

Specification for Above Ground On- Crossing Pedestrian Detection Systems

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REGISTRATION OF AMENDMENTS

| Amend No | Page No | Signature & Date of Incorporation of Amendments | Amend No | Page No | Signature & Date of Incorporation of Amendments |
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TR 2179B**SPECIFICATION FOR ABOVE GROUND ON-
CROSSING PEDESTRIAN DETECTION
SYSTEMS****Contents****Chapter**

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1 INTRODUCTION

General

1.1 This specification supersedes TR 2179A from the date of issue.

1.2 The Traffic Signs Regulations and General Directions (TSRGD) provides legislation for the conveyance of instructions to the road user by the use of traffic signals in the UK, apart from Northern Ireland which is covered by "Traffic Signs Regulations (Northern Ireland) 1997".

1.3 The TSRGD specifies the requirement for Statutory Type Approval of traffic control equipment (see Chapter 2 Regulations). For ease of reference this will be referred to as 'Approval' throughout this specification.

1.4 All equipment supplied to this specification shall comply, where appropriate and where relevant to the detector technology used, with all the relevant statutory requirements and specifications.

1.5 All microwave equipment approved to this specification shall meet the Department of Trade and Industry (DTI) Radio Communication Agency Performance Specification MPT 1349 (Specification entitled Transmitters and Receivers for the use in the Microwave Band allocated to low power devices).

1.6 The equipment defined in this specification is intended for use in connection with traffic signal control equipment. Its purpose is to detect the presence of people on a pedestrian crossing in order to adjust the traffic signal timings. The detection system may comprise more than one sensor.

1.7 The detection system defined in this specification is a crucial part of a crossing as defined in the Zebra, Pelican and Puffin Pedestrian Crossing Regulations and General Directions 1997, and other approved nearside signal facilities. The "limits of crossing" (between the crossing studs) is 4 metres.

1.8 Where detection is required between "limits of crossing" of 4 to 10 metres (see Figure 3.1), guidance should be sought from the Approval Authority.

1.9 Advice on the provision of above detection equipment is given in the Traffic Advisory Leaflets issued by DTLR (Department of Transport Local Government and Regions).

Scope

1.10 This specification details the functional requirements for above ground on-crossing detection systems designed to detect people crossing at Puffin, Toucan, pedestrian facilities at signalised traffic junctions and at any other authorised crossing facility.

1.11 The specification outlines the zones of detection, target size, speeds, reliability of operation, output conditions required to interface to the signal controller, functional testing requirements and the Regulations and Standards that must be met by the design authority of the equipment.

1.12 This specification details the functional, constructional, environmental and EMC requirements for the detection equipment.

Implementation

1.13 This specification shall be implemented from the date of issue. All new Approvals will be conducted against this specification from that date.

1.14 Existing Approvals issued against TR 2179A will remain valid.

1.15 Any comments or enquiries relating to this document should be addressed to:

Highways Agency
Traffic Control Systems and Lighting Team
c/o Plans Registry
Temple Quay House
2 The Square
Temple Quay
Bristol
BS1 6HA

Email: tss_plans_registry@highways.gsi.gov.uk

2 REGULATIONS

2.1 The product shall comply with all relevant statutes in force at the time of supply, and particular attention is drawn to those implementing European Directives.

2.2 Any requirement of the specification for goods or materials must be made in accordance with the general introduction and clauses 104 and 105 of Volume 1 of the Specification for Highways Works.

Approval

2.3 Equipment manufactured to this Standard will require to be Statutory Type Approved (hereafter referred to as Approval) before it may be operated on public roads within the United Kingdom.

Procedures for Statutory Type Approval

2.4 Details of the Approval procedure may be found in Highways Agency standard TRG 0500.

2.5 TRG 0500 details the relationship between the UK Approval and EC Standards Certification.

2.6 Any anomalies or interpretation of requirements of this standard must be resolved with the Approval Authority.

Applications for Approval

Applications for Approval of equipment or any queries regarding such Approval should be addressed to:

Traffic Systems and Signing Division
Highways Agency
Temple Quay House
2, The Square
Temple Quay
Bristol
BS1 6HA
England

Authorisation

2.7 In the UK, apart from Northern Ireland, any symbols to be displayed on a signal or sign that are not prescribed in the TSR&GD are authorised by the Department for Transport, Local Government and the Regions (DTLR). In Northern Ireland a similar function is performed by the Department for Regional Development.

