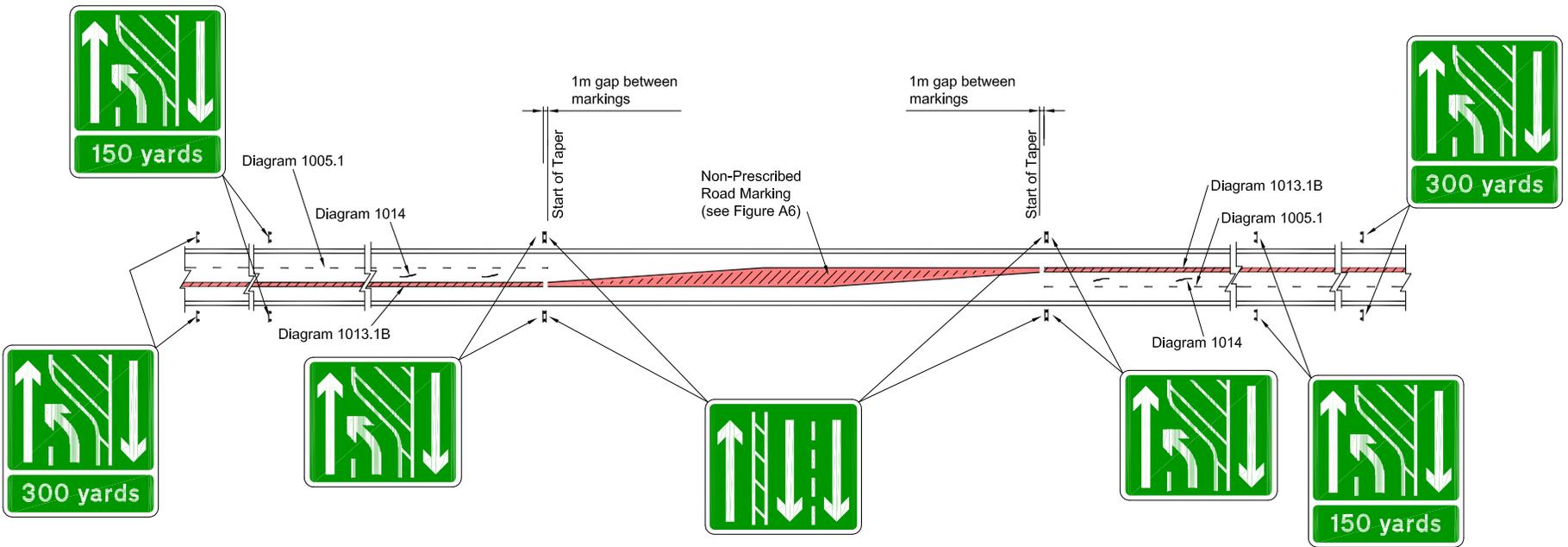
Figure A/1: Signs and Markings at WS2+1 Interface (Commencing on Single Lane Section)



Notes:

1. Diagram Numbers refer to Traffic Signs Regulations and General Directions.
2. Arrows to TSRGD Diagram 1014 to be placed in accordance with Traffic Signs Manual Chapter 5 Table 4-6.
3. Road studs to be placed in accordance with Traffic Signs Manual Chapter 5.
4. In Scotland advance informatory signs are to be used at 2 miles and 1 mile ahead.
5. Distance information on informatory signs should follow the advice in Traffic Signs Manual Chapter 4 paragraph 5.9, except in Scotland where the length of the Overtaking Lane Section is to be provided.

