Design Manual for Roads and Bridges

General Principles & Scheme Governance
Design

GD 301
Smart motorways

(formerly IAN 161/15 and MPI 66)

Version 0.0.1

Summary
This document sets out the design requirements and advice for smart 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 National Highways team. The email address for all enquiries and feedback is: Standards_Enquiries@highwaysengland.co.uk

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GD 301	0.0.**1**	December 2021	Core document, England NAA	Incremental change to notes and editorial updates

Updates made to references to Highways England and replaced by National Highways.

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Document code	Version number	Date of publication of relevant change	Changes made to	Type of change
GD 301	0	October 2020		

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Foreword

Publishing information

This document is published by National Highways.

This document supersedes IAN 161/15 and MPI 66, which are withdrawn.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 document sets out the design requirements and advice 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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Terms and definitions

Terms and definitions

Term	Definition
Smart motorways	England-only term for motorways that use variable mandatory speed limits in order to increase capacity and smooth the flow of traffic.

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1. Scope

Aspects covered

1.1 The national requirements for smart motorways set out in the National Application Annexes shall be followed.

Implementation

1.2 This document shall be implemented forthwith on all smart motorways on the Overseeing Organisations' motorway network according to the implementation requirements of GG 101 [Ref 1.N].

Use of GG 101

1.3 The requirements contained in GG 101 [Ref 1.N] shall be followed in respect of activities covered by this document.

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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	National Highways. GG 101, 'Introduction to the Design Manual for Roads and Bridges'

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General Principles & Scheme Governance
Design

GD 301
England National Application Annex to GD 301 Smart motorways

(formerly IAN 161/15 and MPI 66)

Version 0.0.1

Summary
This National Application Annex sets out the National Highways specific requirements for smart motorways.

Feedback and Enquiries
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GD 301	0.0.**1**	December 2021	Core document, England NAA	Incremental change to notes and editorial updates

Updates made to references to Highways England and replaced by National Highways.

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Foreword

Publishing information

This document is published by National Highways.

This document supersedes IAN 161/15 and MPI 66, which are withdrawn. This document also replaces Smart Motorways Concept of Operations, which has been incorporated into this document as Appendix E/B. Appendix E/B sets out, at a high-level, guidance around the operational elements of smart motorways for those who are responsible for either the design or operation of 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 provides National Highways-specific design requirements and advice for smart motorways all lane running and controlled motorway schemes.

Assumptions made in the preparation of this document

The assumptions made in GG 101 [Ref 25.N] apply to this document.

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Abbreviations and symbols

Abbreviations

Abbreviation	Definition
ADS	Advance direction sign
ALR	All lane running
CCTV	Closed circuit television
DfT	Department for Transport
DSR	Design strategy record
EA	Emergency area
ERIC	Eliminate, reduce, isolate, control
ERT	Emergency roadside telephone
FWI	Fatal and weighted injury
HADECS	Highways Agency digital enforcement camera system
KSI	Killed or seriously injured
MIDAS	Motorway incident detection and automatic signalling
MSA	Motorway service area
MSP	Maintenance service provider
NSSH	New short section of hard shoulder
NTIS	National Traffic Information Service
PCF	Project control framework
PIC	Personal injury collision
PTZ	Pan, tilt and zoom
SCRG	Safety control review group
SSD	Stopping sight distance
SVD	Stopped vehicle detection
TJR	Through junction running
TSRGD	Traffic Signs Regulations and General Directions
TTM	Temporary traffic management
VMS	Variable message sign
VRS	Vehicle restraint system

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Terms and definitions

Terms

Term	Definition
All lane running	A smart motorway which includes the permanent conversion of a hard shoulder to a running lane
Auxiliary lane	An additional lane parallel to the mainline carriageway to provide increased merge or diverge opportunity or additional space for weaving traffic (as defined in CD 122 [Ref 17.N]).
Carbon efficiency	Carbon efficiency is allied to resource efficiency and as well as minimising energy and materials, considers the embodied greenhouse gases within materials
Circular approach	A circular approach to the use of materials is where products are kept in use for as long as possible, and after they reach the end of their useful life they are recovered or regenerated to retain as much value as possible (as defined in GG 103 [Ref 24.N])
Controlled motorway	A smart motorway where the hard shoulder is retained. NOTE: An intra-junction section that retains a hard shoulder and has an upstream or downstream link converted to all lane running is not defined as a controlled motorway section and is considered part of the adjacent all-lane running section
Core responder	Category 1 responder: A person or body listed in Part 1 of Schedule 1 to the CCA 2004 [Ref 3.N]. These bodies are likely to be at the core of the response to most emergencies. As such, they are subject to the full range of civil protection duties in the Act
Emergency area	A purpose built place of relative safety which is located adjacent to the nearside of a mainline carriageway or diverge connector road NOTE: The legislative title for an emergency area is an 'emergency refuge area' and the regulations governing the use of a normal hard shoulder apply.
Fixed taper point	Datum for commencing the temporary traffic management cones for lane closures to enable maintenance at downstream locations. They are typically used for planned short-term temporary traffic management.
Inter-junction	The section of mainline between consecutive junctions
Intra-junction	The section of mainline within a junction, between a diverge and merge
Link	A length of road between junctions (as defined in CD 109 [Ref 22.N])
Maintenance hard standing	An area where authorised workers can stop adjacent to the carriageway (as defined in CD 169 [Ref 52.N])
New short section of hard shoulder	A purpose built place of relative safety which is located adjacent to the nearside of a diverge connector road

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Terms (continued)

Term	Definition
Operator	Control centre operator that monitors and controls technology assets on the strategic road network, acting as a first line of response to changing conditions
Place of relative safety	A facility where road users can stop in an emergency. A place of relative safety only includes the following: 1) a motorway service area (MSA) and rest area; 2) an emergency area; 3) an existing hard shoulder that is a minimum of 3 metres wide and a minimum of 100 metres in length, located intra-junction or on a diverge connector road; and, 4) a new short section of hard shoulder (NSSH) located on a diverge connector road that is 100 metres in length and is a minimum of 3 metres wide. Examples of features that are not a place of relative safety include: 1) a maintenance hard standing; 2) depots or turnarounds, including their connector roads; 3) verges; and, 4) any location outside the Overseeing Organisation's land boundary (excluding MSAs).
Resource efficiency	Minimising the use of materials, energy and other resources in order to reduce environmental impacts and costs (as defined in GG 103 [Ref 24.N]).
Responder	Organisation required to plan and prepare a response to an emergency.
Responsibly sourced	The process of taking into the account social, environmental and economic dimensions of materials and products prior to their use (as defined in GG 103 [Ref 24.N]).
Smart motorways	Motorways that use variable mandatory speed limits to increase capacity and smooth the flow of traffic.
STATS19	Road accident data recorded by the police.
Statutory Instrument (Variable Speed Limits)	Regulations made by the Secretary of State for Transport in exercise of the powers conferred by section 17(2) and (3) of the Road Traffic Regulation Act 1984 c.27 RTRA (1984) [Ref 45.N] for the implementation of variable speed limits.
Through junction running	Conversion of an intra-junction hard shoulder to a running lane.
Variable mandatory speed limits	Automatic or manually set variable mandatory speed limits displayed on signals or variable message signs.

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E/1. General requirements

Categories of smart motorway and scope of requirements

E/1.1 All-lane running shall be implemented where a mainline hard shoulder on an existing motorway is permanently converted to a running lane for an entire link between adjacent junctions.

E/1.1.1 Smart motorway design should be in accordance with the smart motorway programme design guide SMP-HEX-GEN-SA02-DA-KK-0001 [Ref 48.N].

E/1.2 Controlled motorway shall be implemented where a hard shoulder on an existing motorway link is retained and variable mandatory speed limits are required.

E/1.3 Lane referencing for smart motorways shall be as detailed in Table E/1.3.

Table E/1.3 Smart motorway lane referencing

Existing motorway	All-lane running	Controlled motorway
Hard shoulder	Lane 1	Hard shoulder
Lane 1	Lane 2	Lane 1
Lane 2	Lane 3	Lane 2
Lane 3	Lane 4	Lane 3
Lane 4	-	Lane 4

E/1.4 The requirements in this document shall apply where the resulting mainline link has no more than four lanes in either direction.

E/1.4.1 A fifth lane may be used to provide an auxiliary lane at a junction where needed to accommodate the forecast design year traffic flows.

Cross referenced documents

E/1.5 Where compliance with a requirement in a cross referenced document is not achieved, a departure from standard shall only be submitted against the cross referenced document and not the clause in this document that references it.

Existing departures from standard

E/1.6 Existing departures from standard shall be reviewed and where required re-submitted in accordance with the departures manual DfS Manual [Ref 5.N].

NOTE *The departures manual DfS Manual [Ref 5.N] provides guidance on the process for reviewing and resubmitting previously approved departures from standard.*

E/1.6.1 Where an assessment of an existing departure from standard demonstrates that there is no degradation in risk following the introduction of smart motorway operation and this assessment has been accepted by the SCRG, the existing departure from standard should not be resubmitted.

NOTE *The re-submission of existing departures from standard where there is no degradation in risk following the introduction of smart motorway operation can generate unnecessary administration.*

Sustainable development and design

E/1.7 Smart motorway design shall be in accordance with GG 103 [Ref 24.N] Introduction and general requirements for sustainable development and design.

NOTE 1 *Design plays a key role in how places are perceived. As well as promoting sustainable development in design, GG 103 [Ref 24.N] introduces the concept of 'good road design'. Good road design aims to put people at its heart by designing an inclusive, resilient and sustainable road network; appreciated for its usefulness but also its elegance, reflecting in its design the beauty of the natural, built and historic environment through which it passes, and enhancing it where possible.*

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NOTE 2 *GG 103 [Ref 24.N] requires evidence to be provided that demonstrates the application of the principles of good road design, with particular consideration to aesthetics. Specific care and attention needs to be given to the design and location of equipment and signage. Opportunities to combine equipment on structures and minimise infrastructure need to be sought.*

Design strategy record

E/1.8 When applying the requirements of this document, a design strategy record (DSR) shall be developed as part of the design process.

E/1.9 The DSR shall be updated and maintained during each PCF stage (NH PCF [Ref 27.N]).

E/1.10 The DSR shall record departures from standard, key design decisions and constraints and assessments in support of any relaxations to requirements.

E/1.11 The DSR shall be used to record:

1) a causal analysis of the local collision history to identify any performance issues or trends, comprising the most recently available 36 months of collision data;
2) all safety control review group (SCRG) acceptances;
3) the strategy for determining traffic flows to be used in the design (including data source and design year);
4) all items to be recorded as required in this document;
5) the decisions made with regards to carbon and resource efficiency and a circular approach to the use of materials;
6) the decisions made with regards to the use of responsibly sourced materials that minimise adverse impacts on people and their environment;
7) the decisions made with regards to the design and the sourcing of materials from other public-sector projects;
8) the contribution that schemes are seeking to make against the Overseeing Organisation's performance measures;
9) the steps taken to comply with GD 304 [Ref 9.N];
10) the signing strategy agreed with the Overseeing Organisation;
11) the VMS and control signal positioning strategy accepted by SCRG.

NOTE *The smart motorway programme design guide SMP-HEX-GEN-SA02-DA-KK-0001 [Ref 48.N] provides further advice for preparation of a DSR.*

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E/2. Operational safety

General

E/2.1 The level of safety risk management on smart motorways shall be determined and managed in accordance with GG 104 [Ref 40.N].

E/2.1.1 Smart motorway schemes should work towards the goal of bringing the number of people killed or injured on the network as close as possible to zero by 2040.

E/2.2 Safety mitigation measures that have the potential to provide an improved contribution to the Overseeing Organisation's safety performance shall be identified, assessed and submitted to the Overseeing Organisation and the SCRG for acceptance.

E/2.3 Safety risks for individual populations shall be assessed and managed in accordance with GG 104 [Ref 40.N].

E/2.4 Where different forms of smart motorway are proposed on opposing carriageways, then the demonstration of the safety objective being met shall be assessed per link per carriageway.

NOTE *Different forms of smart motorway on opposing carriageways can include controlled motorway on one carriageway and all lane running on the other.*

Safety baseline and objectives - all lane running

Road user safety baseline

E/2.5 The road user safety baseline for all lane running shall be the current situation.

NOTE 1 *The safety baseline provides a point from which the variance in risk of introducing all lane running can be estimated.*

NOTE 2 *The current situation is the operational section of motorway prior to the implementation of all lane running.*

E/2.6 Safety baseline data shall include the six safety indicators in Table E/2.6 for three years prior to the start of construction of an all lane running scheme.

Table E/2.6 Safety indicators

Number	Safety indicator
1	Number (averaged per annum) of fatal and weighted injury (FWI) casualties
2	FWI casualty rate per hundred million vehicle miles
3	Number (averaged per annum) of personal injury collisions (PICs)
4	PIC rate per hundred million vehicle miles
5	Number (averaged per annum) of killed or seriously injured (KSI) casualties
6	KSI casualty rate per hundred million vehicle miles

NOTE *FWI is defined as: (number of fatalities) + 0.1 x (number of serious casualties) + 0.01 x (number of slight casualties).*

E/2.7 Validated STATS19 PIC data covering the scheme extent, including merge and diverge connector roads shall be used to determine the safety indicators.

E/2.7.1 The most recent three complete years of validated STATS19 PIC data should be used.

Road user safety objective

E/2.8 An all lane running scheme shall be deemed to have satisfied the minimum road user safety objective where each of the six safety indicators in Table E/2.6 are demonstrated to be better than the safety baseline, for the three years after full scheme opening.

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NOTE *A hazard log based analysis has been undertaken on the generic all lane running design and is summarised in the smart motorways safety report GD 301 (GSR) [Ref 1.I].*

Road worker safety objective

E/2.9 The risk to road workers must be managed in accordance with the requirements of the Health and Safety at Work etc Act (HASAWA 1974 c.37 [Ref 21.N]).

NOTE *There is no specific numerical safety objective set for road workers.*

Safety baseline and objectives - controlled motorway

Road user safety baseline

E/2.10 The safety baseline and data for a controlled motorway road user safety assessment shall be the same as an all lane running scheme.

Road user safety objective

E/2.11 Where a controlled motorway scheme is installed on a section of motorway that has MIDAS queue protection in the current situation, the scheme shall be deemed to have satisfied the minimum road user safety objective where each of the six safety indicators in Table E/2.6 are demonstrated to show an improvement from the safety baseline equivalent to that expected from the implementation of congestion management, for the three years after full scheme opening.

NOTE *Implementation of congestion management is expected to provide a 15% safety improvement.*

E/2.12 Where a controlled motorway scheme is installed on a section of motorway that does not have MIDAS queue protection in the current situation, the scheme shall be deemed to have satisfied the minimum road user safety objective where each of the six safety indicators in Table E/2.6 are demonstrated to show an improvement from the safety baseline equivalent to that expected from the implementation of MIDAS queue protection and congestion management, for the three years after full scheme opening.

NOTE 1 *Implementation of MIDAS queue protection is expected to provide a 10% safety improvement in addition to the 15% safety improvement expected to be provided by congestion management.*

NOTE 2 *A safety assessment has been undertaken on the generic controlled motorway design and is summarised in the smart motorways safety report GD 301 (GSR) [Ref 1.I].*

Road worker safety objective

E/2.13 The road worker safety objective for a controlled motorway scheme shall be the same as an all lane running scheme.

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E/3. Designing for maintenance

General

E/3.1 Smart motorways must be designed for maintenance in accordance with the Construction (Design and Management) Regulations SI 2015 No.51 (CDM Regs) [Ref 20.N].

E/3.2 Health and safety shall be designed into maintenance in accordance with GD 304 [Ref 9.N].

E/3.2.1 Risk reduction strategies that may be applied to smart motorways are included in Appendix E/C.

Maintenance access

E/3.3 Maintenance access arrangements shall be assessed and designed in accordance with Major Projects instruction MPI 11 [Ref 34.N].

E/3.4 Maintenance access assessments and design proposals shall be submitted to the SCRG for acceptance.

Temporary traffic management

E/3.5 Where variable message signs (VMS) and control signals meet the temporary traffic management requirements of the signalling for roadworks project or another alternative to remotely operated temporary traffic management signs has been accepted by the SCRG, remotely operated temporary traffic management signs shall not be provided.

E/3.6 Guidance shall be sought from the Overseeing Organisation on the signalling for roadworks project.

E/3.7 Where required, remotely operated temporary traffic management signs shall be in accordance with TR 2603 [Ref 50.N].

E/3.7.1 Where required, remotely operated temporary traffic management signs should be designed in accordance with SMP-HEX-TGN-0-DA-ZZ-0006 [Ref 37.N], SMP-HEX-HGN-0-DA-ZZ-0008 [Ref 13.N], SMP-HEX-TGN-0-DA-ZZ-0009 [Ref 36.N], SMP-HEX-TGN-0-DA-ZZ-0010 [Ref 38.N].

E/3.8 Fixed taper points shall be designed to support the deployment of temporary traffic management on all lane running sections.

E/3.8.1 Fixed taper points should be designed in accordance with the taper selection requirements stated in SMP-HEX-HGN-0-DA-ZZ-0008 [Ref 13.N] and in conjunction with the control signal and variable message sign siting requirements in CD 146 [Ref 33.N].

E/3.8.2 Fixed taper points defined for remotely operated temporary traffic management signs may be different to those defined for control signal and variable message sign siting.

E/3.9 Fixed taper points shall be recorded in the DSR.

E/3.10 Fixed taper points for temporary traffic management shall not be located such that remotely operated temporary traffic management signs are positioned in an emergency area.

E/3.11 Fixed taper points shall not be located within the length of an emergency area.

E/3.12 The maintenance service provider (MSP) shall be consulted over proposals for fixed taper point locations.

E/3.13 Proposals for fixed taper point locations shall be submitted to the Overseeing Organisation for acceptance.

E/3.14 Where requested by the Overseeing Organisation, provision shall be made in the design for fixed taper roadside identification.

E/3.15 The use of fixed taper points and signalling for roadworks/remotely operated temporary traffic management signs shall be assessed for controlled motorway sections in accordance with GG 104 [Ref 40.N] and the decision recorded in the DSR.

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Asset renewal and removal

E/3.16 Opportunities to integrate asset renewal works into a smart motorway scheme shall be assessed as early in the development of the scheme as possible.

NOTE 1 *This assessment enables the Overseeing Organisation to make an informed decision on the level of interventions required and the benefits their inclusion offers.*

NOTE 2 *Asset renewal does not form part of the core scope of smart motorway schemes. The costs of any asset renewals are not to be included as part of a smart motorway scheme unless agreed by the Overseeing Organisation.*

E/3.16.1 Asset renewal assessment and proposals should be in accordance with SMP-HEX-GEN-CTW-RP-ZX-0007 [Ref 14.N].

