Design Manual for Roads and Bridges

General Principles & Scheme Governance
Design

GD 302
Smart motorways: Upgrading hard shoulder running to all lane running operation

Revision 0

Summary
This document sets out the design requirements and advice for upgrading hard shoulder running and controlled all lane running to all lane running operation.

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

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

This is a controlled document.

Contents

Release notes

Version	Date	Details of amendments
0	Oct 2020	GD 302 document created to outline design requirements and advice for upgrading hard shoulder running and controlled all lane running to all lane running operation. This document has been written in accordance with the Highways England drafting rules.

Foreword

Publishing information

This document is published by Highways England.

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.

Introduction

Background

This document sets out the design requirements and advice for converting hard shoulder running and controlled all lane running sections to all lane running operation.

Assumptions made in the preparation of this document

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

Terms and definitions

Terms and definitions

Term	Definition
All lane running	England only term for a smart motorway which includes the permanent conversion of a hard shoulder to a running lane.
Controlled all lane running	England only term for a smart motorway which includes the permanent conversion of a hard shoulder to a running lane but includes technology and emergency area provision aligned to a hard shoulder running scheme.
Hard shoulder running	England only term for a smart motorway which includes the dynamic conversion of a hard shoulder to a running lane.
Smart motorway	England only term for motorways that use variable mandatory speed limits to increase capacity and smooth the flow of traffic.

1. Scope

Aspects covered

1.1 The national requirements for upgrading hard shoulder running and controlled all lane running sections set out in the National Application Annexes shall be followed.

Implementation

1.2 This document shall be implemented forthwith on all hard shoulder running and controlled all lane running conversions 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.

2. Normative references

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

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

General Principles & Scheme Governance
Design

GD 302 ENAA
England National Application Annex to GD 302 Smart motorways: Upgrading hard shoulder running to all lane running operation

(formerly SFP-9848)

Revision 0

Summary
This National Application Annex sets out Highways England specific design requirements and advice for upgrading hard shoulder running and controlled all lane running to all lane running operation.

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

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Introduction

Background

This document provides design requirements and advice for upgrading hard shoulder running and controlled all lane running sections to all lane running operation. As a result of the evolution of smart motorways, several variants now exist on Highways England's network. Providing a consistent approach to hard shoulder use will improve road user understanding of smart motorways. Therefore, hard shoulder running and controlled all lane running sections that are currently operational are expected to be upgraded to all lane running.

Assumptions made in the preparation of this document

The assumptions made in GG 101 [Ref 15.N] apply to this document.

Abbreviations

Abbreviations

Abbreviation	Definition
ADS	Advance direction sign
CCTV	Closed circuit television
DSR	Design strategy record
ERIC	Eliminate, reduce, isolate, control
FTMS	Fixed text message sign
FWI	Fatal and weighted injury
HSM	Hard shoulder management
KSI	Killed or seriously injured
MIDAS	Motorway incident detection and automatic signalling
NSSH	New short section of hard shoulder
PCF	Project control framework
PIC	Personal injury collisions
SCRG	Safety control review group
TJR	Through junction running
TSRGD	Traffic Signs Regulations and General Directions
VMS	Variable message sign
VRS	Vehicle restraint system

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 (as defined in GD 301 [Ref 28.N]).
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 10.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.
Carriageway signal	A signal or VMS which can display aspects and legends that apply to the whole carriageway.
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 14.N]).
Controlled all lane running	A smart motorway which includes the permanent conversion of a hard shoulder to a running lane but includes technology and emergency area provision aligned to a hard shoulder running scheme.
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 that is to be upgraded to all lane running is not defined as a controlled motorway section and is considered part of the adjacent all lane running section (as defined in GD 301 [Ref 28.N]).
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 (as defined in GD 301 [Ref 28.N]).
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 (as defined in GD 301 [Ref 28.N]).
Hard shoulder running	A smart motorway which includes the dynamic conversion of a hard shoulder to a running lane. Hard shoulder running is also referred to as dynamic hard shoulder running. NOTE: The Overseeing Organisation no longer implements hard shoulder running schemes. These are legacy schemes only.
Lane signal	A signal which can display aspects that apply to the specific lane over which it is mounted.
Link	A length of road between junctions (as defined in CD 109 [Ref 12.N]).

