

TOPAS

Traffic Open Products and Specifications

TOPAS 2515C

Performance Specification for Equipment to Detect High and Over-height Vehicles at Low Structures

Revision	Date	Scope	Authorised by
C(v2)	25/2/21	Final	Board

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TOPAS 2515C

PERFORMANCE SPECIFICATION FOR EQUIPMENT TO DETECT HIGH AND OVER-HEIGHT VEHICLES AT LOW STRUCTURES

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CHANGE LOG

Corrigenda 15/2/24

Amending typographic errors only

Change log B to C

a. References to the sign element of the system consolidated to refer to TSRGD and BSEN12966.

b. Legends to be displayed under different operational and fault conditions referred back to TSRGD.

c. Environmental Performance referenced to TOPAS 2130

d. Added in Height Detection OVD and HVD detectors operating as pairs with vehicle approaching detection and fault monitoring.

Added fault monitoring of VMS for pixel faults and comms failures triggering category 1 fault.

Update Electrical requirements to BSEN50556 in line with other standards

Added requirement in technical file for safety test result

Added remote monitoring either through OMU or UTMC MIB. OMU fault and status outputs added in new Appendix B

Added fault logging, sign operation log and manual override.

Corrigendum 9/12/24

Add requirement for RED in Appendix Z and optical performance where no TOPAS 2516 evidence is given

Updated Appendix Z – no other content changes

1. INTRODUCTION

- 1.1 This specification covers the requirements for equipment to detect and protect low structures from overheight vehicles on all public highways.
- 1.2 TOPAS specifications are explicitly purchasing specifications and compliance with them is not mandatory. However Local and other Purchasing Authorities may typically require that equipment purchased complies with TOPAS specifications and is TOPAS registered.
- 1.3 Manufacturers may register products as being compliant with this specification, using the process defined in TOPAS 0600
- 1.4 TOPAS registration requires manufacturers submit a Technical File to an appropriate Technical Assessor to aid compliance verification. The content requirement for the Technical File is defined in Appendix Z of this specification.
- 1.5 Guidance to potential users of this Product is given in Appendix A.
- 1.6 Within this specification, "The Product" shall mean all components necessary to provide a complete operational unit meeting the requirements of this specification and the common requirements defined in TOPAS 0600.
- 1.7 This specification will be immediately implemented from the date of issue for all new TOPAS Registrations.
- 1.8 For Products previously registered against TOPAS 2515B manufacturers are simply required to confirm in writing using Form 005 in TOPAS 0600 Appendices that the products remain compliant with this amended specification. Once confirmed the product registration will be migrated on the TOPAS website.
- 1.9 This specification will be immediately implemented from the date of issue for all new TOPAS Registrations

Glossary of Terms

- 1.10 A comprehensive glossary of terms and abbreviations may be found in the Institute of Highway Engineers guidance note "Traffic Control and Information systems".

Implementation

- 1.7 This specification will be immediately implemented from the date of issue for all new TOPAS Registrations.

2 FUNCTIONAL REQUIREMENTS

General

- 2.1 This specification covers the operational requirements of a Product for detecting high and over-height vehicles at restricted height structures.
- 2.2 The Product defined in this specification may include all or a sub-set of the following:
- Controller
 - Height detector (HD)
 - Vehicle Presence Detector (VPD)
 - Structure Incident Detector
 - Message Signs
- 2.3 Where a low structure protection scheme includes message signs these signs shall conform to BSEN12966 and the messages displayed on those signs to TSRGD. (Such messages typically convey warnings and route choice information.) Messages are prescribed in TSRDG schedule 16 Part 2.
- 2.4 A means of height detection, prior to the sign, is used to detect over-height vehicles.
- 2.5 Height detection methods shall be designed to provide reasonable immunity to false detections caused by environmental conditions, and other triggers while having a high level of confidence in detecting vehicle height. Particular requirements are given in sections 2.34 to 2.43 below
- 2.6 If a vehicle is detected as being over-height a trigger shall be sent to the message signs to display the appropriate message.
- 2.7 Presence detectors may be used at the height detector locations as verification of the presence of a vehicle. Particular requirements are given in sections 2.44 to 2.45 below.
- 2.8 Where remote monitoring of the system is provided then Structure Incident Detectors may be installed to provide a warning when a possible structure collision/incident has occurred.
- 2.9 Where remote monitoring is required the system can support an OMU interface as defined in Appendix B. Alternatively the UTMC MIB Overheight Warning Signs MIB or sections of Remote Monitoring MIB may be used for Remote Monitoring, available from www.utmc.uk.

