VOLUME 8 TRAFFIC SIGNS AND ROAD LIGHTING
SECTION 2 TRAFFIC SIGNS AND ROAD MARKINGS

PART 2

TD 25/15

INSPECTION AND MAINTENANCE OF TRAFFIC SIGNS ON MOTORWAY AND ALL-PURPOSE TRUNK ROADS

SUMMARY

This Standard sets out the requirements and recommendations for the safety inspection and maintenance of permanent traffic signs on motorways and all-purpose trunk roads. It supersedes TD 25/01.

INSTRUCTIONS FOR USE

1. This document supersedes TD 25/01, which is now withdrawn.

2. Remove TD 25/01, which is superseded by TD 25/15 and archive as appropriate.

3. Insert TD 25/15 in Volume 8, Section 2, Part 2.

4. Archive this sheet as appropriate.

Note: A quarterly index with a full set of Volume Contents Pages is available separately from The Stationery Office Ltd.
Standing Order Service

Are you making full use of our standing order service?

The Standing Order Service is a free monitoring of the publications of your choice from over 4,000 classifications in 30 major subject areas. We send your books as they are published along with an invoice.

With a standing order for class 05.03.046 you can be supplied automatically with future titles for volume 8 or 05.03.052 for this and all other Roads and Bridges titles as they are published.

The benefits to you are:

- Automatic supply of your choice of classification on publication
- No need for time-consuming and costly research, telephone calls and scanning of daily publication lists
- Saving on the need and the costs of placing individual orders

We can supply a wide range of publications on standing order, from individual annual publications to all publications on a selected subject. If you do not already use this free service, or think you are not using it to its full capacity, why not contact us and discuss your requirements?

You can contact us at:

The Stationery Office
Standing Order Department
PO Box 29
St. Crispins
Duke Street
Norwich
Norfolk
NR3 1GN

Telephone 0333 202 5070; Fax 0333 202 5080
Online: www.toshop.co.uk

We look forward to hearing from you.
Inspection and Maintenance of Traffic Signs on Motorway and All-Purpose Trunk Roads

Summary: This Standard sets out the requirements and recommendations for the safety inspection and maintenance of permanent traffic signs on motorways and all-purpose trunk roads. It supersedes TD 25/01
<table>
<thead>
<tr>
<th>Amend No</th>
<th>Page No</th>
<th>Signature &amp; Date of incorporation of amendments</th>
<th>Amend No</th>
<th>Page No</th>
<th>Signature &amp; Date of incorporation of amendments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

July 2015
## REGISTRATION OF AMENDMENTS

<table>
<thead>
<tr>
<th>Amend No</th>
<th>Page No</th>
<th>Signature &amp; Date of incorporation of amendments</th>
<th>Amend No</th>
<th>Page No</th>
<th>Signature &amp; Date of incorporation of amendments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

July 2015
PART 2

TD 25/15

INSPECTION AND MAINTENANCE OF TRAFFIC SIGNS ON MOTORWAY AND ALL-PURPOSE TRUNK ROADS

Contents

Chapter

1. Introduction
2. Safety Inspection
3. Categorisation and Rectification of Defects
4. Maintenance
5. Removal or Replacement
6. Inventory and Records
7. References
8. Bibliography
9. Enquiries

Annexes

Annex A Northern Ireland Addendum
Annex B Examples of Retroreflective Sheeting Materials
Annex C Coefficient of Retroreflection Intervention Levels
Annex D Illustration of Key Structural Elements, Fixtures and Fittings
Annex E Examples of the Categorisation of Defects
Annex F Examples of Manufacturing Defects
Annex G Examples of Signs which are Subject to the Timescales Stated in the Traffic Signs Regulations
1. INTRODUCTION

General

1.1 This Standard sets out the requirements and recommendations for the safety inspection and maintenance of permanent traffic signs on motorways and all-purpose trunk roads. It supersedes TD 25/01, which is hereby withdrawn.

1.2 Variations to this document to cover national requirements in Northern Ireland are set out in the addendum at Annex A.

Scope

1.3 The scope of this Standard includes regulatory, warning, informative and directional traffic signs, together with associated equipment, in permanent use on motorways and all-purpose trunk roads. To the extent permitted by 1.6, the term, associated equipment, embraces all other items necessary to form a complete traffic sign installation. Examples of associated equipment include sign posts, lighting units and electrical installations.

1.4 The requirements for the safety inspection and maintenance of traffic signs are defined in this Standard in terms of the outcomes that are to be achieved.

