Design Manual for Roads and Bridges

Road Layout
Design

CD 146
Positioning of signalling and advance direction signs

(formerly TD 46/05, TD 18/85)

Revision 1

Summary
This document provides the positioning requirements of signalling (lane signals and variable message signs) and advance direction signs for motorways

Application by Overseeing Organisations
Any specific requirements for Overseeing Organisations alternative or supplementary to those given in this document are given in National Application Annexes to this document.

Feedback and Enquiries
Users of this document are encouraged to raise any enquiries and/or provide feedback on the content and usage of this document to the dedicated Highways England team. The email address for all enquiries and feedback is: Standards_Enquiries@highwaysengland.co.uk

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Release notes

Version	Date	Details of amendments
1	Mar 2020	Revision 1 (March 2020) Revision to update references only. Revision 0 (July 2019) CD 146 replaces TD 46/05 and TD 18/85. This full document has been re-written to make it compliant with the new Highways England drafting rules.

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Foreword

Publishing information

This document is published by Highways England.

This document supersedes:

1) TD 46/05 Motorway Signalling;
2) TD 18/85 Criteria for the use of gantries for traffic signs and matrix traffic signals on trunk roads and trunk road motorways;
3) parts of sections 5 and 6 of Interim Advice Note 149/17 Existing Motorways: Additional Requirements and Relaxations;
4) clauses 2.7.2, 2.7.21 and 2.7.25 of Interim Advice Note 161/15 Smart Motorways;
5) those parts of TD 33/05, TA 60/90, TA 74/05, TA 83/05 and IAN 109/08 relating to signal positioning.

Contractual and legal considerations

This document forms part of the works specification. It does not purport to include all the necessary provisions of a contract. Users are responsible for applying all appropriate documents applicable to their contract.

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Introduction

Background

This document provides the positioning requirements of signalling (above lane signals and variable message signs) and advance direction signs for motorways.

Assumptions made in the preparation of this document

The assumptions made in GG 101 [Ref 2.N] apply to this document.

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Abbreviations

Abbreviations

Abbreviation	Definition
ADS	Advance Direction Signs
DMRB	Design Manual for Roads and Bridges
ESS	Entry Slip Signal
HGV	Heavy Goods Vehicle
HSR	Hard Shoulder Running
IAN	Interim Advice Note
MSA	Motorway Service Area
SM	Smart Motorways
TSRGD	Traffic Signs Regulations and General Directions
VMS	Variable Message Sign
VMSL	Variable Mandatory Speed Limits
VPD	Vehicles Per Day

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Terms and definitions

Terms

Term	Definition
Advance direction signs	Sign giving route information in respect of a junction ahead. NOTE: Definition from IAN 145/16 Directional Signs on Motorway and All-Purpose Trunk Roads At Grade and Compact Grade Separated Junctions.
Datum points	Defined points at merges and diverges used for the purposes of locating features such as signs and signals and measuring weaving lengths.
Downstream	A position trailing a reference point, measured in the direction of travel. NOTE: Definition from TD 131 [Ref 1.I].
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: At a diverge it is to separate the points of exit to a slip road.
Inter-junction	This is the region between junctions on the mainline carriageway between the merge tip of the nose of one junction and the diverge tip of the nose of the next junction. NOTE: Definition from TD 131 [Ref 1.I].
Intra-junction	This is the region within a junction on the mainline carriageway between the diverge tip of the nose and the entry tip of the nose. NOTE 1: Intra-junction also includes the entry slip road. NOTE 2: Definition from TD 131 [Ref 1.I].
Upstream	A position in advance of a reference point, measured in the direction of travel. NOTE: Definition from TD 131 [Ref 1.I].
Variable message signs	VMS are technology devices, within the definition of Schedule 16 of the TSRGD [Ref 3.N], capable of displaying, at different times, two or more defined legends or messages. NOTE: VMS can be in the form of light emitting or non light emitting, electrical or electro-mechanical devices.

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1. Scope

Aspects covered

1.1 This document shall be used for the positioning of signalling (above lane signals and variable message signs) and advance direction signs (ADS) for motorways.

NOTE 1 *This document does not cover positioning requirements relevant for all purpose trunk roads and expressways.*

NOTE 2 *Requirements related to all other types of fixed signing apart from ADS signs are not included in this document.*

NOTE 3 *Positioning requirements of signals and ADS related to smart motorways are contained within the National Application Annexes, where applicable.*

NOTE 4 *The datum points for merge and diverge layouts used in this document are defined in CD 122 [Ref 1.N] for the purposes of locating signs and signals.*

Implementation

1.2 This document shall be implemented forthwith on all schemes involving the positioning requirements of signals (above lane signals and variable message signs) and ADS on the Overseeing Organisations' motorway according to the implementation requirements of GG 101 [Ref 2.N].

Use of GG 101

1.3 The requirements contained in GG 101 [Ref 2.N] shall be followed in respect of activities covered by this document.

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2. General

2.1 Where an existing portal gantry is present and it has sufficient residual design life, the feasibility of re-using this existing infrastructure shall be assessed while complying with the functional, spacing and visibility requirements specified in this document.

NOTE *An assessment for the feasibility of re-using the existing equipment is to be undertaken as part of the feasibility, option selection or design phase of a scheme.*

2.1.1 Variable message signs (VMS) and direction signs associated with a junction should be cantilever and post mounted respectively.

2.2 Where cantilever mounted signals/signs are to be installed and the motorway lighting is in the verge, signals/signs shall be positioned at least one column length away from the nearest lighting column.

NOTE *Cantilever mounted signals/signs are positioned at least one column length away from the nearest lighting column to prevent damage being sustained by the signal in the event of the lighting column being knocked down by a vehicle. The lantern height is usually 10m or greater and therefore does not interfere with signal visibility.*

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3. Advance direction signs

3.1 All advance direction sign (ADS) position distances shall be measured from the exit datum point.

3.2 A primary and secondary ADS shall be provided on the approach to each junction exit in accordance with the hierarchy and distances outlined in Table 3.3.2

NOTE *Illustrative diverge and merge layouts for ADS are provided in Figures A.1 and A.2 in Appendix A.*

3.3 The hierarchy of primary and secondary ADS positioning shall be applied in sequence starting at 'priority 1' as shown in Table 3.3.2.

3.3.1 Only when it is not practicable to provide a combination of signs within the tolerances given in Table 3.3.2, a lower priority combination may be used.