System Configuration and Operation

- 2.10 For all height detection systems signs shall be located on every approach to the structure.
- 2.11 On the application or re-application of power to the system it shall become fully operational within 30s.
- 2.12 When a sign is displaying legend other than a blank face the flashing yellow conspicuity lanterns shall also be operative.
- 2.13 When the predetermined display time has expired then the signs will revert to a blank face (message A of appendix A) with the amber lanterns switched off.
- 2.14 The Design Authority shall ensure that where appropriate the provisions of BS EN 60825 Safety of Laser products are incorporated into their design.

Single Over-Height Detection

- 2.15 For a girder or horizontal bridge decks or structures a single height detection system shall be used.
- 2.15.1 An over-height vehicle is defined as one whose height dimension is too great to pass under the protected structure.
- 2.15.2 If an approaching over-height vehicle is detected and validated, by the presence detector if fitted, then, an output shall be provided to trigger appropriate signs to display message B of appendix A and to trigger other equipment.
- 2.15.3 The sign or signs on the opposite side of the structure from the side where the detection occurs shall not be affected.

Dual Over-Height Detection

- 2.16 For an arched structure a dual height detection system shall be used.
- 2.17 If an over-height vehicle is detected then the Product shall operate as that defined in paragraphs 2.15.1 through 2.15.3.
- 2.17.1 A high vehicle is defined as one that is too high to pass under the outer parts of an arched structure but may pass under the centre of the arch.
- 2.17.2 If a high vehicle is detected and validated, by the presence detector, then legend C of appendix A shall be displayed for a predetermined time only on the appropriate sign(s).
- 2.17.3 The sign on the opposite side of the structure shall display legend D of appendix A for a predetermined time.

Controller

- 2.18 The operation of the Product may be based on a single intelligent device or a number of distributed intelligent devices interlinked by a secure communications medium.
- 2.19 The Product shall be capable of operating with simultaneous inputs from all detector locations.
- 2.20 The Product shall provide features that will enable an operator, through a secure interface, to set timing parameters and monitor/change the operational status of all system components e.g. to reset latched failures. The user interface will allow the Operator to force sign legends. The user interface should provide a timestamped log of operation of the OVD and fault logging including:
- OVD Low Beam Fail
 - Single Beam Fail
 - Total Beam Fail
 - Presence Detector Fail
 - Amber Lantern Fail
 - Non Critical LED fail
 - Critical LED fail
 - Power Fail
 - Watchdog Fail
 - Sign Controller Fail
 - Luminance Failure
- Or equivalent.

