Design Manual for Roads and Bridges

General Principles and Scheme Governance
Design

GD 304
Designing health and safety into maintenance

(formerly IAN 69/15)

Revision 2

Summary
This document contains requirements related to designing health and safety into maintenance.

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
2	Mar 2020	Revision 2 (March 2020) Update to references in England and Northern Ireland NAA. Revision 1 (January 2020) Update to references in England and Northern Ireland NAA. Revision 0 (June 2019) GD 304 replaces IAN 69/15. The full document has been re-written to make it compliant with the new Highways England drafting rules.

Foreword

Publishing information

This document is published by Highways England.

This document supersedes IAN 69/15, which is withdrawn.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.

Introduction

Background

The Overseeing Organisation has legal duties with respect to the safety of road workers, road users and other parties.

These legal duties are derived from the following enabling legislation:

1) The Health and Safety at Work etc Act 1974 HASAWA 1974 c.37 [Ref 2.N] - applicable in England, Wales and Scotland. The Health and Safety at Work (NI) Order 1978 SI 1978/1039 (NI 9) [Ref 3.N] - applicable in Northern Ireland.
2) The Highways Act 1980 Highways Act 1980 [Ref 4.N] - applicable in England and Wales. The Roads (Scotland) Act 1984 Roads(S) 1984 [Ref 6.N] and The Roads Order (NI) 1993 R(NI)O 1993 [Ref 8.N].

The detailed requirements for the discharge of duties under the enabling legislation are set out in topic specific Regulations. Of particular relevance are the Construction (Design and Management) Regulations SI 2015/51 [Ref 7.N] and the Management of Health and Safety at Work Regulations SI 1999/3242 [Ref 1.N].

Designers have an important role to play in supporting the discharge of these duties. Health and safety risk for all highway works should be managed throughout the whole life of the activity. The structured assessment of risk in the design process, including the suitable and sufficient consideration of maintenance can achieve safety improvements and whole life cost savings.

Assumptions made in the preparation of this document

The assumptions made in GG 101 [Ref 5.N] apply to this document.

Abbreviations

Abbreviations

Abbreviation	Definition
CBA	Cost Benefit Analysis

Terms and definitions

Terms

Term	Definition
Principal Designer	Designers appointed by the client in projects involving more than one contractor. NOTE: They can be an organisation or an individual with sufficient knowledge, experience and ability to carry out the role.
Designers	Those, who as part of a business, prepare or modify designs for a building, product or system relating to construction work. NOTE: Designers can be design consultancies, contracting organisations, specialist suppliers or client organisations.
So far as is reasonably practicable	Balancing the level of risk against the measures needed to control the real risk in terms of money, time or trouble. NOTE: Action is not required if it would be grossly disproportionate to the level of risk.
Principles of prevention	Principles of prevention means the general principles of prevention specified in Schedule 1 to the Management of Health and Safety at Work Regulations 1999 SI 1999/3242 [Ref 1.N].
Populations	Those belonging to a specific group. NOTE: At the highest level these are divided into 'workers', 'users' and 'other parties'.

Note - Definitions are taken from the CDM Regulations.

1. Scope

Aspects covered

1.1 This document contains requirements related to designing health and safety into maintenance and shall be applied to all activities.

Implementation

1.2 This document shall be implemented forthwith in all activities involving design on the Overseeing Organisations' motorway and all-purpose trunk roads according to the implementation requirements of GG 101 [Ref 5.N].

Use of GG 101

1.3 The requirements contained in GG 101 [Ref 5.N] shall be followed in respect of activities covered by this document.

2. Design risk management

2.1 The principles of prevention (The Management of Health and Safety at Work Regulations) must be applied in all design decision making SI 1999/3242 [Ref 1.N].

2.2 Designers must take into account the principles of prevention to eliminate foreseeable risks to the health and safety of any person in accordance with the Construction, (Design and Management) regulations SI 2015/51 [Ref 7.N].

2.2.1 Designers should undertake a structured and recorded process of design reviews to assess whole life health and safety risk.

2.2.2 Design reviews may take the form of stakeholder workshops.

2.2.3 A structured assessment of risk to improve the safety of all populations and identify whole life costs or savings should be undertaken during the design phase when making design decisions.

NOTE *Whole life costs or savings include money, time and trouble.*

2.2.4 The structured assessment of risk should accurately reflect capital and whole life operational and maintenance costs.

2.2.5 Methods and designs which reduce maintenance risks should be used in the design.

2.3 Mitigation arising from the application of the principles of prevention shall be applied so far as is reasonably practicable.

2.3.1 For a health and safety measure not to be implemented in a design, the whole life cost should be grossly disproportionate to the benefit.

2.4 The specific requirements of the Overseeing Organisation on designing health and safety into maintenance shall apply.

NOTE *Overseeing Organisation specific requirements on designing health and safety into maintenance are provided in the National Application Annexes.*

3. Stakeholder engagement

3.1 The Principal Designer shall consult, throughout the design process, the organisations responsible for, or affected by, future maintenance of the asset.