3.3.2 ADS should be positioned as close as practicable to the distances they sign.

Table 3.3.2 ADS Combinations

Priority	Primary ADS position distance	Secondary ADS position distance	Upstream tolerance of signed distance	Downstream tolerance of signed distance
1	1 mile	1/2 mile	10%	20 metres
2	2/3 mile	1/3 mile	10%	20 metres
3	1 mile	1/3 mile	10%	20 metres
4	1 1/4 mile	1/2 mile	15 metres	20 metres
5	1 1/3 mile	1/2 mile	10%	20 metres
6	1 1/4 mile	1/3 mile	10%	20 metres
7	1 1/3 mile	2/3 mile	10%	20 metres
8	1 1/3 mile	1/3 mile	10%	20 metres

NOTE *1 1/3 mile ADS is more accurate than 15 metres upstream of the 1 1/4 mile ADS.*

3.4 A final direction sign shall be positioned at the exit datum or up to 50 metres upstream of it.

3.5 A confirmatory direction sign shall be provided.

3.6 Where there is a confirmatory above lane signal gantry, the confirmatory direction sign shall be co-located on the confirmatory above lane signal gantry.

3.7 Where there is no confirmatory above lane signal gantry, the confirmatory direction sign shall be verge mounted and located on the 'diverge' island, not more than 30 metres beyond the physical nose.

3.8 For ghost island diverges, verge mounted signs in accordance with Diagram 2904.2 of TSRGD [Ref 3.N] shall be provided between the primary and secondary ADS and between the secondary ADS and the final DS.

3.8.1 For ghost island diverges, verge mounted signs should be positioned as close as practicable to the midpoint between the relevant ADSs.

Criteria to be met before using gantries for direction signs

3.9 Gantries shall only be used for mounting direction signs where one or more of the following criteria are met:

1) the carriageway has or will have 4 or more running lanes;
2) the carriageway has 3 running lanes and carries (or will carry within 15 years of opening) 33,000 vehicles per day (1-way) (high growth estimate) and the proportion of HGVs is greater than 20%;
3) the number of lanes available to a driver going ahead reduces after the junction;
4) a series of junctions are (an average of) less than 3km apart measured between centres of junctions;

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5) the road is on a structure but does not have a hard shoulder;
6) the road is on a steep embankment or in a deep cutting;
7) an assessment of the cost has confirmed that it is cheaper to provide gantry mounted signs rather than mounting direction signs on the left-hand side of the road.

NOTE 1 *Side-mounted signs can be obscured for a significant proportion of a driver's 'reading time' when the traffic volume is high and when the proportion of HGVs is high. It is also a function of the width of the road where the driver in the extreme right-hand lane has the highest probability of poor visibility due to the traffic in the other lanes.*

NOTE 2 *The demands on drivers are greater when approaching complex layouts which can draw their attention away from the road, including where the number of lanes reduces after a junction, where junctions follow in quick succession or on elevated roads.*

Carriageways with 5 or more lanes

3.10 Where ADS signs are to be provided on sections of 5 or more lanes, they shall be mounted on gantries.

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4. Signalling and variable message signs

General

4.1 Where the operational need for above lane signals has been established, above lane signals shall be positioned in accordance with the requirements within the 'Above lane signals' sub-section.

4.1.1 Where the provision of above lane signalling is not justified, verge mounted signals should be provided if:

1) the existing signalling infrastructure is near the end of its design life or where an opportunity for replacement is provided by highway improvement or maintenance works;
2) the signals are being used in a sequence forming part of a signalling scheme and not on an individual basis.

4.1.2 Where the operational need for a system of signalling has been identified, gantries for motorway signalling should be positioned in a sequence and not on an individual basis.

4.1.3 Above lane signals or variable message signs (VMS) should not be positioned within 300m downstream of a change in the number of carriageway lanes between junctions.

4.1.4 The Overseeing Organisation should be advised at an early stage of any alterations to signals outside the scheme boundaries that are potentially necessary.

NOTE *The boundaries between carriageway and lane signalling cannot always coincide with the limits of the scheme if safe signal sequencing is to be achieved. Therefore, it is important to check the effect of the scheme design on existing signals in adjacent sections of motorway.*

Variable message signs

4.2 Where a new system of variable message signs (VMS) is to be provided and above lane signals are not or not planned to be present, VMS shall be located in accordance with the requirements in the 'Variable message signs' section of this document.

NOTE *Illustrative diverge and merge layouts for VMS are provided in Figures A.1 and A.2 in Appendix A.*

4.3 Where above lane signals are or planned to be present, VMS shall be located in accordance with requirements in the 'Above lane signals' section of this document.

4.4 The first VMS shall be provided between 200 and 400 metres downstream of the entry datum point.

4.4.1 The first VMS downstream of the entry datum point should be provided as close to the 300 metres point as practicable.

NOTE *The function of a first or primary VMS can be fulfilled by a single VMS.*

4.5 A primary VMS shall be provided between 200 and 400 metres upstream of the primary ADS.

4.5.1 The primary VMS upstream of the primary ADS should be provided as close to the 300 metres point as practicable.

NOTE *The function of a first or primary VMS can be fulfilled by a single VMS.*

4.5.2 Where it is not practicable to locate the primary VMS between 200 and 400 metres upstream of the primary ADS, the VMS may be co-located with the relevant gantry mounted ADS.

4.6 A secondary VMS shall be provided between 200 and 400 metres upstream of the secondary ADS, and a minimum of 180 metres downstream of the primary ADS.

4.6.1 The secondary VMS upstream of the secondary ADS should be provided as close to the 300 metres point as practicable.

NOTE *The function of a first or secondary VMS can be fulfilled by a single VMS.*

4.6.2 Where it is not practicable to locate a secondary VMS between 200 and 400 metres upstream of the secondary ADS, the VMS may be co-located with the relevant gantry mounted ADS.

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4.7 A final VMS shall be provided at the back of the diverge nose.

4.7.1 The final VMS should be provided as close as practicable to the back of the diverge nose.

4.8 VMS shall be spaced between 600 and 1,500 metres apart between the first VMS and the primary VMS.

4.9 An intra-junction VMS shall be provided if the distance between the first VMS and the upstream VMS is greater than 1,500 metres.

4.9.1 The intra-junction VMS should be located as near to the midpoint of the upstream VMS and first VMS as practicable.

4.10 There shall be unobstructed forward visibility to each VMS for at least two thirds of the distance between the VMS in question and the upstream VMS.

4.11 Visibility shall be measured to the centre of the VMS:

1) from the centre of the left-hand lane on left-hand curves with radii up to 2,880m;
2) from the centre of the right-hand lane on right-hand curves with radii up to 2,880m; and
3) from the centre of the lane closest to the signal elsewhere.