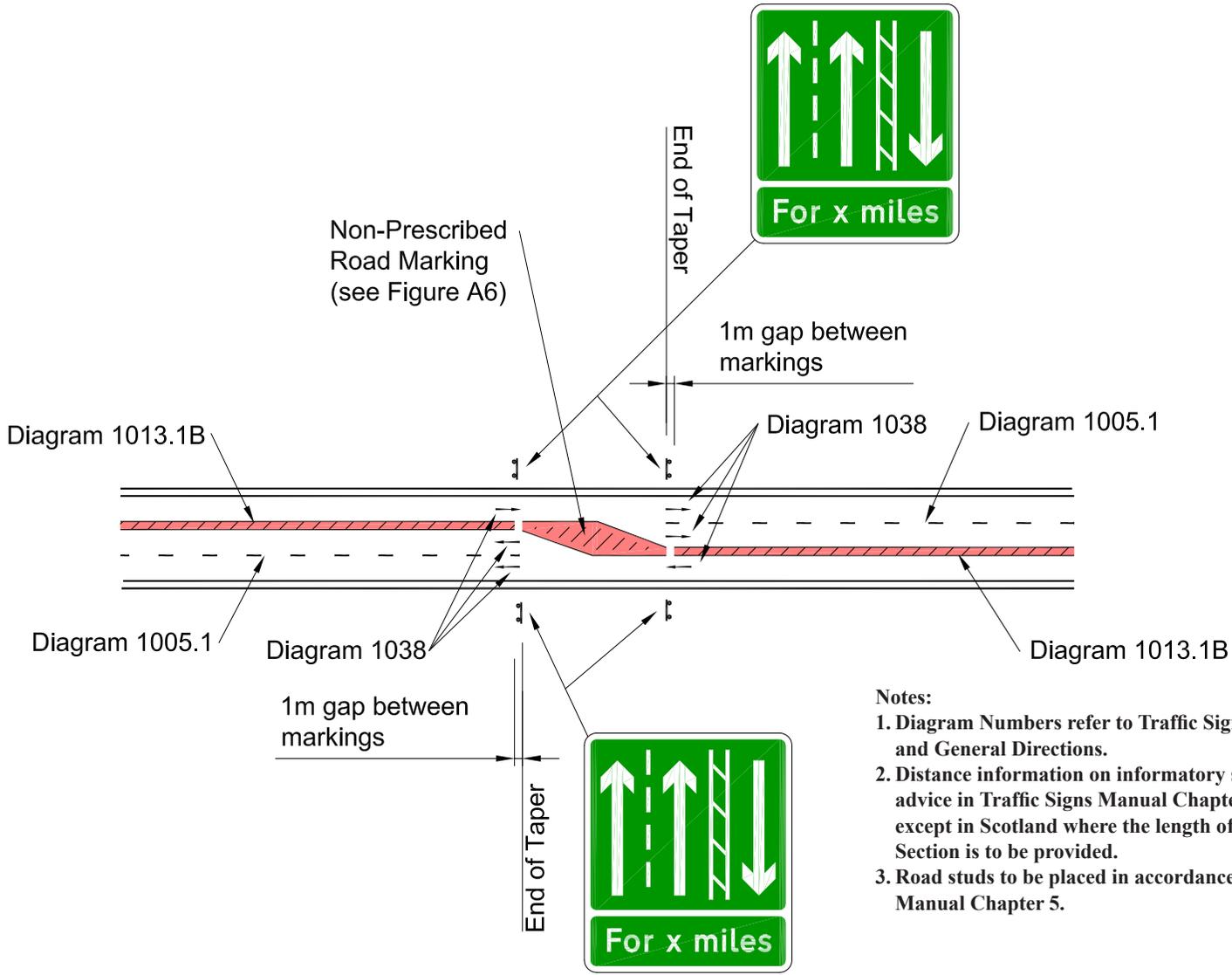
Figure A/2: Signs and Markings at WS2+1 Interface (Commencing on Overtaking Lane Section)



Notes:

1. Diagram Numbers refer to Traffic Signs Regulations and General Directions.
2. Arrows to TSRGD Diagram 1014 to be placed in accordance with Traffic Signs Manual Chapter 5 Table 4-6.
3. Road studs to be placed in accordance with Traffic Signs Manual Chapter 5.