- 2.21 The interface to this process may be in any form although it is preferred that an RJ45 socket be provided so that a remote terminal can configure the Product using a web browser session using an IP Address and a secure log-on feature.
- 2.22 When an IP address is provided the factory default shall be set as 192.168.1.1. This value shall be configurable by an authorised user.
- 2.23 The time between the over-height detection being confirmed and the message being displayed, shall not be greater than 500 milliseconds except where a delay between 1 and 15 seconds has been defined in the site data.
- 2.24 The length of time a message can be displayed shall be determined by the site data for each attached VMS. This parameter shall be independently selectable between 1 and 30 seconds in 1-second increments.
- 2.25 Controller inputs and outputs shall conform to TOPAS 2523
- 2.26 The Product shall provide the functionality to operate up to a maximum of eight VMS.
- 2.27 Optionally where the VMS can provide an output affirming valid operation then this may be accepted at the controller.
- 2.28 Where structure incident detectors are provided the controller shall have the capacity to accept inputs from up to 4 such detectors.
- 2.29 Where structure incident detectors are provided the controller shall have a configurable facility to delay or extend each structure incident input by up to 30s in 1s steps.
- 2.30 Where structure incident detectors are provided the controller shall include a facility to report structure incidents over the remote monitoring interface.
- 2.31 The Product shall provide an independent watchdog facility that will monitor the main controller processes and shall cause a category 1 fault condition in the event of a failure.
- 2.32 The Product shall provide the necessary algorithms to determine the direction of travel of over-height and high vehicles for all possible operational traffic movements at the measurement location, including for example one over-height vehicle moving away from the protected structure as a second over height vehicle moves towards the same structure.
- 2.33 Where timing parameters are included in the algorithms defined in paragraph 2.32 a means shall be included to enable an authorised person to update these on site.

Height Detectors

- 2.34 The over-height vehicle detector (OVD) and the high vehicle detector (HVD) shall provide the functionality to detect over-height or high vehicles at a defined height above the road surface and in the specific direction approaching the restricted height structure.
- 2.35 The height detection means shall operate over a distance of, or where more than one component defines the detection a distance between the measurement technology locations shall be, at least 25 meters.
- 2.36 The height detectors shall operate in all light conditions and in all weather conditions.
- 2.37 Optical detectors shall conform to the safety requirements defined in BS EN 60825.

2.38 Reliable operation shall be maintained in all reasonably expected conditions of use and shall be unaffected by communication transmissions from other sources of radio transmission and by screening or reflections from vehicles or buildings.

2.39 The OVD detectors should be operated in pairs A & B see Figure 1.1 while HVD detectors should operate in pairs C & D see Figure 1.2

2.40 Only oncoming vehicles should be detected using detection of OVD A then B or HVD C then D. Failure of both beams to operate shall cause a category 1-fault. Alternatives using a single OVD or HVD detector shall be considered as long as failures can be monitored.

2.41 Where HVD is required this shall be mounted below and in vertical alignment with the corresponding OVD.

2.42 Each height detector shall include a feature that will inform the controller the operational status of each device at intervals of not greater than 300 seconds from the last actuation.

2.43 If a height detector develops a fault and ceases to operate the Product shall cause a category 1-fault.

Presence Detector

2.44 The Product may provide equipment that will confirm the presence of a vehicle at the same location as the Over height detectors which will:

- Where provided the presence detector shall be used to inhibit the reporting of detections from non-vehicular obstructions.
- The presence detector shall operate in all light conditions and in all weather conditions.
- The presence detector shall

operate in temperatures from –20C to +45C and in relative humidities from 0% to 100%.

- The presence detector shall perform as defined by this specification with a confidence limit of not less than 90% for not less than the sooner of:

i) A period of three years after delivery to the purchaser;

ii) The number of operations corresponding to 10,000,000 vehicles having been detected.

2.45 The presence detector shall include a feature that will inform the controller the operational status of the device at intervals not less than 300 seconds.

Variable Message Signs

2.46 The VMS deployed, as part of this Product, shall be of the light emitting variety in accordance with BS EN 12966, TSRGD 2016 as amended and TOPAS 2516.

2.47 The VMS must monitor its display pixels when one pixel fails the fault should be recorded. If remote monitoring is available the failure shall be reported. If more pixels fail so that any warning legend or conspicuity device is no longer legible or then the fault shall cause a category 1 fault.

2.48 The VMS will be controlled and monitored by the controller if the VMS loses communications with the controller for more than 2s then the sign fault will cause a category 1 fault.

Structure Incident Detector (Optional)

2.49 The option shall consist of a supplementary detection system in close proximity to the structures portal.

- 2.50 The Product shall provide the necessary processing to discriminate between a stationary queue of normal height vehicles and a stationary over-height vehicle.
- 2.51 Where a structure incident detector is provided it shall provide an output to the controller.