NOTE *The greatest benefits, in the identification and consideration of health and safety risks, can be achieved by engaging stakeholders from the commencement of the project.*

4. 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	The National Archives. legislation.gov.uk. SI 1999/3242, 'HEALTH AND SAFETY - The Management of Health and Safety at Work Regulations 1999'
Ref 2.N	The National Archives. legislation.gov.uk. HASAWA 1974 c.37, 'Health and Safety at Work etc. Act 1974'
Ref 3.N	The National Archives. legislation.gov.uk. SI 1978/1039 (NI 9), 'Health and Safety at Work Order (Northern Ireland) 1978'
Ref 4.N	The National Archives. legislation.gov.uk. Highways Act 1980, 'Highways Act 1980'
Ref 5.N	Highways England. GG 101, 'Introduction to the Design Manual for Roads and Bridges'
Ref 6.N	The Stationery Office. Roads(S) 1984, 'Roads (Scotland) Act 1984'
Ref 7.N	The National Archives. legislation .gov.uk. SI 2015/51, 'The Construction (Design and Management) Regulations 2015'
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General Principles and Scheme Governance
Design

GD 304
England National Application Annex to GD 304 Designing health and safety into maintenance

(formerly IAN 69/15)

Revision 2

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This National Application Annex sets out the Highways England specific requirements on the process to be adopted for recording and communicating the approach to maintaining assets constructed on the strategic road network.

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Introduction

Background

This National Application Annex gives the Highways England specific requirements for the process to be adopted for recording and communicating the approach to maintaining assets constructed on the strategic road network.

The document defines the requirements for a maintenance and repair statement.

This document defines the requirements for a maintenance and repair statement and ensures a consistent approach to addressing maintenance and operational issues during the design stage of the project.

A maintenance and repair statement ensures the assessment of health and safety issues at the earliest practical time in the project development.

Assumptions made in the preparation of the document

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

The approach set out in GG 104 [Ref 5.N] applies to this document.

The approach set out in GG 182 [Ref 4.N] applies to this document.

Abbreviations

Abbreviations

Abbreviation	Definition
MRS	Maintenance Repair Statement
NAA	National Application Annex

E/1. Maintenance and repair statement

Design risk management (GD 304, Section 2)

E/1.1 A maintenance and repair statement (MRS) shall be prepared during the design stage.

E/1.2 The MRS shall be maintained and updated in response to any design change or development throughout the whole life of the asset.

E/1.3 The Principal Designer shall advise the Overseeing Organisation of the implications of the approach to maintenance given in a MRS.

E/1.3.1 A MRS should contain the following items:

1) introduction;
2) scheme description;
3) objectives;
4) matters influencing maintenance;
5) anticipated maintenance tasks;
6) maintenance philosophy statements:
    a) maintenance philosophy statement 01 – e.g. individual structure;
    b) maintenance philosophy statement 02 – e.g. spillage pond;
    c) maintenance philosophy statement 03 – e.g. overhead gantry;
    d) maintenance philosophy statement 04 – e.g. customer impact;
    e) list to be developed to reflect characteristics of the particular project;
7) appendices:
    a) scheme layout drawings;
    b) minutes of design for maintenance / safety in design meetings;
    c) record of stakeholder engagement.

NOTE *Appendix E/A contains examples of methods used to reduce risks in design.*

E/1.3.2 A typical maintenance philosophy statement should describe:

1) the anticipated tasks and their frequency;
2) the assumed means of safe access to the place of work;
3) the temporary traffic management measures required;
4) the assumed safe method of work;
5) assumptions regarding provision and location of welfare facilities;
6) any specific safety measures affecting maintenance;
7) any specific risks;
8) other issues (demonstrate efficiencies of the above in time, cost, operation and safety).

E/2. Normative references

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

Ref 1.N	Highways England. CD 127, 'Cross-sections and headrooms'
Ref 2.N	Highways England. GG 101, 'Introduction to the Design Manual for Roads and Bridges'
Ref 3.N	Highways England. LD 117, 'Landscape design'
Ref 4.N	Highways England. GG 182, 'Major schemes: Enabling handover into operation and maintenance'
Ref 5.N	Highways England. GG 104, 'Requirements for safety risk assessment'

E/3. Informative references

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

Ref 1.I	TSO. Department for Transport. TSM Chapter 8, 'Traffic Signs Manual Chapter 8 - Road works and temporary situations'

Appendix E/A. Risk reduction examples

Table E/A.1 TYPE A: ELIMINATE THE NEED FOR MAINTENANCE (ELIMINATE THE HAZARD / AVOID THE MAINTENANCE ACTIVITY THROUGH BETTER OR ALTERNATIVE DESIGN)