E/3.17 Asset renewal proposals shall be submitted to the Overseeing Organisation for review and acceptance.

E/3.18 The scope of asset renewal shall be fixed by the end of PCF stage 3 (NH PCF [Ref 27.N]).

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E/4. Highway links

General

E/4.1 Highway link design for smart motorways shall be in accordance with CD 109 [Ref 22.N].

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E/5. Cross sections, headrooms and vehicle restraint

Cross sections and headrooms

E/5.1 Cross section and headroom design for smart motorways shall be in accordance with CD 127 [Ref 4.N].

Vehicle restraint systems

E/5.2 Vehicle restraint system (VRS) design for smart motorways shall be in accordance with CD 377 [Ref 39.N] and this document.

Central reserve VRS

E/5.3 Where the existing central reserve VRS does not have a containment level of H1 or greater in accordance with BS EN 1317 [Ref 42.N], new central reserve VRS shall be provided.

E/5.4 New central reserve safety barrier shall be H1 or greater containment level in accordance with BS EN 1317 [Ref 42.N].

E/5.5 New central reserve safety barrier shall be rigid, have a serviceable life of not less than 50 years and be designed such that after testing in accordance with BS EN 1317-1 [Ref 44.N] and BS EN 1317-2 [Ref 43.N], it does not require realignment, replacement or repair.

E/5.6 Where new central reserve VRS is required, an assessment shall be made of the benefits/dis-benefits of both soft and paved central reserve options to establish the solution.

E/5.7 The chosen central reserve solution shall be subject to acceptance by the SCRG and recorded in the DSR.

Verge VRS

E/5.8 Where existing verge assets are identified for removal and are located behind VRS, a RRRAP [Ref 54.N] assessment shall be undertaken to determine whether the associated sections of VRS can be removed.

E/5.9 Redundant sections of VRS identified through a RRRAP [Ref 54.N] assessment shall be removed.

E/5.9.1 Where existing VRS to be removed is in close proximity to underground services that are to be retained, the VRS posts may need to be cut off to avoid damage to underground services.

E/5.10 Where existing VRS posts are cut off to avoid damage to underground services, this shall not present a hazard to pedestrians or vehicles in the verge.

NOTE *Maximising gaps between sections of verge VRS provides road users in an emergency with an opportunity to stop their vehicle in part or in whole away from a live lane if they are unable to reach a place of relative safety.*

E/5.11 The assessment of redundant VRS shall be recorded in the DSR.

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E/6. Junctions

General

E/6.1 Junction design for smart motorways shall be in accordance with CD 122 [Ref 17.N].

E/6.1.1 On all lane running schemes intra-junction hard shoulders should be converted to running lanes at all locations, following analysis of the design year traffic flows and considering any operational or physical constraints.

NOTE *Where the design year traffic flows indicate that a lane gain/lane drop arrangement is appropriate in accordance with CD 122 [Ref 17.N], through junction running could still be considered where it provides enough capacity for non-lane drop/lane gain diverges/merges.*

E/6.2 The proposed intra-junction layout for each junction on all lane running schemes shall be submitted to the SCRG for acceptance.

NOTE *The proposed intra-junction layouts to be submitted to the SCRG for acceptance also include the terminal junctions of the scheme.*

E/6.3 Where a CD 122 [Ref 17.N] assessment shows an operational need for an additional lane on a merge or diverge connector road the impact of any changes shall be assessed and any changes to the existing layout agreed with the Overseeing Organisation.

E/6.3.1 When assessing the impact of additional lanes on a merge or diverge connector road a balance should be achieved between the optimal junction layout and scheme constraints, whether physical, such as existing paved area or value for money.

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E/7. All lane running: Other highway features

Observation platforms

E/7.1 Where an existing observation platform is located adjacent to a live carriageway and there is no safe means of access or egress following the conversion of the hard shoulder, the observation platform shall either be removed, modified or re-located.

NOTE *Potential options for observation platforms can include:*

1) *use of overbridges;*
2) *bespoke provision on entry slip roads;*
3) *bespoke mainline provision;*
4) *bespoke provision at the upstream end of an emergency area; or*
5) *shared use of a maintenance hard standing at the upstream end of an emergency area.*

E/7.2 New, modified or re-located observation platforms shall only be provided on an all lane running scheme where this has been agreed by the Overseeing Organisation.

E/7.3 Proposals shall include a risk assessment of alternative observation platform locations and modification proposals.

E/7.3.1 Observation platform design should be in accordance with CD 169 [Ref 52.N] with the exception of access and egress tapers.

E/7.4 Observation platform risk assessments and design proposals shall be agreed with stakeholders.

E/7.5 Observation platform risk assessments and design proposals shall be submitted to the SCRG for acceptance.

Abnormal load bays

E/7.6 Where an existing abnormal load bay is adjacent to a live carriageway on an all lane running scheme, this shall be closed off or removed and all related signing removed unless modifications can be made to provide safe and effective operation when all lane running becomes operational.

E/7.6.1 When an abnormal load bay has to be closed or removed, an alternative location may be provided on non-all lane running sections following consultation with the Overseeing Organisation and stakeholders.

E/7.7 Abnormal load bay proposals shall be submitted to the SCRG for acceptance.

Access/egress to work depots and turnaround facilities

E/7.8 Where there are existing access and egress arrangements to depots or turnaround facilities from a live carriageway on an all lane running scheme, an assessment shall be made to determine whether any modifications are required to support safe and effective operation.

E/7.9 Proposals for access and egress arrangements to work depots and turnaround facilities shall be submitted to the SCRG for acceptance.

Turnaround provision

E/7.10 The potential time for traffic officers and core responders to reach live lane incidents shall be assessed in the design.

NOTE 1 *Additional turnaround provision can be needed for traffic officers to meet their incident response targets.*

NOTE 2 *Reference can be made to SMP-SA02-ITLG-DGA-E-E1.10 [Ref 60.N].*

E/7.11 The incident response time assessment and any additional turnaround provision shall be submitted to the SCRG for acceptance.

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E/8. All lane running: Place of relative safety provision and spacing

Mainline provision and spacing

E/8.1 From any entry point on to an all lane running section, the maximum distance to the first place of relative safety shall not exceed 1.6km.

E/8.1.1 From any entry point on to an all lane running section, the maximum distance to the first place of relative safety should not exceed 1.2km.

E/8.2 From any entry point on to an all lane running section, a distance greater than 1.2km to the first place of relative safety shall be submitted to the SCRG and Overseeing Organisation for acceptance.

NOTE 1 *From any entry point on to an all lane running section, the distance to the first place of relative safety can be extended to 1.6km where the cost of providing a new place of relative safety is determined to be disproportionate by a GG 104 [Ref 40.N] assessment, and this has been accepted by the SCRG and Overseeing Organisation.*

NOTE 2 *Locations where it is deemed as disproportionate to provide a new place of relative safety could be an elevated structure or where land purchase is required as this could introduce the requirement to follow the development consent order process, thereby significantly extending the scheme programme.*

NOTE 3 *Other justifications could be the disproportionate impact on key environmental sites, significant visual intrusion from the re-positioning of affected gantries etc or the location is unsuitable in terms or road user safety due to its topography and geometry.*

E/8.3 The distance to the first place of relative safety shall be measured from:

1) the top of a merge slip road when there is no hard shoulder on the slip road;
2) where the hard shoulder ends on a merge slip road or interchange link which merges with an all lane running link;
3) where the intra-junction hard shoulder ends at the gateway junction to an all lane running link.

E/8.4 Throughout an all lane running section of road, a place of relative safety shall be provided at a maximum spacing of 1.6km and the spacing between places of relative safety measured as shown in Figure E/8.6.

E/8.4.1 Throughout an all lane running section of road, a place of relative safety should be provided at a maximum spacing of 1.2km.

E/8.5 Throughout an all lane running section of road, a place of relative safety spaced more than 1.2km shall be submitted to the SCRG and Overseeing Organisation for acceptance.

NOTE 1 *Spacing between places of relative safety can be extended to 1.6km where the cost of providing a new place of relative safety is determined to be disproportionate by a GG 104 [Ref 40.N] assessment, and this has been accepted by the SCRG and Overseeing Organisation.*

NOTE 2 *Locations where it is deemed as disproportionate to provide a new place of relative safety could be an elevated structure or where land purchase is required as this could introduce the requirement to follow the development consent order process, thereby significantly extending the scheme programme.*

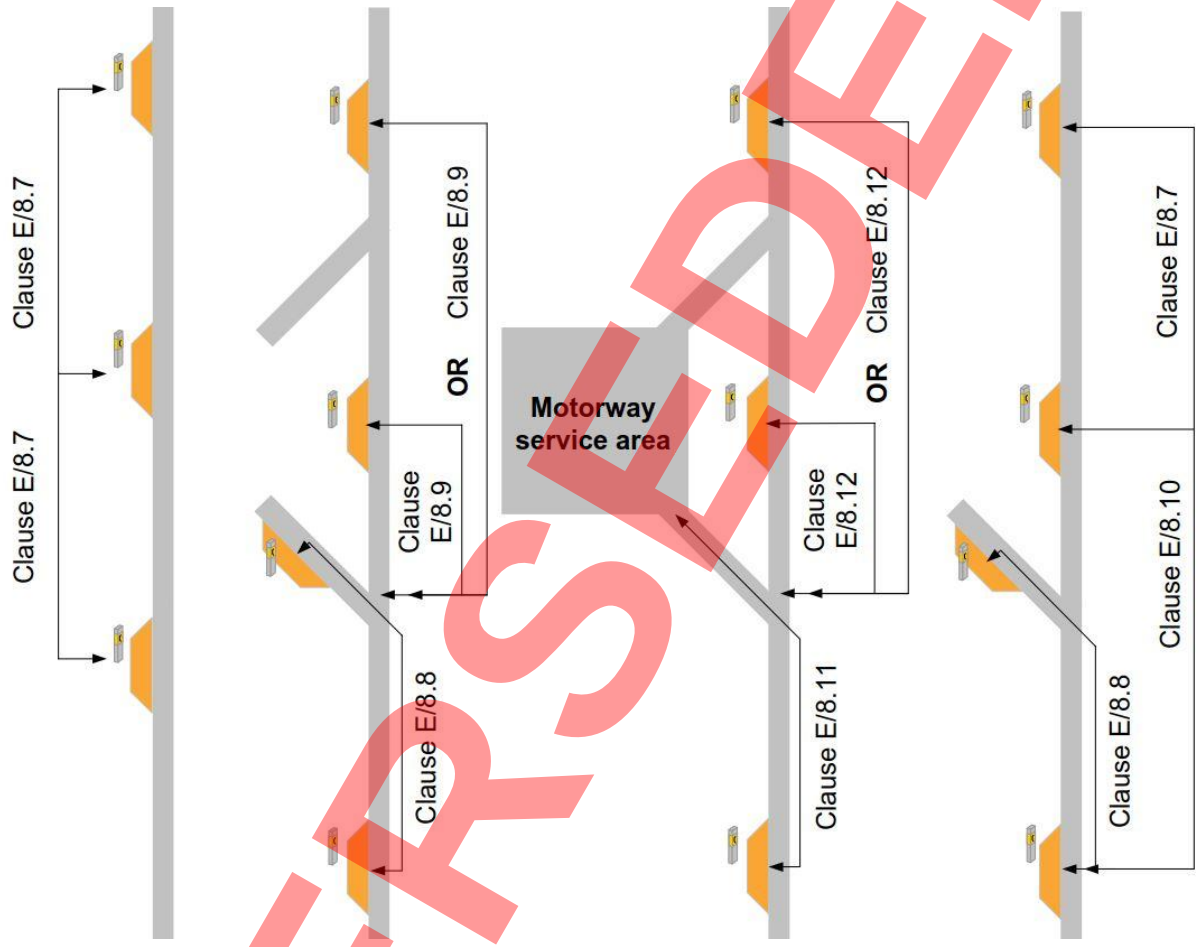
NOTE 3 *Other justifications could be the disproportionate impact on key environmental sites, significant visual intrusion from the re-positioning of affected gantries etc or the location is unsuitable in terms of road user safety due to its topography and geometry.*

E/8.6 The minimum spacing between places of relative safety shall be 600 metres.

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Figure E/8.6 Place of relative safety - spacing measurement (illustrated by an emergency area and motorway service area)



E/8.7 At emergency areas, the spacing shall be measured from/to the emergency roadside telephone (ERT).

E/8.8 At a diverge connector road place of relative safety, the spacing shall be measured to the ERT.

E/8.9 Where a diverge connector road leads to a junction or interchange that provides direct access back to the mainline, the mainline spacing from the diverge connector road place of relative safety shall be measured from the tip of the diverge nose.

E/8.10 Where a diverge connector road leads to a junction or interchange that does not provide direct access back to the mainline, the mainline spacing shall be measured from the last upstream place of relative safety before the diverge connector road.

NOTE *Free flow links to another motorway is an example of an interchange that does not provide direct access back to the mainline.*

E/8.11 When measuring to a MSA, the spacing shall be measured to a location where a road user can safely stop away from a live lane.

NOTE *An existing hard shoulder on an MSA diverge connector road can be a location where a road user is able to safely stop away from a live lane.*

E/8.12 When measuring from a MSA, the spacing shall be measured from the tip of the MSA diverge nose.

E/8.13 Where a hard shoulder is present on a downstream link or intra-junction, the spacing shall be measured to the start of the hard shoulder.

E/8.14 When measuring from a hard shoulder on a link or intra-junction hard shoulder, the spacing shall be

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measured from 50 metres upstream of the end of the hard shoulder.

E/8.15 The decision-making process regarding the location of each mainline place of relative safety shall be submitted to the SCRG for acceptance.

E/8.16 The decision-making process regarding the location of each mainline place of relative safety shall be recorded in the DSR.

Intra-junction provision

E/8.17 An existing intra-junction hard shoulder that is a minimum of 100 metres in length and at least 3 metres wide shall be defined as a place of relative safety.

E/8.18 Where an intra-junction hard shoulder is not present, an intra-junction emergency area shall be provided where it is needed to meet place of relative safety spacing requirements.

NOTE 1 *In accordance with GG 104 [Ref 40.N], where the cost of providing an intra-junction emergency area is determined to be disproportionate, and this has been accepted by the SCRG, then a departure from standard can be submitted where the place of relative safety spacing requirements cannot practicably be achieved.*

NOTE 2 *Locations where it is deemed as disproportionate to provide a new place of relative safety can be an elevated structure or where land purchase is required.*

E/8.19 The decision-making process regarding the location of an intra-junction place of relative safety shall be submitted to the SCRG for acceptance.

E/8.20 The decision-making process regarding the location of an intra-junction place of relative safety shall be recorded in the DSR.

Diverge connector road provision

E/8.21 Where the upstream mainline link leading to a diverge has no hard shoulder, a place of relative safety shall be retained or provided on the diverge connector road.

NOTE 1 *In accordance with GG 104 [Ref 40.N], where the cost of providing a new place of relative safety on a diverge connector road is determined to be disproportionate, and this has been accepted by the SCRG, a departure from standard can be submitted to support the omission of a place of relative safety.*

NOTE 2 *Locations where it is deemed as disproportionate to provide a new place of relative safety can be an elevated structure or where land purchase is required.*

NOTE 3 *There is no requirement for a diverge connector road place of relative safety where the upstream link that leads to the diverge retains the hard shoulder.*

E/8.22 Where an existing hard shoulder is not present on a diverge connector road, an emergency area or NSSH shall be provided.

E/8.22.1 Where an existing hard shoulder is not present on a diverge connector road, an emergency area should be provided in preference to a NSSH wherever practicable.

E/8.23 The start of the emergency area entry taper or NSSH shall be a minimum of 50 metres downstream from the back of the nose on the diverge connector road.

NOTE *Locating the emergency area or NSSH a minimum of 50 metres downstream from the back of the nose on the diverge connector road can reduce the likelihood of a late manoeuvre from the main carriageway.*

E/8.24 Emergency areas and NSSH shall not be provided on diverge connector roads for MSAs.

E/8.25 The decision-making process regarding the location of a place of relative safety on a diverge connector road shall be submitted to the SCRG for acceptance.

E/8.26 The decision-making process regarding the location of a place of relative safety on a diverge connector road shall be recorded in the DSR.

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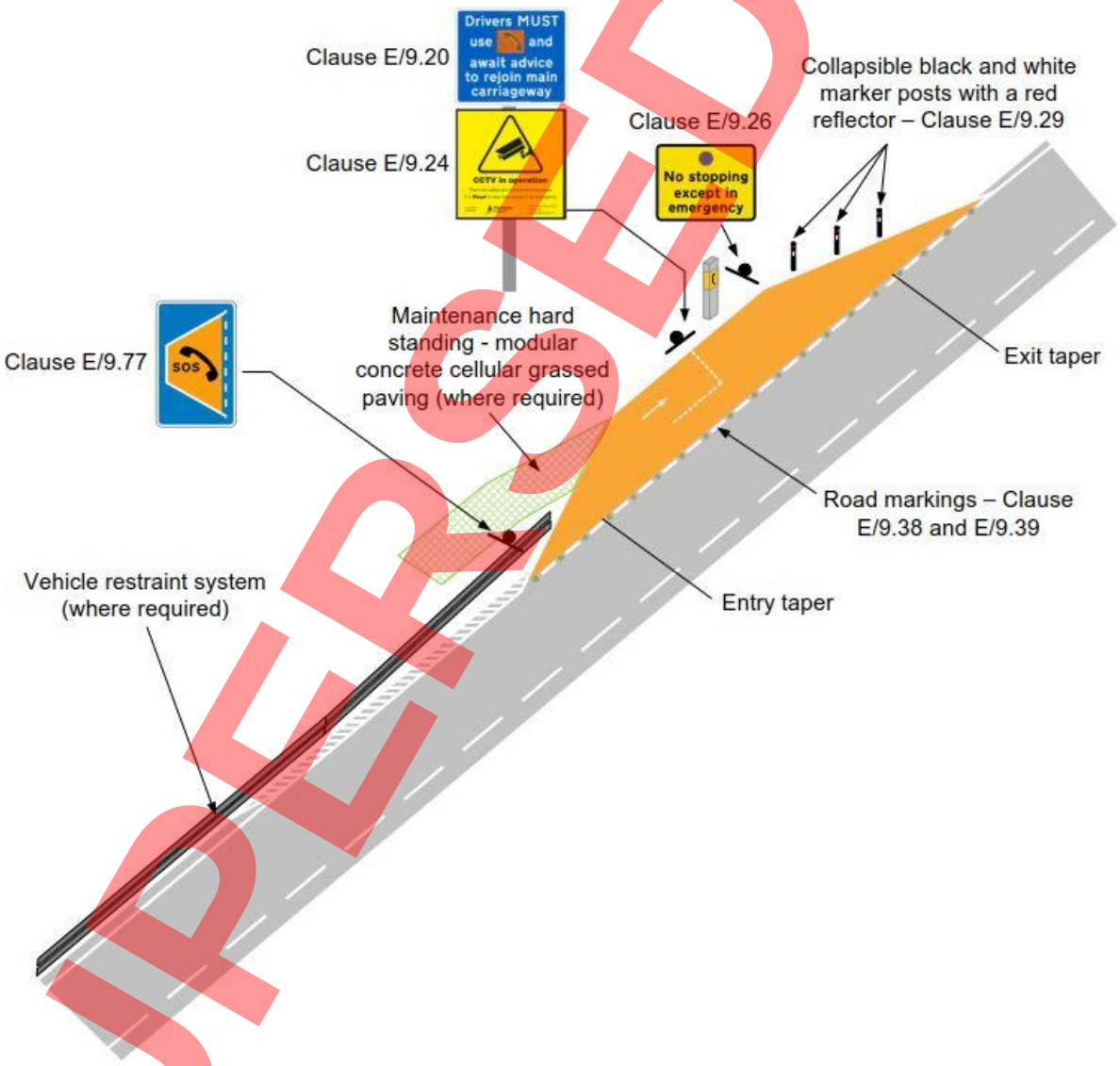
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E/9. All lane running: Emergency areas, place of relative safety siting and signing

Emergency area layout

E/9.1 The requirements in this section of the document shall be used for the layout of emergency areas as illustrated in Figure E/9.1a and E/9.1b.