Strategic variable message signing

4.12 Where the operational need for the provision of strategic VMS has been established, strategic VMS shall be provided between 200m and 400m upstream of the associated of 1 mile and 1/2 mile ADS.

4.13 Strategic VMS shall not be co-located with fixed signs.

4.14 Where existing strategic VMS are present they shall be retained or be re-positioned.

NOTE *It is not necessary to provide additional strategic VMS as part of a scheme.*

4.14.1 The sequence of sign and signalling installations on the approach to a junction should be strategic VMS, VMS, and then the primary ADS.

4.14.2 The sequence of sign and signalling installations following the primary ADS should be strategic VMS, VMS, and then the secondary ADS.

4.15 The spacing between roadside equipment associated with sign and signalling installations shall be no less than 180m.

4.15.1 The spacing between roadside equipment should be located as near to the midpoint as practicable between the sign and signalling installations.

Above lane signals

4.16 Where above lane signals currently exist, an assessment shall be undertaken to determine the impact of modifying their layout in accordance with the requirements in this 'Above lane signals' section.

4.16.1 Where the assessment to determine the impact of modifying the layout of existing above lane signals shows that application of the requirements in this 'Above lane signals' section can lead to operational inconsistencies or lead to disproportionate cost, then the original above lane signal layout may be retained.

NOTE *Operational inconsistencies can include a short length with a different signal layout.*

4.17 The first above lane signals shall be provided between 200 and 400 metres downstream of the entry datum point.

4.17.1 The first above lane signals downstream of the entry datum point should be provided as close to the 300 metres point as practicable.

4.18 Above lane signals shall be co-located with the primary, secondary and final direction signs.

4.19 Confirmatory above lane signals shall be provided between 30 and 50 metres downstream of the diverge nose tip.

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4.20 Where the distance between the final above lane signal and the confirmatory above lane signal gantry exceeds 800 metres, a supplementary above lane signal or signals shall be added so that there is no more than 800 metres between above lane signals.

4.21 Inter-junction above lane signals shall be spaced between 600 and 1,500 metres apart between the first above lane signal and the primary above lane signal.

4.21.1 The spacing between existing inter-junction above lane signals may be retained if:

1) the minimum spacing is less than 600 metres; and
2) the structure or foundations are suitable for reuse with new above lane signals.

4.22 Intra-junction above lane signals shall be provided if above lane signals are to be provided on the downstream link and where the distance between the confirmatory above lane signal gantry and the first above lane signal is greater than 1,500 metres.

4.22.1 Intra-junction above lane signals should be located as near to the midpoint of the confirmatory and first above lane signals as practicable.

4.23 There shall be unobstructed forward visibility to each set of above lane signals for at least two thirds of the distance between the above lane signals in question and the above lane signals upstream.

4.24 Visibility shall be measured to the two least obstructed signals:

1) from the centre of the left-hand lane on left-hand curves with radii up to 2,880m; or
2) from the centre of the right-hand lane on right-hand curves with radii up to 2,880m; or
3) from the centre of the lane closest to the signals elsewhere.

4.25 A primary VMS shall be provided between 200 and 400 metres upstream of the primary ADS above lane signal.

4.25.1 The primary VMS upstream of the primary ADS above lane signal should be provided as close to the 300 metres point as practicable.

4.26 A secondary VMS shall be provided between 200 and 400 metres upstream of the secondary ADS above lane signal.

4.26.1 The secondary VMS upstream of the secondary ADS above lane signal should be provided as close to the 300 metres point as practicable.

4.27 The secondary VMS shall be located at least 180 metres downstream of the primary ADS above lane signal.

4.28 A VMS shall be co-located on the first, confirmatory and all inter-junction and intra-junction gantries, unless this results in ahead signs, exit signs, above lane signals and VMS being mounted on a single gantry.

4.29 Where an all purpose trunk road feeds directly into a motorway, gantry mounted above lane signals shall be provided where the road:

1) merges with the motorway as a slip road, the gantry is provided prior to the point where the two carriageways merge;
2) ends and becomes a motorway, the gantry is provided immediately after the start of a motorway.

4.30 A minimum of one additional gantry shall be provided in advance of the start of a motorway, except where the speed limit of the approach road is less than 40mph.

4.31 Where above lane signals are provided on the mainline, an entry slip road signal shall be provided on the offside verge at the start of the entry slip road.

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5. Normative references

The following documents, in whole or in part, are normative references for this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Ref 1.N	Highways England. CD 122, 'Geometric design of grade separated junctions'
Ref 2.N	Highways England. GG 101, 'Introduction to the Design Manual for Roads and Bridges'
Ref 3.N	The Stationery Office. TSRGD, 'The Traffic Signs Regulations and General Directions 2016'

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6. Informative references

The following documents are informative references for this document and provide supporting information.

Ref 1.I	Highways England. TD 131, 'Roadside technology and communications'