Terms (continued)

Term	Definition
Maintenance hardstanding	An area where authorised workers can stop adjacent to the carriageway (as defined in CD 169 [Ref 33.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 (as defined in GD 301 [Ref 28.N]).
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 and rest area; 2) an emergency area (as defined in Section E/9); 3) an existing hard shoulder that is a minimum of 3m wide and a minimum of 100m in length, located intra-junction or on a diverge connector road; 4) a new short section of hard shoulder (NSSH) located on a diverge connector road that is 100m in length and is a minimum of 3m 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; 4) any location outside the Overseeing Organisation's land boundary (excluding motorway service areas) (as defined in GD 301 [Ref 28.N]).
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 14.N]).
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 14.N]).
Smart motorways	Motorways that use variable mandatory speed limits to increase capacity and smooth the flow of traffic (as defined in GD 301 [Ref 28.N]).
STATS19	Road accident data recorded by the police.
Through junction running	Conversion of an intra-junction hard shoulder to a running lane (as defined in GD 301 [Ref 28.N]).
Upgrade scheme	Scheme to upgrade a section of motorway from hard shoulder running or controlled all lane running to all lane running.
Variable mandatory speed limits	Automatic or manually set variable mandatory speed limits displayed on signals or variable message signs (as defined in GD 301 [Ref 28.N]).

E/1. General requirements

Categories of upgrade and scope of requirements

E/1.1 Where a decision in support of upgrading has been made by the Overseeing Organisation, a hard shoulder running/controlled all lane running section shall be upgraded to all lane running in accordance with the requirements of this document.

E/1.1.1 Reference should be made to the concept of operation document included in Appendix E/B of GD 301 [Ref 28.N] for supporting information on the operation of smart motorways.

NOTE 1 *The concept of operation document sets out, at a high-level, guidance around the operational elements of smart motorways.*

NOTE 2 *The intended audience of the concept of operation document is all those who are responsible for the design, operation or maintenance of smart motorways.*

E/1.1.2 Smart motorway design should be in accordance with the smart motorway programme design guide SMP-HEX-GEN-SA02-DA-KK-0001 [Ref 29.N].

E/1.2 Lane referencing shall be as detailed in Table E/1.2.

Table E/1.2 Lane referencing

Hard shoulder running	Controlled all lane running	All lane running
Lane below signal 1	Lane below signal 1	Lane 1
Lane below signal 2	Lane below signal 2	Lane 2
Lane below signal 3	Lane below signal 3	Lane 3
Lane below signal 4	Lane below signal 4	Lane 4

Cross referenced documents

E/1.3 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/1.4 Existing departures from standard shall be reviewed and where required, re-submitted in accordance with the departures manual DfS Manual [Ref 3.N].

NOTE *The departures manual DfS Manual [Ref 3.N] provides guidance on the process for reviewing and resubmitting previously approved departures from standard.*

E/1.4.1 Where an assessment of an existing departure from standard demonstrates that there is no degradation in risk following the introduction of all lane running operation and this assessment has been accepted by the SCRG, the existing departure from standard should not be re-submitted.

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

Sustainable development and design

E/1.5 Smart motorway design shall be in accordance with GG 103 [Ref 14.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 14.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.*

NOTE 2 *GG 103 [Ref 14.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/1.6 When applying the requirements of this document, a design strategy record (DSR) shall be developed as part of the design process.

E/1.7 The DSR shall be updated and maintained during each project control framework (PCF) stage HE PCF [Ref 13.N].

E/1.8 The DSR shall record departures from standard, key design decisions and constraints and assessments in support of any relaxations to requirements.

E/1.9 The DSR shall also 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 contribution that schemes are seeking to make against the Overseeing Organisation's performance measures; and
8) the steps taken to comply with GD 304 [Ref 6.N].

NOTE *The smart motorway programme design guide SMP-HEX-GEN-SA02-DA-KK-0001 [Ref 29.N] provides further advice for preparation of a DSR.*

E/2. Operational safety

General

E/2.1 The level of safety risk management on upgrade schemes shall be determined and managed in accordance with GG 104 [Ref 23.N].

E/2.1.1 Upgrade 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 23.N].

Safety baseline and objectives

Road user safety baseline

E/2.4 The road user safety baseline for an upgrade scheme shall be the safety performance of 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 hard shoulder running/controlled all lane running prior to the upgrade to all lane running.*

E/2.5 Safety baseline data shall include the six safety indicators in Table E/2.5 for three years prior to the start of construction of an upgrade to all lane running.

Table E/2.5 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/2.6 Validated STATS19 PIC data covering the scheme extent, including merge and diverge connector roads shall be used to determine the safety indicators.