Figure E/9.1a Emergency area layout - detail 1

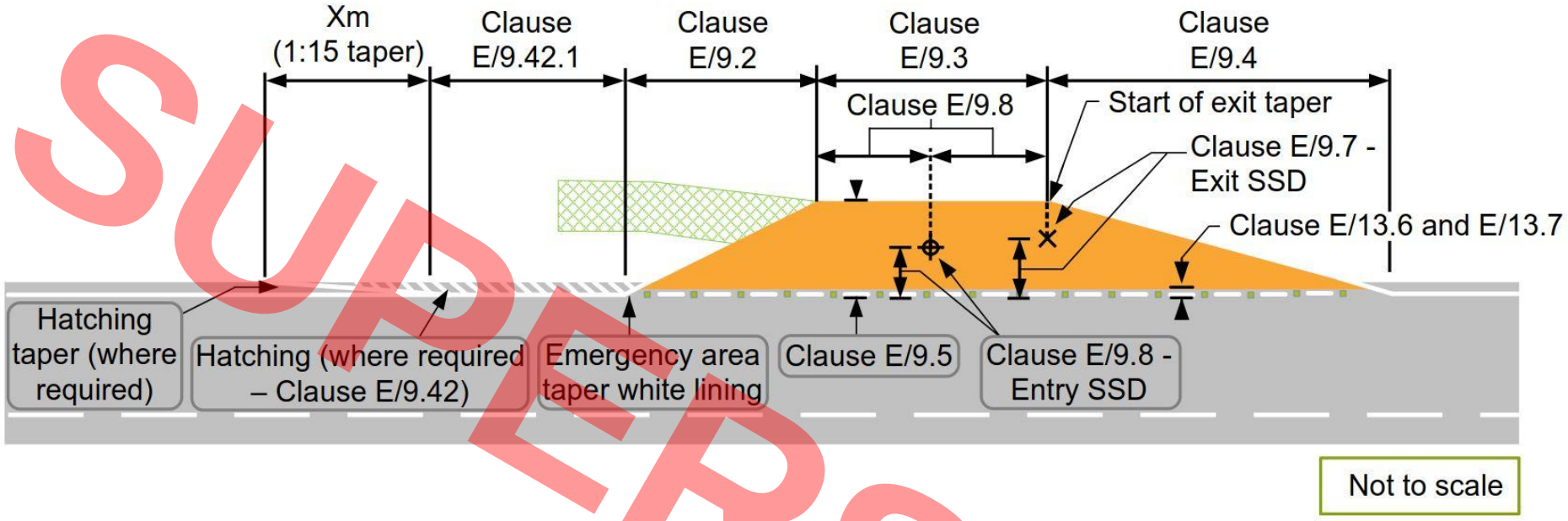


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Figure E/9.1b Emergency area layout - detail 2



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E/9.2 The length for an emergency area entry taper shall be a minimum of 25 metres.

E/9.3 The length for an emergency area stopping area shall be 30 metres.

E/9.4 The length for an emergency area exit taper shall be a minimum of 45 metres.

E/9.5 The width of an emergency area stopping area shall be 4.6 metres as measured from the trafficked side of the edge line.

Siting requirements

Stopping sight distances

E/9.6 Stopping sight distances (SSD) for road users entering and exiting an emergency area or NSSH shall be the desirable minimum for the design speed.

E/9.6.1 Where required due to physical or environmental constraints, a one step relaxation below desirable minimum SSD may be permitted.

E/9.7 For emergency areas, the exit SSD shall be measured from the start of the exit taper, 2.4 metres back from the trafficked side of the edge line, to an object height of 1.05 metres.

NOTE *Figure E/9.1b illustrates the location for the exit SSD measurement.*

E/9.8 For emergency areas, the entry SSD shall be measured from the centre of lane 1 to the midpoint of the 30 metre stopping area of an emergency area, 2.0 metres back from the trafficked side of the edge line, to an object height of 1.05 metres.

NOTE *Figure E/9.1b illustrates the target location for the entry SSD measurement.*

E/9.9 For NSSH on a diverge connector road, the exit SSD shall be measured from the mid-point of the 100 metre hard shoulder, 1.5 metres back from the trafficked side of the edge line, to an object height of 1.05 metres.

E/9.10 For NSSH on a diverge connector road, the entry SSD shall be measured from the centre of lane 1 to a point 1.5 metres back from the trafficked side of the edge line, to an object height of 1.05 metres, measured to the start of the 100 metre hard shoulder section.

E/9.11 SSDs for a place of relative safety shall be recorded in the DSR.

Curves and gradients

E/9.12 Where emergency areas are sited on the outside of a right-hand curve with a radius of less than that given in Table 3.2.1 in CD 169 [Ref 52.N], locations shall be recorded in the DSR.

E/9.12.1 Emergency areas should not be sited on the outside of a right-hand curve with a radius of less than that given in Table 3.2.1 in CD 169 [Ref 52.N].

E/9.13 Where main carriageway emergency areas are located on gradients greater than 2% or immediately upstream of a gradient greater than 2%, they shall be assessed to determine whether any additional mitigation is required for the low speed exit of large goods vehicles or potentially higher entry speed of vehicles.

E/9.14 Each emergency area gradient assessment and design proposal shall be supported by a GG 104 [Ref 40.N] risk assessment .

E/9.15 Each GG 104 [Ref 40.N] risk assessment relating to an emergency area gradient assessment and design proposal shall be submitted to the SCRG for acceptance.

E/9.16 Each emergency area gradient assessment and design proposal shall be recorded in the DSR.

E/9.16.1 Main carriageway emergency areas on gradients greater than 2% or immediately upstream of a gradient greater than 2% should be avoided.

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Other constraints

E/9.17 An emergency area shall not be located between the merge and the gateway gantry.

E/9.18 Emergency areas located between the secondary advance direction sign (ADS) and diverge shall be submitted to the SCRG for acceptance.

E/9.19 Emergency areas located between the secondary advance direction sign (ADS) and diverge shall be recorded in the DSR.

E/9.19.1 Locating an emergency area between the secondary ADS and diverge should be avoided.

Emergency area signing, road markings and studs

Emergency area signing

E/9.20 A 'driver must use SOS phone and await advice to re-join main carriageway' sign as shown in Figure E/9.19, shall be provided at all mainline emergency areas and be located in the verge adjacent to the downstream end of the delineated stopping bay.

Figure E/9.20 NP 2937 'Driver must use SOS phone and await advice to re-join main carriageway' sign



E/9.21 The 'drivers must use SOS phone and await advice to re-join main carriageway' sign must be in accordance with non-prescribed sign reference NP 2937 [Ref 28.N] and is authorised for use with a 50mm 'x' height.

E/9.22 The NP 2937 [Ref 28.N] sign shall be aligned to maximise drivers' visibility from the delineated stopping bay in an emergency area.

E/9.23 The NP 2937 [Ref 28.N] sign shall not be used in emergency areas on diverge connector roads.

E/9.24 A 'CCTV in operation' sign as shown in Figure E/9.23, shall be provided in the verge adjacent to the downstream end of the emergency area delineated stopping bay at a 1.5 metre mounting height.

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Figure E/9.24 'CCTV in operation' sign



NOTE *The 'CCTV in operation' sign is not a traffic sign and does not require non-prescribed sign approval.*

E/9.24.1 At mainline emergency areas, the 'CCTV in operation' sign should be mounted below the NP 2937 [Ref 28.N] sign on the same post.

E/9.25 The 'CCTV in operation' sign shall be 760mm high and 760mm wide.

NOTE *Further details of the 'CCTV operation' sign can be found in SMP-HEX-HGN-0-DA-ZZ-0014 [Ref 31.N].*

E/9.26 A 'no stopping except in emergency' sign in accordance with SI 2016 No.362 (TSRGD) [Ref 56.N] Schedule 4, Part 3 Item 9 shall be located at the start of the emergency area exit taper at a 1.5 metre mounting height.

E/9.27 The 'no stopping except in emergency' sign shall have an 'x' height of 50mm.

E/9.28 The 'no stopping except in emergency' sign shall be aligned to maximise visibility from the delineated stopping bay in an emergency area.

E/9.29 Three collapsible black and white marker posts with a red reflector to SI 2016 No.362 (TSRGD) [Ref 56.N] diagram 560 shall be provided on the exit taper of an emergency area.

E/9.30 Where a vehicle restraint system is located at the back of an emergency area exit taper, the three collapsible black and white marker posts shall be evenly spaced in front of the vehicle restraint system.

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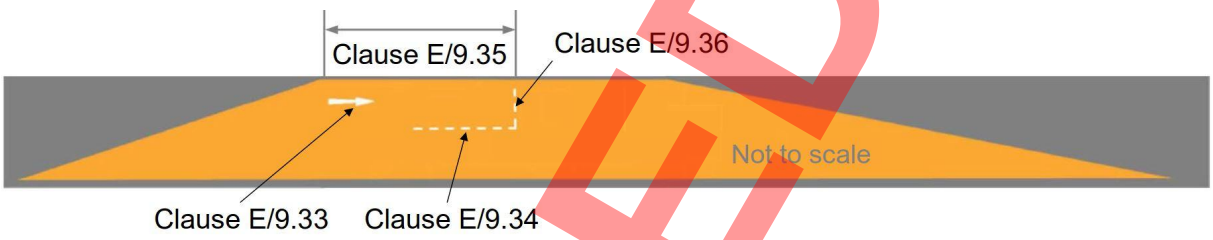
E/9.31 Driver location sign requirements at emergency areas shall be in accordance with CD 193 [Ref 10.N].

Emergency area road markings and studs

E/9.32 Road markings within an emergency area shall be provided in accordance with Figure E/9.31 and include:

1) a 4-metre long arrow in accordance with SI 2016 No.362 (TSRGD) [Ref 56.N] diagram 1038;
2) a delineated stopping bay in accordance with SI 2016 No.362 (TSRGD) [Ref 56.N] diagram 1028.4.

Figure E/9.32 Delineated stopping bay



E/9.33 The centre line of the arrow in the delineated stopping bay shall be located 1.35 metres from the back edge of the emergency area with the tail of the arrow commencing at the start of the 30 metre stopping area.

E/9.34 The longitudinal line of the delineated stopping bay shall be 7.8 metres in length and comprise of seven marks with each mark being 600mm long and 100mm wide with a gap of 600mm between each mark.

E/9.35 The transverse line of the delineated stopping bay shall be 16 metres downstream of the start of the 30 metre stopping area.

E/9.36 The transverse line of the delineated stopping bay shall be 2.7 metres in length and comprise of three marks with each mark being 500mm long and 100mm wide with a gap of 400mm between each mark.

E/9.37 Where the longitudinal and transverse markings of a delineated bay intersect, they shall be laid to form a corner.

E/9.38 Carriageway markings to SI 2016 No.362 (TSRGD) [Ref 56.N] diagram 1010 incorporating green road studs in accordance with TSM Chapter 5 [Ref 57.N] shall be used between the emergency area and lane 1.

E/9.39 Road studs shall not be provided at emergency areas located between a secondary ADS and a diverge.

E/9.40 Carriageway markings to SI 2016 No.362 (TSRGD) [Ref 56.N] diagram 1012 incorporating red road studs in accordance with TSM Chapter 5 [Ref 57.N] shall be used between the NSSH and lane 1 of the diverge connector road.

E/9.41 Where emergency areas are located between a secondary ADS and a diverge, the SI 2016 No.362 (TSRGD) [Ref 56.N] diagram 1010 markings shall be embossed thermoplastic.

E/9.42 Where a hard strip width of 1.05 metres or greater is present in advance of an emergency area, the hard strip shall be hatched out to SI 2016 No.362 (TSRGD) [Ref 56.N] diagram 1040.5.

E/9.42.1 Where a hard strip in advance of an emergency area is hatched out to SI 2016 No.362 (TSRGD) [Ref 56.N] diagram 1040.5, the full width hatching should be a minimum of 25 metres in length.

Emergency area and ERT approach signing

Mainline emergency area approach signing

E/9.43 'EA approach' signs must be provided in accordance with Department for Transport (DfT) Area Wide sign Authorisation GT50/198/0037 [Ref 11.N] (DfT non- prescribed sign case reference 4575) as illustrated in Figure E/9.42 and show the distance to the start of a mainline emergency area entry taper in permitted fractions of miles or yards.

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Figure E/9.43 'EA approach' sign



NOTE 1 *Appendix E/A provides illustrative layouts of mainline and diverge connector road emergency area approach signing.*

NOTE 2 *Figure E/9.42 is an example and other permitted distances can be used. Permitted expressions of distance include distances to the nearest $\frac{1}{4}$ or $\frac{1}{3}$ (using $\frac{1}{4}$, $\frac{1}{3}$, $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$) followed by 'mile' or for distances less than $\frac{1}{2}$ mile in 'yds' (yards).*

NOTE 3 *An 'EA approach' sign can be used on a diverge or diverge connector road when approaching an emergency area.*

E/9.44 Where a distance in yards is provided on an 'EA approach' sign, all downstream 'EA approach' signs prior to the next emergency area shall use yards.

E/9.44.1 Where a distance in yards is provided on an 'EA approach' sign, these should be in increments of 100 yards or 50 yards with 100 yards used wherever practicable.

E/9.45 The last 'EA approach' sign in a sequence before an emergency area shall show the distance in yards.

E/9.45.1 The last 'EA approach' sign in a sequence before an emergency area should be 400 yards or 300 yards prior to the start of the emergency area entry taper.

E/9.46 The distance to an 'EA approach' sign shall be measured from the start of the entry taper of the downstream emergency area.

E/9.47 Except where a merge is present between consecutive 'EA approach' signs or where a hard shoulder is retained intra-junction, spacings of greater than 402 metres between 'EA approach' signs shall be submitted to the SCRG for acceptance.

E/9.47.1 Except where a merge is present between consecutive 'EA approach' signs or where a hard shoulder is retained intra-junction, 'EA approach' signs should be spaced a maximum of 402 metres apart.

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E/9.48 'EA approach' signs shall be located a minimum of 100 metres and a maximum of 400 metres downstream of the entry datum point of a merge and entry datum point of an MSA merge.

E/9.48.1 Where a sequence of 'EA approach' signs span a merge or a MSA merge, the 'EA approach' sign should be located a minimum of 100 metres and a maximum of 200 metres downstream of the entry datum point of the merge or entry datum point of an MSA merge.

NOTE *Locating an 'EA approach' sign between 100 metres and 200 metres downstream of the entry datum point minimises the gap between consecutive 'EA approach' signs that span a merge.*

E/9.48.2 'EA approach' signs should not be located immediately before a works or turnaround access point.

E/9.49 The first 'EA approach' sign in a sequence shall be a minimum of 100 metres and a maximum of 400 metres downstream of the upstream emergency area exit taper.

E/9.49.1 The first 'EA approach' sign in a sequence should be a minimum of 200 metres downstream of the upstream emergency area exit taper.

E/9.50 The signed distance on an 'EA approach' sign shall have an upstream tolerance of 10% and a downstream tolerance of 20 metres.

E/9.51 Where an emergency area is provided intra-junction and is greater than 300 metres downstream of the back of the diverge nose, 'EA approach' signing shall be provided for the emergency area and commence after the diverge.

E/9.51.1 Where 'EA approach' signing is required for an intra-junction emergency area, the first 'EA approach' sign in the sequence should be between 100 metres and 200 metres downstream of the back of the diverge nose.

E/9.51.2 A single 'EA approach' sign in yards may be used where the distance between the diverge and intra-junction emergency area is insufficient to include multiple 'EA approach' signs.

E/9.51.3 Where an emergency area is the next place of relative safety downstream of a merge, 'EA approach' signing should be located in the upstream intra-junction as close as practicable to the end of the intra-junction.

NOTE *Locating an 'EA approach' sign as close as practicable to the end of the intra-junction, minimises the gap between consecutive 'EA approach' signs that span the merge.*

Diverge connector road emergency area approach signing

E/9.52 Where an emergency area is located on a diverge connector road, 'slip road EA' sign(s) and a 'slip road EA arrow' sign shall be provided.

E/9.53 'Slip road EA' signs and a 'slip road EA arrow' signs must be provided in accordance with Department for Transport (DfT) Area Wide sign Authorisation GT50/198/0039 [Ref 12.N] (DfT non- prescribed sign case reference 4577) as illustrated in Figure E/9.52a and 9.52b.

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Figure E/9.53a 'Slip road EA' sign



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Figure E/9.53b 'Slip road EA arrow' sign



NOTE *Appendix E/A provides an illustrative layout of diverge connector road emergency area approach signing.*

E/9.53.1 A 'slip road EA arrow' sign should be located on the gantry leg of the final ADS or within 100 metres upstream of the final ADS.

E/9.54 'Slip road EA' signs shall be located upstream of the 'slip road EA arrow' sign and commence after the upstream mainline emergency area.

E/9.54.1 'EA approach' signs should be located on the diverge or diverge connector road downstream of the 'slip road EA arrow' sign where required to meet the 402 metres spacing on the diverge / diverge connector road.

E/9.55 Where a distance in yards is provided on an 'EA approach' sign on a diverge or diverge connector road, all downstream 'EA approach' signs prior to the diverge connector road emergency area shall use yards.

E/9.55.1 Where a distance in yards is provided on an 'EA approach' sign on a diverge or diverge connector road, this should be in increments of 100 yards or 50 yards with 100 yards used wherever practicable.

