M25 junction 10/A3 Wisley interchange

TR010030

9.67 DMRB Guidance extracts CD122, CD123 and CD127 (Response to ExQ2.2.1and ExQ2.13.13)

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M25 junction 10/A3 Wisley interchange

Development Consent Order 202[x]

9.67 DMRB GUIDANCE EXTRACTS CD122, CD123 and CD127 (Response to ExQ2.2.1 and EXQ2.13.13)

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Contents

Chapters

Pages

1. Relevant extracts from DMRB Guidance CD122 (in response to ExQ2.13.13)

Terms and definitions

Terms

Term	Definition
Auxiliary lane	An additional lane parallel to the mainline carriageway to provide increased merge or diverge opportunity or additional space for weaving traffic.
Compact connector road	A two way connector road between a major and minor road designed as part of a compact grade separated junction.
Compact grade separated junction	A grade separated junction designed with a two way unsegregated link road between the major and minor road. The connector road joins the major road via a priority junction designed to CD 123 [Ref 2.N].
Connector road	A collective term for interchange links, link roads, slip roads and loops designed as part of a full grade separated junction.
Datum points	Defined points at merges and diverges used for the purposes of locating features such as signs and signals and measuring weaving lengths.
Direct access	A connection to an all-purpose trunk road that provides access to a single field or dwelling only, which does not provide a through route.
Downstream	That part of the carriageway(s) where the traffic is flowing away from the section in question.
Fork	An at-grade junction of two roads, usually within an interchange, which diverge from the approach road at similar angles. NOTE: Usually both diverging roads have equal status.
Full grade separated junction	A grade separated junction designed with free flowing merges and/or diverges in accordance with this document.
Ghost island	An area of the carriageway marked to separate lanes of traffic travelling in the same direction on merge and diverge layouts. NOTE 1: The purpose of the ghost island at a merge is to separate the points of entry of two slip road traffic lanes. NOTE 2: The purpose of the ghost island at a diverge it is to separate the points of exit to a slip road.
Grade separated junction	A grade separated junction has at least two carriageway links at different levels, and usually involves the provision of a structure to accommodate carriageways crossing.
Interchange	A grade separated junction that provides free flow from one mainline to another.
Interchange link	A connector road carrying free flowing traffic within an interchange between one level and/or direction and another.
Intra-junction	The section of mainline within a junction, between a diverge and merge.
Lane drop	A layout where a lane(s) of the upstream carriageway becomes a lane(s) of the diverging connector road.

Terms (continued)

Term	Definition
Lane gain	A layout where a lane(s) of the merging connector road becomes a lane(s) of the mainline carriageway.
Link road	In the context of junctions, a link road is one way connector road adjacent to but separate from the mainline carriageway carrying traffic in the same direction. It is used to connect the mainline carriageway to the local highway network where successive direct connections cannot be provided to an adequate standard because the junction spacing is too close.
Loop	A connector road, one or two way, which is made up of the elements of the loops shown in Figure 5.10N and which passes through an angle in the range of approximately 180 to 270 degrees. NOTE: The loop is considered to extend to the end of the near straight length of road contiguous with the back of the diverge or merge nose.
Mainline	The major route within a junction which typically is a higher road classification and/or carries greater traffic volumes.
Near straight	A length of connector road with a radius no less than the desirable minimum radius with superelevation of 5% as detailed in TD 9 [Ref 3.N] for the mainline design speed.
Nose	A paved area, approximately triangular in shape, between a connector road and the mainline at a merge or diverge, suitably marked to discourage drivers from crossing it.
Nose ratio	Nose ratio is the ratio of the back of nose width and the nose length.
Parallel merge/diverge	A merge or diverge layout where an auxiliary lane is provided alongside the mainline carriageway.
Priority junctions	A junction controlled by a 'Give Way' or 'Stop' arrangement. NOTE 1: Stop arrangements are only used where there is severe visibility restrictions. NOTE 2: Direct accesses can operate in a similar manner but are not classed as priority junctions.
Rural road	An all-purpose road or motorway that is generally not subjected to a local speed limit.
Slip road	A connector road between a mainline carriageway and another road NOTE: At the end of a slip road, traffic usually encounters a priority junction, a roundabout or traffic signals.
Stopping sight distance	As defined in TD 9 [Ref 3.N].
Taper merge/diverge	A merge or diverge layout where merging or diverging traffic joins or leaves the mainline carriageway through an area forming a funnel to or flare from the mainline carriageway.

