Design Manual for Roads and Bridges

Control & Communications Technology
Design

TD 101
Traffic signalling systems

(formerly TA 12/07, TA 16/07, TA 56/87, TA 82/99, TA 84/06, TD 07/07, TD 24/97, TD 35/06)

Revision 0

Summary
This document contains design requirements for traffic signalling systems.

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

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

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Volume 8 home page

Contents

Release notes

Version	Date	Details of amendments
0	Jun 2019	TD 101 replaces TA 12/07, TA 16/07, TA 56/87, TA 82/99, TA 84/06, TD 07/07, TD 24/97, TD 35/06. 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This document supersedes TA 12/07, TA 16/07, TA 56/87, TA 82/99, TA 84/06, TD 07/07, TD 24/97, TD 35/06, which are withdrawn.

Contractual and legal considerations

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

Introduction

Background

This document contains design requirements for traffic signalling installations.

Assumptions made in the preparation of the document

The assumptions made in GG 101 [Ref 3.N] apply to this document.

It is assumed that the parties reading TD 101 are aware of additional documents to those within the DMRB; The Department for Transport (DfT) prepares general advice, some of which is applicable to motorway and all purpose trunk roads. Of these documents, the most relevant are Local Transport Notes (LTN), and Traffic Advisory Leaflets (TAL), which mostly cover topics which apply to local rather than strategic roads, but some are of general relevance.

It is assumed that a traffic signalling engineer will be part of the review process throughout all stages of traffic signalling design.

Mutual Recognition

Where there is a requirement in this document for compliance with any part of a "British Standard" or other technical specification, that requirement may be met by compliance with the Mutual Recognition clause in GG 101 [Ref 3.N].

Abbreviations

Abbreviations

Abbreviation	Definition
BS	British Standard
BS EN	British Standard European Norm
CDM	Construction, Design and Management
IET	The Institution of Engineering and Technology
TOPAS	Traffic Open Products And Specifications
VMS	Variable message signs

Terms and definitions

Terms

Term	Definition
Adjacent authorities	Any organisation which has responsibility for the highway control and management. NOTE: Adjacent authorities can be either borough, county or city governance. It can also include major transport infrastructure locations which have a direct links to the highway such as airports, ports, rail and freight.
Control strategy	A system used to control the installation. NOTE 1: Control strategy includes isolated adaptive control, co-ordinated control (such as Urban Traffic Control), cable-less linking or fixed-time. NOTE 2: An installation can be capable of operating more than one type, depending on factors such as time of day or traffic conditions.
Design file	A file of basic information and certification for a scheme, produced during the design process to provide a record of the development of the scheme, the decisions made and the safety considerations.
In-station equipment	The computer hardware located within a control room.
Ramp metering	Traffic signalling systems installed at motorway slip roads to regulate flow on to the major route depending on the current traffic conditions.
Reserve capacity	The practical reserve capacity (PRC) of a traffic signal junction. NOTE 1: The practical reserve capacity which is positive indicates that a junction has spare capacity and may be able to accept more traffic. NOTE 2: A PRC value is calculated by the commonly used traffic signal modelling software.
Roadside equipment	All on-street hardware to direct traffic and provide sequencing to the road users.
Site conditions	Physical conditions of the proposed area of the schemes to be considered as part of the design stage.
System software	A type of computer programme that is designed to run a computer's hardware and application programmes.
Traffic control equipment	Equipment used in connection with the signals (including the content of all instructions stored in, or executable by, that equipment). NOTE: Examples of associated equipment can include communication devices.
Traffic signalling systems	The combination of traffic signalling equipment and/or traffic control equipment, associated software, hardware and data.
Traffic signalling engineer	A person with specialist skills, knowledge and experience for the design and commissioning of traffic signalling equipment.
Traffic signalling equipment	All items of hardware installations which operate together and indicate to users to proceed with safety at road traffic junctions against relevant diagrams of the Traffic Signs Regulations and General Directions TSRGD SI2016 No.362 [Ref 7.N].