E/9.56 The last 'EA approach' sign in a sequence before an emergency area on a diverge connector road shall show the distance to the start of the emergency area entry taper in yards.

E/9.56.1 The last 'EA approach' sign in a sequence before an emergency area on a diverge connector road should be 400 yards or 300 yards prior to the start of the emergency area entry taper.

E/9.57 The distance to an 'EA approach' sign on a diverge or diverge connector road shall be measured from the start of the entry taper of the downstream emergency area.

E/9.58 The signed distance on an 'EA approach' sign on a diverge or diverge connector road shall have an

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upstream tolerance of 10% and a downstream tolerance of 20 metres.

E/9.59 A spacing greater than 402 metres between 'Slip road EA' signs shall be submitted to the SCRG for acceptance.

E/9.59.1 'Slip road EA' signs' signs should be spaced a maximum of 402 metres apart.

E/9.60 A spacing greater than 402 metres between 'Slip road EA' signs and 'Slip road EA arrow' signs shall be submitted to the SCRG for acceptance.

E/9.60.1 'Slip road EA' signs and 'Slip road EA arrow' signs should be spaced a maximum of 402 metres apart.

E/9.61 A spacing greater than 402 metres between 'Slip road EA arrow' signs and 'EA approach' signs shall be submitted to the SCRG for acceptance.

E/9.61.1 'Slip road EA arrow' signs and 'EA approach' signs should be spaced a maximum of 402 metres apart.

E/9.62 The first 'Slip road EA' sign in a sequence shall be a minimum of 100 metres and a maximum of 400 metres downstream of the upstream mainline emergency area exit taper.

E/9.62.1 The first 'Slip road EA' sign in a sequence should be a minimum of 200 metres downstream of the upstream mainline emergency area exit taper.

ERT approach signing

E/9.63 Where a NSSH or hard shoulder on a diverge connector road is defined as a place of relative safety, 'slip road ERT' sign(s) and a 'slip road ERT arrow' sign shall be provided.

E/9.64 'Slip road ERT' signs and a 'slip road ERT arrow' signs must be provided in accordance with Department for Transport (DfT) Area Wide sign Authorisation GT50/198/0039 [Ref 12.N] (DfT non- prescribed sign case reference 4577) as illustrated in Figure E/9.63a and 9.63b.

Figure E/9.64a 'Slip road ERT' sign



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Figure E/9.64b 'Slip road ERT arrow' sign



NOTE *Appendix E/A provides an illustrative layout of diverge connector road ERT approach signing.*

E/9.64.1 A 'slip road ERT arrow' sign should be located on the gantry leg of the final ADS or within 100 metres upstream of the final ADS.

E/9.65 'Slip road ERT' signs shall be located upstream of the 'slip road ERT arrow' sign and commence after the upstream mainline emergency area.

E/9.65.1 'ERT approach' signs in accordance with SI 2016 No.362 (TSRGD) [Ref 56.N] diagram 2713.1 should be located downstream of the 'slip road ERT arrow' sign where required to meet the 402 metre spacing on the diverge / diverge connector road.

E/9.66 Where a distance in yards is provided on an 'ERT approach' sign on a diverge or diverge connector road, all downstream 'ERT approach' signs prior to the diverge connector road ERT shall use yards.

E/9.66.1 Where a distance in yards is provided on an 'ERT approach' sign on a diverge or diverge connector road, these should be in increments of 100 yards or 50 yards with 100 yards used wherever practicable.

E/9.67 The last 'ERT approach' sign in a sequence before an ERT on a diverge connector road shall show the distance to the start of the ERT in yards.

E/9.67.1 The last 'ERT approach' sign in a sequence before an ERT on a diverge connector road should be 400 or 300 yards prior to the ERT .

E/9.68 The distance to an 'ERT approach' sign on a diverge or diverge connector road shall be measured from the downstream ERT.

E/9.69 Where no 'ERT approach' signs are located downstream of a 'Slip road ERT arrow' sign, a spacing greater than 402 metres between a 'Slip road ERT arrow' sign and ERT shall be submitted to the SCRG for acceptance.

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E/9.69.1 Where no 'ERT approach' signs are located downstream of a 'Slip road ERT arrow' sign, a 'Slip road ERT arrow' sign and ERT should be spaced a maximum of 402 metres apart.

E/9.70 A spacing greater than 402 metres between the last 'ERT approach' sign in a sequence and ERT shall be submitted to the SCRG for acceptance.

E/9.70.1 The last 'ERT approach' sign in a sequence and ERT should be spaced a maximum of 402 metres apart.

E/9.71 The signed distance on an 'ERT approach' sign shall have an upstream tolerance of 10% and a downstream tolerance of 20 metres.

E/9.72 A spacing greater than 402 metres between 'Slip road ERT' signs shall be submitted to the SCRG for acceptance.

E/9.72.1 'Slip road ERT' signs' signs should be spaced a maximum of 402 metres apart.

E/9.73 A spacing greater than 402 metres between 'Slip road ERT' signs and 'Slip road ERT arrow' signs shall be submitted to the SCRG for acceptance.

E/9.73.1 'Slip road ERT' signs and 'Slip road ERT arrow' signs should be spaced a maximum of 402 metres apart.

E/9.74 A spacing greater than 402 metres between 'Slip road ERT arrow' signs and 'ERT approach' signs shall be submitted to the SCRG for acceptance.

E/9.74.1 'Slip road ERT arrow' signs and 'ERT approach' signs should be spaced a maximum of 402 metres apart.

E/9.75 The first 'Slip road ERT' sign in a sequence shall be a minimum of 100 metres and a maximum of 400 metres downstream of the upstream mainline emergency area exit taper.

E/9.75.1 The first 'Slip road ERT' sign in a sequence should be a minimum of 200 metres downstream of the upstream mainline emergency area exit taper.

E/9.76 Where a hard shoulder on an intra-junction is defined as a place of relative safety and an ERT is greater than 300 metres downstream of the back of the diverge nose, one 'ERT approach' sign in accordance with SI 2016 No.362 (TSRGD) [Ref 56.N] diagram 2713.1 shall be provided a minimum of 100 metres downstream of the back of the diverge nose.

EA Final sign

E/9.77 An 'EA final' sign shall be located up to 20 metres upstream or up to 10 metres downstream of the start of the entry taper of mainline and diverge connector road emergency areas.

E/9.77.1 An 'EA final' sign should be located at the start of the entry taper of mainline and diverge connector road emergency areas.

E/9.78 'EA final' signs must be provided in accordance with DfT Area Wide sign Authorisation GT50/198/0037 [Ref 11.N] (DfT non- prescribed sign case reference 4575) as illustrated in Figure E/9.77.

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Figure E/9.78 'EA final' sign



E/9.79 Except where a merge is present between a 'EA approach' sign and 'EA final' sign, a spacing greater than 402 metres between 'EA approach' signs and 'EA final' signs shall be submitted to the SCRG for acceptance.

E/9.79.1 Except where a merge is present between a 'EA approach' sign and 'EA final' sign, 'EA approach' signs and 'EA final' signs should be spaced a maximum of 402 metres apart.

E/9.80 Where no 'EA approach' signs are located downstream of a 'Slip road EA arrow' sign, a spacing greater than 402 metres between a 'Slip road EA arrow' sign and 'EA final' sign shall be submitted to the SCRG for acceptance.

E/9.80.1 Where no 'EA approach' signs are located downstream of a 'Slip road EA arrow' sign, a 'Slip road EA arrow' sign and 'EA final' sign should be spaced a maximum of 402 metres apart.

Place of relative safety signing for motorway service areas

E/9.81 Place of relative safety signing shall not be provided for an MSA.

NOTE *Additional place of relative safety signing is not required due to the presence of MSA signing.*

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E/10. Roadside technology and communications

General

E/10.1 General requirements for roadside technology and communications shall be in accordance with TD 131 [Ref 46.N].

E/10.2 Where redundant technology infrastructure and equipment can be extracted without damaging existing assets to be retained, redundant technology infrastructure and equipment shall be removed.

E/10.3 Where redundant technology infrastructure and equipment is not removed, the justification for not removing each item shall be recorded in the DSR.

Control signals and VMS

E/10.4 Control signals and VMS design shall be in accordance with CD 146 [Ref 33.N].

E/10.5 Redundant gantry superstructures and foundations shall be removed to surface level.

CCTV

E/10.6 CCTV design shall be in accordance with TD 131 [Ref 46.N].

Detection

E/10.7 Detection design to support MIDAS-based incident detection, variable mandatory speed limits, traffic counting sites and stopped vehicle detection shall be in accordance with TD 131 [Ref 46.N].

Emergency roadside telephones

E/10.8 ERT design for smart motorways shall be in accordance with TD 131 [Ref 46.N].

Ramp metering

E/10.9 Ramp metering design shall be in accordance with TD 121 [Ref 35.N].

Enforcement system

E/10.10 Speed and red X enforcement shall be provided.

E/10.10.1 Speed and red X enforcement design should be in accordance with Highways Agency Digital Enforcement Camera System (HADECS) v3 SMP-HEX-TGN-0-DA-ZZ-0003 [Ref 23.N].

E/10.11 To enable operation of variable mandatory speed limits, smart motorway schemes shall have the necessary legal framework in place.

Remotely operated temporary traffic management signs

E/10.12 Where required, remotely operated temporary traffic management signs shall be provided in accordance with Section E/3.

Digital highway and connected vehicle provision

E/10.13 Digital highway and connected vehicle requirements shall be sought from the Overseeing Organisation.

Infrastructure and telecommunication services

E/10.14 Infrastructure and telecommunication services design shall be in accordance with TD 131 [Ref 46.N].

E/10.15 All technology at the roadside shall employ internet protocol communications interfaces and comply with the remote access requirements specified in TR 2597 [Ref 16.N].

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NOTE *Remote access allows technology to be reset, diagnosed, configured and firmware updated without the need to access the roadside.*

E/10.16 Where access/egress to a transmission station is affected by an all lane running scheme, access/egress improvements or the relocation of the transmission station shall be agreed with the Overseeing Organisation following consultation with their telecommunications service provider.

Electrical power

E/10.17 Provision of electrical power shall be in accordance with TD 131 [Ref 46.N] and this document.

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E/11. Signing and roadmarking

General

E/11.1 Place of relative safety signing for all lane running shall be provided in accordance with Section E/9.

Variable speed limit sign

General

E/11.2 At least one 'variable speed limit' sign in accordance with NP 409 [Ref 29.N] shall be provided at all gateways.

Figure E/11.2 NP 409 'Variable speed limit' sign



NOTE 1 *Gateways include mainline entry and all merge connector roads to a section with variable mandatory speed limits.*

NOTE 2 *Sign NP 409 [Ref 29.N] is shown in Figure E/11.2 and is a non-prescribed sign that has been nationally authorised.*

NOTE 3 *Sign NP 409 [Ref 29.N] has been authorised for use with a 250mm, 200mm, 150mm, 125mm and 100mm 'x' height.*

Mainline

E/11.3 At least one sign in accordance with NP 409 [Ref 29.N] shall be placed at the mainline gateway as close as practicable to 250 metres in advance of the first downstream VMS that displays variable mandatory speed limits.

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E/11.3.1 The sign in accordance with NP 409 [Ref 29.N] should be placed in the nearside verge at each mainline gateway.

Merge / merge connector roads

E/11.4 At least one sign in accordance with NP 409 [Ref 29.N] shall be provided at each merge or merge connector road and MSA merge or merge connector road.

E/11.4.1 The sign in accordance with NP 409 [Ref 29.N] should be placed in the nearside verge before the nose of each merge or MSA merge.

Enforcement camera sign

E/11.5 An enforcement camera sign in accordance with SI 2016 No.362 (TSRGD) [Ref 56.N] diagram 878 shall be provided at each variable mandatory signalling location.

E/11.5.1 Where visibility of the sign permits, an enforcement camera sign in accordance with SI 2016 No.362 (TSRGD) [Ref 56.N] diagram 878 should be mounted on the signalling superstructure rather than on a separate post.

E/11.5.2 The enforcement camera sign should not obscure the view of the HADECS v3 enforcement equipment for approaching traffic.

E/11.6 The enforcement camera sign in accordance with SI 2016 No.362 (TSRGD) [Ref 56.N] diagram 878 shall have a minimum 'x' height of 200mm.

E/11.6.1 The enforcement camera sign in accordance with SI 2016 No.362 (TSRGD) [Ref 56.N] diagram 878 should have a 'x' height of 250mm.

Variable speed limit ends signing

General

E/11.7 A minimum of one 'variable speed limit ENDS/national speed limit' sign to NP 409.1 [Ref 30.N] shall be provided at all exit points unless otherwise stated in this document.

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Figure E/11.7 NP 409.1 'Variable speed limit ENDS/national speed limit' sign



NOTE 1 *Exit points include mainline exits and connector roads leaving a section with variable mandatory speed limits.*

NOTE 2 *Sign NP 409.1 [Ref 30.N] is shown in Figure E/11.7 and is a non-prescribed sign that has been nationally authorised.*

NOTE 3 *NP 409.1 [Ref 30.N] 'variable speed limit ENDS' sign has been authorised for use with a 250mm, 200mm, 150mm, 125mm and 100mm 'x' height.*

E/11.8 The NP 409.1 [Ref 30.N] sign shall be placed as close as practicable to each boundary of the associated Statutory Instrument (Variable Speed Limits) unless otherwise stated in this section.

Mainline

E/11.9 Only one NP 409.1 [Ref 30.N] sign shall be provided at the end of the mainline section of variable mandatory speed limits.

E/11.9.1 The NP 409.1 [Ref 30.N] sign should be located in the verge.

E/11.9.2 Where a merge is located downstream of the end of a mainline section of variable mandatory speed limits, the NP 409.1 [Ref 30.N] sign should be placed just before the merge, and as close as practicable to 300 metres downstream of the termination VMS.

E/11.9.3 Where there is no merge located downstream of the end of a mainline section of variable mandatory speed limits, the NP 409.1 [Ref 30.N] sign should be located as near as is practicable to between 200 metres and 300 metres upstream of the next mainline advisory signal.

E/11.9.4 Where the next mainline advisory signal is greater than 1000 metres downstream, the NP 409.1 [Ref 30.N] sign should be placed between 300 metres and 800 metres downstream of the termination VMS.

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Diverge slip roads

E/11.10 A sign to NP 409.1 [Ref 30.N] shall not be provided on diverge connector roads where the end of motorway regulations sign to SI 2016 No.362 (TSRGD) [Ref 56.N] diagram number 2931 is already present.

NOTE *SI 2016 No.362 (TSRGD) [Ref 56.N] diagram number 2931 is the end of motorway regulations sign for motorway diverge slip roads.*

E/11.11 A sign to NP 409.1 [Ref 30.N] shall not be located where road users can mistake the sign as applying to the mainline motorway.

E/11.11.1 A sign to NP 409.1 [Ref 30.N] may be located in the nearside verge, offside verge or both verges of a diverge link road.

E/11.12 Where a diverge slip road leads to a road with lighting that has a national speed limit in place after the motorway exit, the end of motorway regulations sign shall be accompanied by a national speed limit repeater sign in accordance with SI 2016 No.362 (TSRGD) [Ref 56.N] diagram number 671.

E/11.13 The national speed limit repeater sign shall be placed on or adjacent to the first lighting column after the end of motorway regulations sign.

E/11.13.1 The national speed limit repeater sign may be located on the nearside or offside.

E/11.14 Where a diverge slip road leads to a road with or without lighting that has a speed limit other than the national speed limit in place after the motorway exit, the end of motorway regulations sign shall be accompanied by a pair of speed limit signs in accordance with SI 2016 No.362 (TSRGD) [Ref 56.N] diagram number 670.

E/11.15 The pair of speed limit signs shall be located on the nearside and offside adjacent to or after the end of motorway regulations sign.

MSA diverges

E/11.16 A sign to NP 409.1 [Ref 30.N] shall not be provided on MSA diverge connector roads where the end of motorway regulations sign to SI 2016 No.362 (TSRGD) [Ref 56.N] diagram number 2932 is already present.

NOTE *SI 2016 No.362 (TSRGD) [Ref 56.N] diagram number 2932 is the end of motorway regulations sign for exits to MSAs and maintenance compounds.*

E/11.17 Where a diverge slip road leads directly to an MSA or maintenance compound that has a speed limit, the end of motorway regulations sign shall be accompanied by a pair of speed limit signs in accordance with SI 2016 No.362 (TSRGD) [Ref 56.N] diagram number 670.

E/11.18 The pair of speed limit signs shall be located on the nearside and offside adjacent to or after the end of motorway regulations sign.

E/11.19 Where there are constraints which result in the speed limit signs to SI 2016 No.362 (TSRGD) [Ref 56.N] diagram number 670 being placed greater than 100 metres after the end of motorway regulations sign, a repeater sign or signs to SI 2016 No.362 (TSRGD) [Ref 56.N] diagram number 671 shall be placed either nearside or offside between the end of motorway regulations sign and speed limit sign to SI 2016 No.362 (TSRGD) [Ref 56.N] diagram number 670.

Diverge interchange link roads

E/11.20 Only one NP 409.1 [Ref 30.N] sign shall be provided on a diverge interchange link road at the end of the section of variable mandatory speed limits.

'No hard shoulder' sign - all lane running

E/11.21 An information sign 'No hard shoulder for XX miles' to SI 2016 No.362 (TSRGD) [Ref 56.N] diagram 820.1 shall be provided on the mainline at the downstream end of the intra-junction section entering an

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all lane running link and on all merge or merge connector roads providing entry to an all lane running link.

NOTE 1 *'XX' is the appropriate numerical distance in miles.*

NOTE 2 *A 'No hard shoulder for XX miles' sign is not required on merge or merge connector roads from an MSA.*

E/11.22 The distance shown on the 'no hard shoulder for XX miles' sign shall be measured from the start of the reduction in width/end of the hard shoulder to the point a full width hard shoulder is provided at the end of an all lane running (ALR) section.

E/11.23 Where a new ALR scheme is implemented adjacent to an existing ALR scheme, the distance on any 'no hard shoulder for XX miles' signs in the existing ALR section shall be modified where required to reflect the revised length of carriageway without a hard shoulder present.

E/11.24 The 'no hard shoulder for XX miles' sign shall be located where road users requiring emergency use of the hard shoulder have adequate time to decide to pull over and come to a stop before the start of the reduction in width/end of the hard shoulder.

E/11.24.1 The 'no hard shoulder for XX miles' sign should be located as close as practicable to 100 metres upstream of the start of the reduction in width/end of the hard shoulder.

E/11.24.2 Where there is limited verge width that requires a reduced 'x' height or limited clear visibility, the 'no hard shoulder for XX miles' sign may be located in advance of the taper to SI 2016 No.362 (TSRGD) [Ref 56.N] diagram 1040.5.