Terms (continued)

Term	Definition
Transition curves	Transition curves have a changing radius to provide a smooth transition between two different radius curves, or a curve and a straight.
Upstream	That part of the carriageway(s) where traffic is flowing towards the section in question.
Urban road - motorway	A motorway with a speed limit of 60 mph or less within a built up area.
Urban road - all purpose roads	An all-purpose road within a built up area, either a single carriageway with a speed limit of 40 mph or less or a dual carriageway with a speed limit of 60 mph or less.
Weaving section	The length of the carriageway between a successive merge or lane gain and diverge or lane drop, where vehicles leaving the mainline at the diverge or lane drop have to cross the paths of vehicles that have joined the mainline at the merge or lane gain.
Weaving section lanes calculation	The weaving section lanes calculations determine the requirements for overall carriageway width based on the traffic flows and the length of the weaving section.

3.12.1 Where the flows are in the region indicated by the * symbol in Figure 3.12b and Layout E option 2 is to be used, an extended auxiliary lane should be provided instead of a taper merge.

3.12.2 A merge layout that offers a higher level of capacity than the worst case peak flow may be provided, e.g Layout C instead of Layout A.

NOTE *A merge layout that offers less capacity than the worst case peak flow cannot be used e.g. a Layout C instead of Layout F.*

3.13 For 3 lane merges onto the main carriageway, Layout G or H (see Figures 3.14i to 3.14k) shall be used based on the number of downstream lanes to be provided.

3.14 Merge layouts shall be as shown in Figures 3.14a to 3.14k below.

Figure 3.14a Layout A option 1 - taper merge

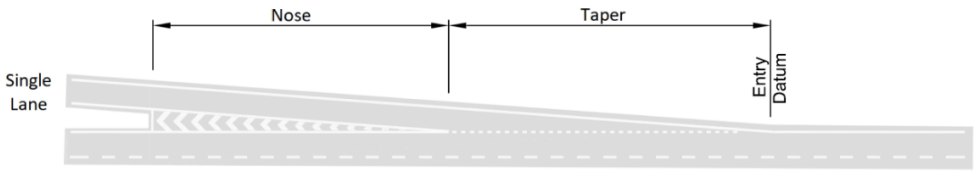


Figure 3.14b Layout A option 2 - 2 lane taper merge

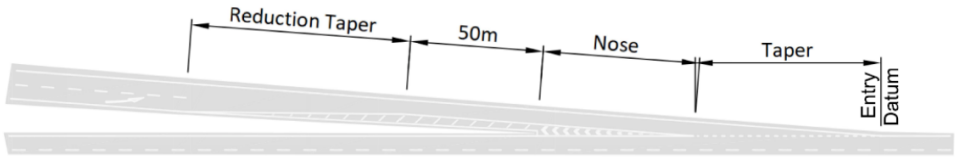


Figure 3.14c Layout B - parallel merge

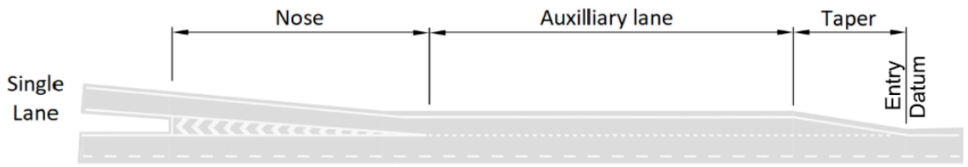
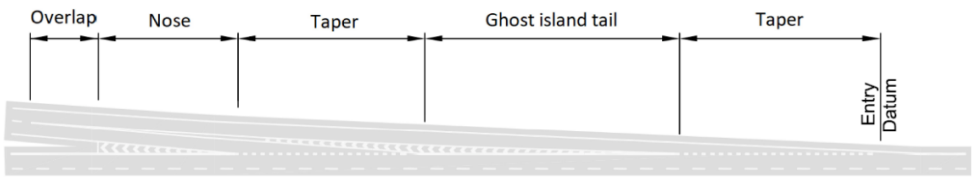


Figure 3.14d Layout C - ghost island merge



a need to maintain continuity with the number of upstream lanes (on the slip road).