E/2.6.1 The most recent three complete years of validated STATS19 PIC data should be used.

Road user safety objective

E/2.7 An upgrade to all lane running shall be deemed to have satisfied the minimum road user safety objective where each of the six safety indicators in Table E/2.5 are demonstrated to be better than the safety baseline, for the three years after full scheme opening.

NOTE *A hazard log based analysis has been undertaken on the generic upgrade of hard shoulder running and controlled all lane running sections to all lane running operation and is summarised in the GD 302 (GSR) [Ref 1.I].*

Road worker safety objective

E/2.8 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 11.N].

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

E/3. Designing for maintenance

General

E/3.1 Upgrade schemes must be designed for maintenance in accordance with the Construction Design and Management Regulations 2015 SI 2015/51 [Ref 32.N].

E/3.2 Health and safety shall be designed into maintenance in accordance with GD 304 [Ref 6.N].

Maintenance access

E/3.3 Maintenance access arrangements shall be assessed and designed in accordance with Major Projects instruction MPI 11 [Ref 17.N].

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

Temporary traffic management signs

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 31.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 20.N], SMP-HEX-HGN-0-DA-ZZ-0008 [Ref 7.N] SMP-HEX-TGN-0-DA-ZZ-0009 [Ref 19.N], SMP-HEX-TGN-0-DA-ZZ-0010 [Ref 21.N].

E/3.8 Fixed taper points shall be designed to support the deployment of temporary traffic management.

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 7.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 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 point roadside identification.

Asset renewal

E/3.15 Opportunities to integrate asset renewal works into an upgrade 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 an upgrade scheme. The costs of any asset renewals are not to be included as part of an upgrade scheme unless agreed by the Overseeing Organisation.*

E/3.15.1 Asset renewal assessment and proposals should be in accordance with SMP-HEX-GEN-CTW-RP-ZX-0007 [Ref 8.N].

E/3.16 Asset renewal proposals shall be submitted to the Overseeing Organisation for review and acceptance.

E/3.17 The scope of asset renewal shall be fixed by the end of stage 3 HE PCF [Ref 13.N].

E/4. Highway links

General

E/4.1 Highway link design for upgrades from hard shoulder running shall be in accordance with the smart motorway requirements in CD 109 [Ref 12.N] and this document.

E/4.2 Controlled all lane running highway links shall not be modified unless there is an existing safety problem that needs to be addressed or changes to lane widths or junction layouts are proposed.

E/4.3 Where highway alignment changes are required to controlled all lane running sections, the upgrade design shall be in accordance with the smart motorways requirements in CD 109 [Ref 12.N].

E/5. Cross-sections and vehicle restraint systems

Cross-sections and headrooms

E/5.1 Cross-sections and headrooms shall be in accordance with CD 127 [Ref 2.N] and this document.

Lane widths

E/5.2 Where full carriageway re-surfacing of a whole link is not planned for maintenance renewal purposes and the existing lane widths comply with Table E/5.2, the existing lane widths shall be retained.

Table E/5.2 Minimum lane requirements

All lane running lane reference	Lane 1	Lane 2	Lane 3	Lane 4
Minimum lane width (m)	3.4	3.5	3.5	3.2

NOTE *The width of lane 1 is after the conversion of the existing edge line from 150mm to 200mm wide in accordance with SI 2016/382 [Ref 35.N] diagram 1012.2.*

E/5.3 Where full carriageway re-surfacing of a whole link is not planned for maintenance renewal purposes and the existing lane widths do not meet the minimum widths in Table E/5.2, new lane positions shall be designed to meet the requirements of Table E/5.3.

Table E/5.3 Minimum re-allocated lane requirements

All lane running lane reference	Lane 1	Lane 2	Lane 3	Lane 4
Minimum lane width (m)	3.5	3.5	3.4	3.2

NOTE *The width of lane 1 is after the conversion of the existing edge line from 150mm to 200mm wide in accordance with SI 2016/382 [Ref 35.N] diagram 1012.2.*

E/5.4 Where full carriageway re-surfacing of a whole link is planned for maintenance renewal purposes, new lane positions shall be designed to meet the all lane running requirements in CD 127 [Ref 2.N].

NOTE *The lateral movement of lane markings can necessitate the need to adjust the alignment and lateral position of gantry mounted lane signals and signs that are being retained as part of the upgrade scheme.*

E/5.4.1 The existing nearside and offside edge line locations should be retained where practicable.