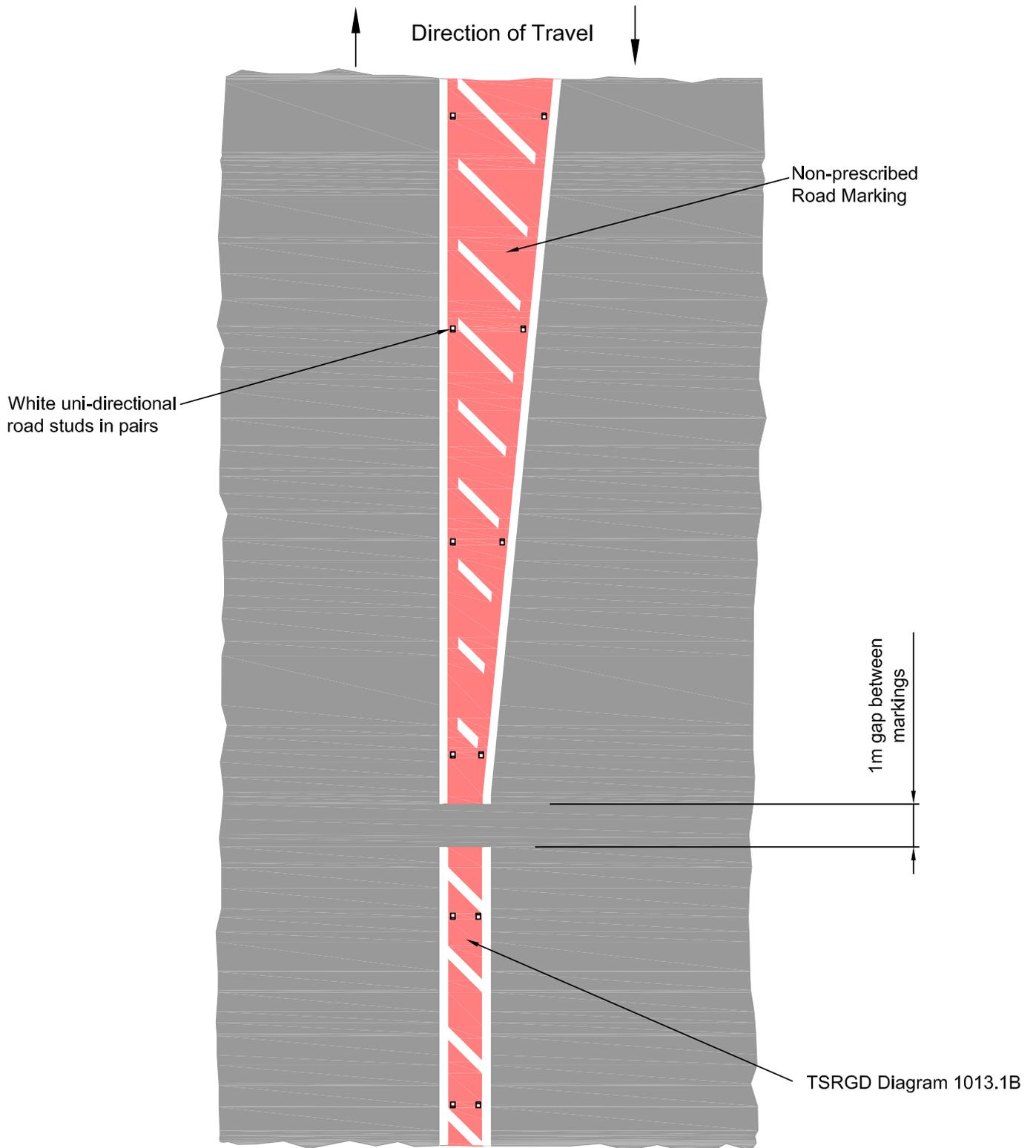
Figure A/3: Signs and Markings at Conflicting Changeover



Notes:

1. Diagram Numbers refer to Traffic Signs Regulations and General Directions.
2. Distance information on informatory signs should follow the advice in Traffic Signs Manual Chapter 4 paragraph 5.9, except in Scotland where the length of the Overtaking Lane Section is to be provided.
3. Road studs to be placed in accordance with Traffic Signs Manual Chapter 5.

Figure A/4: Signs and Markings at Non-Conflicting Changeover



Notes:
1. Authorisation required for markings as illustrated.

Figure A/6: Interface Between TSRGD Diagram 1013.1B and Non-prescribed Road Marking