3 FUNCTIONAL REQUIREMENTS

General

3.1 The function of the detection system is to respond to people crossing the carriageway.

3.2 The detection system shall cover the detection zones as required by Figure 3.1. The dimensions and shape of the zones shown are for test purposes only.

3.3 The detection system shall also detect vehicles, in the 'must detect zone', during the vehicle signal stage/phase, to verify the operational state of the detection system. See 3.13.

3.4 For the purpose of this specification a minimum sized person is defined as having a height greater than or equal to 1 metre, width 0.5 metre, depth 0.2 metres, mass of 20Kg and with the form and dynamic properties of a walking average five year old child.

3.5 The requirements of 3.4 must include a person seated in a wheelchair or pushchair.

3.6 For the purpose of this specification a maximum sized person is defined as having a height of at least 2.0 metres, width of 0.75 metres, depth of 0.35 metres, mass of 80Kg and with the form of a walking adult.

3.7 The detection system shall respond correctly to both cyclists and pedestrians dressed in a worst case condition relevant to the detector technology used and in a manner appropriate to the normal range of UK weather, including fog, and at all times of day or night.

Detection Zones

3.8 Tolerances of detection zones have been allowed for by the inclusion of a 'may detect zone' as shown in Figure 3.1.

Must Detect Zone

3.9 The dimensions of the 'must detect zone' declared by the equipment supplier shall fall between the maximum and minimum dimensions which are defined in Figure 3.1.

3.10 The detection system shall be capable of detecting targets in any part of the maximum sized zone by configuration and/or adjustment. This configuration shall be user definable.

3.11 A continuous detect condition output, from the detection system, shall be maintained when a minimum sized person crossing is detected moving towards or away from the kerb, either perpendicularly or diagonally, in the 'must detect' zone.

3.12 The requirements of 3.11 shall be met when the minimum sized person crossing is moving perpendicularly to the kerb at speeds of:

- i) 0.5 metres per second.
- ii) 10 metres per second.

3.13 The detection system shall produce a detect condition for a motorcycle, or any other motor vehicle, moving parallel to the footway, at a speed greater than or equal to 10kph, in either direction through the 'must detect' zone.

May Detect Zone

3.14 The detection system may produce either a Detect or No Detect condition in this zone.

Must Not Detect Zone

3.15 The detection system shall not respond and shall provide a No Detect condition to maximum sized pedestrians, cyclists or vehicles in the 'must not detect' zone.

Output Conditions

3.16 The output from the detection system shall be either an open or a closed circuit which is DC isolated from its earth and power supplies. If a polarity sensitive solid state output is used, then internal protection against a reverse voltage, shall be provided.

Visual indication

3.17 An indicator showing the Detect condition shall be provided, which is visible from both the footway and the crossing, to enable the operation of the detector system to be verified.

3.18 In the No Detect condition, the output shall be a low resistance state in which the output shall continuously present a resistance of not greater than 50 ohms. Reasonable precautions shall be taken to protect the output against sustained voltage or current fault conditions.

3.19 In the Detect condition, the output shall be a high resistance state in which the output shall continuously present a resistance of at least 100 Kohms. The output must be able to withstand 50 volts DC across it continuously. This condition is specified with the output relay de-energised.

Failure Conditions

3.20 A failure of the power supply to the detection system, or any sensor, shall after an interval not exceeding ten seconds, automatically produce a Detect condition.

3.21 The equipment shall regain its operational performance, as required by this specification, within ten seconds of restoration of the power supply.

Mutual Interference

3.22 The detection system shall not affect, or be affected by, the operation of another similar equipment when correctly mounted and operated in the following positions:

- i) back to back with the housings 25 ± 10 mm apart;
- ii) at right angles with the backs of the housings 25 ± 10 mm apart;
- iii) face to face up to 20m apart;
- iv) side by side up to 10m apart, facing the same direction.