Terms (continued)

Term	Definition
Traffic signalling installations	Permanent traffic signalling equipment at prescribed locations as defined in the Traffic Signs Regulations and General Directions TSRGD SI2016 No.362 [Ref 7.N] on all purpose trunk roads. NOTE: Examples of locations include junctions, emergency vehicle stations, level crossings, airports, tunnels, swing/movable bridges and signalised crossings.
Vulnerable users	The user of the traffic signalling junction, the amount of protection required within the design and the capability of those users to be able to use the traffic signalling elements.

1. Scope

Aspects covered

1.1 This document outlines traffic signalling installation design requirements that shall be implemented on all new or modified traffic signalling installations.

Implementation

1.2 This document shall be implemented forthwith on all schemes involving traffic signalling installations on the Overseeing Organisations' motorway and all-purpose trunk roads according to the implementation requirements of GG 101 [Ref 3.N].

Use of GG 101

1.3 The requirements contained in GG 101 [Ref 3.N] shall be followed in respect of activities covered by this document.

2. General requirements

Electrical work

2.1 All electrical work must comply with 'The Electricity at Work Regulations [Ref 6.N].

2.2 All electrical work on traffic signalling systems shall comply with the Requirements for Electrical Installations. IET Wiring Regulations BS 7671 [Ref 4.N].

Security

2.3 Security threats to traffic signalling systems shall be mitigated in accordance with the requirements of Security of Network and Information Systems [Ref 5.N].

2.4 Where evident, security threats to traffic signalling systems shall be assessed, documented, mitigated and managed.

NOTE *Examples of security threats to traffic signalling systems can include compromised roadside equipment, in-station equipment and system software.*

2.5 Risk to the existing communications infrastructure by the introduction of new traffic signalling equipment shall be avoided.

2.6 A metal theft risk assessment shall be undertaken at the design stage.

2.6.1 Where a metal theft risk assessment highlights a risk, corresponding measures should be put in place to provide protection to the infrastructure against the risk of theft or damage.

Legislative

2.7 The design of the traffic signalling installation must meet the requirements of the Traffic Signs Regulations and General Directions TSRGD SI2016 No.362 [Ref 7.N].

2.8 The design of the traffic signalling installation shall meet the requirements of the Traffic Signs Manual TSM [Ref 2.N].

3. General design

Design brief

3.1 In order to identify and confirm the expected outcomes of the traffic signals installation(s), a consultation with the Overseeing Organisation shall be arranged.

3.1.1 As part of the consultation, the overall objectives and benefits from carrying out the traffic signalling installation should be defined.

NOTE *Example objectives and benefits of a traffic signalling installation can include journey time reduction, improved safety benefits, improved accessibility.*

3.2 The extent of the brief for the traffic signalling installation(s) to be undertaken shall be approved with the Overseeing Organisation and recorded.

3.2.1 A design file for the traffic signalling installation should be established with the Overseeing Organisation.

NOTE *The responsibilities for ownership of the design file are in line with Construction, Design and Management (CDM) regulations S.I. 2015 No.15 [Ref 1.I] throughout the life-cycle of the scheme.*

3.2.2 All aspects associated with the design and implementation process of traffic signalling installations should be agreed with the Overseeing Organisation.

NOTE *Agreeing the extent of the brief with the Overseeing Organisation ensures effective planning.*

3.3 Consultation with the adjacent authorities to the traffic signalling installation(s) shall be carried out.

3.3.1 The consultation with the adjacent authorities to the traffic signalling installation should agree on the following points:

1) The need for the scheme.
2) Impact on the users and the community.
3) Benefits on the users and the community.
4) Alternative options/solutions.
5) Programme timescales.
6) Temporary works, including diversions.
7) Expected outcomes.
8) Planning consent.
9) Any links to the wider strategy.
10) Environmental impact.

NOTE *Consultation with the adjacent authorities to the traffic signalling installation can help to achieve design and installation acceptance.*

Site conditions

3.4 Site conditions shall be assessed prior to commencement of traffic signalling installation design and recorded in the design file.

3.4.1 Site conditions may be assessed by desktop study (reviewing previous reports), video surveys, site visit, ecological surveys, interview surveys, walking, cycling & horse-riding assessment and review, traffic counts and speed surveys.