1.5 Maintenance organisations must establish the processes, procedures and frequencies of the safety inspection and maintenance activities needed to deliver the specified outcomes.

1.6 The following are outside the scope of this Standard:

(i) Regulatory and variable message signs associated with light signals and within the scope of TD 24.

(ii) Structures within the scope of BD 63.

(iii) Lighting columns.

1.7 Traffic signs mounted on structures within the scope of BD 63 or lighting columns remain within the scope of this Standard.

Principles

1.8 Traffic signs perform a key role in communicating directions, warnings, regulations and other information to road users, and must therefore be maintained so that they facilitate the safe use and effective operation of the highway. Safety inspection and maintenance of traffic signs are necessary because:

(i) traffic signs are subject to legislation and their legal status, or that of an associated statutory provision, may be affected if there is a failure in the performance of a sign or associated equipment;

(ii) over-provision of traffic signs can have a negative visual impact on the environment and can have a negative impact on the comprehension of road users where there is an overload of information;

(iii) the visual performance of signs degrades over time, reducing conspicuity and legibility during daylight and the hours of darkness;
(iv) impairment of the visibility and legibility of signs can be detrimental to road safety by distracting road users and/or hindering drivers’ uptake of vital information;

(v) deterioration of supporting structures and electrical installations may occur, potentially becoming hazardous to road users, road workers and/or other parties; and

(vi) rectification of defects and, where appropriate, preventive maintenance are key to a traffic sign installation achieving its design life.

1.9 If further guidance on the reasons for maintaining traffic signs is required, reference should be made to Chapter 1 of the Traffic Signs Manual.

Implementation

1.10 This standard must be implemented in accordance with the implementation requirements of GD 01.

Definitions

1.11 “Traffic Signs Regulations” means the Traffic Signs Regulations and General Directions 2002, as subsequently amended or replaced.

2. SAFETY INSPECTION

General

2.1 The safety inspection of each traffic sign installation is necessary to identify defects which may affect safety or operational performance; to determine the overall condition of the asset; and to gather intelligence for use in determining the frequency of subsequent safety inspections.

2.2 The key elements to be included in the safety inspection of traffic signs are:

(i) visual performance;
(ii) structural integrity; and
(iii) electrical safety.

2.3 Safety inspections of each traffic sign must be undertaken periodically under both daytime and night-time conditions so that the outcomes mandated in this Section 2 are achieved. Where a specified outcome is not achieved, the defect(s) must be categorised and rectified in accordance with the requirements of Section 3.

2.4 The need for the removal or replacement of traffic signs must be identified and managed in accordance with the requirements of Section 5.

2.5 Information obtained and decisions made during safety inspections must be recorded in accordance with the requirements of Section 6.

Visual Performance

2.6 The visual performance of signs may be affected by:

(i) obscuration or obstruction caused by dirt, graffiti, posters, vegetation or other signs or structures;
(ii) loss, damage or fading of sign face material;
(iii) degradation in retroreflectivity or variances in retroreflectivity where a part of a sign has been replaced;
(iv) incorrect orientation of signs relative to users;
(v) incorrect vertical or horizontal alignment of the panels of a sign; or
(vi) a failure of internal or external illumination under night-time conditions.

2.7 Assessment of the visual performance of a sign must demonstrate that the following outcomes are being achieved:

(i) The minimum clear visibility distance for the type of sign is achieved when assessed under both daytime and night-time conditions, and in accordance with the relevant value given in Local Transport Note 1/94 (for directional and other worded signs) or the Traffic Signs Manual (for warning and regulatory signs).
(ii) All elements of the sign are legible when assessed under both daytime and night-time conditions.

(iii) Where required by the Traffic Signs Regulations, the sign is illuminated.

(iv) Where provided, all sign lighting units are functioning; are operating during the hours of darkness only; and are correctly aligned towards the sign face.

**Visual Performance – Visibility**

2.8 The assessment of minimum clear visibility distance may be undertaken from a moving vehicle at the prevailing traffic speed. If the minimum clear visibility distance cannot be estimated or particular defects affecting visibility cannot be identified from a moving vehicle, the assessment should be repeated during a site visit.

2.9 For a sign mounted on the nearside, clear visibility should be assessed from the centre of the nearest lane. For signs mounted on the offside of the road, visibility should be assessed from the centre of the closest lane to which the sign relates.

2.10 Visibility should not be impaired by any of the factors listed in 2.6 (i) during the assessment.

2.11 Additional assessments of visibility may be necessary during the spring and summer months when vegetation growth may obscure signs.

