

Specification for Rising Bollards Control System

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REGISTRATION OF AMENDMENTS

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TR 2207A**SPECIFICATION FOR RISING BOLLARDS
CONTROL SYSTEM****Contents****Chapter**

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1 INTRODUCTION

General

1.1 This specification defines the functional and safety requirements for vehicle access restriction devices such as rising bollards.

1.2 The Traffic Signs Regulations and General Directions (TSRGD) provides UK legislation for the conveyance of instructions to the road user by the use of signals. UK legislation for the conveyance of instructions to the road user by the use of signs and signals is provided by the Traffic Signs Regulation and General Directions (TSRGD).

1.3 The TSRGD also specifies the requirement for Statutory Type Approval for traffic control equipment (Chapter 11).

1.4 Advice on the provision of this equipment is given in Traffic Advisory Leaflet 4/97.

Scope

1.5 This specification details the functional, constructional, environmental, optical and EMC requirements for bollard systems.

Implementation

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

1.7 Approvals previously issued against individual manufacturers specifications for this type of equipment will remain valid. Retrospective action against these approvals will not be mandatory.

Glossary

1.8 A glossary of terms is given in Chapter 10 Glossary.

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 GENERAL REQUIREMENTS

General

3.1 The control system shall provide controlled access by lowering the bollards only when requested by authorised vehicles or when operated manually.

3.2 Validation of an authorised vehicle may be achieved by equipment such as a 'swipe' card reader, vehicle tag/transponder based loop system, etc.

3.3 The control system shall incorporate a safety guard detector to prevent the bollards rising if obstructed by vehicles, bicycles, pushchairs, etc.

3.4 Entry/exit loops shall be provided either side of the bollards to ensure that they only rise after the safety guard detector has confirmed that they have remained clear of obstruction for a predetermined time to prevent the bollards rising under 'tailgating' vehicles.

3.5 Separate red and green indicators shall, where provided, be provided to indicate to vehicle drivers the status of the bollards i.e. fully retracted, about to rise or fully raised.

3.6 Interlocks shall be provided to prevent the controller from displaying indicators that conflict with the status of the bollards or with each other.

3.7 The control system shall incorporate facilities to monitor the operation of the indicators and bollards so that failure conditions can be detected and reported.

Date Dependency

3.8 Equipment manufactured to this specification shall be compliant with British Standards Institute document "A Definition of year 2000 conformity requirements" (DISC PD2000-1).

4 FUNCTIONAL REQUIREMENTS

Start-up Sequence

4.1 In the absence of mains power the bollards shall be in their fully retracted position with both indicators extinguished.

4.2 Upon switching the equipment on, or manually clearing a fault, the red indicator shall be illuminated and the bollards rise after a configurable delay. The system will then follow the operational sequence.

Operation Sequence

4.3 When a valid request for access is received, the controller shall lower the bollards.

4.4 During this period only the red indicator shall be illuminated.

4.5 Only when the bollards are fully lowered shall the red indicator be extinguished and the green indicator illuminated.

4.6 When the vehicle passing through the controlled zone is detected by the safety guard detector in 3.3, the green indicator shall be extinguished and the red indicator illuminated.

4.7 When the vehicle has passed through the controlled zone and vacated the exit loop, the bollards shall rise. If another vehicle is detected by the entry loop during this period, the red indicator shall remain illuminated and the bollards immediately retract.

4.8 If the presence of a vehicle, bicycle, pushchair, etc., is detected by the safety guard detector in 3.3 whilst the bollards are being raised, they shall immediately fully retract and the red indicators remain illuminated.

4.9 When obstruction is no longer present, the bollards shall rise. If the bollards become obstructed whilst being raised the sequence in 4.8 shall be repeated.

4.10 If, whilst the bollards are being raised, a valid request for access is received, the bollards shall immediately return to their fully retracted position and repeat the sequence from 4.5.

Manual Control

4.11 Facilities shall be provided to allow the bollards to be manually raised and lowered as required.

4.12 The provisions specified in 3.3 and 3.4 shall not be overridden when operating in this mode of control.

4.13 Facilities shall also be provided to enable the controller to be:

- i) switched 'on' following an interruption of the mains supply, or
- ii) following failure (see 4.16).