No	GENERAL METHOD	TYPICAL EXAMPLE
A1	Relocation of features	1) Move sign positions away from trees or vice versa, either longitudinally or transversely. 2) Consider placing lighting columns in verge to facilitate lantern changes. 3) Consider placing lighting columns on approaches to under bridges rather than on the bridge to remove the need to access them from the over bridge itself. 4) Locate access to bridge interiors such that operatives can avoid live carriageways (i.e. no access to manholes in carriageways).
A2	Consider alternative drainage designs	1) Use of vegetated drainage systems rather than buried hard solutions that need regular or frequent maintenance (e.g. interceptors). 2) Cross carriageway drains can be difficult to maintain and repair in addition to contributing to pavement failure if damaged. Avoid the use of offside gullies. 3) Use of semi-bound filter drain material to reduce stone scatter problems from filter drains close to running lanes. 4) Avoid manhole covers within running lanes and hard shoulders / hard strip. 5) Provide overflow pipes to spillage ponds to prevent filling up with surface water runoff resulting in need to regularly drain ponds.
A3	Eliminate need for any on-going work	1) Use materials for roadside features that have low maintenance requirements thereby reducing the need for maintenance or replacement. 2) Design out roadside features and equipment thereby eliminating the need to undertake maintenance work. 3) Use of non self-seeding variety trees. 4) No planting located within visibility splays.
A4	Edge line road studs placed on non-trafficked side of lines	No typical example.

Table E/A.1 TYPE A: ELIMINATE THE NEED FOR MAINTENANCE (ELIMINATE THE HAZARD / AVOID THE MAINTENANCE ACTIVITY THROUGH BETTER OR ALTERNATIVE DESIGN) (continued)

No	GENERAL METHOD	TYPICAL EXAMPLE
A5	Increase design life of assets	1) Increase pavement design life. 2) Choose barrier design life taking account of both working life costs and the safety issues associated with in service maintenance of the barrier system. 3) Choose street lighting system with design life that take account of both working life costs and the safety issues associated with in service maintenance.
A6	Structures – design for durability/maintainability	Make bridge decks continuous and integral where possible – eliminate joints and bearings.
A7	Reduce need for cleaning	Use of automated wash wipe systems for CCTV cameras to remove need for manual cleaning of cameras. Materials or coatings that minimise the accumulation of detritus.

Table E/A.2 TYPE B: REDUCE THE HAZARD (REDUCED EFFORT)

Ref	GENERAL METHOD	TYPICAL EXAMPLE
B1	Reduce amount of grass cutting	1) Use low growth species. 2) Harden central reserves to reduce grass cutting and litter picking.
B2	Reduce time exposure	Simplify tasks and methods e.g. design of gullies compatible with common plant used to clean and empty gullies.
B3	Provide sign bins	Stock with commonly needed signs.
B4	Reduce manual handling effort during construction and maintenance	1) Give requirements for kerbs that do not unnecessarily restrict a constructor's choice of construction methods and their ability to meet their H&S obligations. 2) Fixed location of flapped or remotely operated TM signs. 3) Avoid over specifying manhole covers in non-trafficable areas, also allow flat area to place lifted covers. 4) Specify requirements for components in performance terms to enable constructors to use components made of lightweight materials e.g. in the provision of fence panels and paving slabs.
B5	Reduce need for crash repair	1) At sign post locations in addition to consideration of whole life cost of the options of road restraint protected posts and passively safe posts with no restraint the relative maintenance safety issues should also be considered. 2) Use socketed posts for signs or safety barriers that are likely to be damaged often or could be difficult to access to repair e.g., where safety barriers are founded in concrete or driven through hardened surfaces, a sleeve may assist speed of repair. Repair databases would assist identification of high risk locations.
B6	Co-locate features at locations where maintenance is safe and convenient	Weather stations, control and power cabinets.

Table E/A.2 TYPE B: REDUCE THE HAZARD (REDUCED EFFORT) (continued)

Ref	GENERAL METHOD	TYPICAL EXAMPLE
B7	Increase life of assets	1) In choosing design lives for components ensure that safety risks of in-service replacement of signs has been adequately taken into account. 2) Lift metal objects from ground using plinths /platforms (if no driver hazard created) to reduce corrosion risks. 3) Consider the use of sign face treatments that reduce the need for in service maintenance interventions. 4) Prior to installation on site off site running of technology (soak testing) prone to early life failure to minimise the need for in-situ repair or replacement.
B8	Provide permanent crossover locations	1) Consider constructing central reserve crossovers on new roads for future use. 2) If no crossover to be provided at outset, consider instead providing minimal equipment in central reserve to minimise future work.
B9	Reduce drainage blockages	1) Minimise use of combined kerb/drainage units. 2) Litter traps/netting at culverts. 3) Plant trees away from drainage pipes to reduce damage by roots. 4) Consider the minimum acceptable size of culvert if access will be required in future.
B10	Ease erection, placement and subsequent maintenance of temporary signs	Provide sockets to locate posts e.g. in concrete central reserve barrier.

Table E/A.2 TYPE B: REDUCE THE HAZARD (REDUCED EFFORT) (continued)

Ref	GENERAL METHOD	TYPICAL EXAMPLE
B11	Structures	1) In considering choice between use of weathering steel and paint systems (both standard and longer life systems) ensure account is taken of working life costs and maintenance requirements for each approach and their associated maintenance safety implications. 2) Consider the use of corrosion resistant rebar to eliminate future corrosion / spalling. 3) Increase cover to maximum permitted by standards. 4) Remove joints from string courses to remove use of joint sealants over live running lanes.