**Visual Performance – Legibility**

2.12 The assessment of legibility should replicate a road user travelling towards and reading a sign from the closest lane to which the sign relates. Assessment of legibility should begin from the relevant minimum clear visibility distance identified in section 2.7 (i), and continue to the point at which it would no longer be practicable for a driver to continue reading the sign.

2.13 Legibility should not be impaired by any of the factors listed in 2.6 (i) to (vi) (inclusive) during the assessment.

2.14 An evaluation of the extent to which colours have faded and there has been loss or damage to the legend should be included in the assessment of legibility. Any fading, loss or damage may significantly affect the contrast between different elements of the sign, and hence its legibility. The effects of fading, loss or damage may have a more significant impact on the legibility of a sign under night-time conditions.

2.15 Where degradation in the retroreflective performance of a sign or a part of a sign is suspected, the extent of the problem and the need for intervention should be ascertained by measuring the coefficient of retroreflection in accordance with 2.17 to 2.24 (inclusive).

2.16 Where the orientation of a sign is suspected of compromising legibility, the extent of the problem and the need for intervention should be ascertained by reference to Chapter 1 of the Traffic Signs Manual, which contains guidance on the correct orientation of traffic signs in relation to the carriageway.

**Visual Performance – Coefficient of Retroreflection**

2.17 The coefficient of retroreflection is a measure of the amount of light reflected by the retroreflective sheeting material used in the construction of a sign face. As a sign ages, its retroreflective performance will degrade at a rate determined primarily by the extent of exposure to environmental factors such as sunlight, moisture and pollutants.
2.18 For signs constructed in accordance with BS EN 12899-1, the measurement of the coefficient of retroreflection is only likely to be necessary seven years after installation for Performance Class RA1 materials or 10 years after installation for Performance Class RA2, R2 and R3B-UK materials. Earlier measurements may be required where:

(i) retroreflectivity is suspected of having degraded at a faster rate than assumed in this Standard; or

(ii) the sign has an overlay or coating for dew resistance or protection against graffiti which affects its retroreflective performance.

2.19 To assess the extent of degradation in the retroreflective performance, the coefficient of retroreflection of the white areas of each sign, including both original and replacement parts, should be measured.

2.20 The measurement of the coefficient of retroreflection should be carried out using a calibrated retroreflectometer with the settings adjusted to an observation angle of 20° and an entrance angle of +5°. The retroreflectometer should be held vertically and so that it is perpendicular to the sign face, and should be operated in accordance with the manufacturer’s instructions. Before the measurement is carried out, the sign face should be cleaned and the performance class of the retroreflective sheeting material under assessment should be identified.

2.21 Annex B provides examples for the identification of material performance classes where details are not available in the Overseeing Organisation’s asset management system or on the back of the sign.

2.22 The coefficient of retroreflection for colours other than white may be tested where:

(i) there are no white areas of a sign, or these are too small to be measured;

(ii) where a non-white element of a sign is suspected of having degraded at a faster rate than white or other areas of the sign; or

(iii) it is necessary to take a series of measurements to identify the performance class or approximate age of the material under test.

2.23 Where the coefficient of retroreflection of part of the sign is measured to be less than the relevant intervention level stated in Annex C, the sign should be considered to be defective.

2.24 Caution should be exercised in interpreting the measurement of the coefficient of retroreflection of a coloured area of a sign where the colour has faded (e.g., a red border fading to white). Under these circumstances, the coefficient of retroreflection may show an unwanted increase in retroreflectivity.

**Structural Integrity**

2.25 A failure of the structure supporting a sign may present a hazard to road users, road workers and other parties. A failure of the structure may also affect the visual performance of the sign.

2.26 The condition of the structure supporting a traffic sign must not present a safety hazard to road users, road workers or other parties.

2.27 The condition must be managed so that the life of each component of the structure is maximised.
2.28 All structural elements, fixtures and fittings must be present, serviceable and securely attached in accordance with the manufacturer’s installation and maintenance instructions.

2.29 Annex D illustrates the key structural elements, fixtures and fittings typically required for a post-mounted sign installation.

2.30 Common sources of failure in supporting structures include:

(i) insufficient foundations, demonstrated by excessive movement in the structure or the surrounding ground;

(ii) corrosion of sign posts or extension posts owing to damage, loss of material (concrete posts) or failure of protective measures;

(iii) cracking, buckling or leaning of passively safe sign posts;

(iv) missing or insecure clips, bands, bolts, washers or nuts;

(v) damaged channels, potentially caused by overtightening of bands or the nuts for clips, or the absence of washers;

(vi) missing or insecure panel butting clamps/plates or joints at the interfaces between panels;

(vii) missing post caps, leading to build-up of moisture and corrosion within the post;

(viii) missing or unsecured doors to recesses; and

(ix) seized door locks.