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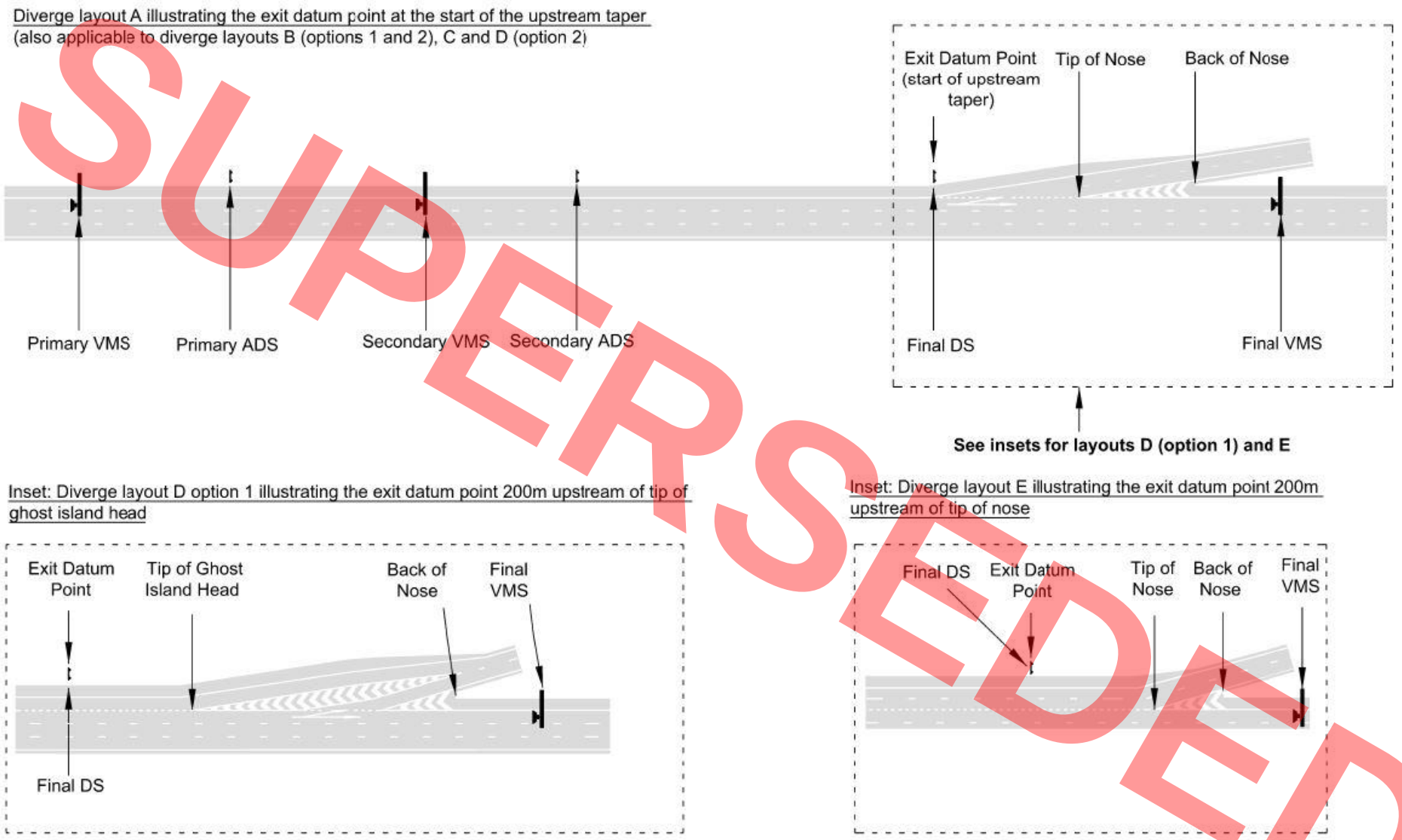
Appendix A. Illustrative diverge and merge layouts for VMS and ADS

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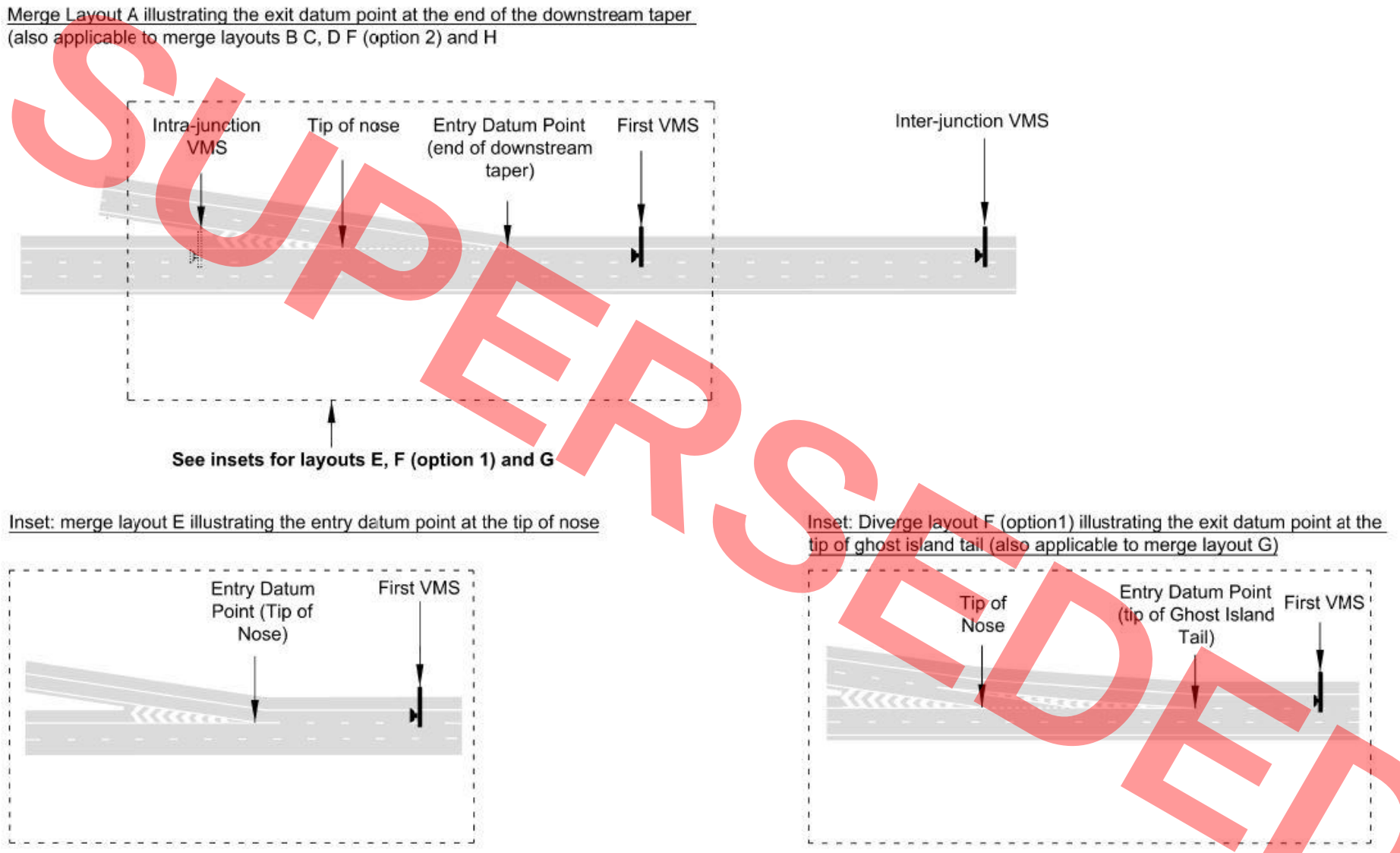
Figure A.1 Illustrative Diverge Layouts for VMS and ADS



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Figure A.2 Illustrative Merge Layouts for VMS and ADS



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Road Layout
Design

CD 146
England National Application Annex to CD 146 Positioning of signalling and advance direction signs

(formerly TD 46/05 and TD 18/85)

Revision 1

Summary
This National Application Annex sets out the Highways England specific positioning requirements of signalling (lane signals and variable message signs) and advance direction signs for motorways.