Table E/A.3 TYPE C: REDUCE THE HAZARD (ALTERNATIVE TECHNIQUES / TECHNOLOGY

Ref	GENERAL METHOD	TYPICAL EXAMPLE
C1	Reduce use of hand held tools	1) Design areas of landscaping and planting to allow grass cutting by mower. 2) Rebar detailing may reduce need for drilling e.g. use reinforcement couplers. 3) Design widths of paved areas so that paviors / flags do not need cutting.
C2	CCTV and other remote monitoring to reduce need for special inspections	Bridge strain and wire break detectors using remote data logging.
C3	Use sensors to trigger alarms	1) Can indicate water levels in culverts or interceptors using flashing beacons or similar linked to sensors. 2) Alarms linked to pre-determined mobile phone numbers – text message systems to provide alerts.
C4	Reduce risk of electrocution	Assess need for sign lighting and options for its provision to reduce this risk.
C5	Reduce carriageway crossings to erect or change temporary signs	Use remotely operated signs.

Table E/A.4 TYPE D: REDUCE THE HAZARD (REDUCE PROXIMITY OF OPERATIVES TO HAZARDS)

Ref	GENERAL METHOD	TYPICAL EXAMPLE
D1	Move work remote from traffic	Cabinets near highway boundary.
D2	Avoid high risk locations when siting design features	Avoid locating a phone, cabinet or sign at end of lane merge tapers or at narrow hard shoulders.
D3	Increase space	Increase verge and central reserve widths (including modest increase to safety barrier setbacks and working widths).
D4	Structures	Consider use of inspection galleries built into structures to remove need for operatives accessing from Mobile Elevating Work platforms (MEWPs).

Table E/A.5 TYPE E: INFORM OTHERS OF RESIDUAL HAZARDS (INFORMATION - IMPROVE ACCESS)

Ref	GENERAL METHOD	TYPICAL EXAMPLE	COMMENT
E1	Redesign of access		1) Hatches positioned such that operatives stand whilst inspecting/ maintaining lighting columns etc. 2) Deep manholes configuration of ladders such that traffic faced on entry/egress. 3) Provide overlap in safety barriers to allow access to features to be maintained. 4) Locate Emergency Areas adjacent to features to be maintained.
E2	Provide alternative routes of access to avoid need to use carriageway, hard strip or hard shoulder.		1) Use of parallel tracks rather than hard shoulder – longitudinal footways between features to allow safe access. 2) Locked gates in highway boundary. 3) Provide space between drainage ditches and steep slopes to allow plant access.
E3	Provide safer places to stop		1) Hardstandings adjacent to hardstrips or hard shoulders, particularly for frequently maintained features e.g. signal controllers at junctions. 2) Small "works units" accessed via gates from public laybys. 3) Drop kerbs at roundabouts plus hardstanding.
E4	Better access to "at height" working	Walkways and ladders at structures.	
E5	Improve operative or vehicular access to central reserve	Use tunnels or ramps from junction or overbridges.	

Table E/A.5 TYPE E: INFORM OTHERS OF RESIDUAL HAZARDS (INFORMATION - IMPROVE ACCESS) (continued)

Ref	GENERAL METHOD	TYPICAL EXAMPLE	COMMENT
E6	Reduce risk of falls from height		1) Relocate gantry operating equipment to ground level. 2) Consider casting in means to attach temporary edge protection to string-course of structures to provide protection when removing/replacing parapets.
E7	Provide cut-throughs at interchanges	Small lengths of gated access road.	
E8	Improve access to consumables	e.g. bearings, joints, pumps	This may include significant designed-in features e.g. to allow in-situ jacking.
E9	Increase bridge head-rooms	Allow painting scaffold without road/lane closure, but consider risk to operatives of over-height vehicles.	Subject to value for money assessment (to be considered by Technical Approval Authority).
E10	Minimise features in central reserves and other difficult sites	1) Consider merits of super-span gantries that avoid central support. 2) Consider lighting from verges. 3) Avoid access chambers in hard shoulders and central reserves. 4) Increase distance from feature to traffic (e.g. landscape planting).	Min distances are contained in LD 117 [Ref 3.N].

Table E/A.6 TYPE F: INFORM OTHERS OF RESIDUAL HAZARDS AND ASSUMPTIONS - IMPROVE MANAGEMENT SYSTEMS

Ref	GENERAL METHOD	TYPICAL EXAMPE	COMMENT
F1	Co-ordinated "mass" maintenance	Consider road closure to complete several items at once	Customer feedback and media reaction is a key element in determining this. May justify permanently signed (flapped) diversion routes.
F2	Reduce survey needs	1) Aerial surveys may be sufficient for feasibility stages of improvements. 2) Improve asset management to reduce site visits e.g. full data on safety fence types, lengths, bolts etc.	
F3	Liaison designer/maintainer	1) Consider methods and plant available and rules of the route for maintenance. 2) Regular meetings held with maintainer during development of the scheme to identify maintenance requirements.	
F4	Liaison designer/ principal designer	1) Regular meetings held with Principal Designer during development of the scheme to discuss the maintenance requirements. 2) Identification of project goals to account for future maintenance.	