**Electrical Safety**

2.31 Electrical installations must not present a safety hazard to road users, road workers or other parties.

2.32 Safety inspection and testing of electrical installations must be conducted in accordance with the requirements and recommendations of BS 7671 – Requirements for Electrical Installations.

**Frequency of Safety Inspections**

2.33 The frequency and timing of the safety inspection of each traffic sign should be determined by means of risk assessment. Factors to be considered in the risk assessment should include:

(i) whether the sign is essential for safety (eg, a warning sign) or is necessary for the enforcement of a statutory provision;

(ii) whether the sign must be illuminated by a means of internal or external lighting during the hours of darkness to comply with the Traffic Signs Regulations or for adequate night-time visibility;

(iii) the interval since the previous safety inspection;

(iv) the status and condition of the components of each sign asset, as recorded at the previous safety inspection;
(v) the extent to which a sign installation is exposed to adverse weather conditions such as strong winds;

(vi) the proximity of vegetation which may obscure the visibility of a sign and/or affect the rate at which dirt or vegetation builds-up on the sign face;

(vii) seasonal growth in vegetation which may obscure the visibility of a sign; and

(viii) the proximity of the carriageway, which may affect the rate at which dirt builds-up.

2.34 The recommended maximum frequency between safety inspections is two years. Provided that each of the key elements listed in 2.2 is included in the safety inspection regime, this frequency may be achieved through a combination of on-site safety inspections, routine patrols, and mobile safety inspections using automated asset data collection technologies.

**Competency of Inspectors**

2.35 Maintenance organisations must ensure that inspectors of traffic signs are trained and competent in both the application of this Standard and the key factors which affect achievement of the specified outcomes.
3. CATEGORISATION AND RECTIFICATION OF DEFECTS

General

3.1 Traffic sign defects must be categorised and rectified in accordance with Table 1 and by taking into account the severity and likelihood of any risk to the safety of road users, road workers and other parties, and the effective operation of the highway.

Categorisation Guidance

3.2 Annex E provides examples of the categorisation of defects.

Warranties

3.3 Where a defect is attributable to a failure by a manufacturer, supplier or installer, any remaining warranty should be enforced where reasonably practicable.

3.4 Annex F provides examples of manufacturing defects that may be encountered.
<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>Typical Examples of Defects</th>
<th>Rectification Time</th>
</tr>
</thead>
</table>
| Critical   | A defect which requires prompt attention because it represents an immediate or imminent safety hazard, or there is a breach of statutory duty. | Failure to meet the outcomes described in paragraphs: 2.7 (visual performance for a regulatory or warning sign, or other signs where a partial or incomplete message is detrimental to road safety by distracting road users and/or hindering drivers’ uptake of critical information) 2.26 (structural safety) 2.31 (electrical safety) 2.27 (structural condition management) 2.28 (presence, serviceability and security of structural components, where the failure of one or more components does not represent an immediate or imminent safety hazard) | For a safety hazard:  
Make safe at time of identification or as soon as reasonably practicable thereafter.  
Temporary repair within 24 hours.  
Permanent repair within the timescales defined in the Overseeing Organisation’s contract with the maintenance organisation or, if no such requirements exist, 28 days.  
For a breach of statutory duty:  
Permanent repair as soon as reasonably practicable. |
| Non-Critical | All other defects.                                                           | Failure to meet the outcomes described in paragraphs: 2.7 (i), (ii) and (iv) (visual performance, other than for regulatory or warning signs, and where there is no immediate or imminent safety hazard) 2.27 (structural condition management) 2.28 (presence, serviceability and security of structural components, where the failure of one or more components does not represent an immediate or imminent safety hazard) | Permanent repair within 6 months.                                                                     |

**TABLE 1: CATEGORISATION AND RECTIFICATION OF DEFECTS**
4. MAINTENANCE

Sign Face Cleaning

4.1 Each sign must be cleaned on an “as required” basis, commensurate with the local environment and the rate at which dirt and/or vegetation builds-up on the sign face.

4.2 Sign faces can be damaged by inappropriate cleaning with abrasive materials. The cleaning recommendations of the sign face or retroreflective sheeting supplier must be followed to ensure that cleaning methods and materials do not cause damage to the sign face. The cleaning methodology must also be selected so that associated equipment, such as sign lights, is not damaged.