Failure Conditions

4.14 The control system shall continuously monitor for the occurrence of the following fault conditions:

- i) Mains failure.
- ii) Failure of the vehicle authorising equipment;
- iii) Safety guard detector fault;
- iv) Detection of a 'green indicator/raised bollard' conflict;
- v) Entry/exit loop fault.
- vi) Red indicator fault.

4.15 In the event of any of the above failure conditions, the system shall immediately retract the bollards to their fully lowered position and extinguish the red and green indicators.

4.16 In the event of the failure conditions in 4.14(ii) to 4.14(vi) inclusive, the fault indicator shall be illuminated.

4.17 The failure conditions in 4.14 shall be latched (even in the event of a power supply interruption) and require manual resetting on site before normal operation can be resumed.

4.18 Upon manual resetting the system the fault indicator shall be extinguished and the system enter the start-up sequence described in 4.1.

5 SAFETY AND RELIABILITY

Safety

Optical Safety

5.1 Manufacturers shall formally certify that their indicators are 'eye-safe' to the general public when operating normally, when failed and when being maintained in accordance with their maintenance instructions.

5.2 Where new technology is used and no British or European safety standard exists, manufacturers are to provide a risk assessment as part of the Approval submission.

5.3 When Light Emitting Diodes (LED) are used as the light source, the equipment shall comply with the requirements of BS EN 60825: Safety of Laser products.

Reliability

5.4 The controller shall have a Mean Time Between Failures (MTBF) prediction figure of greater than 12,000 hours continuous operation. The data contained in MIL HDBK 217 shall be used where applicable for reliability predictions.

6 ELECTRICAL REQUIREMENTS

General

6.1 The electrical construction shall meet the appropriate requirements of BS 7671.

Electrical Supply and Limits

6.2 All equipment shall be suitable for operation on a nominal 230V RMS, 50 Hz supply.

6.3 Indicators connected to the control system shall operate from an Extra Low Voltage supply.

6.4 The electrical requirements shall be as specified in the following classes of BS 7987 (HD 638 SI):

6.5 Operating voltage Range

Class	Action
A1	Nominal Voltage -13%...+10%

6.6 Low Voltage -Switch off response voltage (Voff)

Class	Action
B0	No Automatic switch off is required

6.7 Auxiliary state switch response voltage (Vaux)

Class	Action
C0	No auxiliary state is required

6.8 Over voltage

Class	Action
D0	No protective device is required

6.9 Voltage dip

Class	Action
E2	Period t1 <20ms Period t2 >800ms

6.10 Mains frequency

Class	Action
F2	50Hz±4%

Supply Interruption

6.11 In the event of a mains supply failure being detected by the controller (in which case the failure must be longer than 800 ms) the controller shall shut down as described in Chapter 4 Functional Requirements.

Supply Fusing and Isolation

6.12 A double pole switch with a fuse of appropriate rating in the live lead, or approved alternative (e.g. a circuit breaker to BS EN 60947) shall be provided within the equipment enclosure to isolate all equipment in the controller enclosure from the mains supply. The device must be capable of being locked in the 'off' position.

6.13 A separate switch and fuse, or circuit breaker, which does not break the neutral connection, shall be provided to disconnect the controller ancillary equipment from the mains supply.

6.14 A switched 13-amp socket outlet shall be provided for maintenance tools and test equipment. This socket, to BS 1363, shall not be isolated by the switch/circuit breaker in 6.12, and shall be protected by a residual current device of maximum rating 30 mA residual current to the requirements of BS EN 61008.

6.15 Where separate ancillary equipment is fitted, a 5.0 Amp fused supply shall be provided. The manufacturer may provide, at his discretion, either a separate switch or a 13 amp switched socket, to BS 1363, for this supply. If a 13-amp socket outlet is provided, the provisions of 6.14 shall apply.

6.16 A separate fuse or circuit breaker shall be provided for the power supply for equipment located externally to the controller e.g. electromechanical bollard assembly.

Electrical installation

6.17 The equipment shall be installed as described in Local Transport Note LTN 1/98 "Installation of Traffic Signal and Associated Equipment" and meet the appropriate requirements of BS 7671.