3.4.2 An assessment of the surrounding environment should be performed to ensure the sensitivity of the landscape, heritage and local community are not detrimentally affected by the traffic signalling installation design.

NOTE 1 *An assessment of the surrounding environment can be achieved through a desktop study of the area and a risk assessment.*

NOTE 2 *A video survey to review traffic and other user behaviours is an example of an assessment of the surrounding environment.*

3.4.3 The compatibility of traffic control equipment with existing traffic signalling installations that are being modified should be determined.

NOTE *Traffic control equipment can include bus priority systems, CCTV and variable message signs (VMS).*

3.4.4 Modifications to existing traffic signalling installations, records of junction history, previous assessments and any known issues should be reviewed.

Control strategy

3.5 The traffic signalling installation design shall define a control strategy.

3.5.1 To determine the optimal control strategy, location of the site, other existing signals, road speed and junction type should be assessed by undertaking appropriate modelling.

3.5.2 Determination of the optimal control strategy may be discussed with the Overseeing Organisation.

3.5.3 The chosen control strategy should take into account the compatibility with existing traffic signalling equipment in order to optimise functionality and performance.

3.6 The detection method shall be selected as part of the traffic signalling system design.

NOTE 1 *The accessibility of the site and the chosen detection method can have an impact on the safety of the maintenance operatives.*

NOTE 2 *Site conditions, such as adjacent vegetation growth, can impact on the chosen detection method.*

NOTE 3 *Detection methods can be below or above ground.*

Reserve capacity

3.7 Overall junction reserve capacity shall be a contributing factor for the chosen control strategy at the design stage to allow for future additional use.

3.7.1 The potential reserve capacity provided in the chosen control strategy should be based upon local knowledge at the design stage.

NOTE *Known and planned future developments and improvement schemes can impact on reserve capacity.*

Design for maintenance and inspection

3.8 The traffic signalling installation design shall promote and enable safe site maintenance and inspection.

NOTE 1 *The maintenance and inspection requirements can inform the design of the traffic signalling installation.*

NOTE 2 *The regimes of equipment manufacturers can be used to inform the design of the traffic signalling installation.*

Equipment

3.9 Traffic signalling equipment shall be in accordance with the Traffic Open Products And Specifications (TOPAS) requirements [Ref 8.N].

NOTE *Traffic signal displays, road markings and variable message signs, in legal terms, are 'traffic signs' and subject to the TSRGD SI2016 No.362 [Ref 7.N].*

3.10 Traffic signalling equipment shall be selected to maintain performance, in accordance with equipment specifications, throughout its life-cycle.

3.10.1 Maintenance schedules should be assessed to ensure the performance of the traffic signalling equipment is suitable for the environment in which it is installed.

3.11 The components of the traffic signalling equipment shall be compatible with the traffic control equipment for each installation.

3.11.1 For modifications to existing installations, new traffic signalling equipment should be compatible with the existing installation.

Traffic signal interaction with walkers, cyclists and horse-riders

3.12 Traffic signalling installations with pedestrian facilities shall be designed to make provision for disabilities and specific age groups (elderly and children) in accordance with the Public Sector Equality Duty of [Ref 1.N].

3.13 An assessment shall be made at the design stage as to whether the interaction of the traffic signalling installation with walkers, cyclists and horse-riders is needed.

3.14 Where the interaction of walkers, cyclists and horse-riders affects the traffic signalling installation, the requirements of HD 42 [Ref 9.N] shall be met.

NOTE *Traffic signalling installation measures to make provision for disabilities and specific age groups can include tactile indicators, audible signals, dropped kerbs and tactile paving.*

Connection to public transport systems

3.15 Public transport systems that have an impact, or can be impacted, by the traffic signal installation shall be identified for integration to the system at the design stage.

3.15.1 The integration of the traffic signalling system to public transport systems should include priority measure, location and access to boarding.

Remote monitoring

3.16 All traffic signalling installations shall include a method of remote monitoring.

3.17 The traffic signalling installations shall enable the Overseeing Organisation to remotely monitor the status of the installation.

3.18 The chosen method of remote monitoring the traffic signalling installation shall allow operational and fault reporting to be achieved.