Table E/A.7 Type G: INFORM OTHERS OF RESIDUAL HAZARDS AND ASSUMPTIONS – PROVIDE INFORMATION - PROVIDE SAFE AND CONVENIENT DIVERSION ROUTES

Ref	GENERAL METHOD	TYPICAL EXAMPLE	COMMENT
G1	Co-ordinated "mass" maintenance	Consider road closure to complete several items at once.	1) Customer feedback and media reaction is a key element in determining this. 2) May justify permanently signed (flapped) diversion routes.
G2	Reduce survey needs	1) Aerial surveys may be sufficient for feasibility stages of improvements. 2) Improve asset management to reduce site visits e.g. full data on safety barrier types, lengths, bolts etc.	
G3	Liaison designer/ maintainer	1) Consider methods and plant available and rules of the route for maintenance. 2) Regular meetings held with maintainer during development of the scheme to identify maintenance requirements.	

Table E/A.8 TYPE H: INFORM OTHERS OF RESIDUAL HAZARDS AND ASSUMPTIONS – PROVIDE INFORMATION - PROVIDE IDENTIFIERS

Ref	GENERAL METHOD	TYPICAL EXAMPLE
H1	Improve identity of features	Make finding features easier to reduce time exposure e.g. provide "asset numbers" and/or markers particularly where features (e.g. manhole covers) could be hidden in grass.
H2	Name junctions and bridges	Eases task of keeping accurate records and identifying network defects.
H3	Provide marker posts on all purpose trunk roads	Makes finding features easier, reducing time-exposure

Table E/A.9 Type I: INFORM OTHERS OF RESIDUAL HAZARDS AND ASSUMPTIONS – TRAFFIC MANAGEMENT

Ref	GENERAL METHOD	TYPICAL EXAMPLE	COMMENT
I1	Safe pull-off areas for maintenance vehicles	1) Make provision on roads without any existing hard shoulder or designed pull-off area. 2) Locate pull of areas adjacent to features to be maintained to remove need for traffic management.	CD 127 [Ref 1.N]
I2	Safer taper positions for temporary traffic management.		This is aimed at identifying locations where Traffic Signs Manual Chapter 8 TSM Chapter 8 [Ref 1.I] tapers may be safely installed, and deriving a traffic management policy around this.
I3	Site specific traffic management layouts		Derivation of site specific traffic management layouts where application of standard Chapter 8 layouts is difficult.
I4	Central reserve construction	1) Harden central reserve. 2) Discourage use of type 1 material or topsoil and seed. 3) Use remote controlled signs. 4) Consider access ladders from gantries to centre reserve area.	Consider safe reserve within the central reserve by surfacing, access, storage or widening.
I5	Wider hard shoulder	Consider wider hard shoulders to incorporate a 1.2m hatched separation strip.	

Table E/A.10 Type J: INFORM OTHERS OF RESIDUAL HAZARDS AND ASSUMPTIONS – Anti-theft / Vandalism

Ref	GENERAL METHOD	TYPICAL EXAMPLE
J1	Theft	Identify on a site specific basis those areas that are, or are likely to be, subject to highway features materials theft and specify materials and fixings that address these issues.
J2	Vandalism	Consider the use of anti-graffiti coatings.

Department for Infrastructure
An Roinn Bonneagair

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Revision 2

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Background

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The detailed requirements for the discharge of duties under the enabling legislation are set out in topic specific Regulations. Of particular relevance are CDM (NI) 2016 [Ref 4.N] and the Management of Health and Safety at Work (NI) Regulations 2000.

The document defines the requirements for a maintenance and repair statement.

This document defines the requirements for a maintenance and repair statement and ensures a consistent approach to addressing maintenance and operational issues during the design stage of the project.

A maintenance and repair statement ensures the assessment of health and safety issues at the earliest practical time in the project development.

Assumptions made in the preparation of the document

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Abbreviations

Abbreviations

Abbreviation	Definition
MRS	Maintenance and Repair Statement
NAA	National Application Annex

NI/1. Applicability of this document

NI/1.1 The requirements of this document shall be applied on motorway and trunk road projects, when the design is produced by an organisation external to the Department for Infrastructure Roads and Rivers.

NI/1.1.1 Internal departmental H&S policy (Planning and Implementing Arrangement 14 - Managing, Design, Construction and Maintenance) should be applied on projects when the design is carried out by staff within the Department for Infrastructure, in the place of GD 304.

NI/2. Maintenance and repair statement

Design risk management (GD 304, Section 2)

NI/2.1 A maintenance and repair statement (MRS) shall be prepared during the design stage.

NI/2.2 The MRS shall be maintained and updated in response to any design change or development throughout the whole life of the asset.

NI/2.3 The Principal Designer shall advise the Overseeing Organisation of the implications of the approach to maintenance given in a MRS.