4.3 Particular care must be taken when cleaning signs that have a dew resistant overlay or coating. Unless permitted by the manufacturer’s instructions, detergents, abrasive sponges, high pressure water jets or brushes must not be used to clean a sign with a dew resistant overlay or coating. When such signs require cleaning and in the absence of manufacturers’ instructions, only clean water from a low pressure hose must be used.

4.4 Loss of legibility and permanent damage to sign faces occur if cleaning is not carried out at sufficiently frequent intervals. Table 2 provides recommended maximum intervals for the cleaning of signs in different circumstances, subject to the additional guidance in 4.5.

<table>
<thead>
<tr>
<th>Sign Location</th>
<th>Recommended Maximum Interval between Cleaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signs mounted at height (e.g., on gantries)</td>
<td>6 years *</td>
</tr>
<tr>
<td>Other signs</td>
<td>3 years *</td>
</tr>
</tbody>
</table>

* Subject to reduction where the circumstances described in 4.5 apply.

TABLE 2: RECOMMENDED MAXIMUM INTERVALS BETWEEN CLEANING

4.5 Maintenance organisations should identify the signs that require cleaning more frequently than others to maintain legibility including those where:

(i) the close proximity of vegetation or persistent shading results in increased build-up of vegetation on the sign face; and

(ii) the low mounting height of the sign or a tunnel environment may result in increased build-up of dirt.

4.6 Where practicable, sign cleaning should be programmed as part of other works to make best use of temporary traffic management.

Mechanical Signs

4.7 Mechanical elements of signs, such as rotating prism-type variable message signs, should be serviced and maintained in accordance with the requirements of the manufacturer’s operation and maintenance manual.
Sign Post Maintenance

4.8 Maintenance organisations should identify the need for sign post maintenance through the safety inspections described in Section 2. Required preventive maintenance may include the repainting of posts and the restoration of protective measures.
5. REMOVAL OR REPLACEMENT

General

5.1 The removal or replacement of a sign will be necessary when its performance has deteriorated beyond repair. Factors leading to removal or replacement include:

(i) loss, damage or fading of sign face material so that the sign is no longer legible;

(ii) degradation in retroreflective performance so that coefficient of retroreflection measurements are below the intervention levels given in Annex C;

(iii) an irreparable structural defect; or

(iv) theft of key components.

5.2 The removal or replacement of a sign will also be necessary if the sign is obsolete. A sign may be obsolete or become obsolete if, for example:

(i) there is no longer a clear need for the sign or the information on the sign is incorrect;

(ii) the sign is no longer prescribed in the Traffic Signs Regulations;

(iii) the sign is not prescribed in the Traffic Signs Regulations and has not been specially authorised by the Secretary of State, Scottish Ministers or the Welsh Government;

(iv) the sign does not align with the terms of the statutory provision, which has caused it to be placed on the highway;

(v) it is a temporary sign, subject to removal in the timescales given in the Traffic Signs Regulations.

5.3 Installations, such as sign posts, which are no longer associated with a sign must be removed so that they do not present a hazard to road users, road workers or other parties, or an unlawful obstruction of the highway.

Proposals for Removal and/or Replacement

5.4 Maintenance organisations must identify the need for the removal or replacement of signs and unused sign infrastructure, and must submit proposals for the works to the Overseeing Organisation as soon as reasonably practicable after the need is identified.

5.5 The need for the removal or replacement of signs and unused sign infrastructure should be identified through the safety inspections described in Section 2 and via observations made while the maintenance organisation carries out its other day-to-day responsibilities.

5.6 In developing proposals for sign removal or replacement, consideration should be given to whether:

(i) adjacent signs may be combined to reduce sign clutter;

(ii) replacement of lighting units is necessary if a sign is not required to be illuminated by means of internal or external lighting to comply with the Traffic Signs Regulations or for adequate night-time visibility;
(iii) the information shown is up-to-date; and

(iv) a sign is part of a wider signing strategy.

5.7 The ongoing legitimacy of some signs is subject to the timescales given in the Traffic Signs Regulations. Annex G provides examples of such signs.
6. INVENTORY AND RECORDS

Inventory

6.1 Each traffic sign should be assigned an identification number or code which uniquely identifies the asset from other traffic sign assets. The same number or code should be used to identify the asset in the Overseeing Organisation’s asset management system.

6.2 The identification number or code should be displayed on the sign installation. Any labelling should comply with the Traffic Signs Regulations with respect to placing of items on the backs of signs or on posts.