Verge, edge detail and hard strip

E/5.5 Verge, edge detail and hard strip design for upgrades from hard shoulder running shall be in accordance with the smart motorways requirements in CD 127 [Ref 2.N].

E/5.6 Verge, edge detail and hard strip arrangements on controlled all lane running sections shall not be modified unless there is an existing safety problem that needs to be addressed or changes to lane widths or junction layouts are proposed.

E/5.7 Where verge, edge detail and hard strip changes are required to controlled all lane running sections, the upgrade design shall be in accordance with the smart motorways requirements in CD 127 [Ref 2.N].

Vehicle restraint systems

E/5.8 New and amended vehicle restraint system (VRS) requirements shall be in accordance with CD 377 [Ref 22.N] and this document.

E/5.9 Set back requirements for VRS shall be in accordance with CD 127 [Ref 2.N].

Central reserve VRS

E/5.10 Where the existing central reserve VRS does not have a containment level of H1 or greater in accordance with BS EN 1317 [Ref 24.N], new central reserve VRS shall be provided.

E/5.11 New central reserve safety barrier shall be H1 or greater containment level in accordance with BS EN 1317 [Ref 24.N].

E/5.12 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 26.N] and BS EN 1317-2 [Ref 25.N], it does not require realignment, replacement or repair.

E/5.13 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/5.14 The chosen central reserve solution shall be subject to acceptance by the SCRG and recorded in the DSR.

Verge VRS

E/5.15 Where existing verge assets are identified for removal and are located behind VRS, a RRRAP [Ref 34.N] assessment shall be undertaken to determine whether the associated sections of VRS can be removed.

E/5.16 Redundant sections of VRS identified through a RRRAP [Ref 34.N] assessment shall be removed.

E/5.16.1 Where existing VRS to be removed is in close proximity to underground services, the VRS posts may need to be cut off to avoid damage to underground services.

E/5.17 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/5.18 The assessment of redundant VRS shall be recorded in the DSR.

E/6. Junctions

General

E/6.1 An assessment of existing junctions shall be undertaken at stage 1 HE PCF [Ref 13.N] to identify if there are any existing safety or operational problems with the junction layout.

E/6.2 The junction assessment shall include all junctions on an upgrade scheme, including intra-junctions and terminal junctions.

E/6.3 The junction assessment shall be recorded in the DSR and submitted to SCRG for acceptance.

E/6.4 Junction improvement works identified by the junction assessment shall not form part of an upgrade scheme unless otherwise instructed by the Overseeing Organisation.

NOTE 1 *Junction improvement works fall outside of the scope of an upgrade scheme and therefore any works would need to be separately funded.*

NOTE 2 *Junction improvement includes the addition or removal of through junction running.*

E/7. Other highway features

Observation platforms

E/7.1 Assessment and design of observation platforms shall be in accordance with GD 301 [Ref 28.N].

Abnormal load bays

E/7.2 Assessment and design of abnormal load bays shall be in accordance with GD 301 [Ref 28.N].

Access/egress to work depots and turnaround facilities

E/7.3 Assessment and design of access/egress to work depots and turnaround facilities shall be in accordance with GD 301 [Ref 28.N].

Turnaround facilities

E/7.4 Assessment and design of turnaround facilities shall be in accordance with GD 301 [Ref 28.N].

Existing maintenance hardstandings

E/7.5 Where there is an existing maintenance hardstanding, an assessment shall be made to determine whether closure or any physical or operational modification is required to support safe and effective use with all lane running operation.

E/7.6 Assessments of existing maintenance hardstandings and associated closure or mitigation proposals shall be submitted to the SCRG for acceptance.

E/8. Place of relative safety

General

E/8.1 Place of relative safety design shall be in accordance with GD 301 [Ref 28.N] and this document.

E/8.2 The minimum spacing requirements for places of relative safety in GD 301 [Ref 28.N] shall not apply to existing places of relative safety on upgrade schemes.

E/9. Emergency areas

Emergency areas

E/9.1 Emergency areas shall be in accordance with GD 301 [Ref 28.N] and this document.

E/9.2 Where an existing emergency area does not meet the minimum stopping sight distance requirements in GD 301 [Ref 28.N] and cannot practicably be improved to support all lane running operation, it shall be assessed for permanent closure.

E/9.3 The closure assessment of an emergency area and associated mitigation proposals shall be submitted to the SCRG for acceptance.

E/9.4 Where an existing emergency area is permanently closed, the orange surfacing and associated signing shall be removed.