3.15 Parallel merges (Layout B) shall be used instead of taper merges (Layout A) if one or more of the following apply:

1) the mainline horizontal radius is less than desirable minimum in a left hand curve direction;
2) the mainline is on an uphill or downhill gradient of 3% or steeper for longer than 1.5 km prior to the start of the taper;
3) the connector road entering a merge is on an uphill gradient of 3% or steeper for longer than 400 metres before the back of nose.

3.16 Ghost island merge layouts shall not be used on urban roads.

3.16.1 For new slip roads on urban roads where a Layout A merge is required, Layout A option 2 may be provided.

3.17 For new slip roads on rural roads where a Layout A merge is to be provided, Layout A option 1 shall be used.

3.18 Where a single lane Layout A option 1 or Layout B merge is to be provided from an existing 2 lane slip road, the slip road shall be reduced to a single lane prior to the nose in accordance with Layout A option 2.

3.19 The reduction taper in Layout A option 2 and Layout G option 2 shall be in accordance with Table 7-4 of TSM Chapter 5 [Ref 5.N].

NOTE *For Layout G option 2, the lane reduction followed by the merge are successive merges and therefore the 3.75v spacing requirements apply (see Section 3, "Successive diverges and merges").*

3.20 An overlap of 50 metres shall be provided on Layouts C, E, F, G option 1 and 2 and H.

3.21 The geometric design parameters for a merge layout shall be in accordance with Table 3.21.

Table 3.21 Merge layouts geometric parameters

Road class	Length of entry taper (metres)	Nose ratio (metres)	Nose length (metres)	Minimum auxiliary lane length (metres)	Length of auxiliary lane taper (metres)	Length of ghost island tail (metres)
Rural motorway						
Mainline	205	1:40	115	230	75	180
Within in-terchange	130	1:25	75	160	55	150
Rural all-purpose design speed						
120kph	150	1:30	85	190	55	150
100A kph or less	130	1:25	75	160	55	150
Urban road speed limit						
60 mph	95	1:15	50	125	40	n/a see Note
50 mph or less	75	1:12	40	100	40	n/a see Note

NOTE *Lengths are measured along the left edge of the carriageway and shown on Figure 3.21N.*

4. Full grade separated: weaving and spacing

General

4.1 For all-purpose roads, the minimum length between a full grade separated junction and an at-grade junction, service area and lay-by shall be:

1) 1 km for rural roads; and
2) the minimum weaving section length as derived for urban roads.

NOTE *At-grade junctions include priority junctions, signal controlled junctions, roundabouts and direct accesses.*

4.2 A weaving section shall be assessed using the weaving section lanes calculation where successive full grade separated junctions are spaced less than:

1) 3 km for rural motorways; and
2) 2 km for rural all-purpose roads.

NOTE 1 *An assessment of weaving is only required between closely spaced (less than 3km for rural motorways and 2km for rural all-purpose roads) successive junctions where a merge is followed by a diverge.*

NOTE 2 *On motorways up to 5 lanes wide, merges and diverges tend not to interact where they are spaced over 3 km apart.*

NOTE 3 *On all-purpose roads up to 3 lanes wide, merges and diverges tend not to interact where they are spaced over 2 km apart.*

NOTE 4 *Weaving section lanes calculation is provided in Equation 4.7.*

4.3 Motorway service areas accesses shall be treated as a junction for the purpose of weaving assessments.

Weaving section length

Measurement of weaving sections

4.4 Weaving sections shall be measured to/from the points detailed in Tables 4.4a and 4.4b.

Table 4.4a Weaving section measurement points - merges

Merge type	Measurement point
Layouts A1, A2 and D	Entry datum point
Layout B	As defined in Figure 4.4a
Layout C	As defined in Figure 4.4b
Layouts E1, E2, G2 and H	As defined in Figure 4.4c
Layout F	As defined in Figure 4.4d
Layout G1	As defined in Figure 4.4e

Table 4.4b Weaving section measurement points - diverges

Diverge type		Measurement point
Layout A1		Exit datum point
Layouts A2 and B2		As defined in Figure 4.4f
Layout B1		As defined in Figure 4.4g
Layouts C, D1, D2, E, and F	≥100kph design speeds	Exit datum point + 100 metres as defined in Figure 4.4h
	≤85kph design speeds	Exit datum point + 50 metres as defined in Figure 4.4h