Feedback and Enquiries
Users of this document are encouraged to raise any enquiries and/or provide feedback on the content and usage of this document to the dedicated Highways England team. The email address for all enquiries and feedback is: Standards_Enquiries@highwaysengland.co.uk

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Release notes

Version	Date	Details of amendments
1	Mar 2020	Revision 1 (March 2020) Update to references only. Revision 0 (July 2019) Highways England National Application Annex to CD 146.

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Foreword

Publishing information

This document is published by Highways England.

This document supersedes parts of Section 2.7 of Interim Advice Note 161/15 Smart Motorways.

Contractual and legal considerations

This document forms part of the works specification. It does not purport to include all the necessary provisions of a contract. Users are responsible for applying all appropriate documents applicable to their contract.

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Introduction

Background

This National Application Annex gives the Highways England-specific positioning requirements for signalling (above lane signals and variable message signs) and advance direction signs for smart motorways.

Assumptions made in the preparation of this document

The assumptions made in GG 101 [Ref 1.N] apply to this document.

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Abbreviations

Abbreviations

Abbreviation	Definition
ADS	Advance Direction Sign
ALR	All Lane Running
CM	Controlled Motorways
EA	Emergency Area
ESS	Entry Slip Signals
FTP	Fixed Taper Point
HGV	High Good Vehicle
MSA	Motorway Service Area
SCRG	Safety Control Review Group
SM	Smart Motorways
VMS	Variable Message Sign

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Terms and definitions

Terms

Term	Definition
Conditioning VMS	At the start of the scheme the first VMS is defined as the conditioning VMS.
Continuation VMS	With the exception of the terminal junction, the VMS located on a gantry at the diverge nose is defined as a continuation VMS.
Inter-junction	This is the region between junctions on the mainline carriageway between the merge tip of the nose of one junction and the diverge tip of the nose of the next junction. NOTE: Definition from TD 131 [Ref 1.l].
Intra-junction	This is the region within a junction on the mainline carriageway between the diverge tip of the nose and the entry tip of the nose. NOTE 1: Intra-junction also includes the entry slip road. NOTE 2: Definition from TD 131 [Ref 1.l].
Termination VMS	At the terminal junction of a scheme, the VMS located on a gantry at the diverge nose is defined as the termination VMS.

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E/1. Smart motorways

Direction signing

E/1.1 CD 146, clause 3.5 shall not apply.

Control signals

E/1.2 VMS shall be provided at every signalling site except where:

1) ahead signing, exit signing and above lane signalling are all co-located on the same structure;
2) there are existing strategic message signs.

E/1.2.1 Where additional signals are required between the secondary ADS and the continuation/termination VMS, then these may take the form of a cantilever VMS, above lane signals or VMS on the final ADS gantry.

E/1.3 Where carriageway signalling is provided, both this and the VMS capability shall be integrated within one item of equipment, as shown in Figures E/A.1 and E/A.2, except where there are existing strategic message signs.

E/1.3.1 For all lane running (ALR) schemes, the midpoint of the carriageway signal/VMS enclosure should be located between the edge of carriageway road marking and the lane 1/lane 2 road marking.

E/1.3.2 For controlled motorways (CM) schemes, the midpoint of the carriageway signal/VMS enclosure should be located between the edge of carriageway and the hard shoulder/lane 1 road marking, except where there are existing strategic message signs.

NOTE *The final choice of carriageway signal/VMS lateral position is dictated by the horizontal and vertical alignment of the carriageway and presence of upstream obstructions.*

E/1.4 Where existing signal portal gantry structures at gateway or intermediate locations are retained as part of a scheme, mandatory above lane signals shall be provided to replace the advisory above lane signals.

E/1.4.1 VMS should be provided to replace the advisory above lane signals where:

1) existing signal portal gantry structures that are not at gateway or intermediate locations are retained as part a scheme; and
2) there are no more than 4 running lanes.

E/1.5 Above lane signalling shall be provided in locations with 5 or more running lanes (e.g. a parallel connector road on the approach to a junction).

E/1.6 Where additional signals are required between the secondary ADS and the continuation/termination VMS in order to meet the positioning and visibility requirements, these shall take the form of a cantilever VMS, above lane signals or VMS on the final ADS gantry.

E/1.7 A conditioning VMS shall be provided on all mainline approaches to a smart motorways (SM) scheme.

NOTE *The approaches to a SM scheme can be multiple locations at a motorway to motorway interchange.*

E/1.7.1 Only one conditioning signal should be provided per approach when transitioning from advisory signalling.

E/1.7.2 The VMS should be provided on an existing gantry in a location over the main carriageway that simplifies traffic management requirements for maintenance.

Positioning requirements for control signalling/VMS

E/1.8 Above lane signals and VMS shall be provided between 200 and 400 metres downstream of the entry datum point, at the "gateway signals and VMS" location, as shown in Figures E/A.1 and E/A.2.

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E/1.8.1 Above lane signals and VMS downstream of the entry datum point should be provided as close to the 300 metres point as practicable.

E/1.8.2 Where there are two successive merges, and the distance between the end of the first merge and the nose of the second merge is insufficient to locate a gateway gantry between 200 and 400 metres, then the gateway gantry at the first merge may be omitted.

E/1.9 A minimum of two signal sites per link (between the entry and exit datum points) shall be provided.

E/1.9.1 The second set of signals, on a link with only two signal sites, may either be above lane or carriageway signals.

NOTE 1 *Signal spacing less than 600m is acceptable to meet the requirement to provide a minimum of two signal sites per link (between the entry and exit datum points).*

NOTE 2 *The selection of signal type for the second site will need to be endorsed by the SCRG (Safety Control Review Group).*

E/1.9.2 The spacing between the two signal sites per link should be equal.

E/1.10 For link lengths between 5km and 6km measured from the gateway signal to the downstream continuation/termination VMS at the back of the diverge nose, an assessment shall be undertaken to determine whether additional "above lane signals and VMS" sites are to be provided, as shown in Figures E/A.1 and E/A.2 at the "intermediate signals and VMS" location.

NOTE *The decision whether additional "above lane signals and VMS" sites are provided for link lengths between 5km and 6km measured from the gateway signal to the downstream continuation/termination VMS at the back of the diverge nose will need to be endorsed by the SCRG.*

E/1.11 Where the link exceeds 6km then a minimum of one "intermediate signal and VMS" site shall be provided.

NOTE *The decision to provide one or more "intermediate signal and VMS" sites if the link exceeds 6km will need to be endorsed by the SCRG.*

E/1.12 The distance between signals as described below shall not be greater than 6km:

1) gateway signal to the downstream continuation/termination VMS at the back of the diverge nose;
2) gateway signal to a downstream intermediate signal;
3) intermediate signal to the downstream continuation/termination VMS at the back of the diverge nose;
4) intermediate signal to downstream intermediate signal.