E/11.24.3 Where there are space constraints, then the 'no hard shoulder' sign and the 'variable speed limit' sign may be co-located.

E/11.25 Where links switch between ALR and non-ALR, then the distance on the 'no hard shoulder for XX miles' sign shall be to the start of the hard shoulder for the downstream non-ALR link.

E/11.26 Where links switch between non-ALR and ALR, at the end of the non-ALR link a 'no hard shoulder for XX miles' sign shall be provided for the downstream ALR link or links.

E/11.26.1 Where a non-through junction running (TJR) junction is located between a non-ALR link and an ALR link, the 'No hard shoulder for XX miles' sign should be provided on the mainline at the downstream end of the intra-junction section.

E/11.26.2 Where a TJR junction is located between a non-ALR link and an ALR link, the 'No hard shoulder for XX miles' sign should be provided on the mainline at the downstream end of the upstream non-ALR link.

E/11.27 A 'No hard shoulder for XX miles' sign shall not be provided intra-junction at non-TJR junctions where the upstream and downstream links operate all lane running.

Road markings

E/11.28 Vehicle separation markings to SI 2016 No.362 (TSRGD) [Ref 56.N] diagram 1064 and their associated signs shall not be used on smart motorway schemes.

E/11.29 All mainline road markings shall be replaced on smart motorway schemes.

NOTE *The replacement of road markings includes intra-junction mainline.*

E/11.30 Diverge road markings shall be replaced between the mainline and back of the diverge nose on smart motorway schemes.

E/11.31 Merge road markings shall be replaced between the back of the merge nose and mainline on smart motorway schemes.

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E/12. Drainage

General

E/12.1 Drainage design for smart motorways shall be in accordance with CG 501 [Ref 8.N] and LA 113 [Ref 41.N].

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E/13. Pavement

General

E/13.1 Pavement design for smart motorways shall be in accordance with CD 226 [Ref 6.N], CD 227 [Ref 7.N] and this document.

Emergency areas

E/13.2 Emergency areas shall have a pavement construction in accordance with CD 226 [Ref 6.N].

E/13.3 Emergency areas shall be surfaced in accordance with CD 236 [Ref 49.N].

E/13.4 Emergency area finished surface shall be bright orange in colour.

E/13.4.1 Emergency area finished surface should be in accordance with BS 5252 [Ref 15.N] / BS 4800 [Ref 47.N] '08 E 55'.

E/13.4.2 Where a colour match is not achieved, guidance should be sought from the Overseeing Organisation.

E/13.5 Sealants used to fill emergency area joints shall be in accordance with MCHW Series 1000 [Ref 26.N].

NOTE *Sealant colour can vary from the emergency area finished surface colour.*

E/13.6 Where there is no surface longitudinal joint between different pavement construction materials of the emergency area and main carriageway between 300mm and 500mm from the trafficked side of the edge line, then the orange surface shall start 300mm from the trafficked side of the edge line.

E/13.7 Where there is a surface longitudinal joint between different pavement construction materials of the emergency area and main carriageway between 300mm and 500mm from the trafficked side of the edge line, then the orange surface shall start between 300mm and 500mm from the trafficked side of the edge line.

NOTE *The edge of the emergency area finished surface colour can finish abutting the longitudinal joint.*

E/13.8 Where a slot drain is placed in the emergency area adjacent to the longitudinal joint, the orange surfacing shall be continued over its upper surface.

E/13.8.1 Where a slot drain is placed in the emergency area and the midway slot is between 300mm and 500mm from the trafficked side of the edge line, the orange surfacing may be curtailed along the line of the midway slot feature.

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E/14. Structures

Structures review

E/14.1 Existing highway structures throughout a smart motorway scheme shall be reviewed to determine how they can be accommodated.

E/14.1.1 The review of existing highway structures should include:

1) inventory;
2) structural assessment reports;
3) inspection reports;
4) condition information;
5) safety related defects; and
6) geometry.

E/14.2 Where additional assessment work is required to inform the review of existing highway structures, this shall be agreed with the Overseeing Organisation.

E/14.3 Loading requirements for structure design and assessment shall be in accordance with CD 350 [Ref 51.N] for design and CS 454 [Ref 2.N] for assessment.

E/14.4 Smart motorway schemes shall be treated as highway widening schemes for the purposes of CD 367 [Ref 59.N] structure design, assessment and modification.

E/14.5 Gantry structure design and modifications for smart motorways shall be in accordance with CD 365 [Ref 32.N].

E/14.6 Highway structure piers and parapets that are not compliant with current Design Manual for Roads and Bridges requirements shall be identified, risk assessed and recommendations for mitigation agreed with the Overseeing Organisation.

E/14.7 Where the carriageway is altered, widened or realigned the risk of vehicle impact on highway structure parapets shall be assessed in accordance with CS 461 [Ref 1.N].

Other infrastructure authorities or third party structures

E/14.8 Where structures owned by other infrastructure authorities or third parties are affected by a smart motorway scheme this information shall be submitted to the Overseeing Organisation as part of the review of existing highway structures.

E/14.9 Where structures owned by other infrastructure authorities or third parties are affected by a smart motorway scheme, any changes shall be reported as part of the review of existing highway structures, discussed and agreed with the owner and subject to their approval procedures.

E/14.9.1 Liaison with infrastructure authorities or third parties whose structures are affected by a smart motorway scheme should be started as early in the development of the scheme as possible.

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E/15. 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. CS 461, 'Assessment and upgrading of in-service parapets'
Ref 2.N	Highways England. CS 454, 'Assessment of highway bridges and structures'
Ref 3.N	National Archives. legislation.go.uk. CCA 2004, 'Civil Contingencies Act 2004 (CCA) '
Ref 4.N	Highways England. CD 127, 'Cross-sections and headrooms'
Ref 5.N	Highways England. DfS Manual, 'Departures manual'
Ref 6.N	National Highways. CD 226, 'Design for new pavement construction'
Ref 7.N	Highways England. CD 227, 'Design for pavement maintenance'
Ref 8.N	Highways England. CG 501, 'Design of highway drainage systems'
Ref 9.N	Highways England. GD 304, 'Designing health and safety into maintenance'
Ref 10.N	Highways England. CD 193, 'Driver location signs'
Ref 11.N	Department for Transport. GT50/198/0037, 'Emergency Area Signs Authorisation'
Ref 12.N	Department for Transport. GT50/198/0039, 'Emergency areas, place of relative safety and emergency telephone ahead signs authorisation'
Ref 13.N	Highways England. SMP-HEX-HGN-0-DA-ZZ-0008, 'Fixed Taper Points and Remotely Operated Traffic Management Signs'
Ref 14.N	Highways England. SMP-HEX-GEN-CTW-RP-ZX-0007, 'Fixing the Scope of Asset Renewal Works on SMP Projects'
Ref 15.N	BSI. BS 5252, 'Framework for colour co-ordination for building purposes'
Ref 16.N	Highways England. TR 2597, 'Generic roadside device requirements for remote access'
Ref 17.N	National Highways. CD 122, 'Geometric design of grade separated junctions'
Ref 18.N	Highways England. MCH 2584, 'Guidance for the calibration and optimisation of Smart Motorway systems'
Ref 19.N	Highways England. HADECS3, 'HADECS3 implementation guidance'
Ref 20.N	SI 2015 No.51 (CDM Regs), 'HEALTH AND SAFETY - The Construction (Design and Management) Regulations 2015'
Ref 21.N	The National Archives. legislation.co.uk. HASAWA 1974 c.37, 'Health and Safety at Work etc. Act 1974'
Ref 22.N	Highways England. CD 109, 'Highway link design'
Ref 23.N	Highways England. SMP-HEX-TGN-0-DA-ZZ-0003, 'Highways Agency Digital Enforcement Camera System (HADECS) v3'
Ref 24.N	Highways England. GG 103, 'Introduction and general requirements for sustainable development and design'
Ref 25.N	National Highways. GG 101, 'Introduction to the Design Manual for Roads and Bridges'

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Ref 26.N	Highways England. MCHW Series 1000, 'Manual of Contract Documents for Highway Works. Volume 1 - Specification for Highway Works. Series 1000 Road Pavements – Concrete Materials'
Ref 27.N	National Highways. NH PCF, 'National Highways' Project Control Framework'
Ref 28.N	Department for Transport. NP 2937, 'Non-prescribed sign authorisation'
Ref 29.N	Department for Transport. NP 409, 'Non-prescribed sign authorisation'
Ref 30.N	Department for Transport. NP 409.1, 'Non-prescribed sign authorisation'
Ref 31.N	Highways England. SMP-HEX-HGN-0-DA-ZZ-0014, 'Place of Relative Safety (PRS) including Emergency Areas (EA)'
Ref 32.N	Highways England. CD 365, 'Portal and cantilever signs/signals gantries'
Ref 33.N	Highways England. CD 146, 'Positioning of signalling and advance direction signs'
Ref 34.N	Highways England. MPI 11, 'Provision of Access Arrangements to Equipment on SM-ALR Schemes'
Ref 35.N	Highways England. TD 121, 'Ramp metering'
Ref 36.N	Highways England. SMP-HEX-TGN-0-DA-ZZ-0009, 'Remotely Operated Temporary Traffic Management (ROTTM) sign, Guidance on Specification and Design'
Ref 37.N	Highways England. SMP-HEX-TGN-0-DA-ZZ-0006, 'Remotely Operated Temporary Traffic Management (ROTTM) signs associated with Fixed Taper Points (FTPs)'
Ref 38.N	Highways England. SMP-HEX-TGN-0-DA-ZZ-0010, 'Remotely Operated Temporary Traffic Management (ROTTM) signs, Guidance on Operation and Maintenance'
Ref 39.N	Highways England. CD 377, 'Requirements for road restraint systems'
Ref 40.N	Highways England. GG 104, 'Requirements for safety risk assessment'
Ref 41.N	Highways England. LA 113, 'Road drainage and the water environment'
Ref 42.N	BSI. BS EN 1317, 'Road restraint systems. (All Parts)'
Ref 43.N	BSI. BS EN 1317-2, 'Road restraint systems. Performance classes, impact test acceptance criteria and test methods for safety barriers including vehicle parapets '
Ref 44.N	BSI. BS EN 1317-1, 'Road restraint systems. Terminology and general criteria for test methods.'
Ref 45.N	The National Archives. legislation.gov.uk. c.27 RTRA (1984), 'Road Traffic Regulation Act 1984'
Ref 46.N	Highways England. TD 131, 'Roadside technology and communications'
Ref 47.N	BSI. BS 4800, 'Schedule of paint colours for building purposes'
Ref 48.N	Highways England. SMP-HEX-GEN-SA02-DA-KK-0001, 'SMP Design Guide'
Ref 49.N	Highways England. CD 236, 'Surface course materials for construction'
Ref 50.N	Highways England. TR 2603, 'Technical Specification for remote controlled temporary traffic management signs for use on the Highways Agency Strategic Road Network'
Ref 51.N	Highways England. CD 350, 'The design of highway structures'
Ref 52.N	Highways England. CD 169, 'The design of lay-bys, maintenance hardstandings, rest areas, service areas and observation platforms'

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Ref 53.N	SI 2008/2367, 'The Removal and Disposal of Vehicles (Traffic Officers) (England) Regulations 2008'
Ref 54.N	Highways England. RRRAP, 'The Road Restraint Risk Assessment Process'
Ref 55.N	Highways England. TMMM, 'The Technology Management and Maintenance Manual'
Ref 56.N	The National Archives. legislation.gov.uk. SI 2016 No.362 (TSRGD), 'The Traffic Signs Regulations and General Directions 2016'
Ref 57.N	TSO. Department for Transport. TSM Chapter 5, 'Traffic Signs Manual Chapter 5 - Road Markings'
Ref 58.N	TSO. TSM Chapter 8, 'Traffic Signs Manual Chapter 8 - Traffic Safety Measures and Signs for Road Works and Temporary Situations'
Ref 59.N	Highways England. CD 367, 'Treatment of existing structures on highways widening schemes'
Ref 60.N	Highways England. SMP-SA02-ITLG-DGA-E-E1.10, 'Turnarounds (and other facilities that aid operations)'

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E/16. Informative references

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

Ref 1.I	National Highways. GD 301 (GSR), 'GD 301 Smart Motorways Generic Safety Report'
Ref 2.I	Department for Transport. RIS 1, 'Road Investment Strategy'

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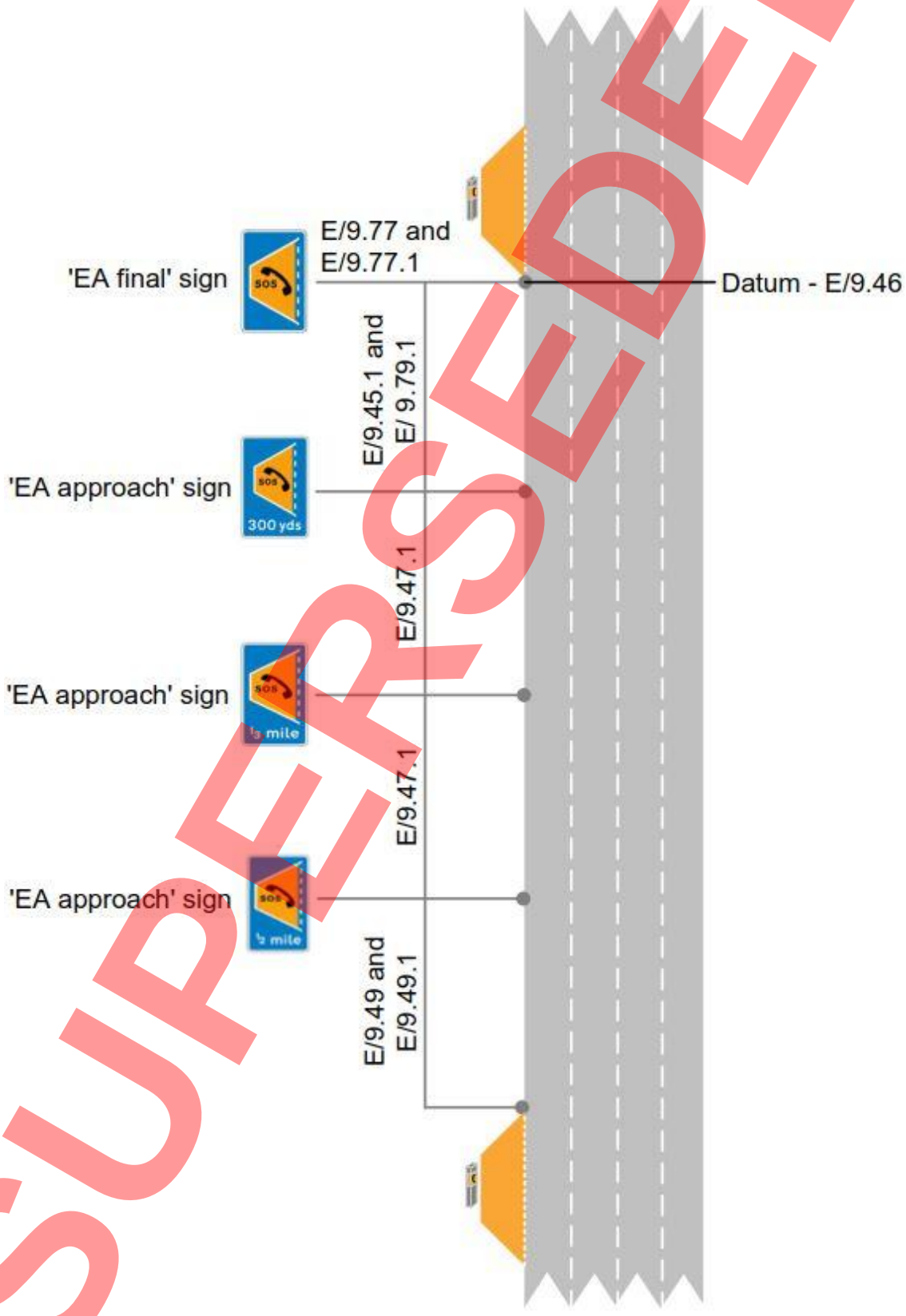
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Appendix E/A. Emergency area signing - illustrative layouts

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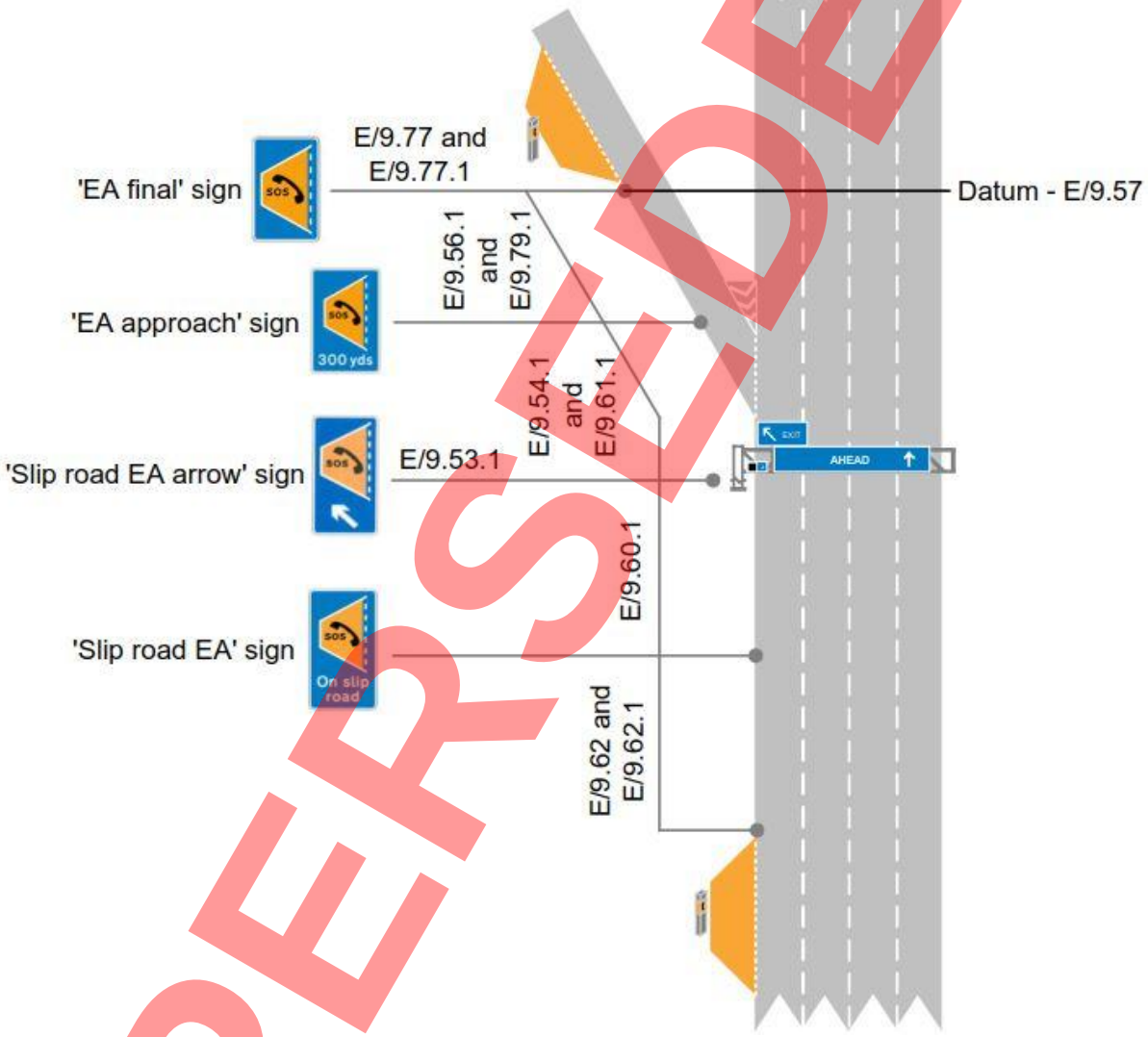
Figure E/A.1 Mainline emergency area approach signing (illustrative purposes only)