7 ENVIRONMENTAL AND EMC PERFORMANCE

Test Requirements

7.1 The controller and bollard operating equipment shall pass the environmental tests specified in the European Harmonisation Document BS 7987 (HD 638 SI) for:

- i) Dry Heat (Class AB3 60° C).
- ii) Cold. (Class AE2 -10° C
- iii) Damp Heat. (Class AK1- 1 cycle)
- iv) Water Penetration: (as for IP requirement)
- v) Random vibration (Class AJ1- 1 hour)
- vi) EMC Test

NOTE: the Change of Temperature Test may replace The Dry Heat and Cold tests.

Degrees of Protection Provided by Enclosures (IP Codes)

7.2 The equipment enclosure shall be to BS EN 60259 IP55. The manual panel, when open, shall provide protection to IP43.

7.3 The main enclosure door, when open, shall provide protection to IP20.

7.4 The controller enclosure shall provide mechanical protection to IK10. Surface cracks are allowed provided that complete penetration does not occur i.e. that the integrity of the seal is not broken. This test shall be conducted before the tests listed in 7.1 and consist of a single impact as specified in BS EN 50102.

Electromagnetic Compatibility (EMC)

7.5 The equipment shall be compliant with the requirements of EMC Directive 89/336/EEC (EMC Regulations 1992, Statutory Instrument 1992 No.2372 as implemented in the UK using BS EN 50293.

8 CONSTRUCTION

Enclosure

8.1 The enclosure shall be manufactured from suitable material to provide mechanical protection of the controller equipment in the intended environment. It shall be designed to maintain mechanical, environmental and EMC protection for a minimum of 15 years.

8.2 If the enclosure is to be constructed from non-metallic material, the manufacturer shall satisfy the Approval Authority that the enclosure shall provide adequate protection, including fire, to the control equipment.

8.3 The enclosure shall have at least one fully opening door to allow installation of control equipment and access for maintenance personnel.

8.4 All doors shall be secured against unauthorised entry by the use of suitable locks.

8.5 Where any part of the enclosure is below ground level, it may be constructed of non-metallic material. If constructed from steel to BS 1449, it shall be finished with hot metal spray to BS EN 22063 Part 1 and coated with a bituminous finish or hot dip galvanised to BS 729 or, alternatively, the material may be stainless steel.

8.6 The enclosure shall contain suitable provision for the installation of the Electricity Board's termination and cut-out for the incoming mains supply.

8.7 Where required by the Procurement Specification, the enclosure shall provide the space and means for support of ancillary equipment such as remote monitoring equipment, selective vehicle detection equipment, etc.

Manual Panel

8.8 The controller shall be provided with an externally accessible, lockable panel to allow access to the manual control facilities described in **Error!**
Reference source not found..

8.9 Within the panel, or visible through it, shall be a single red indicator that shall be permanently lit in the event of the fault condition described in 4.3.

8.10 The indicator shall be easily visible from the outside of the panel and be of such intensity that it may be readily seen under conditions of bright sunlight but not present any ambiguous signals to drivers that may be mistaken for those associated with the state of the bollards.

Rising Bollard Unit

8.11 Upon impact by a vehicle, the bollard and any of its operating components shall remain secured to its underground housing unit.

8.12 When fully retracted, the top of a bollard shall be flush with the level of the carriageway to avoid a projection or trip hazard to road users and pedestrians.

9 INDICATOR OPTICAL PERFORMANCE REQUIREMENTS

General

9.1 The colours of the two indicators shall be red and green as defined in Table 9.1 and with a minimum luminous intensity of 40 cd in the reference axis.

9.2 The light emitting technology used shall be capable of being monitored to meet the requirements of 3.7.

9.3 The light emitting area of the indicators shall be nominally 100mm in diameter and arranged vertically with the red indicator uppermost and aligned to be visible to the driver of an approaching vehicle when in the proximity of the signal indicators.

Chromaticity Requirements

9.4 The colour chromaticity of the optics shall be within the coordinates shown in Table 9.1.

Luminous Intensity Distribution

9.5 The luminous intensity distribution provided by the indicators shall be at least the minimum values shown in Table 9.2.