E/1.12.1 The spacing between the signals as described below should be equal:

1) gateway signal to the downstream continuation/termination VMS at the back of the diverge nose;
2) gateway signal to a downstream intermediate signal;
3) intermediate signal to the downstream continuation/termination VMS at the back of the diverge nose;
4) intermediate signal to downstream intermediate signal.

E/1.13 Where no confirmatory ADS gantry is present or proposed, a VMS shall be provided downstream of the diverge back of nose at a junction or interchange except at a motorway service area (MSA).

E/1.13.1 The VMS should be provided as close to the diverge back of nose as practicable.

E/1.13.2 Where an existing gantry is present over the diverge nose then this may be used for VMS provision, instead of locating the signal downstream of the back of nose.

E/1.14 At diverge junctions, carriageway signalling on a VMS shall be located upstream of the primary and secondary ADS.

E/1.14.1 At diverge junctions, carriageway signalling on a VMS should be located between 200 and 400 metres upstream of the primary and secondary ADS.

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E/1.14.2 Where existing portal gantries are present, existing infrastructure should be re-used where suitable, thereby co-locating the control signalling with the primary, secondary and final direction signs.

E/1.15 Mandatory control signals shall be spaced between a minimum of 600m and up to a maximum of 1500m apart.

NOTE 1 The actual mandatory control signal spacing is determined by the requirements in the 'visibility requirements for control signalling/VMS' sub-section.

NOTE 2 The spacing requirements for mandatory control signals is also applicable at MSAs.

NOTE 3 Any situation where mandatory control signal spacing is less than 600m is to be endorsed by the SCRG.

NOTE 4 Any situation where mandatory control signal spacing is greater than 1500m is to be endorsed by the SCRG and operations technical leadership group.

E/1.15.1 At intra-junction, mandatory control signals should be spaced between a minimum of 600m and up to a maximum of 1500m apart.

NOTE At intra-junction, mandatory control signals spaced less than 600m or more than 1500m is to be endorsed by the SCRG.

E/1.16 Signal gantries shall not be positioned such that they span a ghost island.

NOTE Signal gantries positioned such that they span a ghost island can cause inappropriate signals to be displayed to road users.

E/1.17 An intra-junction VMS with combined signal shall be provided if the distance between the continuation VMS/conditioning VMS and the gateway signal/VMS following the junction merge, is greater than 1500m.

E/1.17.1 The intra-Junction VMS should be located as near to the midpoint as possible subject to sight line and buildability constraints.

Visibility requirements for control signalling/VMS

E/1.18 There shall be unobstructed forward visibility for a minimum distance of 350m in advance of the downstream signal.

E/1.19 Where the distance between signals is greater than 800m, there shall be unobstructed forward visibility to each signal for at least half of the distance between the signal in question and the signal upstream.

E/1.20 The maximum distance between the upstream signal and the start of visibility of the downstream signal shall not exceed 600m.

NOTE Where a scheme design proposes non-visibility distances greater than 500m, this is to be endorsed by the SCRG.

E/1.21 Where the downstream signal is provided by a verge mounted VMS, the unobstructed forward visibility shall be provided for a minimum of 50% of the VMS sign face (right hand side).

E/1.22 Where the downstream signal is provided by an above lane signal, the unobstructed forward visibility shall be provided to all of the signal mounted over lane 1 (right hand bend) or lane 4 (left hand bend).

E/1.23 The unobstructed forward visibility shall be determined:

1) from the centre line of the right hand traffic lane on right hand bends;
2) from the centre line of the left hand traffic lane on left hand bends;
3) from the centre point of any lane on straights or near straights.

E/1.24 The need for fixed taper points (FTPs) shall be established.

E/1.24.1 The final signal/VMS should be positioned between 300m and 450m upstream of the FTP.

E/1.24.2 The secondary signal/VMS should be positioned between 500m and 1500m from the final signal/VMS.

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E/1.24.3 The primary signal/VMS should be positioned between 500m and 1500m from the secondary signal/VMS.

E/1.25 For every emergency area (EA), a VMS shall be located upstream of the EA such that a vehicle exiting the EA is visible from all lanes at a point adjacent to this VMS.

NOTE 1 *VMS located upstream of the EA is referred to as the EA VMS.*

NOTE 2 *VMS located upstream of the EA such that a vehicle exiting the EA is visible from all lanes at a point adjacent to this VMS, enables the message "slow vehicle leaving refuge area" to be set where required.*

E/1.26 The visibility requirements in this section shall be met for signal sites that are designated as 'live' and 'non-live' enforcement sites.

Strategic variable message signing

E/1.27 In addition to the requirements of CD 146, where it is not possible to relocate strategic VMS according to the requirements, alternative positions shall be agreed with regional control centres (RCC), national traffic information service (NTIS) and the senior user and endorsed by the SCRG.

Entry slip signals (ESS)

E/1.28 ESS shall be provided at all junctions.

E/1.29 ESS shall be located at the last decision point before accessing the motorway.

NOTE 1 *The last decision point can be the start of the slip road, such that customers still have the option not to join the motorway (during a motorway closure) when viewing the signal(s).*

NOTE 2 *Multiple directions of entry to a slip road can require additional signals to provide visibility from all approach angles.*

E/1.30 Where the first signal downstream of the merge is not visible from the entry datum point, existing ESS shall be upgraded to be capable of displaying all of the following:

1) advisory speed limits;
2) mandatory speed limits;
3) lane control aspects.

E/1.30.1 Where existing ESS are being upgraded the existing infrastructure should be re-used where it has been determined that it has sufficient residual design life.

E/1.30.2 Existing ESS capable of displaying advisory aspects may be retained if they are suitably located to provide visibility from all approach angles, and the first signal downstream of the merge is visible from the entry datum point.

E/1.31 Where existing ESS are not suitably located at the start of the slip to meet the visibility requirements, or there are no existing ESS, then a single mandatory ESS shall be installed at the start of the slip road, located to provide visibility from all approach angles.

E/1.32 Where visibility from all approach angles is not achieved with one signal, additional signals shall be provided as necessary to achieve visibility from all approach angles.

E/1.33 Where ESS are not currently installed at MSAs they shall only be provided if:

1) the first signal downstream of the merge is not visible from the entry datum point; or
2) the ESS is able to be located such that customers still have the option not to join the motorway (during a motorway closure) when viewing the signal.

E/1.33.1 Where the first signal downstream of the merge is visible from the entry datum point, existing ESS at MSAs may be retained.