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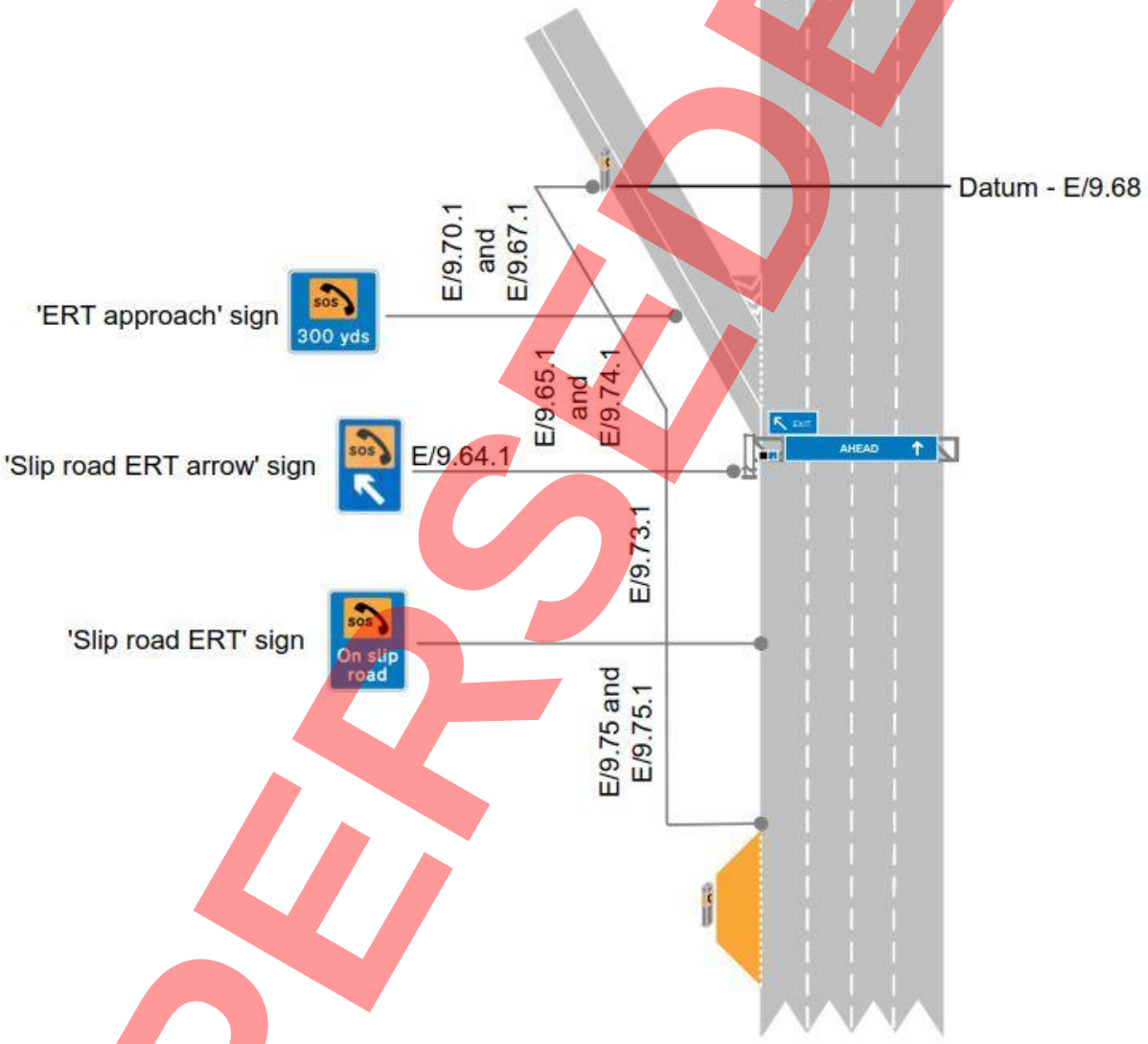
Figure E/A.2 Diverge connector road emergency area approach signing (illustrative purposes only)



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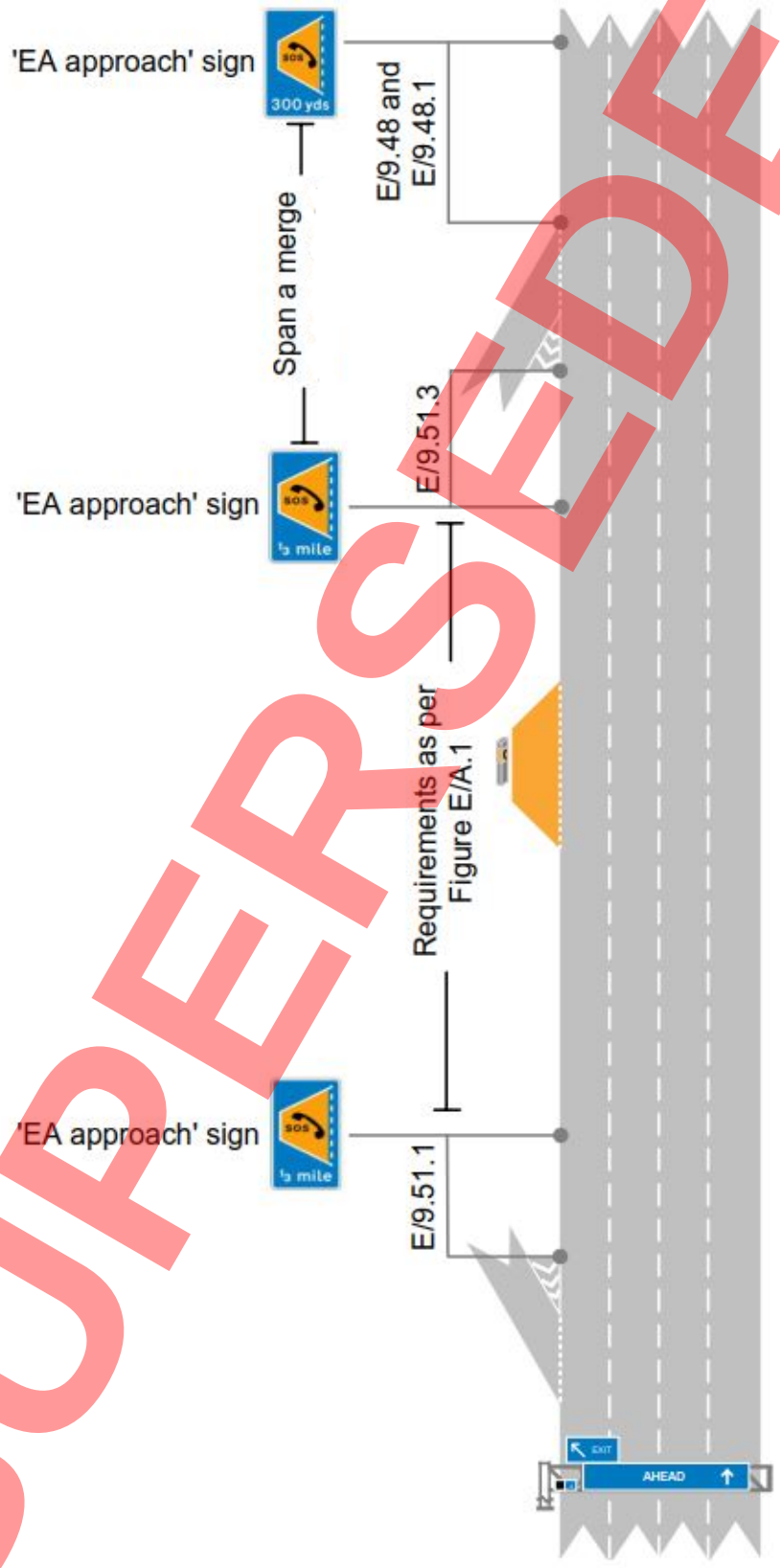
Figure E/A.3 Diverge connector road ERT approach signing (illustrative purposes only)



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Figure E/A.4 Mainline emergency area approach signing at diverge and merge connectors (illustrative purposes only)



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Appendix E/B. Concept of operation

E/B1 Introduction

The concept of operation document sets out, at a high level, guidance around the operational elements of smart motorway schemes designed to the requirements of this document, including both all lane running and controlled motorway. Any operational differences between all lane running and controlled motorway are identified.

The intended audience for the concept of operation document is all those who are responsible for either the design or operation of smart motorway schemes; including those performing incident management or maintenance activities on these sections once built, as well as those involved with customer and stakeholder communications.

The concept of operation document demonstrates that smart motorway schemes designed to the requirements in this document can be effectively operated and maintained. Detailed work instructions, operational procedures and processes should be in place and training given on their use in advance of smart motorway schemes becoming operational. These work instructions, procedures and processes are not covered in depth within this document.

The concept of operation document covers the following areas:

1) design components and operational overview (E/B2) - describes the design components and high level operation of smart motorways;
2) operating regimes (E/B3) – describes how a smart motorway scheme is operated under 'normal' conditions, during both the peak and off-peak periods and also describes driver information;
3) controlled environment, compliance and enforcement (E/B4) – describes the importance of a controlled environment and the use of enforcement and other measures to achieve this;
4) management of incidents and other heightened situations (E/B5) – describes the management of incidents and other heightened situations and how the Overseeing Organisation works with core responders;
5) maintenance (E/B6) - describes the impacts of smart motorways on maintenance;
6) regional operation centres and traffic officers (E/B7) – describes the impact of smart motorways on regional operation centres and on road traffic officers;
7) validation and continual improvement (E/B8) – describes how validation of smart motorway operation is undertaken and applied to enable continual improvement.

E/B2 Design components and operational overview

E/B2.1 Summary of design components

Table E/B.1 summarises the design components of both all lane running and controlled motorway. Detailed requirements are contained in the main body of this document and take precedence over Table E/B.1.

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Table E/B.1 Design components

Design component	All lane running	Controlled motorway
Hard shoulder	Converts the hard shoulder to a permanent running lane	Retains the existing hard shoulder provision
Variable message signs and control signalling	Applies to both. Provided at intervals not exceeding 1500 metres for incident, traffic and congestion management	
Automated speed and red X enforcement	Applies to both	
Vehicle detection system	Applies to both. Used to support queue protection and congestion management	
Stopped vehicle detection	Mandated	Not typically required
Remotely operated temporary traffic management signs	Mandated until such time that it is confirmed by the Overseeing Organisation that overhead VMS and control signals can be used in their place	May be included - their use is to be assessed but is not mandated
Pan-tilt-zoom CCTV coverage	Full coverage of running lanes, place of relative safety, and any maintenance hard standings	Comprehensive coverage providing visibility of in excess of 95% of the total scheme area and coverage of all emergency roadside telephones
Central reserve safety barrier	H1 or greater containment level with a serviceable life of not less than 50 years - mandated	H1 or greater containment level with a serviceable life of not less than 50 years - to be assessed but provision of H1 is not mandated
Place of relative safety	Provided at a maximum spacing of 1600 metres	Not required due to the retention of the hard shoulder
Emergency roadside telephones	Provided in all designated place of relative safety in accordance with TD 131 [Ref 46.N] and this document	Provided in accordance with TD 131 [Ref 46.N]

E/B2.2 Operational overview

E/B2.2.1 General

The smart motorways philosophy is to provide the minimum amount of infrastructure required to safely and effectively operate the scheme. Smart motorway schemes have successfully demonstrated how the provision of additional capacity on busy parts of the network can have a positive impact on performance metrics such as journey time reliability and safety.

Delivering a controlled environment encourages compliant road user behaviour which is a key contributor to providing safe and effective operation for both road users and workers. Smart motorway signing and signalling provides clear, appropriate and unambiguous information to road users, for example regarding speed limits or lane availability. Information is delivered to the road user in such a way that it does not cause overload or leave the road user in doubt as to what compliant behaviour is required of them. Controlled environment, compliance and enforcement are covered in more detail in Section E/B4.

A safety assessment GD 301 (GSR) [Ref 1.I] has been undertaken on the generic controlled motorway and all lane running design and shows that the generic safety objective for road users and road workers is expected to be met for both variants of smart motorway. See Section E/2 for further information.

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E/B2.2.2 All lane running

All lane running delivers additional capacity through the permanent conversion of the hard shoulder and is therefore not reliant on technology being operational for the converted lane to be open to traffic. The permanent removal of the hard shoulder impacts the conventional management of incidents, as it takes away the ability to move broken down vehicles and other debris from a live traffic lane into a dedicated hard shoulder, or to use the hard shoulder as an emergency access route. These impacts are mitigated by smart motorway design components and operational procedures, particularly through the use of technology and place of relative safety provision.

The increased live lane breakdown frequency expected on all lane running sections may require a greater presence by traffic officers on the road and in the operations centre compared to a conventional motorway. The controlled environment contributes towards a scheme meeting the road user safety objective by delivering a reduction in the typical frequency and severity of collisions. This has a corresponding positive impact on the resources required for incident management.

The permanent removal of the hard shoulder also impacts on conventional maintenance access to verge assets. This impact is mitigated by smart motorway design components and operational procedures, particularly through off network access provision, maintenance hard standings at emergency areas (where required) and remotely operated temporary traffic management signs to reduce roadworker exposure where live lane closures are required for maintenance access. Provision of a high containment, non-deformable barrier in the central reserve also reduces roadworker exposure and cross over incidents.

In an emergency, road users within an all lane running section can exit the network at the next available downstream junction, or alternatively stop in a place of relative safety such as an emergency area. Places of relative safety are included in the design requirements at up to 1600 metres intervals, providing a place for road users to stop in an emergency or breakdown. Subject to an appropriate risk assessment, places of relative safety may also be used to provide maintenance access, or to assist with the recovery of vehicles or removal of debris during incident management. With the exception of MSAs, places of relative safety are provided with a dedicated emergency roadside telephone. Existing emergency roadside telephones adjacent to converted sections of hard shoulder are removed.

Incident detection supports the automatic setting of signals and message signs for queue protection and congestion management. Live lane breakdowns are detected by a stopped vehicle detection system and an alert is presented at the operations centre for verification and action.

PTZ CCTV cameras are positioned to provide full coverage of the main carriageway, emergency areas and any maintenance hard standings.

Unless detection is enabled, operations centre operators are not automatically alerted whenever a vehicle enters or leaves an emergency area; although the road user is instructed by fixed signs in the emergency area to contact the operations centre using the ERT. Operators are able to observe the vehicle using CCTV, and where necessary dispatch a traffic officer patrol and/or set signs and signals to assist the vehicle's safe exit.

E/B2.2.3 Controlled motorway

In contrast to all lane running, controlled motorway retains the existing hard shoulder. Whilst controlled motorway does not typically add physical capacity to the network in terms of increasing the number of lanes available, the implementation of variable mandatory speed limits as part of a congestion management system is expected to provide some additional network capacity as the controlled environment helps to smooth traffic flows and increase throughput.

As on conventional motorways, the hard shoulder provides a place of relative safety in an emergency, a means of accessing incidents, and, subject to the necessary controls, a place from which maintenance access can be provided and/or temporary traffic management set out. There is no requirement for emergency areas within controlled motorway sections.

Incident detection supports the automatic setting of signals and message signs for queue protection and congestion management.

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As with all lane running sections, operations centre operators are able to access images from PTZ CCTV cameras. Cameras are positioned to provide comprehensive coverage of the main carriageway and not full coverage on a controlled motorway scheme.

E/B3 Operating regimes

This section describes, in broad terms, how a generic smart motorway scheme built to the requirements of this document is operated under 'normal' conditions, during both the peak and off-peak periods. It sets out the principles of how the Overseeing Organisation and other stakeholders respond to certain circumstances in order to deliver the intended benefits of a smart motorway scheme.

Operations centre operators are able to remotely observe network conditions, confirm incidents and stopped vehicle alerts and where they are visible, verify signal settings by utilising the PTZ CCTV coverage. Smart motorways do not require additional close monitoring, although they may be identified as a higher priority in terms of patrolling, given that these schemes tend to be built on the busiest parts of the network.

Traffic officers should be provided with and trained in the use of suitable procedures and work instructions prior to a smart motorway scheme becoming operational in their particular region.

E/B3.1 Off-peak operation

Off-peak operation describes a scenario where all lanes are available for use and traffic volumes are low and flowing freely with large headways. These conditions are typically expected to occur on weekdays; starting in the late evening, and continuing overnight. Off-peak conditions may also apply throughout the weekends; or between the morning and afternoon peak periods (the "inter-peak"), depending on the location and traffic patterns.

During these times, the national speed limit applies, and electronic signs and signals are not required for operational purposes, and as such remain blank unless required for queue protection or other non-smart motorways related purposes such as strategic signing etc.

With the exception of SVD alert monitoring, there are no additional requirements introduced by a smart motorway scheme during these periods of off-peak operation over and above the normal roles and responsibilities of operational staff. The off-peak period provides the most appropriate conditions to perform maintenance or other activities that may impact network availability, without unduly compromising network performance.

E/B3.2 Operation during peak times

During peak periods, traffic volumes are higher. Although the extra capacity provided on all lane running schemes by the conversion of the hard shoulder to a running lane helps to maintain headways, on occasions flow breakdown may still occur.

The peak period usually occurs on weekdays: typically in the morning and evening. Certain locations may also routinely experience peak conditions outside of these times, which is apparent from the traffic flow profiles recorded in the combined operations PCF product (NH PCF [Ref 27.N]); but may also be generated by infrequent demand increasing events e.g. festivals, concerts, sporting events, etc.

The vehicle detection system continuously monitors the flow of vehicles, and when necessary the congestion management system triggers the automatic setting of appropriate mandatory speed restrictions, applicable to the entire carriageway, in an attempt to first prevent, and subsequently limit the effects of flow breakdown.