E/9.5 Where an existing emergency area is permanently closed, the existing road markings between the emergency area and lane 1 shall be replaced with diagram 1012.1 in accordance with SI 2016/382 [Ref 35.N].

E/9.6 Where an existing emergency area is permanently closed, the existing road studs between the emergency area and lane 1 shall be replaced with red road studs in accordance with TSM Chapter 5 [Ref 36.N].

E/9.7 Where an existing emergency area is permanently closed, the existing emergency roadside telephone shall be removed.

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 27.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 signal and VMS design shall be in accordance with CD 146 [Ref 16.N] and this document.

E/10.4.1 Existing infrastructure and control signalling/VMS equipment should be retained, modified and/or removed wherever practicable to deliver the requirements in CD 146 [Ref 16.N].

NOTE *New infrastructure and control signalling/VMS equipment can be provided where needed to comply with CD 146 [Ref 16.N].*

E/10.5 Existing lane signalling shall be retained where any of the following are met:

1) the gantry is defined as a gateway or intermediate gantry in accordance with CD 146 [Ref 16.N];
2) a junction is complex and the junction approach signalling proposal has been accepted by the SCRG;
3) the gantry is a live enforcement site;
4) retention of lane signalling is required to meet the visibility requirements in CD 146 [Ref 16.N];
5) there is no existing VMS on the gantry capable of displaying mandatory speed aspects, lane control aspects, text messages and pictograms; and
6) the gantry is located over 5 or more lanes.

E/10.6 Where existing lane signalling does not meet the retention criteria detailed in this section, existing lane signals shall be assessed for removal.

E/10.6.1 Regular changes between lane and carriageway signalling on a link should be avoided.

NOTE 1 *Consistency of the type of signalling proposed on a link is important to road users.*

NOTE 2 *Carriageway signalling is primarily used for all lane running and can be displayed on the VMS. Removal of lane signalling contributes to the creation of a similar environment to a scheme designed in accordance with GD 301 [Ref 28.N].*

NOTE 3 *The existing VMS need to be re-configured to support carriageway signalling on gantries where lane signals are removed.*

E/10.7 Existing lane signals shall be removed where the removal assessment has been accepted by the SCRG and Overseeing Organisation.

E/10.8 Where an existing VMS is no longer required to meet the spacing and visibility requirements of CD 146 [Ref 16.N] it shall be removed along with associated equipment, cabinets and cabling.

E/10.9 Redundant gantry superstructures and foundations shall be removed to surface level.

E/10.10 Existing lane signals located directly above a hard shoulder that is to be retained shall be removed.

E/10.11 Existing entry slip signals shall be retained.

E/10.12 Signalling proposals for an upgrade scheme shall be submitted to the SCRG for acceptance and recorded in the DSR.

Hard shoulder monitoring (HSM) closed circuit television (CCTV)

E/10.13 Existing HSM CCTV cameras, masts, cabinets and cabling shall be removed unless otherwise instructed by the Overseeing Organisation.

E/10.14 Where existing HSM CCTV mast bases and cabinet bases can be extracted without damaging underground services, HSM CCTV mast bases and cabinet bases shall be removed.

NOTE *Retained HSM CCTV bases and cabinet bases can be a trip hazard and their clearance can also facilitate the removal of VRS where this is only required for HSM CCTV equipment.*

E/10.15 Where specific HSM CCTV bases and cabinet bases are not removed, the justification for not removing each base shall be recorded in the DSR.

E/10.16 Where the existing HSM sub-system in the regional operations centre becomes redundant, the sub system shall be removed.

Surveillance CCTV

E/10.17 Surveillance CCTV requirements shall be in accordance with the requirements in TD 131 [Ref 27.N] and this document.

E/10.18 Existing surveillance CCTV equipment and infrastructure shall be retained and/or modified wherever practicable to deliver the requirements in TD 131 [Ref 27.N].

NOTE 1 *Additional surveillance CCTV outstations are likely to be required to meet the all lane running coverage requirements in TD 131 [Ref 27.N].*

NOTE 2 *Existing surveillance CCTV outstations are likely to require upgrading to include infra-red CCTV on sections without road lighting.*

Detection

E/10.19 Existing detection systems to support motorway incident detection and automatic signalling (MIDAS)-based incident detection, variable mandatory speed limits and traffic counting shall be retained unless otherwise stated in this document or instructed by the Overseeing Organisation.

E/10.20 All existing inductive loops in emergency areas shall be disconnected and removed from configuration data.