E/1.33.2 Where the first signal downstream of the merge is not visible from the entry datum point, existing ESS at MSAs should be replaced with a single ESS capable of displaying:

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1) advisory speed limits;
2) mandatory speed limits;
3) lane control aspects.

VMS/signalling requirements on free flow links

E/1.34 Where a SM scheme intersects with an existing or planned SM scheme at a motorway to motorway interchange with free flow links between the schemes, the VMS/signalling requirements shall be agreed with the Overseeing Organisation.

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E/2. Normative references

The following documents, in whole or in part, are normative references for this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Ref 1.N	Highways England. GG 101, 'Introduction to the Design Manual for Roads and Bridges'

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E/3. Informative references

The following documents are informative references for this document and provide supporting information.

Ref 1.I	Highways England. TD 131, 'Roadside technology and communications'

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Appendix E/A. Figures of generic designs for ALR and CM

NOTE: The mounting options for VMS, signs and signals are shown in Figure E/A.1 and E/A.2 for illustrative purposes, and the form of the superstructure may be varied.

NOTE:The following are omitted from Figure E/A.1 for clarity:

1) Count-down markers
2) Marker posts
3) Driver location signs
4) No hard shoulder for 'x' miles sign
5) EA/ERT approach signing
6) EA signing

NOTE: The following are omitted from Figure E/A.2 for clarity:

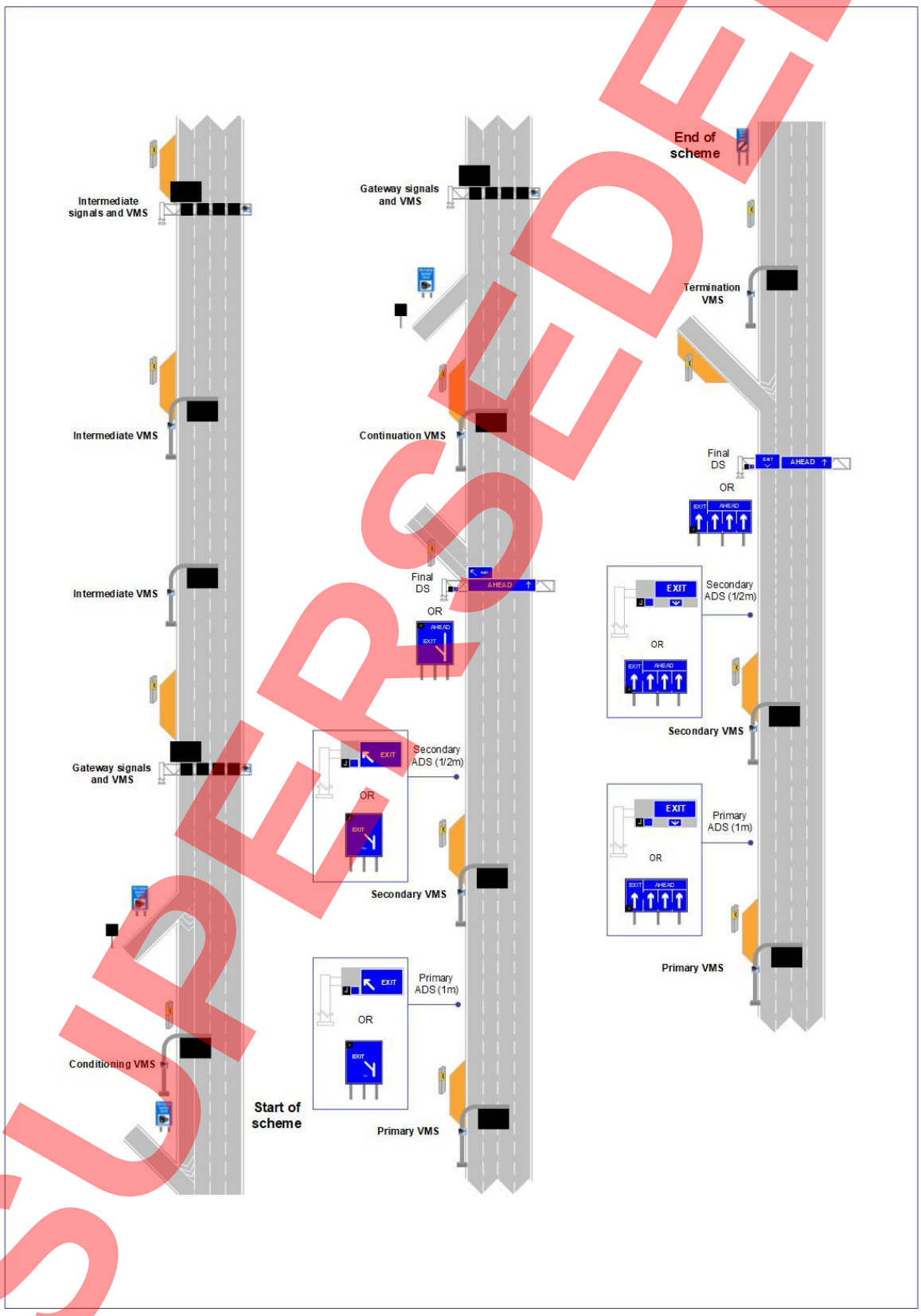
1) Count-down markers
2) Marker posts
3) Driver location signs

NOTE: ERTs are not shown in Figure E/A.1 and E/A.2 for clarity.