E/B3.3 Provision of driver information

E/B3.3.1 Tactical driver information

To encourage compliant road user behaviour, information relating to current network conditions e.g. speed restrictions, lane availability, etc. is provided through roadside infrastructure. Although some driver information is provided through lane specific overhead signals, the majority is displayed using

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nearside mounted variable message signs, also described as 'carriageway signals', since any information displayed on them is applicable to the whole carriageway.

A single variable message sign can display up to three simultaneous elements. In addition to a speed restriction and a supporting text legend, the sign is also able to display either a warning pictogram typically in the form of a 'red triangle' diagram as shown in Figure E/B.1:

Figure E/B.1 Warning pictogram



Or alternatively, a lane closure aspect, as indicated in Figure E/B.2:

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Figure E/B.2 Lane closure aspect



It is an offence to proceed in a lane to which the red X relates or to enter that lane until another signal indicates that the lane is no longer closed, by displaying the word "End" or a speed limit sign.

All message signs have the capability to display a higher priority message should the need arise, with prioritisation determined automatically by the signalling control software and site data.

E/B3.3.2 Strategic driver information

When variable message signs are used to display combinations of speed limits, lane closure aspects or pictograms, they are not available to display text associated with strategic traffic management or driver information.

Pre-existing strategic VMS capability is retained so that strategic signing is not lost during the peak hours of operation or during incidents. There may be a need to re-position these signs to provide the correct sequence of sign and signalling installations on the approach to a junction in accordance with the design requirements set out in CD 146 [Ref 33.N].

At some locations, other non-strategic VMS are regularly set as part of the National Traffic Information Service (NTIS) to display strategic traffic management or driver information messages, and this capability may also need to be retained. The exact level of provision on each scheme is to be agreed by the Overseeing Organisation.

Messages generated by the queue protection subsystem have a higher priority than strategic message settings, and as such would overwrite them. To prevent this, any retained message signs should be prevented from displaying system generated queue protection information. This is achieved within the site data by removing the retained signs from MIDAS pointers.

Smart motorways require certain gantries to house both lane signals and a variable message sign. As information relating to lane availability and/or speed restrictions are provided at those locations using the lane signals, the message sign is available to show supporting text legends, which can be of a strategic nature.

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The message signs co-located with the signals on these gantries can, where required, be prioritised for strategic use within the message hierarchy. NTIS may also be granted lower priority access to the other message signs within the scheme, permitting their strategic use when not otherwise required for tactical purposes.

E/B3.3.3 Speed restrictions

Unlike conventional motorways, the variable speed limits displayed within a smart motorway scheme are mandatory. Existing entry stop signals can be left as advisory where the downstream visibility requirements of the mainline mandatory signals are met.

Where fixed plate speed restrictions below the national speed limit are in place (for example at sub-standard bends), the highest displayable speed on adjacent signalling has to be set below the speed limit displayed on the fixed sign.

When variable mandatory speed limits are displayed, they can be enforced using strategically positioned digital cameras that are able to automatically detect and record speeding offences and initiate the prosecution process. It is therefore critical that the displayed speed limit is appropriate to protect the credibility of the system and enforcement regime.

The vehicle detection system determines the speed limit(s) necessary to keep traffic flowing smoothly: where a speed restriction is generated, appropriate mandatory speed limits are automatically displayed on the signalling infrastructure.

Where the national speed limit is in operation, the signs and signals are either blank e.g. where there is no congestion, or display the standard national speed limit symbol to communicate that a previous speed restriction no longer applies. This is automatically determined by the signalling rules.

At locations where speed restrictions are displayed on nearside mounted message signs, that speed limit applies to the entire carriageway. At locations where speed restrictions are communicated using lane specific signals, the same speed limit is displayed above all the open lanes of a particular carriageway.

For safety reasons, operational policy is that the speed limit should not drop by more than 20mph on consecutive signals. There may be instances on some schemes where the distance between signals makes even a 20mph drop in speed limit undesirable.

When a primary signal is set, the signal sequencing rules automatically determine and set appropriate secondary supporting signals, based on the primary settings and the distance between signals.

Configuration settings for the queue protection and congestion management systems e.g. speed/flow threshold should be tuned and reviewed regularly so that appropriate speed limits continue to be set after the scheme has been handed over into operation - refer to Section E/B8.

E/B4 Controlled environment, compliance and enforcement

A controlled environment is provided through the effective operation of appropriate infrastructure and technology. It provides the road user with the right information, at the right location at the right time; thereby promoting appropriate and intuitive driver behaviour through situational awareness. Road users travel through a scheme in an environment where information and the presence of CCTV is highly visible and they perceive that their behaviour is being monitored.

A controlled environment is one in which road users understand what is expected of them and behave accordingly. This is particularly important with smart motorways, where speed limits and lane configurations may change dynamically, and where the controlled environment provides the mitigation for certain hazards, contributing to the design meeting the safety objective.

A smart motorway design should have due regard for the operation of the scheme and create a controlled environment for the entirety of the scheme, including the lead-in from the section immediately upstream and the lead-out into the next adjacent section downstream.

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E/B4.1 Compliance issues

Smart motorways include a number of features that where not appropriately designed and/or managed may be subject to unacceptable levels of non-compliance. Table E/B.2 outlines these.

Table E/B.2 Potential non-compliance

Area of potential non-compliance	Comment
Exceeding variable mandatory speed restrictions.	Does not arise on a conventional motorway where any variable speed limits are advisory.
Driving in a lane to which a red X signal relates or entering that lane prior to another signal indicating that the lane is no longer closed, by displaying the word "End" or a speed limit sign.	Potential for more abuse on smart motorway schemes, due to the greater volume of signals and higher propensity for their use. On all lane running sections, more frequent lane closures may be expected due to the increase in live lane breakdowns and incidents and greater use of signals to support maintenance.
Non-emergency stops in a place of relative safety.	Does not arise on a conventional or controlled motorway although unauthorised stops on the hard shoulder are observed.

E/B4.2 Achieving compliance on individual schemes

As part of the combined operations PCF product (NH PCF [Ref 27.N]), each scheme is required to produce a compliance strategy. This should identify appropriate measures to address all the potential forms of non-compliance, and highlight any exceptions to the HADECS v3 implementation guidance HADECS3 [Ref 19.N]. The combined operations PCF product (NH PCF [Ref 27.N]) should define the actions required by the scheme in order to provide an appropriate level of compliance.

The compliance strategy section of the combined operations PCF product (NH PCF [Ref 27.N]) includes a requirement to assess the potential for non-compliance with specific rules; identifying any safety hazards that non-compliance would affect, in order to determine the overall impact on achieving the safety objectives.

The compliance strategy should take account of aspects such as: the physical characteristics of the road; the proportion of different vehicle types expected to use the scheme; and levels of road user familiarity with smart motorways, recognising that the latter two may vary by time and day. The strategy should identify where engineering, education, encouragement and enforcement measures may be deployed to improve compliance.

Compliance with signs and signals improves when road users understand why they have been set. Supporting information such as pictograms or text may be set on the message signs to explain why lane closures and/or reduced speed limits have been implemented.

E/B4.3 Agreements with enforcement authorities

Agreements with enforcement authorities need to be put in place.

E/B4.4 Achieving compliance with specific features

E/B4.4.1 Variable mandatory speed limits

Variable mandatory speed limits are enforced using National Highways' automated digital enforcement compliance system.

Each scheme needs to assess how many digital enforcement cameras it requires and where they should be deployed, in accordance with the HADECS v3 implementation guidance HADECS3 [Ref 19.N].

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Where the operations centre identify or are made aware of instances where automatically set speed limits are not credible or appropriate to traffic conditions, they should take immediate action to remove or amend those speed restriction settings. Where displayed limits are clearly not reasonable, compliance is affected both on the link on which they are signed, as well as potentially on nearby links.

Once an incorrect or inappropriate setting has been removed, the Overseeing Organisation notifies the enforcement authority, so that compliance with speed limits is not enforced during this period. The cause of the incorrect setting should be investigated.

The enforcement authority may refuse to enforce limits that are clearly not reasonable, or which regularly lack credibility in their setting.

E/B4.4.2 Lane closures

Where a digital enforcement camera is present, automatic enforcement of a red X infringement is also provided.

E/B4.4.3 Non-emergency stops in emergency areas

The removal of the hard shoulder on all lane running schemes is expected to reduce the rate of non-emergency stops compared to the levels observed before the scheme is built. The hazards associated with the entry, occupancy and exit of emergency area are factors that were assessed when determining their levels of provision for all lane running.

Engineering design has a particular impact on the appropriate use of emergency areas, given their potential attractiveness to road users as a place to make short duration stops. Observed examples of non-emergency use include road users stopping for phone calls, comfort breaks, map reading, tachograph breaks, etc.

Education of road users is an important tool to remind them of the lawful purposes of emergency areas, and of the dangers inherent in making stops in emergency areas for non-emergency use. The design should assess the particular demographic of the expected users of their scheme to understand what type of non-emergency stops might be expected. For example, evidence suggests that where freight users constitute a high proportion of traffic, emergency areas may be used more frequently for tachograph breaks. These issues should be addressed in the scheme's communications plan PCF product (NH PCF [Ref 27.N]).

All lane running design requirements include signing in emergency areas to further discourage unlawful use – refer to Section E/9.

E/B5 Management of incidents and other heightened situations

With the removal of the hard shoulder on all lane running sections, the number of live lane obstructions is expected to increase, since a proportion of the vehicles that would previously have stopped on the hard shoulder in an emergency are now unable to reach the next place of relative safety, and therefore have no option but to stop in one of the live lanes or pull on to the verge where no road restraint system is present.

Once an operator in the operations centre is made aware of an incident through an automated alert from the stopped vehicle detection system, from a phone call, via notification from an on-road resource, or by some other means, the PTZ CCTV cameras can be used to validate the location and confirm the key features of the incident.

The operator also has the ability to set a lane closure sequence with supporting information messages and appropriate reduced mandatory speed limits. This warns approaching road users of the potential hazard, enabling them to safely reduce their vehicle's speed whilst merging into the remaining available lanes past the scene.

E/B5.1 Dealing with incidents - key differences on smart motorway schemes

Smart motorway schemes create a greater need for agreements and clear communication between the Overseeing Organisation, and "core responders". In this context, the term Overseeing Organisation is

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used to include the operations centre and on-road traffic officers, as well as maintenance service providers or any other parties employed or contracted by the Overseeing Organisation.

The greater need for commonly agreed processes and procedures arises due to the different operating environments encountered between smart motorway schemes and conventional motorways. Increased deployment of technology on the network provides staff in the relevant operations centres with greater knowledge of what is happening during incidents, as well as providing the opportunity to assist the on road response with supporting signs and signals, and by providing timely information to core responders' en-route to the scene.

Incident management has four distinct phases, namely: incident detection and verification; initial response and access; scene management; and network restoration.

From the perspective of responding to and managing incidents and other 'unusual' situations, the main differences between a standard three lane motorway and a smart motorway scheme are described in the following sections.

E/B5.1.1 Incident detection and verification

The additional capacity and controlled environment are expected to deliver reductions in both the frequency and the severity of collisions on all lane running when compared to the safety baseline; however more incidents now affect a live lane.

Live lane breakdowns are detected by the stopped vehicle detection system on an all lane running section and an alert is provided at the operations centre. This is of particular benefit during less busy periods with low traffic flows. In busy periods any obstruction on a smart motorway quickly results in congested conditions, enabling slow moving or stationary vehicles to be detected by the queue protection system. This automatically sets messages and signals designed to help prevent secondary incidents.

PTZ CCTV camera coverage enables the location of any reported incident (including SVD alerts) to be quickly verified, allowing an appropriate response to be determined by the operations centre, which may include the setting of lane closures and speed limits using signs and signals to warn road users approaching the scene.

As with all live lane incidents, details should be passed to the national traffic information service for onward dissemination.

E/B5.1.2 Initial response and access

In all lane running sections, the conversion of the hard shoulder to a controlled running lane means core responders have to attend incidents without relying on the hard shoulder as a dedicated access route. In controlled motorway sections, the hard shoulder may be used as an emergency access route.

Signals can be set to facilitate core responder access using any appropriate lane(s).

In some circumstances it may be necessary to access an incident from downstream. Traffic officers have a procedure for this.

Early liaison is required with the users of any existing access and egress points e.g. a works depot or turnaround point, particularly on longer links, so that core responders are able to reach the scene in a timely manner. Refer to Section E/7.

E/B5.1.3 Scene management

Mandatory speed limits, whether automatically generated by a queue protection or congestion management system, or manually set by the operator, help to create and maintain a controlled environment, which provides a safety benefit to those involved in managing the incident.

Mandatory speed limits may be shown on either variable message signs or lane signals, with consecutive information points provided at maximum intervals of 1500 metres to provide road users with adequate guidance.

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Using nearside mounted variable message signs provides operational flexibility, as the speed restriction can be accompanied by appropriate combinations of lane closure aspects, pictograms, or text on a single piece of infrastructure.

Information and instructions displayed on the variable message signs relate to the entire carriageway.

The operations centre may be requested to set variable signs and signals, for example to provide advance warning and instruction to road users of an incident in a live lane.

E/B5.1.4 Network restoration

With no hard shoulder, a greater proportion of incidents on all lane running sections impacts live lanes. In these situations, vehicles need to be recovered to an off–carriageway location, such as a place of relative safety. Debris also needs to be cleared from live lanes.

Broken down vehicles can be re-located to the retained hard shoulder on controlled motorway sections.

E/B5.2 General approach to managing incidents

Variable message signs and signals are the primary mechanism through which the operation centre is able to control traffic on a smart motorway. Before the lanes that are affected by an incident are confirmed, all variable message signs and signals are set as non-lane specific i.e. the same advice applies to all lanes. For unconfirmed incidents a text legend is displayed, for confirmed incidents prior to confirmation of affected lanes a speed restriction is put in place, supported by variable message signs.

Once the lanes that are affected by an incident have been confirmed, lane specific closures are able to be set: by displaying a 'lane closure aspect' on a variable message sign, or setting stop signals on a gantry containing lane specific signals. Once a lane closure has been set, the signal sequencing rules automatically generate and set secondary signals including upstream lane diverts and appropriate speed restrictions throughout the immediate area.

At any time operations centre operators may override an automated speed restriction with a lower speed limit. Operators should set or clear signs and signals according to the requirements of the lead responder on scene in line with policy.

E/B5.3 Operational challenges posed by smart motorways

Smart motorways affect the way in which some operational tasks are carried out, and the manner in which some services are delivered. The following sections discuss some of these operational challenges in more detail.

E/B5.3.1 Ability to confirm incidents

Current policy on the use of variable message signs and signals states that lane specific signalling and messages related to an incident can only be set once the location and the affected lanes have been confirmed by an approved source. Approved sources include a police officer, traffic officer, traffic incident management vehicle at the scene, maintenance service provider and NTIS.

Operation centre operators may also use the images provided by the PTZ CCTV cameras to remotely confirm incident details provided by an unapproved source, and provide an appropriate response.

E/B5.3.2 Accessing the scene

As soon as possible after confirmation of an incident, the operations centre operator should identify the most appropriate access route for core responders and advise them accordingly. Once the choice is confirmed by the core responders, the operations centre should set the signs and signals necessary to clear and protect this route. Guidance exists in the traffic officer work instructions as to the factors to consider when selecting which is the most appropriate lane to close.

Where traffic officers can convert a lane into a sterile area and can manage the incident from there to release the traffic, this should be their first choice, enabling access to the scene for core responders. Where they cannot clear a lane and if the situation warrants it, they may consider access from downstream by implementing reverse access in readiness for larger response vehicles and recovery operators.

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E/B5.3.3 Broken down and abandoned vehicles

Traffic officers have powers under the Removal and Disposal of Vehicles (Traffic Officers) (England) Regulations 2008 SI 2008/2367 [Ref 53.N] that enable them to deal with vehicles that have broken down and are either causing an obstruction or danger to others; are in contravention of a restriction or prohibition; or appear to have been abandoned without lawful authority.

On the majority of the network, where a vehicle has stopped in a location such that it does not cause an obstruction or danger and where there is no police interest in the vehicle, road users are given a "reasonable" time to organise their own recovery. Where suitable arrangements are not or cannot be made, a statutory removal may be invoked by traffic officers.

As an all lane running scheme has no hard shoulder, all lanes are live lanes. Any vehicle that is unable to leave the main carriageway by continuing to the next diverge connector road, or stopping in a place of relative safety, becomes a candidate for statutory removal as it will, by definition, cause an obstruction.

Suitably trained and equipped traffic officers are able to clear most broken down vehicles to the nearest place of safety, which may be a place of relative safety or hard shoulder on a controlled motorway section. This can involve moving vehicles for distances of up to 1.6km on an all lane running section, and in instances where the nearest place of relative safety is occupied or otherwise unavailable there may be a requirement to clear for even greater distances.

Where traffic officers are unable to clear the vehicle for example due to it being overweight, or damaged, they set out emergency traffic management and follow the usual statutory removal process. Once in attendance they remain with the vehicle until it is removed or otherwise protected.

Where a vehicle is broken down in or cleared to an emergency area or other place of relative safety on an all lane running section, the on road traffic officer patrol - as for any other road - should make an assessment of the obstruction or danger posed by that vehicle to determine whether a statutory removal is justified, or whether "owner's choice" of vehicle recovery can be used.

E/B5.3.4 Debris retrieval

As elsewhere on the network, debris is categorised as either that requiring immediate collection e.g. debris of a distressing or hazardous nature; or routine debris e.g. tyre or exhaust debris.

For 'immediate collection' debris, an incident assessment is made by the attending traffic officer who determines whether the debris should be removed to the edge of the carriageway or verge, or left in situ awaiting removal by the maintenance service provider. Where the debris is to be left in situ, the traffic officer remains at the scene, and deploys appropriate live lane work instructions. Where the debris is to be moved to the edge of the carriageway or verge, the traffic officer may need to return to support the maintenance service provider.

For 'routine collection' debris, traffic officers may need to deploy an all lane rolling road block to temporarily hold traffic while the debris is removed to the verge and placed near to a marker post. The maintenance service provider should return in periods of lower flow, or when other maintenance work requires lane closures, to collect the debris. Supporting signs and signals are set, as per agreed work instructions, by the operations centre.

E/B5.3.5 Severe weather

The combination of message signs capable of displaying lane availability with supporting text and pictograms, coupled with the ability to implement mandatory speed limits, provides the operator with useful tools to mitigate the impacts of severe weather on road users.

Certain weather conditions e.g. fog, heavy rain can reduce visibility and increase the risk of collisions. This risk is primarily related to excess speed. Where road users are driving slowly due to the conditions, the queue protection / congestion management system automatically sets appropriate speed restrictions to reduce the associated risk of collisions.