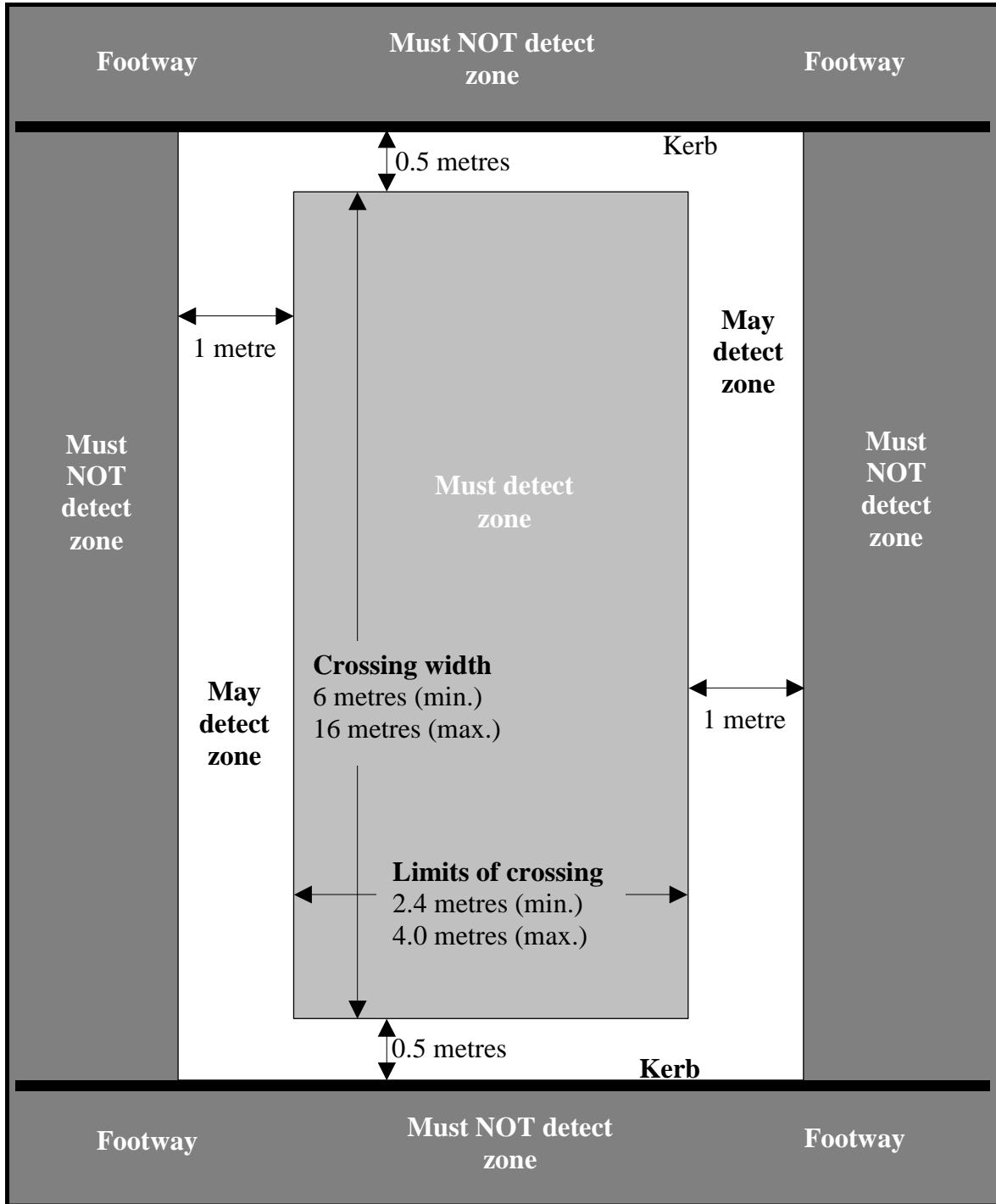


Figure 3.1
"On-Crossing" Zone of Detection

Functional Testing

3.23 The objective of the functional testing is to prove compliance with the Functional Requirements.

3.24 Compliance with the performance requirements will require evidence of the target(s) used. (3.4 to 3.6).

3.25 Test conditions shall represent the worst case conditions for the technology used, as required by 3.7. The manufacturer shall provide evidence to support this worst case requirement.