Electrical Requirements

- 2.52 All equipment shall be suitable for operation in accordance with this specification when connected to the UK mains supply.
- 2.53 All wiring, termination, earthing and labelling shall be in accordance with BS EN50556.
- 2.54 In the event of a supply failure or interruption longer than 50 milliseconds the controller shall cause a category 3 fault.

Construction

- 2.55 The general design, construction and assembly of the Product shall be based on sound proven engineering principles.
- 2.56 The equipment housing shall be constructed in such a manner and from materials to meet the environmental requirements defined in paragraph 2.58.
- 2.57 The Product manufactured to this specification shall be designed to have a minimum in-service life of 15 years with suitable maintenance.

Environmental

- 2.58 The equipment shall meet the environmental performance requirements as specified in TOPAS 2130.

Failure Modes

Category 1

- 2.59 The product shall set all operational signs on the affected approach to display legend type E of Appendix A if available or set the amber yellow conspicuity lanterns flashing with a blank sign face.
- 2.60 The approach(s) not affected by the fault shall continue to operate as normal.
- 2.61 If remote monitoring is available the failure shall be reported.
- 2.62 If faults exist on both approaches then the Product shall cause a category 2-fault.
- 2.63 When all faults are cleared for an approach then normal operation shall be resumed for that approach within the normal product start up time.

Category 2

- 2.64 Any operational signs shall operate as paragraph 2.59.
- 2.65 If remote monitoring is available the failures shall be reported.
- 2.66 When all faults are cleared for any approach then normal operation shall resume for that approach within the normal product start up time.

Category 3

- 2.67 The Product shall shut down without malfunction. Any signs that still have power, shall display legend type E if available or set the yellow conspicuity lanterns flashing with a blank sign face.
- 2.68 When power is restored the Product shall automatically initialise and resume normal operation.