NI/2.3.1 A MRS should contain the following items:

1) introduction;
2) scheme description;
3) objectives;
4) matters influencing maintenance;
5) anticipated maintenance tasks;
6) maintenance philosophy statements
    a) maintenance philosophy statement 01 – e.g. individual structure;
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    d) maintenance philosophy statement 04 – e.g. customer impact;
    e) list to be developed to reflect characteristics of the particular project;
7) appendices:
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    b) minutes of design for maintenance / safety in design meetings;
    c) record of stakeholder engagement.

NOTE *Appendix NI/A contains examples of methods used to reduce risks in design.*

NI/2.3.2 A typical maintenance philosophy statement should describe:

1) the anticipated tasks and their frequency;
2) the assumed means of safe access to the place of work;
3) the temporary traffic management measures required;
4) the assumed safe method of work;
5) assumptions regarding provision and location of welfare facilities;
6) any specific safety measures affecting maintenance;
7) any specific risks;
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NI/4. Informative references

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Appendix NI/A. Risk reduction examples

Table NI/A.1 TYPE A: ELIMINATE THE NEED FOR MAINTENANCE (ELIMINATE THE HAZARD / AVOID THE MAINTENANCE ACTIVITY THROUGH BETTER OR ALTERNATIVE DESIGN)

No	GENERAL METHOD	TYPICAL EXAMPLE
A1	Relocation of features	1) Move sign positions away from trees or vice versa, either longitudinally or transversely 2) Consider placing lighting columns in verge to facilitate lantern changes. 3) Consider placing lighting columns on approaches to under bridges rather than on the bridge to remove the need to access them from the over bridge itself. 4) Locate access to bridge interiors such that operatives can avoid live carriageways (i.e. no access to manholes in carriageways).
A2	Consider alternative drainage designs	1) Use of vegetated drainage systems rather than buried "hard solutions that need regular or frequent maintenance (e.g. interceptors). 2) Cross carriageway drains can be difficult to maintain and repair in addition to contributing to pavement failure if damaged. Avoid the use of offside gullies. 3) Use of semi-bound filter drain material to reduce stone scatter problems from filter drains close to running lanes. 4) Avoid manhole covers within running lanes and hard shoulders / hard strip. 5) Provide overflow pipes to spillage ponds to prevent filling up with surface water runoff resulting in need to regularly drain ponds.
A3	Eliminate need for any on-going work	1) Use materials for roadside features that have low maintenance requirements thereby reducing the need for maintenance or replacement. 2) Design out roadside features and equipment thereby eliminating the need to undertake maintenance work. 3) Use of non self-seeding variety trees. 4) No planting located within visibility splays.
A4	Edge line road studs placed on non-trafficked side of lines	No typical example

Table NI/A.1 TYPE A: ELIMINATE THE NEED FOR MAINTENANCE (ELIMINATE THE HAZARD / AVOID THE MAINTENANCE ACTIVITY THROUGH BETTER OR ALTERNATIVE DESIGN) (continued)

No	GENERAL METHOD	TYPICAL EXAMPLE
A5	Increase design life of assets	1) Increase pavement design life. 2) Choose barrier design life taking account of both working life costs and the safety issues associated with in service maintenance of the barrier system. 3) Choose street lighting system with design life that take account of both working life costs and the safety issues associated with in service maintenance.
A6	Structures-design for durability/maintainability	Make bridge decks continuous and integral where possible – eliminate joints and bearings.
A7	Reduce need for cleaning	Use of automated wash wipe systems for CCTV cameras to remove need for manual cleaning of cameras. Materials or coatings that minimise the accumulation of detritus.

Table NI/A.2 TYPE B: REDUCE THE HAZARD (REDUCED EFFORT)

Ref	GENERAL METHOD	TYPICAL EXAMPLE
B1	Reduce amount of grass cutting	1) Use low growth species. 2) Harden central reserves to reduce grass cutting and litter picking.
B2	Reduce time exposure	Simplify tasks and methods e.g. design of gullies compatible with common plant used to clean and empty gullies.
B3	Provide sign bins	Stock with commonly needed signs.
B4	Reduce manual handling effort during construction and maintenance	1) Give requirements for kerbs that do not unnecessarily restrict a constructor's choice of construction methods and their ability to meet their H&S obligations. 2) Fixed location of flapped or remotely operated TM signs. 3) Avoid over specifying manhole covers in non-trafficable areas, also allow flat area to place lifted covers. 4) Specify requirements for components in performance terms to enable constructors to use components made of lightweight materials e.g. in the provision of fence panels and paving slabs.
B5	Reduce need for crash repair	1) At sign post locations in addition to consideration of whole life cost of the options of road restraint protected posts and passively safe posts with no restraint the relative maintenance safety issues should also be considered. 2) Use socketed posts for signs or safety barriers that are likely to be damaged often or could be difficult to access to repair e.g., where safety barriers are founded in concrete or driven through hardened surfaces, a sleeve may assist speed of repair. Repair databases would assist identification of high risk locations.
B6	Co-locate features at locations where maintenance is safe and convenient	Weather stations, control and power cabinets.