NOTE *Emergency area detection is provided by stopped vehicle detection.*

E/10.21 Stopped vehicle detection shall be provided on upgrade schemes in accordance with TD 131 [Ref 27.N].

Emergency roadside telephones

E/10.22 Emergency roadside telephones shall be in accordance with TD 131 [Ref 27.N] unless otherwise stated in this document.

E/10.23 Existing emergency roadside telephones in emergency areas shall not be relocated from their current position to comply with the siting requirements in TD 131 [Ref 27.N].

Ramp metering

E/10.24 Where required, existing ramp metering sites shall be modified to deliver the requirements in TD 121 [Ref 18.N] and this document.

Enforcement system

E/10.25 Speed and red X enforcement shall be provided.

Remotely operated temporary traffic management signs

E/10.26 Where required, remotely operated temporary traffic management signs shall be provided in accordance with Section E/3.

Digital highway and connected vehicle provision

E/10.27 Digital highway and connected vehicle requirements shall be sought from the Overseeing Organisation.

Infrastructure and telecommunication services

E/10.28 New infrastructure and telecommunication services shall be in accordance with TD 131 [Ref 27.N].

E/10.29 Existing infrastructure and telecommunication services shall be retained and/or modified wherever practicable to deliver the requirements in TD 131 [Ref 27.N].

E/10.29.1 Existing combined equipment cabinets should be retained.

E/10.30 All technology at the roadside shall employ internet protocol communications interfaces and comply with the remote access requirements specified in TR 2597 [Ref 9.N].

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

E/10.31 Where access/egress to a transmission station is affected by an upgrade 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/10.32 Provision of electrical power shall be in accordance with TD 131 [Ref 27.N] and this document.

E/11. Signing and roadmarking

Fixed signing

Advance direction signs (ADS)

E/11.1 Existing ADS shall be assessed for compliance with prescribed and non-prescribed traffic sign authorisations.

E/11.2 Where existing non-prescribed ADS authorisations are no longer applicable due to the change to all lane running, the ADS shall either be replaced or a new non-prescribed traffic sign authorisation obtained.

E/11.3 Where existing prescribed ADS are no longer appropriate due to the change to all lane running, the ADS shall either be replaced or a non-prescribed traffic sign authorisation obtained.

E/11.4 ADS requirements for hard shoulder running upgrade schemes shall be in accordance with CD 146 [Ref 16.N].

NOTE *Existing ADS on controlled all lane running sections are expected to be suitable for all lane running operation unless a junction layout is modified.*

Sign removal

E/11.5 Existing 'end of hard shoulder' signs and associated posts shall be removed.

E/11.6 Existing 'refuge areas for emergency use only' signs and associated posts shall be removed.

E/11.7 Existing 'active traffic management, follow overhead instructions' signs and associated posts shall be removed.

E/11.8 Existing 'end of active traffic management' signs and associated posts shall be removed.

E/11.9 Where redundant sign bases can be extracted without damaging underground services, redundant sign bases shall be removed.

NOTE *Retained sign bases can be a trip hazard and their clearance can also facilitate the removal of VRS where this is only required for the sign.*

E/11.10 Where redundant sign bases are not removed, the justification for not removing each base shall be recorded in the DSR.

"No hard shoulder for X miles" signs

E/11.11 'No hard shoulder for X miles' signs shall be provided in accordance with GD 301 [Ref 28.N].

Emergency area/emergency roadside telephone approach signs

E/11.12 Emergency area/emergency roadside telephone approach signing shall be in accordance with GD 301 [Ref 28.N].

Signing located at an emergency area

E/11.13 Emergency area signing shall be in accordance with GD 301 [Ref 28.N].

Variable speed limit ends signs

E/11.14 Where there is a pair of existing 'variable speed limit ends' signs on the mainline, the offside sign shall be removed if the nearside sign meets the location requirements of GD 301 [Ref 28.N].

Fixed text message signs (FTMS)

E/11.15 Where only one sign face on an existing FTMS is required for all lane running operation, the sign shall be rotated to the face that supports all lane running operation and be locked in place.

E/11.16 Where an existing FTMS sign face is rotated and locked in place for all lane running operation, redundant cables and cabinets shall be removed.

E/11.17 Where all of the sign faces on an existing FTMS sign are not required for hard shoulder running upgrades or any other operational function, the FTMS sign, posts, redundant cables and cabinets shall be removed.