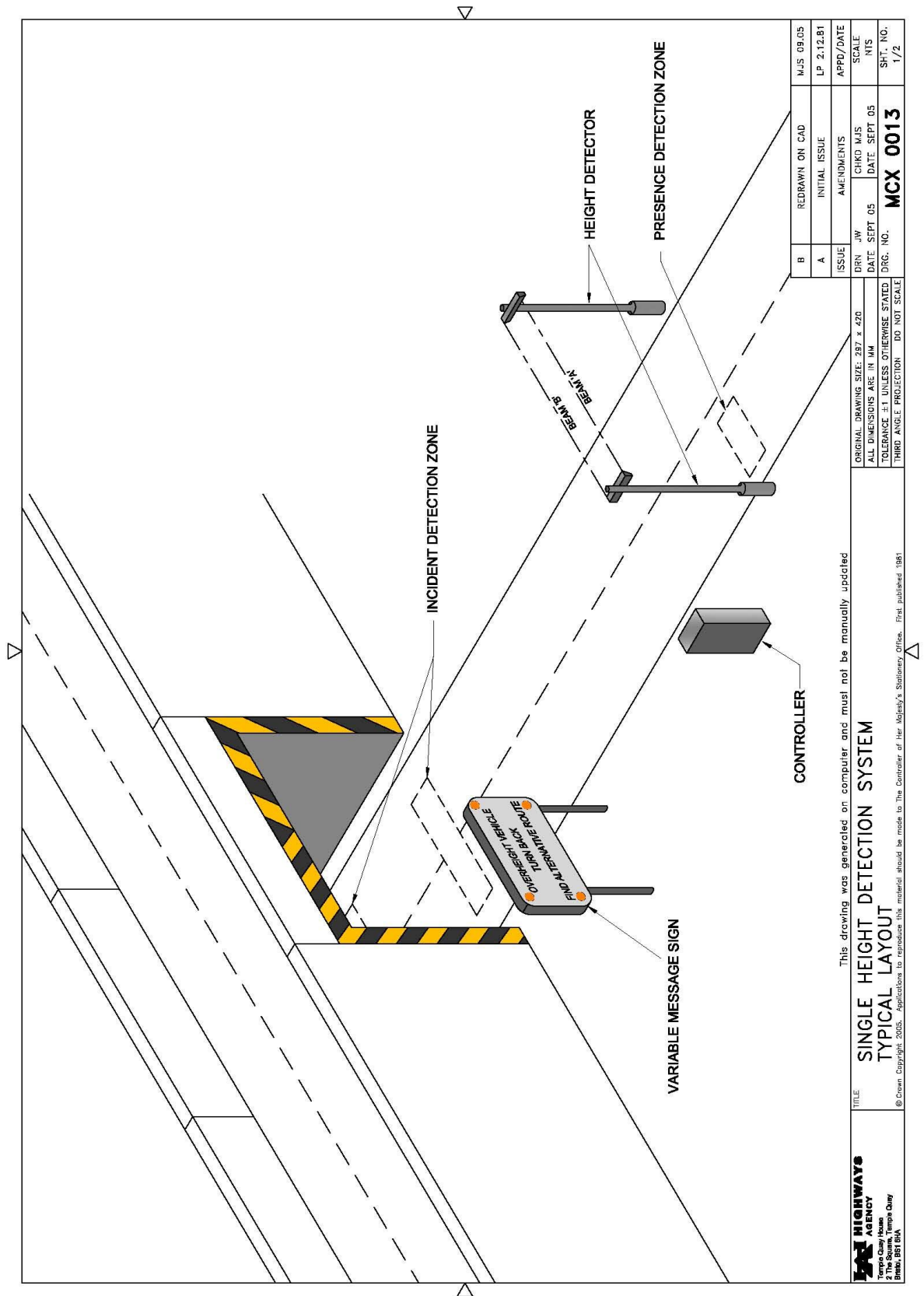


Figure 1.1
 Single Height Detection System (Typical Layout)