Colour	1		2		3		4	
	x	Y	X	y	x	y	x	y
Red	0.660	0.320	0.680	0.320	0.710	0.290	0.690	0.290
Green	0.009	0.720	0.284	0.520	0.209	0.400	0.028	0.400

Table 9.1
Colour Chromaticity

Horizontal \ Vertical	0	±2.5	±5.0	±10.0	±15.0	±20.0
0	100	75	65	15	1.5	<1.5
±1.5	95	90	-	-	-	<1.5
±3.0	70	-	45	-	-	<1.5
±5.0	40	-	-	10	-	<1.5
±10.0	6	-	-	-	5	<1.5
±15.0	1.5	-	-	-	-	<1.5

Table 9.2
Luminous Intensity Distribution of Indicators

NOTES:

- The four angular distributions of luminous intensity for the indicators are specified as minimum luminous intensities expressed as a percentage of the measured values on the axis 0° horizontal and 0° vertical (the reference axis).
- '-' indicates no specified value but within the field of measurement the light pattern shall be substantially uniform, i.e. the light intensity in each direction at each test point shall meet at least the level achieved by the next consecutive measurement.

10 GLOSSARY

For the purpose of this document the following definitions shall apply:

Controlled Access: A method in which an authorised vehicle (or manual control request) can instigate a sequence of events to allow the lowering of the bollards upon presentation and validation of a unique identity.

Controlled Zone: The length of area occupied by the rising bollard installation. The limits of the zone are typically between the installation entry and exit loops.

Controller: The device that performs the monitoring and control functions of the system. This includes instructions to other devices (electrical, hydraulic, pneumatic or mechanical) that may be contained within the same cabinet operate the bollards.

Demand: A signal applied to the controller retract the bollards.

Detector: A device that detects the presence of a vehicle and signals this to the controller.

Extra Low Voltage (ELV): A voltage less than 50V RMS AC or 120V ripple-free DC.

Manual operation: Operation whereby the control of the bollards is under direct control of an operator on site.

Indicators: A pair of indicators (one red, one green) displayed to the driver of the vehicle to indicate the status of the bollards.

Safety guard detector: A detector system that is used to detect the presence of vehicles, bicycles, pushchairs, etc. over the bollards.

Abbreviations

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

DTLR	Department for Transport, Local Government and the Regions
ELV	Extra Low Voltage
EMC	Electromagnetic Compatibility
LED	Light Emitting Diode
MTBF	Mean Time Between Failures
TSRGD	Traffic Signs Regulations and General Directions

11 REFERENCES

11.1 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

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

Contact: +44 (0) 1344 404 429

BS 1363	Specification for 13 Amp fused plugs, Switched and Unswitched Socket – Outlets
BS 7671	Requirements for Electrical Installations
BS 7987 (HD 638 SI)	Road traffic signal systems
BS EN 22063	Specification for Sprayed Metal Coatings
BS EN 50102	Degrees of protection provided by enclosures for electrical equipment against mechanical impacts
BS EN 50293	Electromagnetic Capability – Road traffic signal systems product standard
BS EN 60529	Specification for degrees of protection provided by enclosures (IP Code)
BS EN 60825	Safety of Laser Products
BS EN 61008	Residual current operated circuit-breakers without integral over current protection for household and similar uses (RCCBs)

Specifications

11.3 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 Equipment for the Control of Vehicular and Pedestrian Traffic on Roads
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Other Publications

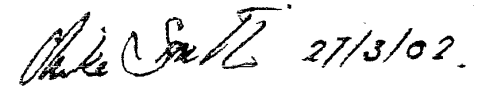
	Traffic Signs Regulations and General Directions
SI 2372	EMC Regulations 1992 (Statutory Instrument 1992 No. 2372)
MIL HDBK 217	Reliability Prediction of Electronic Equipment
TA 4/97	Traffic Advisory Leaflet 4/97 - Rising Bollards
LTN 1/98	Local Transport Note 1/98 – The Installation of Traffic Signals and Associated Equipment

12 HISTORY

Issue A March 2002

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

Traffic Control Systems & Lighting
Zone 2/16E
Temple Quay House
2 The Square
Temple Quay
Bristol
BS1 6HA



M.J. SMITH
Team Manager
Traffic Control Systems & Lighting