6.3 The Overseeing Organisation’s asset management system must be fully populated using the asset data arising from the safety inspection and maintenance of each sign.

6.4 Maintenance organisations must ensure that personnel engaged in the updating of the Overseeing Organisation’s asset management system are competent in the use of the system, and are able to demonstrate understanding of the meaning of the data being entered.

Records

6.5 Records of the safety inspection and maintenance of each traffic sign must be maintained, including all defects identified and details of any action taken or required.

6.6 Records of safety inspection and maintenance must be retained for a minimum of seven years. Retained records must be handed over to the Overseeing Organisation at the end of the maintenance organisation’s incumbency.

6.7 Any as-installed drawings must be updated within one month of a change which affects the information shown on the drawings.
7. REFERENCES

1. TD 24 – All-Purpose Trunk Roads Inspection and Maintenance of Traffic Signals and Associated Equipment (DMRB 8.1.1)

2. BD 63 – Inspection of Highway Structures (DMRB 3.1.4)

3. GD 01 – Introduction to the Design Manual for Roads and Bridges (DMRB) (DMRB 0.1.2)

4. The Traffic Signs Regulations and General Directions 2002 (as amended)


11. BS 7671 – Requirements for Electrical Installations
8. BIBLIOGRAPHY


9. ENQUIRIES

Approval of this document for publication is given by:

Highways England
Temple Quay House
The Square
Temple Quay
Bristol
BS1 6HA

M WILSON
Chief Highways Engineer

Transport Scotland
8th Floor, Buchanan House
58 Port Dundas Road
Glasgow G4 0HF

R BRANNEN
Director, Trunk Road and Bus Operations

Welsh Government
Transport
Cardiff
CF10 3NQ

S HAGUE
Deputy Director
Network Management Division

The Department for Regional Development
TransportNI
Clarence Court
10-18 Adelaide Street
Belfast BT2 8GB

PB DOHERTY
Director of Engineering

All technical enquiries or comments on this Standard should be sent to standards_feedback&enquiries@highwaysengland.co.uk.
ANNEX A  NORTHERN IRELAND ADDENDUM

In Northern Ireland, reference should be made to the Overseeing Organisation for the requirements for the safety inspection and maintenance of traffic signs.
ANNEX B  EXAMPLES OF RETROREFLECTIVE SHEETING MATERIALS

B1  Examples of Class RA1 material, BS EN 12899-1:2007, Table 3

B2  Examples of Class RA2 material, BS EN 12899-1:2007, Table 4

B3  Examples of Microprismatic Class R2 material, BS EN 12899-1:2007, Table NA.1

B4  Examples of Microprismatic Class R3B-UK material, BS EN 12899-1:2007, Table NA.2

NOTES:

1. Shows an Engineer Grade Prismatic (EGP) material which is subject to a European Technical Approval in accordance with clause 4.2 of BS EN 12899-1. The manufacturer has declared that the performance of the material is equivalent to Class RA1.
2. Further information about the sheeting materials in use on the highway may be sought from sheeting material manufacturers and/or suppliers of traffic signs.
## ANNEX C  COEFFICIENT OF RETROREFLECTION INTERVENTION LEVELS

**Geometry of measurements** | Coefficient of Retroreflection Invention Level by Colour (cd.lx⁻¹.m⁻²)
--- | ---
**Observation angle** | **Entrance angle** | **White** | **Yellow** | **Red** | **Green** | **Blue** | **Brown** | **Orange** | **Grey**
20' | +5° | 50 | 35 | 10 | 7 | 2 | 0.6 | 20 | 30 |
| | | 40 | 28 | 8 | 5.6 | 1.6 | 0.5 | 16 | 24 |
| | | N/A | (19.6) | (5.6) | (3.9) | (1.1) | (0.3) | (11.2) | (16.8) |

**NOTES:**
- Reference should be made to BS EN 12899-1: 2007 for supplementary details of the procedure to be followed in measuring the coefficient of retroreflection, including definitions of the observation angle and entrance angle.
- The minimum coefficient of retroreflection for each colour of a new sign is shown for information only in italics in the shaded area of the table.
- Intervention levels shown in bold represent 80% of the minimum coefficient of retroreflection for a new sign; the reduced intervention level in brackets is applicable to coloured areas of signs created by digital or screen printing, or using overlay film.
- Values derived from Table 3 of BS EN 12899-1:2007.