Figure 4.4a Auxilliary lane merge weaving section

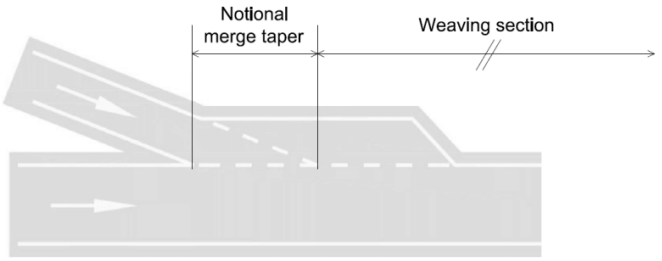


Figure 4.4b Ghost island merge weaving section

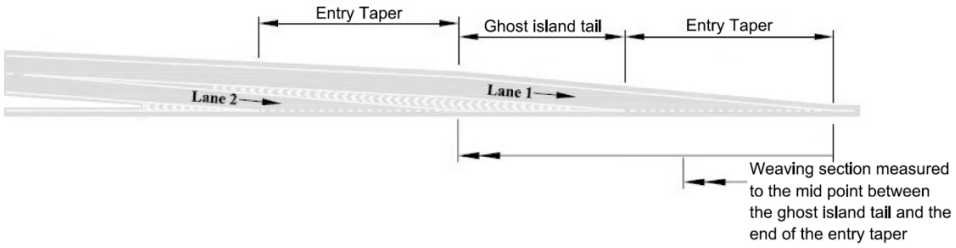


Figure 4.4g Ghost Island and direct taper diverge weaving section

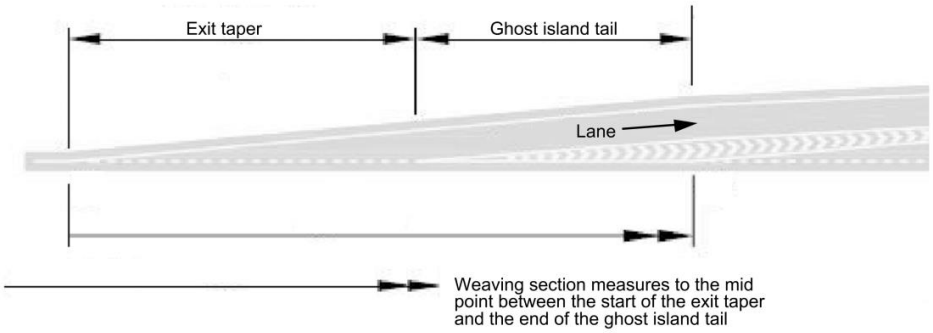
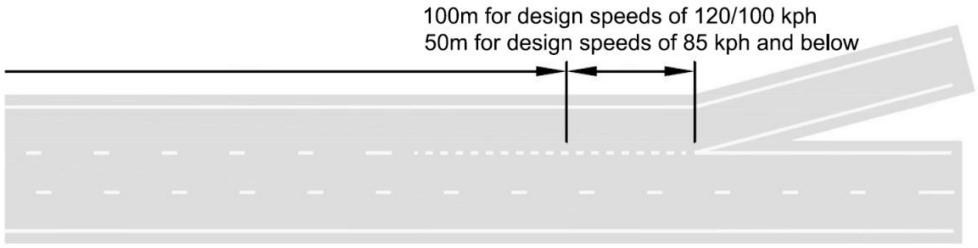


Figure 4.4h Lane drop diverge weaving section



Minimum length of weaving sections

4.5 For rural roads, the minimum weaving section length shall be:

1) 2 km for motorways; and
2) 1 km for all-purpose roads.

NOTE *Where the minimum weaving section length cannot be provided between two closely spaced grade separated junctions, the need for a weaving section can be eliminated by the inclusion of link roads between the junctions, as illustrated in Figure 4.5N.*

5. Connector roads

Full grade separated connector road geometry

5.1 Two way slip roads shall be in the form of a dual carriageway with opposing traffic separated by a physical central reserve with vehicle restraint system.

5.2 Direct accesses and priority junctions shall not be provided on connector roads.

5.3 Single lane interchange links shall only be provided:

1) where their length does not exceed 1 km and they are on an average uphill gradient of up to 3%, are level or on a downhill gradient; and
2) where their length does not exceed 0.5 km and they are on an average uphill gradient of 3% or steeper.