NOTE *Existing FTMS that show four ahead arrows and three arrows with a divert right arrow is an example of a redundant FTMS sign.*

E/11.18 Where redundant FTMS bases and cabinet bases can be extracted without damaging underground services, redundant FTMS bases and cabinet bases shall be removed.

NOTE *Retained FTMS bases and cabinet bases can be a trip hazard and their clearance can also facilitate the removal of VRS where this is only required for FTMS equipment.*

E/11.19 Where redundant FTMS bases and cabinet bases are not removed, the justification for not removing each base shall be recorded in the DSR.

Road markings

E/11.20 Where the hard shoulder is converted to a permanent running lane, the existing lane marking in accordance with SI 2016/382 [Ref 35.N] diagram 1012.1 between the hard shoulder and lane 1 shall be replaced with road markings to reflect both the change from a hard shoulder to a running lane and the specific location of the conversion.

NOTE *Where the hard shoulder is converted to a permanent running lane, the existing lane marking in accordance with SI 2016/382 [Ref 35.N] diagram 1012.1 between the hard shoulder and lane 1 can be replaced with road markings to diagram 1010, 1004.1 or 1005.1 depending on the location.*

E/11.21 The existing diagonal road marking across the hard shoulder at the start of a hard shoulder running link shall be removed.

E/11.22 Where emergency areas are located between a secondary ADS and a diverge, the SI 2016/382 [Ref 35.N] diagram 1010 markings shall be embossed thermoplastic.

NOTE *Due to the absence of road studs in emergency areas located between a secondary ADS and a diverge, embossed thermoplastic markings provide a rumble effect that would normally be provided by road studs.*

E/11.23 Where the existing hard shoulder edge line is 150mm wide or less it shall be replaced with an edge line that is 200mm wide in accordance with SI 2016/382 [Ref 35.N] diagram 1012.2.

E/11.24 All mainline road markings shall be replaced on upgrade schemes.

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

E/11.25 Diverge road markings shall be replaced between the mainline and back of the diverge nose on upgrade schemes.

E/11.26 Merge road markings shall be replaced between the back of the merge nose and mainline on upgrade schemes.

Road studs

E/11.27 Where the hard shoulder is converted to a permanent running lane, the existing red road studs between the hard shoulder and lane 1 shall be replaced with road studs to correspond with the amended road markings in accordance with TSM Chapter 5 [Ref 36.N].

E/11.28 Road studs shall not be provided at emergency areas located between a secondary ADS and a diverge.

E/12. Pavement

General

E/12.1 Pavement design for upgrade schemes shall be in accordance with CD 226 [Ref 4.N], CD 236 [Ref 30.N], CD 227 [Ref 5.N] and this document.

E/12.1.1 Unless re-surfacing is required to support changes in the lateral position of lane markings, carriageway re-surfacing should only be included in an upgrade scheme where asset renewal funding has been agreed as outlined in Section E/3.

Carriageway ironwork

E/12.2 Ironwork in the carriageway shall be in accordance with CD 534 [Ref 1.N].

Emergency areas

E/12.3 Emergency area surfacing shall be in accordance with GD 301 [Ref 28.N].

E/13. Structures

Structures

E/13.1 Structures requirements for upgrade schemes shall be in accordance with GD 301 [Ref 28.N] and this document.

E/14. Legal

Statutory instruments

E/14.1 Guidance shall be sought from the Overseeing Organisation from HE PCF [Ref 13.N] stage 1 regarding the legal changes required to the existing statutory instruments for each hard shoulder running scheme.

NOTE *Legislative changes are required to upgrade dynamic hard shoulder operation to all lane running with a permanent conversion of the hard shoulder to a running lane.*