Table NI/A.2 TYPE B: REDUCE THE HAZARD (REDUCED EFFORT) (continued)

Ref	GENERAL METHOD	TYPICAL EXAMPLE
B7	Increase life of assets	1) In choosing design lives for components ensure that safety risks of in-service replacement of signs has been adequately taken into account. 2) Lift metal objects from ground using plinths /platforms (if no driver hazard created) to reduce corrosion risks. 3) Consider the use of sign face treatments that reduce the need for in service maintenance interventions. 4) Prior to installation on site off site running of technology (soak testing) prone to early life failure to minimise the need for in-situ repair or replacement.
B8	Provide permanent crossover locations	1) Consider constructing central reserve crossovers on new roads for future use. 2) If no crossover to be provided at outset, consider instead providing minimal equipment in central reserve to minimise future work.
B9	Reduce drainage blockages	1) Minimise use of combined kerb/drainage units. 2) Litter traps/netting at culverts. 3) Plant trees away from drainage pipes to reduce damage by roots. 4) Consider the minimum acceptable size of culvert if access will be required in future.
B10	Ease erection, placement and subsequent maintenance of temporary signs	Provide sockets to locate posts e.g. in concrete central reserve barrier.

Table NI/A.2 TYPE B: REDUCE THE HAZARD (REDUCED EFFORT) (continued)

Ref	GENERAL METHOD	TYPICAL EXAMPLE
B11	Structures	1) In considering choice between use of weathering steel and paint systems (both standard and longer life systems) ensure account is taken of working life costs and maintenance requirements for each approach and their associated maintenance safety implications. 2) Consider the use of corrosion resistant rebar to eliminate future corrosion / spalling. 3) Increase cover to maximum permitted by standards. 4) Remove joints from string courses to remove use of joint sealants over live running lanes.

Table NI/A.3 TYPE C: REDUCE THE HAZARD (ALTERNATIVE TECHNIQUES / TECHNOLOGY

Ref	GENERAL METHOD	TYPICAL EXAMPLE
C1	Reduce use of hand held tools	1) Design areas of landscaping and planting to allow grass cutting by mower. 2) Rebar detailing may reduce need for drilling e.g. use reinforcement couplers. 3) Design widths of paved areas so that paviors / flags do not need cutting.
C2	CCTV and other remote monitoring to reduce need for special inspections	Bridge strain and wire break detectors using remote data logging.
C3	Use sensors to trigger alarms	1) Can indicate water levels in culverts or interceptors using flashing beacons or similar linked to sensors. 2) Alarms linked to pre-determined mobile phone numbers – text message systems to provide alerts.
C4	Reduce risk of electrocution	Assess need for sign lighting and options for its provision to reduce this risk.
C5	Reduce carriageway crossings to erect or change temporary signs	Use remotely operated signs.

Table NI/A.4 TYPE D: REDUCE THE HAZARD (REDUCE PROXIMITY OF OPERATIVES TO HAZARDS)

Ref	GENERAL METHOD	TYPICAL EXAMPLE
D1	Move work remote from traffic	Cabinets near highway boundary.
D2	Avoid high risk locations when siting design features	Avoid locating a phone, cabinet or sign at end of lane merge tapers or at narrow hard shoulders.
D3	Increase space	Increase verge and central reserve widths (including modest increase to safety barrier setbacks and working widths).
D4	Structures	Consider use of inspection galleries built into structures to remove need for operatives accessing from Mobile Elevating Work platforms (MEWPs).

Table NI/A.5 TYPE E: INFORM OTHERS OF RESIDUAL HAZARDS (INFORMATION - IMPROVE ACCESS)

Ref	GENERAL METHOD	TYPICAL EXAMPLE	COMMENT
E1	Redesign of access		1) Hatches positioned such that operatives stand whilst inspecting/ maintaining lighting columns etc. 2) Deep manholes configuration of ladders such that traffic faced on entry/egress. 3) Provide overlap in safety barriers to allow access to features to be maintained. 4) Locate Emergency Areas adjacent to features to be maintained.
E2	Provide alternative routes of access to avoid need to use carriageway, hard strip or hard shoulder.		1) Use of parallel tracks rather than hard shoulder – longitudinal footways between features to allow safe access. 2) Locked gates in highway boundary. 3) Provide space between drainage ditches and steep slopes to allow plant access.
E3	Provide safer places to stop		1) Hardstandings adjacent to hardstrips or hard shoulders, particularly for frequently maintained features e.g. signal controllers at junctions. 2) Small "works units" accessed via gates from public laybys. 3) Drop kerbs at roundabouts plus hardstanding.
E4	Better access to "at height" working	Walkways and ladders at structures.	
E5	Improve operative or vehicular access to central reserve	Use tunnels or ramps from junction or overbridges.	