Design speed, horizontal and vertical geometry and superelevation

5.4 The minimum design speeds for connector roads shall be in accordance with Table 5.4.

Table 5.4 Connector road design speed

		Mainline design speed			
		Urban 100 kph	**Urban 85 kph**	**Rural 120 kph**	**Rural 100A kph**
Connector road design speed (kph)	**Interchange link**	70	70	85	85
	Slip road	60	60	70	70
	Link road	100 or 85 see 5.4.1	85 or 70 see 5.4.1	120 or 100A see 5.4.1	100A or 85 see 5.4.1
	Dumb-bell link road	70	70	70	70

NOTE TD 9 [Ref 3.N] provides the base geometric parameters for the design speeds.

5.4.1 On link roads the lower design speed in Table 5.4 should only be used where an appropriate mandatory or advisory speed limit is signed.

5.5 A slip road longer than 0.75 km shall be designed as an interchange link.

5.6 Any transition curves at locations where the design speed changes shall be designed to the higher design speed value.

5.7 On connector roads linking to motorways the longitudinal gradient shall not exceed 6%.

5.7.1 Diverge and merge slip roads should be on uphill and downhill gradients respectively.

NOTE Uphill diverges help diverging traffic reduce their speeds on the approach to the end of the slip road and downhill merges help merging traffic accelerate to the mainline speed.

5.8 Connector roads shall include a near straight at the back of nose, at least equal in length to the nose.

NOTE 1 Nose lengths are given in Table 3.21 and Table 3.31 for merges and diverges, respectively.

NOTE 2 Near straights allow drivers to better match their speed to the mainline when merging, and assist drivers to comprehend the layout ahead and adjust their speed accordingly.

5.9 Connector road loops shall only be provided where they connect to the start/end of the near straight, as illustrated in Figure 5.10N.

5.10 The minimum radii that shall be provided for connector road loops are:

1) 75 metres for loops on to or off a motorway;
2) 30 metres for loops on to an all-purpose carriageway;
3) 50 metres for loops off an all-purpose carriageway.

NOTE *In the case of the horizontal curvature and super elevation for loops, there is evidence to suggest that the radii of loops (Figure 5.10N) can safely be much less than for curves turning through lesser angles, provided that adequate warning is given to drivers and clear sight lines are maintained.*

2. Relevant extracts from DMRB Guidance CD123 (in response to ExQ2.2.1)

Table 2.25 Minimum stagger distances for left/right staggered junctions

Design speed (kph)	Stagger distance (metres)		
	Ghost island	Single lane dualling	Dual carriageway
50	50	--	60
60	50	--	60
70	60	--	60
85	75	75	75
100	100	100	100
120	--	--	130

NOTE *For higher design speeds, the distance is based on the sum of the two deceleration lengths lying side by side plus the turning lengths (and queuing lengths, if appropriate) at each end, otherwise it is based on the manoeuvring requirements of the design vehicle.*

2.26 Staggered junctions shall not be used on climbing lane sections.

Signal-controlled junctions

2.27 Where the 85th percentile speed on the approach roads is greater than or equal to 104 kph (65 mph), a signal-controlled junction shall not be provided.

Direct accesses

2.28 Direct accesses shall not be used on motorways, all-purpose dual three lane carriageways and on WS2+1 roads.

2.29 Direct accesses shall not be provided on overtaking sections.

2.29.1 Direct accesses should be avoided where possible.

NOTE 1 *The primary purpose of the trunk road network is to provide for the safe and expeditious movement of long distance through traffic. That means strictly limiting the number of direct accesses to trunk roads.*

NOTE 2 *Direct accesses can be joined together with a link or service road before they join the main carriageway of the trunk road.*