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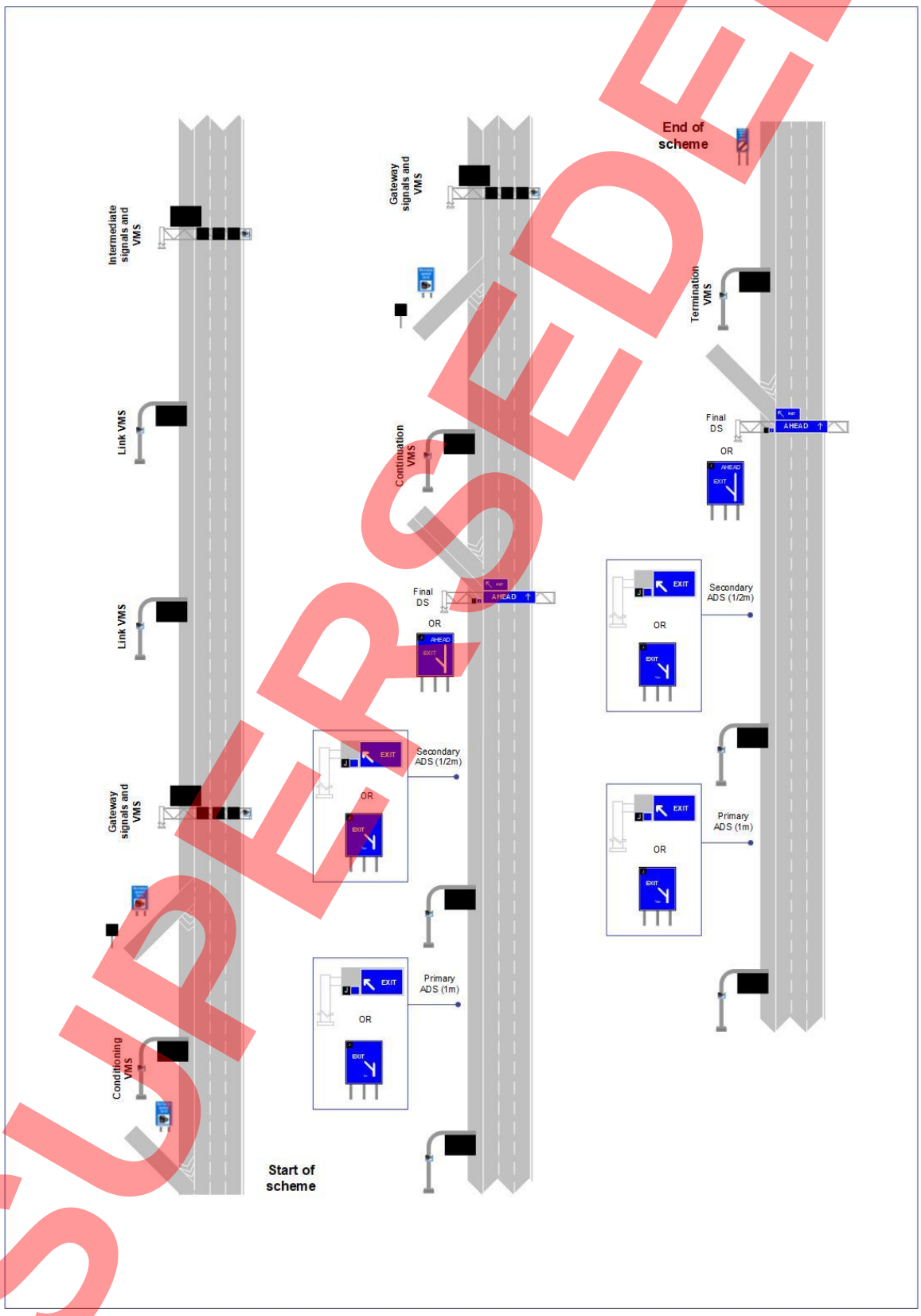
Figure E/A.1 Generic design for ALR - for illustrative purposes only



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Figure E/A.2 Generic Design for CM - for illustrative purposes only



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Department for Infrastructure
An Roinn Bonneagair

Road Layout
Design

CD 146
Northern Ireland National Application Annex to CD 146 Positioning of signalling and advance direction signs

(formerly TD 46/05 and TD 18/85)

Revision 0

Summary
This National Application Annex sets out the Department for Infrastructure, Northern Ireland specific positioning requirements of signalling (lane signals and variable message signs) and advance direction signs for motorways.

Feedback and Enquiries
Users of this document are encouraged to raise any enquiries and/or provide feedback on the content and usage of this document to the dedicated team in the Department for Infrastructure, Northern Ireland. The email address for all enquiries and feedback is: dcu@infrastructure-ni.gov.uk

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Release notes

Version	Date	Details of amendments
0	Jul 2019	Department for Infrastructure, Northern Ireland National Application Annex to CD 146.

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Foreword

Publishing information

This document is published by Highways England on behalf of Department for Infrastructure, Northern Ireland.

This document supersedes TD 46/05 and TD 18/85, which are withdrawn.

Contractual and legal considerations

This document forms part of the works specification. It does not purport to include all the necessary provisions of a contract. Users are responsible for applying all appropriate documents applicable to their contract.

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Introduction

Background

This National Application Annex contains the Department for Infrastructure, Northern Ireland specific requirements related to positioning requirements of signalling (lane signals and variable message signs) and advance direction signs for motorways.

Assumptions made in the preparation of this document

The assumptions made in GG 101 [Ref 1.N] apply to this document.

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Abbreviations

Abbreviations

Abbreviation	Definition
TSRGD	Traffic Signs Regulations and General Directions
TSRNI	Traffic Signs Regulations Northern Ireland

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NI/1. Traffic Signs Regulations Northern Ireland

NI/1.1 The Traffic Signs Regulations Northern Ireland (TSR(NI) 1997 [Ref 2.N]) must be applied in Northern Ireland.

NI/1.2 Where a clause in CD 146 refers to the Traffic Signs Regulations and General Directions (TSRGD [Ref 3.N]), the reference shall be replaced by the TSR(NI) 1997 [Ref 2.N].

NI/1.3 The Department for Infrastructure Northern Ireland shall be contacted for advice on the sign diagram numbers and regulations equivalent to TSRGD [Ref 3.N].

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NI/2. Normative references

The following documents, in whole or in part, are normative references for this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Ref 1.N	Highways England. GG 101, 'Introduction to the Design Manual for Roads and Bridges'
Ref 2.N	The Stationery Office (TSO). Department for Infrastructure (Dfl). TSR(NI) 1997, 'The Traffic Signs Regulations (Northern Ireland) 1997'
Ref 3.N	The Stationery Office. TSRGD, 'The Traffic Signs Regulations and General Directions 2016'

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Road Layout
Design

CD 146
Scotland National Application Annex to CD 146 Positioning of signalling and advance direction signs

(formerly TD 46/05 and TD 18/85)

Revision 0

Summary
There are no specific requirements for Transport Scotland supplementary or alternative to those given in CD 146.

Feedback and Enquiries
Users of this document are encouraged to raise any enquiries and/or provide feedback on the content and usage of this document to the dedicated Transport Scotland team. The email address for all enquiries and feedback is: TSStandardsBranch@transport.gov.scot

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0	Jul 2019	Transport Scotland National Application Annex to CD 146.

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Llywodraeth Cymru
Welsh Government

Road Layout
Design

CD 146
Wales National Application Annex to CD 146 Positioning of signalling and advance direction signs

(formerly TD 46/05 and TD 18/85)

Revision 0

Summary
There are no specific requirements for Welsh Government supplementary or alternative to those given in CD 146.

Feedback and Enquiries
Users of this document are encouraged to raise any enquiries and/or provide feedback on the content and usage of this document to the dedicated Welsh Government team. The email address for all enquiries and feedback is: Standards_Feedback_and_Enquiries@gov.wales

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