### TABLE C1: COEFFICIENT OF RETROREFLECTION INTERVENTION LEVELS – CLASS RA1

**Geometry of measurements** | Coefficient of Retroreflection Invention Level by Colour (cd.lx⁻¹.m⁻²)
--- | ---
**Observation angle** | **Entrance angle** | **White** | **Yellow** | **Red** | **Green** | **Dark Green** | **Blue** | **Brown** | **Orange** | **Grey**
20' | +5° | 180 | 120 | 25 | 21 | 14 | 14 | 8 | 65 | 90 |
| | | 144 | 96 | 20 | 16.8 | 11.2 | 11.2 | 6.4 | 52 | 72 |
| | | N/A | (67.2) | (14) | (11.8) | (7.8) | (7.8) | (4.5) | (36.4) | (50.4) |

**NOTES:**
- Reference should be made to BS EN 12899-1: 2007 for supplementary details of the procedure to be followed in measuring the coefficient of retroreflection, including definitions of the observation angle and entrance angle.
- The minimum coefficient of retroreflection for each colour of a new sign is shown for information only in italics in the shaded area of the table.
- Intervention levels shown in bold represent 80% of the minimum coefficient of retroreflection for a new sign; the reduced intervention level in brackets is applicable to coloured areas of signs created by digital or screen printing, or using overlay film.
- Values derived from Table 4 of BS EN 12899-1:2007.

### TABLE C2: COEFFICIENT OF RETROREFLECTION INTERVENTION LEVELS – CLASS RA2
### Geometry of measurements

<table>
<thead>
<tr>
<th>Observation angle</th>
<th>Entrance angle</th>
<th>White</th>
<th>Yellow</th>
<th>Red</th>
<th>Green</th>
<th>Dark Green</th>
<th>Blue</th>
<th>Brown</th>
<th>Orange</th>
<th>Grey</th>
</tr>
</thead>
<tbody>
<tr>
<td>20’ +5°</td>
<td></td>
<td>180</td>
<td>120</td>
<td>25</td>
<td>21</td>
<td>14</td>
<td>14</td>
<td>8</td>
<td>65</td>
<td>90</td>
</tr>
<tr>
<td>N/A</td>
<td></td>
<td>144</td>
<td>96</td>
<td>20</td>
<td>16.8</td>
<td>11.2</td>
<td>11.2</td>
<td>6.4</td>
<td>52</td>
<td>72</td>
</tr>
</tbody>
</table>

### Notes:

- Reference should be made to BS EN 12899-1: 2007 for supplementary details of the procedure to be followed in measuring the coefficient of retroreflection, including definitions of the observation angle and entrance angle.
- The minimum coefficient of retroreflection for each colour of a new sign is shown for information only in italics in the shaded area of the table.
- Intervention levels shown in bold represent 80% of the minimum coefficient of retroreflection for a new sign; the reduced intervention level in brackets is applicable to coloured areas of signs created by digital or screen printing, or using overlay film.
- Values derived from Table NA.1A of BS EN 12899-1:2007.

### Table C3: Coefficient of Retroreflection Intervention Levels – Class R2

<table>
<thead>
<tr>
<th>Geometry of measurements</th>
<th>Coefficient of Retroreflection Invention Level by Colour (cd.lx⁻¹.m⁻²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation angle</td>
<td>White</td>
</tr>
<tr>
<td>20’ +5°</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td>240</td>
</tr>
<tr>
<td>N/A</td>
<td>(109.2)</td>
</tr>
</tbody>
</table>

### Notes:

- Reference should be made to BS EN 12899-1: 2007 for supplementary details of the procedure to be followed in measuring the coefficient of retroreflection, including definitions of the observation angle and entrance angle.
- The minimum coefficient of retroreflection for each colour of a new sign is shown for information only in italics in the shaded area of the table.
- Intervention levels shown in bold represent 80% of the minimum coefficient of retroreflection for a new sign; the reduced intervention level in brackets is applicable to coloured areas of signs created by digital or screen printing, or using overlay film.
- Values derived from Table NA.1B of BS EN 12899-1:2007.

### Table C4: Coefficient of Retroreflection Intervention Levels – Class R3B-UK
ANNEX D  ILLUSTRATION OF KEY STRUCTURAL ELEMENTS, FIXTURES AND FITTINGS

Caps fitted to all posts/supports with hollow sections

Rear of sign

Panels aligned horizontally and vertically at interface

Clips fitted at each interface between a channel and a support (see Note 2)

Panels aligned horizontally and vertically at interface

Sign posts/supports upright with no excessive movement evident in the structure or adjacent ground

Vertical interfaces between panels

Joints (see Note 3)

D1.1 (Above) Illustration of the rear of a sign showing a complete set of clips, panel butting clamps/plates and post caps.