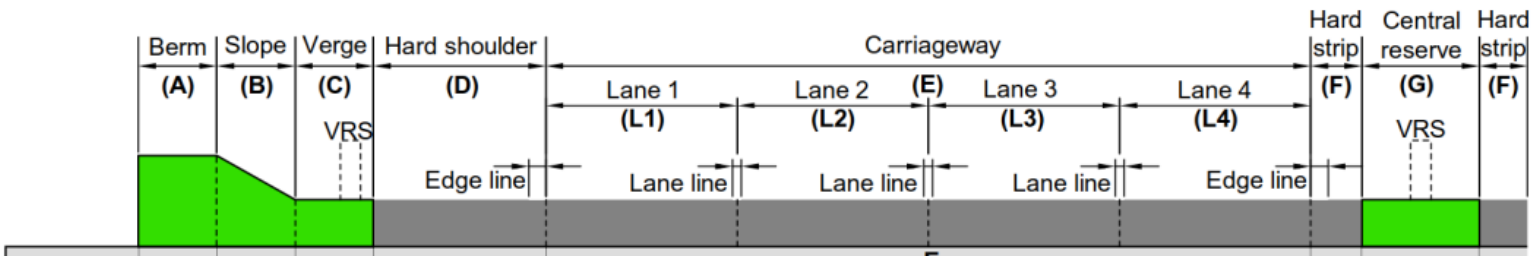
2.29.2 Direct accesses on single carriageway roads should not be positioned facing each other.

2.30 On dual carriageways, gaps in the central reserve to accommodate right turns in and out of a direct access shall not be provided.

2.31 Direct accesses shall not be provided at locations where the major road gradient is greater than 4%.

3. Relevant extracts from DMRB Guidance CD127 (in response to ExQ2.2.1)

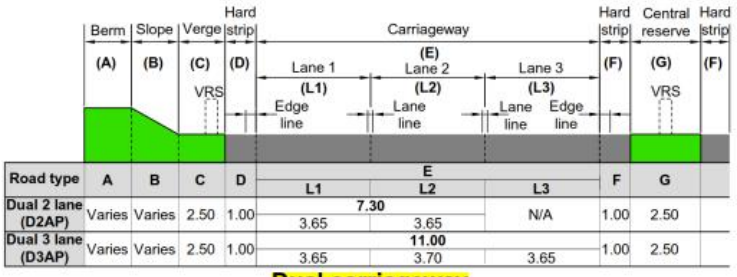
Figure 2.1.1N1a Dimensions of cross-section components for rural motorway mainline



Road type	A	B	C	D	E				F	G	
					L1	L2	L3	L4			
Dual 2 lane (D2M)	Varies	Varies	1.50	3.30	**7.30**		N/A		0.70	3.10	
					3.65	3.65					
Dual 3 lane (D3M)	Varies	Varies	1.50	3.30	**11.00**			N/A	0.70	3.10	
					3.65	3.70	3.65				
Dual 4 lane (D4M)	Varies	Varies	1.50	3.30	**14.70**				0.70	3.10	
					3.65	3.70	3.70	3.65			

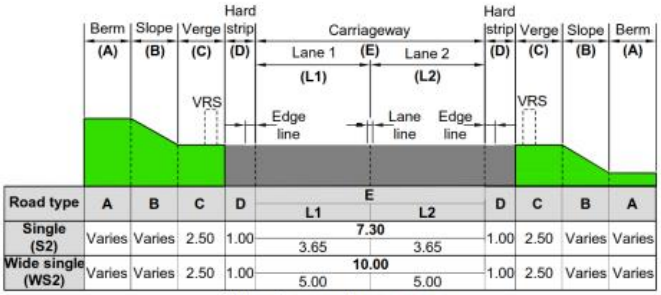
16

Figure 2.1.1N1e Dimensions of cross-section components for rural all-purpose roads mainline



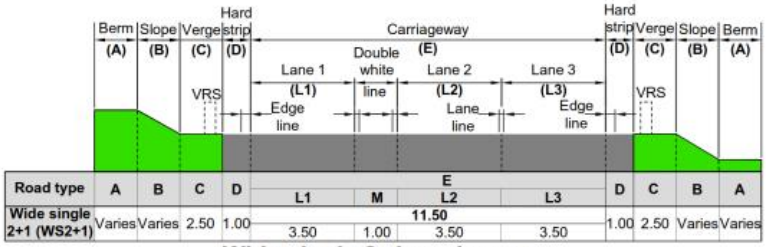
Road type	A	B	C	D	E			F	G
					L1	L2	L3		
Dual 2 lane (D2AP)	Varies	Varies	2.50	1.00	7.30		N/A	1.00	2.50
					3.65	3.65			
Dual 3 lane (D3AP)	Varies	Varies	2.50	1.00	11.00			1.00	2.50
					3.65	3.70	3.65		