3.26 The test area shall extend beyond the may detect zone to provide a must not detect zone. This should surround the entire may detect zone and should have the dimension shown in Figure 3.1.

3.27 The test area shall be representative of the worst case road surface for the technology used.

3.28 The test area shall be arranged in 0.4 metre strips along the width and length of the area under test to form a grid of 0.4 metre squares.

3.29 The strips forming the width shall be lettered and the strips forming the length of the test area shall be numbered.

3.30 The detection system shall be configured/adjusted for each 0.4 metre length of the 'must detect' zone between 6 and 16 metres.

3.31 Test grid areas shall be completed to indicate either by a tick or a cross, the detect or no detect conditions (see 3.25 and 3.26) for targets moving through each square as required by:

- i) Pedestrian(s) and Cyclist(s) (3.12)
- ii) Motorcycle (3.13)
- iii) Pedestrian(s) and Cyclist(s) (3.15)

3.32 Video evidence shall be provided to support the documents produced by 3.31. The video image must show the moving targets together with a visual indication of the corresponding detection system output condition.

4 SAFETY AND RELIABILITY

Reliability

4.1 The pedestrian and cyclist detection system shall have a MTBF (Mean Time Between Failure) prediction figure of greater than or equal to 20,000 hours in continuous operation.

4.2 The data contained in MIL-HDBK 217 shall be used (where applicable) for reliability prediction.

5 ELECTRICAL REQUIREMENTS

5.1 If the detectors are fitted with plugs, then they shall be a Bulgin Buccaneer type plug, Series PX0728/P 9 Pole (or equivalent) with connection designations as in Table 5.1:

| CONTACT | CIRCUIT | CORE COLOUR |
|---------|--------------|--------------|
| PIN 1 | 24V | RED |
| PIN 2 | 24V | BLACK |
| PIN 3 | EARTH/SCREEN | GREEN/SCREEN |
| PIN 4 | COMMON | WHITE |
| PIN 5 | OUTPUT | YELLOW |
| PIN 6 | SPARE | BLUE |
| PIN 7 | SPARE | VIOLET |
| PIN 8 | SPARE | ORANGE |
| PIN 9 | SPARE | PINK/BROWN |

Table 5.1
Bulgin Plug Pin Designations

NOTE: In the power on, no detect condition. the output (Pin 5) is Closed circuit with respect to Common (Pin 4). In the detect condition the output changes to open circuit with respect to Common. (See 3.16 to 3.19)

5.2 Alternatively, the detector may be supplied with a flying lead made of cable generally in accordance with Def Stan 61-12 (Part 4) 7/0.2mm PVC insulated, overall braid screened, PVC sheathed (code 7/2/10C or equivalent). The terminated cable shall have a minimum length of 1 metre.

Power Supply

5.3 The detection system shall operate as required by this specification with a nominal 24 volt \pm 20% supply either AC (RMS, 50Hz) or DC.

Earthing

5.4 Fixed non-current carrying metal parts of the detector shall be bonded together and connected to earth. All electrical connections shall comply with the relevant sections of BS 7671 Regulations for Electrical Installations

6 ENVIRONMENTAL AND EMC PERFORMANCE

6.1 The detector housings shall be designed to at least meet a BS EN 60529 : 1992 IP rating of IP 56.

Environmental Testing

6.2 The detection equipment shall meet the environmental tests criteria defined in BS 7987:2001 (Harmonisation Document HD 638 S1) in agreement with the Approval authority for:

- i) Dry Heat – Class AB3 (+60° C).
- ii) Cold – Class AE2 (-15° C)
- iii) Damp Heat – Class AK2 (2 cycles)
- iv) Water Penetration – As required for IP56
- v) Random Vibration – Class AJ2 (2 hours in each of the 3 axes.)

NOTE: The Dry Heat and Cold tests may be replaced by the Change of Temperature Test.

EMC Requirements

6.3 The equipment shall be designed to avoid the production of undue electromagnetic interference and to have immunity from external electromagnetic interference.

6.4 Proof of conformity shall be demonstrated by compliance with BS EN 50293.

7 CONSTRUCTION

General

7.1 The detector shall be constructed of materials that will withstand the rigours of the environment in which it is intended to operate. Chapter 6 Environmental and EMC Performance details the environmental tests which will demonstrate compliance.