D1.2 (Left) Illustration of part of the rear of a sign showing joints installed at vertical interfaces between panels to fasten the panels together (for the clarity of the illustration, the clips and butting clamps/plates are not shown).
NOTES:

1. This annex describes one way of installing a traffic sign on sign posts so that the installation is structurally sound. The example reflects the most common type of sign mounting arrangement found in the United Kingdom.

2. Appropriately sized clips are attached at each point where a channel, which is designed to accept a clip, square head bolt, nut and washer, crosses a support. The washer is placed between the nut and the clip. The nut is tightened to the torque recommended by the clip supplier to secure the clip to the sign and to the support. Where a torque setting is not specified, the nut is made tight plus a ¼ turn.

3. The individual panels of multi-panel signs are secured together using butting plates or clamps, and, where required, joints at vertical interfaces.

4. The following are outputs of design activities carried out in accordance with BS EN 12899-1 by the manufacturer, supplier, installer and/or consultant to meet the structural performance specified or required by the Overseeing Organisation:

   • post/support type and configuration;
   • foundation type and configuration;
   • the design or selection of the sign substrate;
   • the design or selection of channels and their configuration/spacing; and
   • the design or selection of clips; butting clamps/plates; joints at vertical interfaces; and associated fixings including nuts, bolts and washers.

   Where it is necessary to verify the structural soundness of the above aspects of a sign installation, reference should be made to the installation instructions provided by the manufacturer, supplier, installer and/or consultant, and the declared performance of the installation with respect to BS EN 12899-1.

5. Stainless steel banding is typically suitable for attaching smaller signs to irregular support sizes or shapes such as lighting columns. In all other situations, the appropriate size clip is used.
ANNEX E  EXAMPLES OF THE CATEGORISATION OF DEFECTS

E1  Examples of Critical Defects

E1.1  Partially detached sign panel presenting an immediate hazard to road users.

E1.2  Sign panel with damaged channels and detached post clip, presenting an imminent hazard to road users.

E1.3  Damaged enclosure allowing rain water access to live electrical components.

E1.4  Sign post subject to corrosion and collapse, presenting an imminent hazard to road users.
E1.5 Regulatory sign to diagram 616 is illegible, having faded significantly.

E1.6 Loss and fading of sign face material rendering warning sign illegible.

E1.7 Mis-alignment of unsecured sign panels, rendering sign illegible at critical decision-making point.

E1.8 Significant obscuration of sign by vegetation when viewed from minimum clear visibility distance. Obscuration may result in late lane changing.

E1.9 Structural integrity significantly affected by three missing post clips and absence of panel butting plates.

E1.10 Damaged and unused sign posts, presenting an unlawful obstruction of the highway.
E1.11 Incomplete installation of a passively safe post, allowing movement of the post. This type of post is also subject to a manufacturer’s safety notice requiring the installation of sharp grit between the sleeve and the post.
E2  Examples of Non-Critical Defects

E2.1 Significant dirt and/or vegetation build-up, affecting legibility, particularly at night.

E2.2 Sign misaligned; degradation and dirt visible on the upper sign under illumination (two defects).

E2.3 Dirty bollard and sign to diagram 610.

E2.4 Dirt build-up on sign face and damage to panel, affecting orientation (two defects).

E2.5 Day-burning lighting unit with one bulb failed (two defects).

E2.6 No post caps.
E2.7 Degradation of sign face material (beyond repair)
ANNEX F  EXAMPLES OF MANUFACTURING DEFECTS

F1  Examples of Manufacturing Defects

F1.1  Shrinking of overlay material revealing the white reflective material below.

F1.2  Cracking of overlay material.
ANNEX G

EXAMPLES OF SIGNS WHICH ARE SUBJECT TO THE TIMESCALES STATED IN THE TRAFFIC SIGNS REGULATIONS

G1 Examples of Signs which “cease to have effect” in the Timescales Stated in the Traffic Signs Regulations

G1.1 Direction sign with blue border.

G1.2 Services sign prescribed in the 1994 version of the Traffic Signs Regulations.

G2 Examples of Temporary Signs to be Removed within the Timescales Stated in the Traffic Signs Regulations

G2.1 Temporary sign to diagram 7014 subject to removal within three months of the completion of works to construct the new road layout.

G2.2 Temporary sign to diagram 2701.1 to be removed within six months of the completion of the housing development to which it refers.