NOTE *Operational and fault reporting of the traffic signalling installation can be achieved via mobile or fixed communication connection.*

Passive safety

3.19 The need for any passive safety elements within the traffic signalling installation, including any electrical isolation system, shall be reviewed at the design stage.

3.19.1 The risk factor for passive safety elements, based on severity and likelihood, should take into account the traffic signalling installation aspect arrangements and the wind speed for the area.

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 Stationery Office. UK Government. 'Equality Act 2010'
Ref 2.N	The National Archives. Department for Transport. TSM, 'Guidance. The Traffic Signs Manual'
Ref 3.N	Highways England. GG 101, 'Introduction to the Design Manual for Roads and Bridges'
Ref 4.N	BSI. BS 7671, 'Requirements for Electrical Installations, IET Regulations'
Ref 5.N	gov.uk. 'Security of Network and Information Systems'
Ref 6.N	gov.uk. 'The Electricity at Work Regulations 1989 (SI 1989/635) (as amended) (the Regulations)'
Ref 7.N	HM Gov. TSRGD SI2016 No.362, 'The Traffic Signs Regulations and General Directions'
Ref 8.N	http://www.topasgroup.org.uk/. 'Traffic Open Products and Specifications'
Ref 9.N	Highways England. HD 42, 'Walking, Cycling and Horse-Riding Assessment and Review'

5. Informative References

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

Ref 1.I	The National Archives. legislation.co.uk. S.I. 2015 No.15, 'HEALTH AND SAFETY - The Construction Design and Management (CDM) Regulations 2015'

Volume 8 home page

Control & Communications Technology
Design

TD 101
England National Application Annex to TD 101
Traffic signalling systems

Revision 0

Summary
There are no specific requirements for Highways England supplementary or alternative to those given in TD 101.

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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Volume 8 home page

Contents

Release notes

Version	Date	Details of amendments
0	Jun 2019	Highways England National Application Annex to TD 101.

Volume 8 home page

Department for Infrastructure
An Roinn Bonneagair

Control & Communications Technology
Design

TD 101
Northern Ireland National Application Annex to TD 101 Traffic signalling systems

Revision 0

Summary
This National Application Annex contains the Department for Infrastructure Northern Ireland specific requirements for the design of traffic signalling systems.

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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Volume 8 home page

Contents

Release notes

Version	Date	Details of amendments
0	Jun 2019	Department for Infrastructure Northern Ireland National Application Annex to TD 101.

Foreword

Publishing information

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

This document supersedes TA 12/07, TA 16/07, TA 56/87, TA 82/99, TA 84/06, TD 07/07, TD 24/97, TD 35/06, which are withdrawn.

Contractual and legal considerations

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

Introduction

Background

This National Application Annex contains the Department for Infrastructure, Northern Ireland specific requirements related to traffic signalling system design.

Assumptions made in the preparation of the document

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

Abbreviations

Abbreviations

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

NI/1. Traffic Signs Regulations Northern Ireland

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

NI/1.2 Where a clause in TD 101 refers to the Traffic Signs Regulations and General Directions (TSRGD [Ref 3.N]), the reference shall be replaced by the TSRNI [Ref 2.N].

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

NI/2. Normative References

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

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

Volume 8 home page

Control & Communications Technology
Design

TD 101
Scotland National Application Annex to TD 101 Traffic signalling systems

Revision 0

Summary
There are no specific requirements for Transport Scotland supplementary or alternative to those given in TD 101.

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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Volume 8 home page

Contents

Release notes

Version	Date	Details of amendments
0	Jun 2019	Transport Scotland National Application Annex for TD 101.

Volume 8 home page

Llywodraeth Cymru
Welsh Government

Control & Communications Technology
Design

TD 101
Wales National Application Annex to TD 101
Traffic signalling systems

Revision 0

Summary
There are no specific requirements for Welsh Government supplementary or alternative to those given in TD 101.

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: CustomerHelp@wales.gsi.gov.uk

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Volume 8 home page

Contents

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0	Jun 2019	Welsh Government National Application Annex to TD 101.

Volume 8 home page