7.2 The detector shall be contained within a housing that meets the EMC requirements in Chapter 6 Environmental and EMC Performance.

7.3 The housing of 7.2 shall be designed to have a minimum service life of 10 years, with appropriate maintenance.

7.4 The housing shall be coloured grey, black, brown, dark green or dark blue in accordance with the Zebra, Pelican and Puffin Pedestrian Crossings Regulations and General Directions 1997.

7.5 The housing shall be supplied with a fixing bracket as detailed below, which will permit a detector to be accurately aligned to satisfy the performance requirements.

7.6 The bracket shall be supplied with a locking arrangement capable of maintaining the alignment of a detector and should be designed to resist vandalism.

7.7 The manufacturer shall supply alignment procedures to permit maintenance staff to verify detector alignment on site.

Pole Mounting Arrangement

7.8 Three M6 x 10 mm tapped holes or M6 studs of length 15 to 30 mm, with fixing bolts or nuts, and shake proof washers shall be provided for fixing the housing, as shown in Figure 7.1.

7.9 Alternative mounting arrangements may be considered by the Approval Authority.

7.10 The detector(s) shall be mounted at a height no greater than 4 metres.

Connections

7.11 Connection requirements to the detectors are defined in Chapter 5 Electrical Requirements

7.12 All connections shall be clearly identified.

Marking and Labelling

7.13 The title, supply voltage and serial number of the equipment shall be clearly marked on the external surface of its housing.

7.14 All marks and labelling shall be in English or internationally agreed symbols.

7.15 All internal and external controls such as switches and electrical sockets, which are externally accessed, shall be clearly identified.

7.16 Markings shall maintain legibility throughout the life of the equipment in the specified environmental condition.

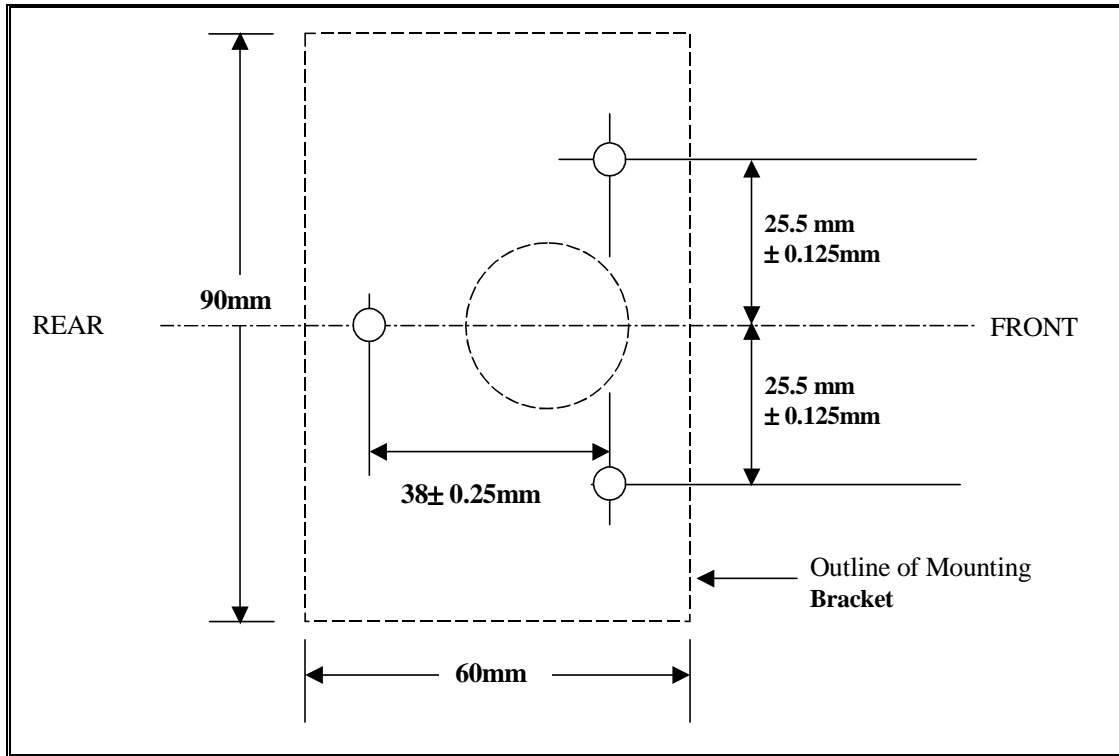


Figure 7.1

Pole Mounting Arrangement Showing Fixing Stud (Or Bolt) Locations On Base Of Detector

8 GLOSSARY

Definitions

For the purpose of this specification the following definitions shall apply.