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. CD 534, 'Chamber tops and gully tops for road drainage and services'
Ref 2.N	Highways England. CD 127, 'Cross-sections and headrooms'
Ref 3.N	Highways England. DfS Manual, 'Departures manual'
Ref 4.N	Highways England. CD 226, 'Design for new pavement construction'
Ref 5.N	Highways England. CD 227, 'Design for pavement maintenance'
Ref 6.N	Highways England. GD 304, 'Designing health and safety into maintenance'
Ref 7.N	Highways England. SMP-HEX-HGN-0-DA-ZZ-0008, 'Fixed Taper Points and Remotely Operated Traffic Management Signs'
Ref 8.N	Highways England. SMP-HEX-GEN-CTW-RP-ZX-0007, 'Fixing the Scope of Asset Renewal Works on SMP Projects'
Ref 9.N	Highways England. TR 2597, 'Generic roadside device requirements for remote access'
Ref 10.N	Highways England. CD 122, 'Geometric design of grade separated junctions'
Ref 11.N	The National Archives. legislation.gov.uk. HASAWA 1974 c.37, 'Health and Safety at Work etc. Act 1974'
Ref 12.N	Highways England. CD 109, 'Highway link design'
Ref 13.N	Highways England. HE PCF, 'Highways England's Project Control Framework'
Ref 14.N	Highways England. GG 103, 'Introduction and general requirements for sustainable development and design'
Ref 15.N	Highways England. GG 101, 'Introduction to the Design Manual for Roads and Bridges'
Ref 16.N	Highways England. CD 146, 'Positioning of signalling and advance direction signs'
Ref 17.N	Highways England. MPI 11, 'Provision of Access Arrangements to Equipment on SM-ALR Schemes'
Ref 18.N	Highways England. TD 121, 'Ramp metering'
Ref 19.N	Highways England. SMP-HEX-TGN-0-DA-ZZ-0009, 'Remotely Operated Temporary Traffic Management (ROTTM) sign, Guidance on Specification and Design'
Ref 20.N	Highways England. SMP-HEX-TGN-0-DA-ZZ-0006, 'Remotely Operated Temporary Traffic Management (ROTTM) signs associated with Fixed Taper Points (FTPs)'
Ref 21.N	Highways England. SMP-HEX-TGN-0-DA-ZZ-0010, 'Remotely Operated Temporary Traffic Management (ROTTM) signs, Guidance on Operation and Maintenance'
Ref 22.N	Highways England. CD 377, 'Requirements for road restraint systems'
Ref 23.N	Highways England. GG 104, 'Requirements for safety risk assessment'
Ref 24.N	BSI. BS EN 1317, 'Road restraint systems.'
Ref 25.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 26.N	BSI. BS EN 1317-1, 'Road restraint systems. Terminology and general criteria for test methods.'
Ref 27.N	Highways England. TD 131, 'Roadside technology and communications'
Ref 28.N	Highways England. GD 301, 'Smart motorways'
Ref 29.N	Highways England. SMP-HEX-GEN-SA02-DA-KK-0001, 'SMP Design Guide'
Ref 30.N	Highways England. CD 236, 'Surface course materials for construction'
Ref 31.N	Highways England. TR 2603, 'Technical Specification for remote controlled temporary traffic management signs for use on the Highways Agency Strategic Road Network'
Ref 32.N	The National Archives. legislation.gov.uk. SI 2015/51, 'The Construction (Design and Management) Regulations 2015'
Ref 33.N	Highways England. CD 169, 'The design of lay-bys, maintenance hardstandings, rest areas, service areas and observation platforms'
Ref 34.N	Highways England. RRRAP, 'The Road Restraint Risk Assessment Process'
Ref 35.N	SI 2016/382, 'The Traffic Signs Regulations and General Directions 2016'
Ref 36.N	TSO. TSM Chapter 5, 'Traffic Signs Manual Chapter 5 - Road Markings'

E/16. Informative references

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

Ref 1.I	Highways England. GD 302 (GSR), 'GD 302 Generic Safety Report'

Department for Infrastructure
An Roinn Bonneagair

General Principles & Scheme Governance
Design

GD 302 NINAA
Northern Ireland National Application Annex to GD 302 Smart motorways: Upgrading hard shoulder running to all lane running operation

Revision 0

Summary
There are no specific requirements for Department for Infrastructure Northern Ireland supplementary or alternative to those given in GD 302.

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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Contents

Release notes

Version	Date	Details of amendments
0	Oct 2020	Department for Infrastructure Northern Ireland National Application Annex to GD 302.

General Principles & Scheme Governance
Design

GD 302 SNAA
Scotland National Application Annex to GD 302 Smart motorways: Upgrading hard shoulder running to all lane running operation

Revision 0

Summary
There are no specific requirements for Transport Scotland supplementary or alternative to those given in GD 302.

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

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Contents

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0	Oct 2020	Transport Scotland National Application Annex to GD 302.

Llywodraeth Cymru
Welsh Government

General Principles & Scheme Governance
Design

GD 302 WNAA
Wales National Application Annex to GD 302 Smart motorways: Upgrading hard shoulder running to all lane running operation

Revision 0

Summary
There are no specific requirements for Welsh Government supplementary or alternative to those given in GD 302.

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

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