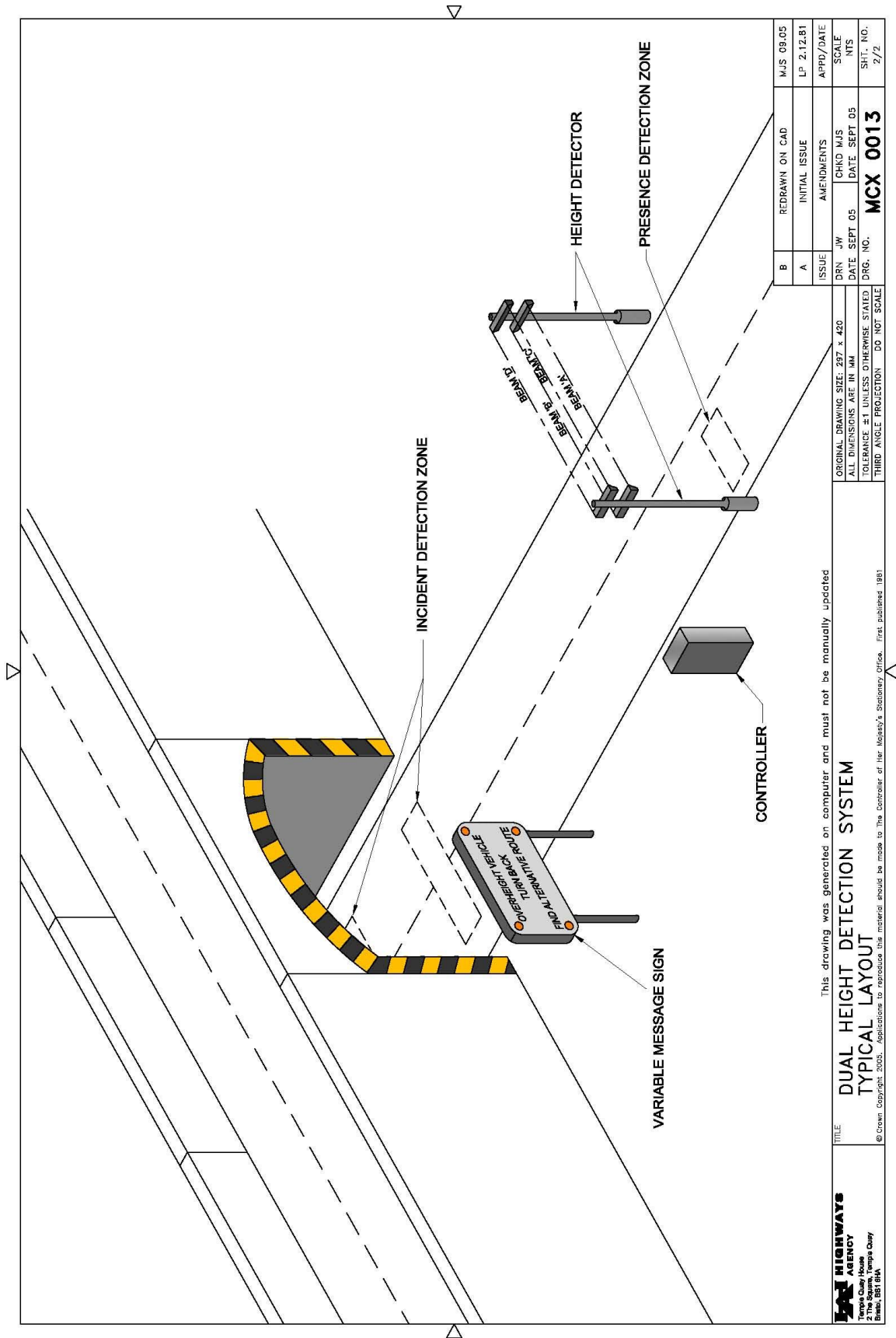


Figure 1.2
 Dual Height Detector System (Typical Layout)

3. REFERENCES

Where undated references are listed, the latest issue of the publication applies.

The British Standards Institution, London, publishes British Standards.

TOPAS 2130	Environmental Tests for Road Traffic Control Equipment
TOPAS 2505	Above Ground Vehicle Detector Systems for Permanent Traffic Signals
TOPAS 2512	Inductive Loop Vehicle detection Equipment
TOPAS 0600	Self-Certification Procedures for Statutory Approval of Traffic Signal Control Equipment
BS EN 50556	Road Traffic Signal Systems
BS EN 12368	Traffic Control Equipment – Signal Heads
BS EN 12767	Passive safety of support structures for road equipment - Requirements and test methods
BS EN 12966	Road vertical sign - Variable message traffic signs
BS EN 50293	Electromagnetic Compatibility Road Traffic Signal Systems Product Standard
BS EN 60825	Safety of laser products Part 1: Equipment classification, requirements and user's guide
BS EN 60068	Environmental testing
BS EN 60529	Degrees of protection provided by enclosures (IP Code)
TSRGD	Traffic Signs Regulations and General Directions
Directive 89/336/EEC	EMC Regulations 1992, (Statutory Instrument 1992 No 2372)

The drawings in figures 1.1 and 1.2 are reproduced from Highways Agency drawings MCX0013 sheets 1 and 2.

APPENDIX A SIGN LEGENDS FOR OVER HEIGHT VEHICLE DETECTION SYSTEMS

A1. These mandated legends are reproduced from TSRGD which takes precedence.

A2. The signs shall be capable of displaying authorised legends that contain words to convey the following information to vehicle drivers. The legends may also contain symbols.

Legend type A – A blank face

Legend type B – Instruction for a driver of an over-height vehicle to take avoiding action.

Legend type C – Instruction for the driver to use the middle of the road when clear.

Legend type D – Warn drivers that a high vehicle may be approaching in the middle of the road.

Legend type E (Optional) – Warn drivers to check height of vehicles – for use in the event of equipment failure.