Table NI/A.5 TYPE E: INFORM OTHERS OF RESIDUAL HAZARDS (INFORMATION - IMPROVE ACCESS) (continued)

Ref	GENERAL METHOD	TYPICAL EXAMPLE	COMMENT
E6	Reduce risk of falls from height		1) Relocate gantry operating equipment to ground level. 2) Consider casting in means to attach temporary edge protection to string-course of structures to provide protection when removing/replacing parapets.
E7	Provide cut-throughs at interchanges	Small lengths of gated access road.	
E8	Improve access to consumables	e.g. bearings, joints, pumps	This may include significant designed-in features e.g. to allow in-situ jacking.
E9	Increase bridge head-rooms	Allow painting scaffold without road/lane closure, but consider risk to operatives of over-height vehicles.	Subject to value for money assessment (to be considered by Technical Approval Authority).
E10	Minimise features in central reserves and other difficult sites	1) Consider merits of super-span gantries that avoid central support. 2) Consider lighting from verges. 3) Avoid access chambers in hard shoulders and central reserves. 4) Increase distance from feature to traffic (e.g. landscape planting).	Min distances are contained in LD 117 [Ref 3.N].

Table NI/A.6 TYPE F: INFORM OTHERS OF RESIDUAL HAZARDS AND ASSUMPTIONS - IMPROVE MANAGEMENT SYSTEMS

Ref	GENERAL METHOD	TYPICAL EXAMPE	COMMENT
F1	Co-ordinated "mass" maintenance	Consider road closure to complete several items at once	Customer feedback and media reaction is a key element in determining this. May justify permanently signed (flapped) diversion routes.
F2	Reduce survey needs	1) Aerial surveys may be sufficient for feasibility stages of improvements. 2) Improve asset management to reduce site visits e.g. full data on safety fence types, lengths, bolts etc.	
F3	Liaison designer/maintainer	1) Consider methods and plant available and rules of the route for maintenance. 2) Regular meetings held with maintainer during development of the scheme to identify maintenance requirements.	
F4	Liaison designer/ principal designer	1) Regular meetings held with Principal Designer during development of the scheme to discuss the maintenance requirements. 2) Identification of project goals to account for future maintenance.	

Table NI/A.7 Type G: INFORM OTHERS OF RESIDUAL HAZARDS AND ASSUMPTIONS – PROVIDE INFORMATION - PROVIDE SAFE AND CONVENIENT DIVERSION ROUTES

Ref	GENERAL METHOD	TYPICAL EXAMPLE	COMMENT
G1	Co-ordinated "mass" maintenance	Consider road closure to complete several items at once.	1) Customer feedback and media reaction is a key element in determining this. 2) May justify permanently signed (flapped) diversion routes.
G2	Reduce survey needs	1) Aerial surveys may be sufficient for feasibility stages of improvements. 2) Improve asset management to reduce site visits e.g. full data on safety barrier types, lengths, bolts etc.	
G3	Liaison designer/ maintainer	1) Consider methods and plant available and rules of the route for maintenance. 2) Regular meetings held with maintainer during development of the scheme to identify maintenance requirements.	

Table NI/A.8 TYPE H: INFORM OTHERS OF RESIDUAL HAZARDS AND ASSUMPTIONS – PROVIDE INFORMATION - PROVIDE IDENTIFIERS

Ref	GENERAL METHOD	TYPICAL EXAMPLE
H1	Improve identity of features	Make finding features easier to reduce time exposure e.g. provide "asset numbers" and/or markers particularly where features (e.g. manhole covers) could be hidden in grass.
H2	Name junctions and bridges	Eases task of keeping accurate records and identifying network defects.
H3	Provide marker posts on all purpose trunk roads	Makes finding features easier, reducing time-exposure

Table NI/A.9 Type I: INFORM OTHERS OF RESIDUAL HAZARDS AND ASSUMPTIONS – TRAFFIC MANAGEMENT

Ref	GENERAL METHOD	TYPICAL EXAMPLE	COMMENT
I1	Safe pull-off areas for maintenance vehicles	1) Make provision on roads without any existing hard shoulder or designed pull-off area. 2) Locate pull of areas adjacent to features to be maintained to remove need for traffic management.	CD 127 [Ref 1.N]
I2	Safer taper positions for temporary traffic management.		This is aimed at identifying locations where Traffic Signs Manual Chapter 8 TSM Chapter 8 [Ref 1.I] tapers may be safely installed, and deriving a traffic management policy around this.
I3	Site specific traffic management layouts		Derivation of site specific traffic management layouts where application of standard Chapter 8 layouts is difficult.
I4	Central reserve construction	1) Harden central reserve. 2) Discourage use of type 1 material or topsoil and seed. 3) Use remote controlled signs. 4) Consider access ladders from gantries to centre reserve area.	Consider safe reserve within the central reserve by surfacing, access, storage or widening.
I5	Wider hard shoulder	Consider wider hard shoulders to incorporate a 1.2m hatched separation strip.	

Table NI/A.10 Type J: INFORM OTHERS OF RESIDUAL HAZARDS AND ASSUMPTIONS – Anti-theft / Vandalism

Ref	GENERAL METHOD	TYPICAL EXAMPLE
J1	Theft	Identify on a site specific basis those areas that are, or are likely to be, subject to highway features materials theft and specify materials and fixings that address these issues.
J2	Vandalism	Consider the use of anti-graffiti coatings.

General Principles and Scheme Governance
Design

GD 304
Scotland National Application Annex to GD 304 Designing health and safety into maintenance

Revision 0

Summary
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Llywodraeth Cymru
Welsh Government

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