Dual carriageway



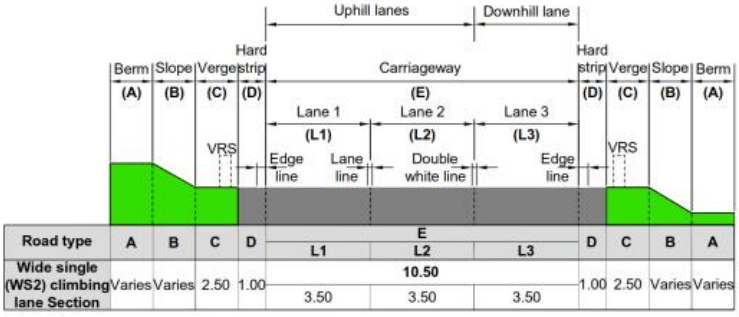
Road type	A	B	C	D	E		D	C	B	A
					L1	L2				
Single (S2)	Varies	Varies	2.50	1.00	7.30		1.00	2.50	Varies	Varies
					3.65	3.65				
Wide single (WS2)	Varies	Varies	2.50	1.00	10.00		1.00	2.50	Varies	Varies
					5.00	5.00				

Single carriageway



Road type	A	B	C	D	E			D	C	B	A
					L1	M	L2	L3			
Wide single 2+1 (WS2+1)	Varies	Varies	2.50	1.00	11.50			1.00	2.50	Varies	Varies
					3.50	1.00	3.50	3.50			

Wide single 2+1 carriageway



Road type	A	B	C	D	E			D	C	B	A
					L1	L2	L3				
Wide single (WS2) climbing lane Section	Varies	Varies	2.50	1.00	10.50			1.00	2.50	Varies	Varies
					3.50	3.50	3.50				

Wide single (WS2) climbing lane section

3) the nearside verge on a single lane rural all-purpose connector road is located immediately adjacent to the highway boundary.

2.11 Where the offside hard strip has been widened for drainage, the reduction of the offside verge shall be no more than the increase in the offside hard strip.

2.11.1 Thin strips of grass or other vegetation within the highway cross-section should be avoided as they can result in safety issues related to maintenance.

NOTE 1 *The verge offers an important component in highway drainage systems, including the storage of snow displaced from the carriageway. It offers an area to support utility plant and to house highway equipment. Congested verges with insufficient room for necessary roadside components present both safety and engineering difficulties.*

NOTE 2 *Documents CD 143 [Ref 7.N] and CD 195 [Ref 6.N] provide requirements and advice on the appropriate widths of facilities for walking, cycling and horse-riding and the horizontal separation (verge) from the carriageway.*

2.12 Where the nearside verge on a single lane rural all-purpose connector road is located immediately adjacent to the highway boundary, the verge shall be increased by a minimum of 0.50 metres over the values given in Figure 2.1.1.N1f.

2.13 Where Figures 2.1.1.N1a to 2.1.1.N1h indicate the verge width "varies" and it is necessary to accommodate communications ducting and chambers, a minimum verge width of 2.00 metres shall be provided.

2.13.1 Where Figures 2.1.1.N1a to 2.1.1.N1h indicate verge width "varies" or where the verge width needs to be increased over the minimum value, the verge should be designed where applicable to:

1) accommodate the requisite stopping sight distances in accordance with CD 109 [Ref 15.N];
2) accommodate any street furniture, utility, drainage features or equipment;
3) meet the requirements for VRS (TD 19 [Ref 24.N]);
4) accommodate any permanent signs required with particular attention to the provision of the required working width and set-back for VRSs relative to the complete sign assembly;
5) accommodate significant level differences;
6) accommodate temporary traffic management layouts for the envisaged maintenance regime;
7) accommodate matrix signs and signals;
8) accommodate any parts of structures or complete structures;
9) provide sufficient space for maintenance operations;
10) fulfil landscape and environmental objectives including environmental fencing;
11) accommodate walking, cycling and horse-riding routes; and/or
12) provide for access to emergency telephones or provide a safe location for stranded motorists.

Wide carriageways

Mainline lane provision

2.14 All-purpose dual carriageways shall not have more than three mainline lanes in one direction.

2.15 Motorways shall not have more than four mainline lanes in one direction.

NOTE *Auxiliary lanes are not included when determining the number of mainline lanes on all-purpose dual carriageways and motorways.*

Auxiliary lane provision

2.16 Where auxiliary lanes are provided, the width of the auxiliary lane(s) shall be equal to the width of the adjacent nearside mainline lane.

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