APPENDIX B REMOTE MONITORING OVER HEIGHT VEHICLE DETECTION SYSTEMS

Where a Outstation Monitoring Unit is connected to the Overheight Vehicle Detection system It must provide digital outputs compatible with TR2523 for the following status and fault signals.

- Controller Working
- Error OHVD 1 (Beams)
- Error OHVD 2 (Beams dual height)
- Error Detector
- Error LED 1 VMS (non critical)
- Error LED 1 VMS (critical)
- Signal Message (Sign Activated)
- Signal OHVD
- Low Beam 2 (Beam maintenance warning)
- Low Beam 2 (Beam maintenance warning)
- Power OK
- Flasher Failure
- OVD Controller Door Open
- VMS Manual Override
- VPD Active

APPENDIX Z TECHNICAL FILE CONTENT

This appendix defines the necessary content for a Technical File (a collection of relevant documents) which must be reviewed by an appropriate Technical Assessor as part of the TOPAS Registration process (See TOPAS 0600).

The 'ticked' items are required to be present in a Technical File used to support TOPAS Registration against TOPAS 2515C. **Please read the description criteria carefully.**

Ref	Item	Description	Required
1	Overview document	<p>A summary document outlining the product, specifying which TOPAS and other relevant specification(s) the product has been designed to comply with, together with a detailed table of contents for the Technical File.</p> <p>Where external certificates or documents are referred to these shall be included either:</p> <p>(a) within this overview document; or</p> <p>(b) supplied separately as part of this Technical File.</p>	✓
2	QA accreditation certificate(s)	A copy of the Quality Management Registration Certificates for the organisation applying for TOPAS Product Registration.	✓
3	Details of all required standards and regulations including CE/CA requirements that apply to the Product	<p>A list of all standards to be complied with.</p> <p>Including explicit CE/CA declarations of performance/conformity for those standards, including all certificates, shall be included in this Technical File.</p>	✓
4	A functional design description of the product	Title, document number, version and date of the overall System Design Document for the Product.	✓
5	Product part numbers	A list of top-level assembly part numbers and their issue states including all firmware / software part numbers and issues.	✓
6	Statement of Compliance	A clause-by-clause statement of compliance against TOPAS 2515C confirming compliance or non-compliance and referencing supporting evidence.	✓

		(An example template can be found on the TOPAS website)	
7	Functional test procedures and results	A list of all functional test schedules and test result documents (by document number and issue) that substantiate the Statement of Compliance.	✓
8	BS EN 50293 EMC test procedures and results	(a) Title, document number, version and date of the EMC test performance requirement document. Copies of the results of EMC testing undertaken by an appropriately qualified independent approved test house <u>must</u> be included in the Technical File.	✓
9	Optical test procedures and results required by this specification	For all products which have any defined optical performance requirements (a) Title, document number, version and date of the optical test performance requirement document. Copies of the results of optical testing undertaken by an appropriately qualified independent approved test house <u>must</u> be included in the Technical File.	✓
10	Environmental test results	(a) A list of relevant Environmental tests performance requirements defined in TOPAS 2130. Copies of the results of the Environmental testing undertaken by an appropriately qualified independent approved test house <u>must</u> be included in the Technical File.	✓
11	Radio Equipment Regulations test results	For all products which include any transmitting and/or receiving radio equipment (a) A copy of the RER Declaration Of Conformity (b) Reference to the RER Technical Documentation for the product (by title, document number and version). (c) Copies of the results of radio testing, undertaken by an appropriately qualified independent approved test house <u>must</u> be included in the Technical File. The test results should be those identified in the RER Technical Documentation and should cover any specific IR2030 requirements for the type of radio used. A copy of the Type Examination Certificate for radio equipment not covered by a Designated EN standard.	✓

12	Primary Safety Test procedure and results	For Traffic signal Control equipment only: (a) The title, document number, version and date of the Primary Safety Test schedule. (b) A copy of the test results must be included as part of the Technical File.	✓
13	Failure Mode Analysis	For Traffic signal Control equipment only Title, document number, version and date of the product failure mode analysis requirements and results.	N/A