Detect Condition: The state when a target is sensed.

Detection System: One or more sensors, configured to cover a specific area and provide a single output.

Detection Zone: An area of carriageway within which a person shall be detected by the detection system.

Limits of Crossing: The distance between the crossing studs as defined in The Zebra, Pelican and Puffin Pedestrian Crossings Regulations and General Directions 1997. (See also Figure 3.1.)

Equipment Supplier: The design authority and/or the provider of the detection system.

No Detect Condition: When no persons are sensed.

Cyclist: A person riding a bicycle.

People or Person Crossing: This is any authorised user of the crossing implied by this specification. (e.g. pedestrian, cyclist, equestrian etc.)

Puffin Crossing (Pedestrian User-Friendly INtelligent): A pedestrian signalled crossing that uses a nearside pedestrian signal and pedestrian detection to optimise signal timings.

Equestrian Crossing: A parallel signalled crossing facility designed for both pedestrians and riders on horseback.

Detector or Sensor: Device giving a signal for detection or measurement of a physical property to which it responds.

Signal Controller: An item of apparatus that is designed to control pedestrian and vehicular signals and their sequences.

Toucan Crossing: A signalled crossing designed for both pedestrians and cyclists implementing pedestrian detection to optimise signal timings.

Target: A person or dynamically equivalent object used for the purpose of testing.

Vehicles: Motor vehicles designed for use on the public highway.

Abbreviations

For the purpose of this specification the following abbreviations shall apply.

| | |
|--------------|--|
| DTI | Department of Trade & Industry |
| DTLR | Department of Transport Local Government & Regions |
| EMC | Electromagnetic Compatibility |
| MTBF | Mean Time Between Failures |
| TSRGD | Traffic Signs Regulations and General Directions |

9 REFERENCES

9.1 This specification incorporates by dated or undated reference, provisions from other publications. These normative references are cited at appropriate places in the text and the publications listed hereafter. For dated references, subsequent amendments to, or revisions of, any of these publications apply to this standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to apply.

British Standards

9.2 British Standards are published by the British Standards Institution, London.

Contact: +44 (0) 1344 404 429

| | |
|--------------|--|
| BS 7671 | Requirements for Electrical Installations |
| BS 7987:2001 | Road Traffic Signal Systems |
| BS EN 50293 | Electromagnetic Compatibility (Road traffic Signal Systems Product Standard) |
| BS EN 60529 | Specification for Degrees of Protection Provided by Enclosures (IP Code) |

Specifications

9.3 Specifications are published by the Highways Agency.

Contact: +44 (0) 117 372 8300

tss_plans_registry@highways.gsi.gov.uk

| | |
|----------|---|
| TRG 0500 | Statutory Approval of equipments for the Control of Vehicular and Pedestrian Traffic on Roads |
|----------|---|

Other Publications

| | |
|----------------------------|--|
| | Traffic Signs Regulations and General Directions |
| | Traffic Signs Regulations (Northern Ireland) 1997 |
| | Road Traffic Regulation Order 1997.(Northern Ireland) |
| | The Zebra, Pelican and Puffin Pedestrian Crossings Regulations and General Directions 1997 |
| | Volume 1 Specification for Highways Works |
| Def Stan 61-12 | Wires, Cords, and Cables, Electrical - Metric Units |
| | Part 4: Cables, Special Purpose, Electrical (Sub-Miniature Electric Cables) |
| MIL HDBK 217 | Reliability Prediction of Electronic Equipment |
| MPT 1349 (DTI Publication) | Specification entitled Transmitters and Receivers for the use in the Microwave Band Allocated to Low Power Devices |

10 HISTORY

Issue A November 1996
Issue B February 2002

Approval of this document for publication is given by the undersigned:

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