Each maintenance service provider is required to produce a severe weather plan which includes the procedures and operational arrangements necessary for the delivery of an effective winter service, and

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as such should identify network features such as smart motorway sections, places of relative safety or local issues such as high altitude or steep gradients which require special consideration.

The severe weather plan also defines the process for snow clearance, for example by setting out the number of lanes to be kept clear for a particular route, and the order in which lanes should be cleared where a 'phased' approach is followed. Message signs and signals can be utilised to display warning information, or inform road users where certain lanes are not available for use.

E/B5.3.6 Road works management

As elsewhere on the network, road works are scheduled to take place at times that minimise the impact on traffic. This means works generally happen at night; in periods of lower flow in the middle of the day; or at weekends. As these periods are dependent on traffic flows they need to be agreed on a scheme by scheme basis, adopting the principles of intelligence based road space management.

During road works, the operations centre should set signs and signals to support the setup, modification or removal of traffic management.

Fixed taper points are identified on all smart motorways and the locations agreed with the Overseeing Organisation and the maintenance service provider. Remotely operated temporary traffic management signs are provided on all lane running schemes. The use of remotely operated temporary traffic management signs has to be assessed for controlled motorway schemes but their use is not mandated.

The aspiration is to eventually replace TSM Chapter 8 [Ref 58.N] approach signing for relaxed works with TTM signing provided by the permanent VMS and control signals. Guidance should be sought from the Overseeing Organisation on the signalling for roadworks project.

E/B5.3.7 Abnormal load movements

Smart motorways do not fundamentally affect the preferred times or routes for abnormal loads, and normal guidance should be followed in scheduling such movements. As for other parts of the network, deviation from the agreed routes should not be made without appropriate consultation.

Smart motorways provide significantly enhanced capabilities to monitor the movement of the abnormal load. NTIS may have established communication with the driver of the abnormal load, and the operations centre should communicate via NTIS so that the driver is aware of downstream traffic conditions, and to facilitate communication where an incident occurs.

E/B5.4 Core responder national agreements and guidance

E/B5.4.1 National agreements

Responding to incidents on smart motorways requires a collaborative approach that reflects the national character of the smart motorways programme.

To support the above, the Overseeing Organisation has established jointly-agreed national positions with: the National Police Chief's Council; the Chief Fire Officers Association; and the Association of Ambulance Chief Executives, regarding the emergency response to incidents. These positions are captured within a national guidance framework.

E/B5.4.2 Regional and scheme level agreements

Individual schemes need to establish agreements with the core responders in their region. These agreements should replicate the principles of the national agreement, unless a strong justification can be provided to deviate from them. Any variance should be agreed with the Overseeing Organisation.

The preference is for each region to have a single agreement, signed by all three of the emergency services, as an addendum to the national guidance framework. However, it is recognised that this may not be possible or desirable in all cases, and that individual agreements with the police, fire and ambulance services separate from the national guidance framework may be necessary in exceptional cases.

Regardless of the precise form, agreements need to take the principles of the national agreements, apply them to the characteristics of the individual scheme, and record the agreed operating practices

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based on scheme-specific requirements. It is anticipated that these agreements would record acceptance of the national principles via memoranda of understanding (MoU), apart from where specific exceptions are deemed necessary; these exceptions are to be included in the scheme's combined operations PCF product (NH PCF [Ref 27.N]).

E/B6 Maintenance

Smart motorway schemes comprise a specific mix of technology and civil infrastructure. These assets require maintenance in order to remain functional, and so deliver the operational and safety benefits required of the scheme. However, the scheme's design itself changes how maintenance service providers carry out maintenance, due to factors including:

1) the pressure of road space booking, arising from the need to access the additional technology assets and roadside infrastructure where alternative means of access are not available;
2) operational restrictions on the time periods during which maintenance activities are able to be conducted, including the need to avoid lane closures during periods of high demand; and
3) for all lane running schemes, the lack of a hard shoulder from which to carry out maintenance, access roadside infrastructure, or set out temporary traffic management.

The following sections describe some of the likely impacts that smart motorway design is expected to have on the ability to plan, schedule, and conduct maintenance activities; as well as suggesting potential opportunities to mitigate those impacts.

E/B6.1 Approach to maintenance

The approach to maintenance on smart motorways should provide a 'step change' in improving the safety and efficiency of maintenance operations by:

1) minimising the need to access technology equipment on network by providing remote access facilities;
2) clustering technology at emergency area/MHS sites or adjacent off network access points where reasonably practicable to reduce the need for TTM;
3) where justified in accordance with CD 365 [Ref 32.N], providing accessible VMS reducing the need for TTM for most VMS maintenance operations;
4) providing a high containment, non-deformable safety barrier in the central reserve. This is mandatory on all lane running schemes.

E/B6.1.1 Meeting the road worker safety objective

Refer to Section E/2 of this document for details of the generic safety reports and roadworker safety objectives.

A specific review of the hazards associated with maintenance should be undertaken, so that the scheme is designed in such a way that it can be operated and maintained safely and that the risks are mitigated so far is reasonably practicable.

E/B6.2 Planning maintenance activities

E/B6.2.1 Plan for incident / longer term maintenance

A review of both existing and new assets should be undertaken to identify any assets that require TTM to be left in place for an extended period i.e. longer than overnight, in order to allow a repair to be completed.

Examples may include the repair of a bridge parapet where the curing of the concrete requires protection for several days until the required minimum strength has been reached, or assets where non-stock materials are needed to make a repair, but traffic needs to be kept away from the vicinity while those materials are sourced.

Action plans for these circumstances need to be established and agreed.

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E/B6.2.2 Plan for severe weather

The permanent conversion of the hard shoulder into a controlled running lane has an implication on the procedures and operational arrangements necessary for the delivery of an effective winter service for all lane running schemes. Snow accumulations are likely to be ploughed and stored in running lanes and emergency areas for a longer period of time; where snow is moved to lane 1, arrangements for clearing slip roads have to be made. Wider carriageways typically need echelon ploughing. Salting routes will need to be designed to allow all lanes to be fully treated. These arrangements should be defined in the severe weather plan.

E/B6.3 Scheduling maintenance

The high traffic volumes that smart motorway schemes are expected to experience during a typical weekday means that the main opportunity to conduct maintenance works is overnight or the weekend where off network access or access via an emergency area is not available or appropriate. Any activity that requires lane closures during working days is likely to create significant congestion and delays to road users. Hence weekday, inter-peak closures are not feasible except for emergency works. Therefore where access cannot be gained safely from off the network or via an emergency area, the majority of activities need to be scheduled at night with additional temporary lighting provided as appropriate or at the weekend.

Intelligence based road space management establishes when it may be possible to permit lane closures during daylight hours to allow activities that are deemed to be unfeasible, or too high risk, to be carried out in the dark e.g. litter picking, soft estate clearance. This is scheme specific and it should not be assumed that such a window exists. Alternative methods of scheduling maintenance access may be required.

E/B6.3.1 Scheduling planned maintenance activities

The performance objectives described in the DfT Road investment strategy RIS 1 [Ref 2.I] increase the requirement to minimise the number of occasions when TTM is in place, in order to minimise the safety risks to both road workers and road users, and to improve the efficiency of maintenance activities.

The maintenance requirements plan introduces the need to minimise network occupancy, meaning the number of activities that are carried out during a single installation of TTM have to be increased wherever possible.

Adopting this approach becomes even more crucial on smart motorway schemes, where the opportunities for maintenance access are reduced. The ability to group maintenance activities together is subject to maintainers having adequate resources available to conduct the work, and there being no adverse impacts on safety associated with the undertaking of a number of activities within the same area.

Consideration also needs to be given to the road user safety risk associated with delaying a particular maintenance activity in order to use a scheduled traffic management intervention.

E/B6.3.2 Scheduling reactive maintenance

Defects and equipment failures are inevitable. Except where the item can be safely accessed from off the network with the necessary tools, plant and materials, accessed remotely via software or using a combined emergency area/MHS; repairs on all lane running require TTM. Both the frequency with which faults or defects occur, and the time needed to make a repair are key factors in determining the need for TTM. Fault response times are detailed in the the technology management and maintenance manual TMMM [Ref 55.N].

E/B6.4 Conducting maintenance

E/B6.4.1 Installation of temporary traffic management

For an all lane running scheme, the main differences when installing TTM on a road without a hard shoulder involve the safe installation of the advance warning signs and the initial set up of the taper.

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Once these are in place then the remainder of the installation is the same as for any motorway with a hard shoulder.

There are two key issues relating to the installation of TTM in an all lane running environment: the initial positioning of signs and taper cones has to take place in live lanes; and setting out the offside signs where needed to TSM Chapter 8 [Ref 58.N] would otherwise require workers to cross four lanes of traffic. With concrete central reserve barrier there is no effective position of refuge for a road worker installing a sign adjacent to the barrier.

To mitigate this, fixed taper positions and remotely operated temporary traffic management signs are used to support the setting out of TTM on all lane running and on controlled motorway where justified. Remotely operated temporary traffic management signs installed upstream of each selected taper location at the distances described in TSM Chapter 8 [Ref 58.N] eliminate the safety hazards to road workers created by the requirement to physically place temporary fixed plate signs adjacent to a live running lane. Remotely operated temporary traffic management signs are operated from a control centre.

Sufficient taper locations are to be identified which allow all the assets, including any signage required to support traffic management, to be maintained within a suitable TTM layout. Therefore, the number and location of the taper positions needs to be agreed and documented in the maintenance and repair statement PCF product (NH PCF [Ref 27.N]).

VMS should be used to support the deployment and removal of TTM.

E/B6.4.2 Remote access to technology assets

Remote access facilities are used to minimise visits to the roadside. Permission should be obtained from the operations centre to take over control of a piece of equipment, so that the equipment is not simultaneously required for operational purposes.

E/B7 Regional operation centres and traffic officers

E/B7.1 Staffing levels

The combined operations PCF product (NH PCF [Ref 27.N]) for each scheme records that an assessment has been completed at a national level, and that the traffic officer staffing requirements to operate the scheme have been agreed.

E/B7.2 Operation centre space requirements

The implementation of a smart motorway may need additional space within an operations centre due to the increase in technology to be installed on the network. Additional space may be required in both the equipment room and/or operations room. Allowances for the migration from National Highways' traffic management system to the Common Highways Agency and Rijkswaterstaat Model (CHARM) should form part of the design.

E/B7.3 Outstation requirements

Outstation provision may need to be enhanced to support additional sections of all lane running.

E/B7.4 Traffic officer work instructions and procedures for smart motorways

To provide national consistency across smart motorways operations, a single, standardised set of work instructions has been produced.

It is the responsibility of each scheme to identify any specific considerations that require a "non-standard" operational procedure. In particular, the scheme needs to identify any specific hazards not included in the relevant generic hazard log, and where necessary determine appropriate mitigations. The implementation of CHARM should be part of this assessment.

The Overseeing Organisation works with each scheme to develop a set of work instructions to cover such scheme specific conditions and to gain the necessary approvals. Where applicable these form a set of regional work instructions that are described for each traffic officer region.

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E/B7.5 Learning requirements

The Overseeing Organisation coordinates a national approach to traffic officer learning requirements associated with smart motorway schemes.

To deliver this work, the Overseeing Organisation analyses the competence requirements associated with the operation of each scheme for all traffic officer roles, mapping legal, safety and national standards requirements to determine whether any gaps exist between the current operational standards, and any new standards required to safely operate a scheme.

This enables new learning interventions and assessments to be created which deliver the required competence standards, and allow for individual achievements against the standards to be recorded.

Detailed training delivery plans should be agreed with each region before the first smart motorway scheme in that region becomes operational.

E/B8 Validation and continual improvement

E/B8.1 General

Smart motorway schemes should be monitored to allow the Overseeing Organisation to validate performance and continually improve smart motorway design and operation. This should include specific monitoring of those features and/or measures taken to avoid, prevent or offset significant adverse effects on the environment.

Broader measurement of environmental performance, linked with appraisal and evaluation processes, should be undertaken to allow demonstration of the activities undertaken and how effective these have been in improving environmental outcomes.

The monitoring of initial operations allows the Overseeing Organisation to determine whether the scheme is operating in an effective and safe manner and whether the operational outcomes are as anticipated. It allows validation of safety assumptions and a response to stakeholder issues.

E/B8.2 Plan for monitoring operations and monitoring output

A plan for monitoring operations and monitoring output should be implemented in accordance with the requirements of PCF (NH PCF [Ref 27.N]).

The objectives of the plan for monitoring operations are to document the monitoring requirements for the scheme, identify monitoring methods to be used, specify the timescale and frequency of monitoring and define the roles and responsibilities.

The plan for monitoring operations provides an overview of the requirements for monitoring the initial operation of the scheme. It sets out the timescales for preparation and issue of the four monitoring deliverables.

E/B8.3 Calibration and optimisation

Calibration and ongoing optimisation of smart motorways should be in accordance with MCH 2584 [Ref 18.N].

Other scheme specific technology assets may also need to be optimised, for example ramp metering installations. These assets should be calibrated and optimised in accordance with the Overseeing Organisation's requirements.

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Appendix E/C. Risk reduction strategies

E/C1 General

The following sections provide examples of principles of prevention with risk reduction strategies under each of the four ERIC headings. Note that these items do not constitute an exhaustive list, as each scheme can have specific local issues; and this guidance does not detract from the Principal Designer's responsibilities under the CDM regulations SI 2015 No.51 (CDM Regs) [Ref 20.N].

E/C2 Eliminate

Assets that are currently installed within the scheme boundary should be catalogued. All redundant or potentially redundant infrastructure should be identified and assessed for removal. As is the policy for the rest of the strategic road network, non-essential infrastructure or technology, should be considered for removal. Proposals should be agreed with the Overseeing Organisation and the MSP.

E/C3 Reduce

Where a particular maintenance activity cannot be eliminated, it may be possible to reduce the frequency with which maintenance access is required, or reduce the length of time the maintenance activity takes. Opportunities include:

E/C3.1 Reduce site visit requirements

The design should reduce or eliminate the need for roadside maintenance activities for new and existing equipment. Maintenance and repair should be undertaken away from the network unless there is no other alternative.

Roadside technology is equipped with remote access capabilities.

E/C3.2 Bring forward renewal programmes

Refer to Section E/3 of this document.

E/C3.3 Utilise low maintenance items

The design should identify where the use of longer life and/or lower maintenance items and assets need to be replaced or installed as part of the scheme. The design should include assets that have extended reactive maintenance periods (e.g. curing of concrete on bridge repairs) to reduce planned and reactive maintenance requirements. Refer to whole-life design requirements in Section E/3 of this document.

E/C3.4 Plan for access restrictions

MSPs should take advantage of the TTM installed for the construction period of the scheme to undertake maintenance activities where agreed with the Overseeing Organisation. This may enable MSPs to reduce the time spent performing maintenance activities once the smart motorway scheme becomes operational.

E/C3.5 Renew 'problem' assets

Existing assets should be identified that are reaching the end of their life, or have short maintenance intervals that are incompatible with the Overseeing Organisation's health and safety policies regarding exposure of road workers at the roadside. The design should consider the replacement of these products with more compatible products. Proposals should be agreed with the Overseeing Organisation and the MSP.

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E/C4 Isolate

A risk can be isolated by separating the hazardous activity from the individuals exposed to it, either by physical protection (e.g. through the provision of guarding) or by limiting access (e.g. through the requirement for maintenance activity to only occur within predetermined 'working windows'). Examples include:

E/C4.1 Re-positioning of existing assets

Designs should include the assessment of existing assets to ascertain whether any may be repositioned to enable their maintenance activities to be conducted via an off network access point, or from within a designated area for maintenance. The capital cost and risk exposure of moving the items should be weighed against the operational costs and risks of maintenance, and the associated loss of capacity over the life of the scheme. Proposals should be agreed with the Overseeing Organisation and the MSP.

E/C4.2 Provision of off-network access

It may be possible to provide safe maintenance access to both new and existing assets without recourse to the network (for example by locating the asset near to an overbridge with pedestrian access). Refer to MPI 11 [Ref 34.N]. However, locations which may be easily accessed by maintainers may also increase the opportunity for use by non-authorised users, along with asset theft. A metal theft risk assessment should be prepared in accordance with TD 131 [Ref 46.N].

E/C4.3 Combining asset locations

When positioning new assets, assess co-location options to enable multiple maintenance activities to be undertaken from the same location. This is particularly important for technology assets which should be co-located at emergency area/MHS sites or adjacent 'off network' access points wherever practicable. The capital cost and risk exposure of co-locating items should be weighed against the operational costs and risks of maintenance and the associated loss of capacity over the life of the scheme.

E/C5 Control

Control measures make it safer for the MSP to perform each maintenance activity, for example by providing a greater degree of protection, or by reducing the exposure time. Examples of controls include:

E/C5.1 Improved accessibility of new assets for maintenance

Designs should include the positioning of new assets to facilitate maintenance access. This may include locating technology components adjacent to emergency area/MHS sites, or within a designated area for maintenance immediately adjacent to an 'off network' access point. This may mean additional assets are required in certain circumstances, but improving maintenance access is expected to deliver an overall safety and operational benefit. Where justified in accordance with CD 365 [Ref 32.N], accessible VMS are provided to reduce TTM requirements and roadworker exposure. Access arrangements for soft estate maintenance should also be determined.

E/C5.2 TTM sign deployment

Refer to Section E/3 of this document.

E/C5.3 Improved installation / access techniques

Review the technology assets to be installed, and identify methods to enable easier/quicker/safer swap out of faulty equipment to reduce the time spent performing maintenance actions.

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Department for Infrastructure
An Roinn Bonneagair

General Principles & Scheme Governance
Design

GD 301 NINAA
Northern Ireland National Application Annex to GD 301 Smart motorways

(formerly IAN 161/15 and MPI 66)

Revision 0

Summary
There are no specific requirements for Department for Infrastructure Northern Ireland supplementary or alternative to those given in GD 301.

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	Oct 2020	Department for Infrastructure Northern Ireland National Application Annex to GD 301.

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General Principles & Scheme Governance
Design

GD 301 SNAA
Scotland National Application Annex to GD 301 Smart motorways

(formerly IAN 161/15 and MPI 66)

Revision 0

Summary
There are no specific requirements for Transport Scotland supplementary or alternative to those given in GD 301.

Feedback and Enquiries
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Release notes

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0	Oct 2020	Transport Scotland National Application Annex to GD 301.

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Llywodraeth Cymru
Welsh Government

General Principles & Scheme Governance
Design

GD 301 WNAA
Wales National Application Annex to GD 301 Smart motorways

(formerly IAN 161/15 and MPI 66)

Revision 0

Summary
There are no specific requirements for Welsh Government supplementary or alternative to those given in GD 301.

Feedback and Enquiries
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Release notes

Version	Date	Details of amendments
0	Oct 2020	Welsh Government National Application Annex to GD 301.

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