

Siting Of Inductive Loops For Vehicle Detecting Equipments At Permanent Road Traffic Signal Installations

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REGISTRATION OF AMENDMENTS

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MCE 0108 C

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1 INTRODUCTION

General

1.1 This specification supersedes MCE 0108 Issue B.

Scope

1.2 This specification describes the siting of and the facilities provided by inductive loop vehicle detecting equipments at permanent traffic signal installations at junctions and away from junctions (PELICANS, PUFFINS and TOUCANS). It does not cover the siting of and the facilities provided by inductive loops as part of installations controlled by Microprocessor Optimised Vehicle Activation (MOVA) systems; these are covered by MCH 1542 "Installation guide to MOVA". It also does not cover inductive loops installed as part of an adaptive urban traffic control system. The installations of inductive loops for the Split Cycle Offset Optimisation Technique (SCOOT) Urban Traffic Control System is covered by MCH 1352 "Technical Guide to SCOOT loop siting".

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

2.7 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

2.8 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 VEHICLE DETECTING EQUIPMENT

Design and Performance

3.1 All vehicle detecting equipment to meet this specification shall be of the buried inductive loop type. The design and performance of the vehicle detecting equipment shall be in accordance with the requirements of Specification TR 0100.

Distance from stop line to loop(s)	Tolerance
0 to 18m	+ 0 - 0.25m
18m and above	+ 0 - 0.5m

Configurations

3.2 The configurations of the loops on each approach to the traffic signals will depend upon whether: -

3.2.1 System D vehicle detection is provided with variable maximum facility;

3.2.2 System D vehicle detection is provided without variable maximum facility;

3.2.3 Speed discrimination or speed assessment is provided (on high speed approaches) in addition to 3.2.1 or 3.2.2;

3.2.4 Vehicle detection is provided at traffic signals away from junctions for example PELICANS, PUFFINS and TOUCANS;

3.2.5 Speed discrimination or speed assessment is provided at traffic signals away from junctions for example PELICANS, PUFFINS and TOUCANS.

3.3 In addition, the dimensions of the loops will vary depending upon site requirements e.g. the width of approach and/or lane(s), distance from the edges of the loops to the kerbs and centre line of the carriageway / central reservation.

Siting Tolerances

3.4 The normal tolerances on the stop line to loop distances quoted in this specification are given in Table 1 unless there are physical obstructions which prevent the siting of any loop(s) at the specified position(s). In this event that loop position shall be moved towards the stop line sufficient to clear the obstruction up to a maximum of 4m and the position of all loops further from the stop line from the one moved, (if any), shall be repositioned by a similar distance towards the stop line. If it is necessary to move the loop position(s) more than 4m to avoid the obstruction the approval of the traffic authority shall be sought.

TABLE 1

3.5 The method of determining the stop line to loop distances for various loop configurations in common use in the UK is shown in Appendix A.

Uni-Directional Operation

3.6 Vehicle detection equipment manufactured in accordance with TR 0100 shall normally respond to vehicles travelling in either direction. Where specified, Uni-Directional Logic equipment (UD Logic) manufactured in accordance with TR 0161 may be used to provide detection in a specified direction only.

3.7 For System 'D', the input to channel A of the UD Logic (TR 0161 Chapter 3 refers) shall be provided by a vehicle detector connected to a loop, positioned as required by Table 2 of this specification.

3.8 The input to channel U of the UD Logic shall be provided by a vehicle detector connected to a loop, positioned as recommended by the vehicle detector manufacturer.

4 VEHICLE DETECTION – NORMAL ROADS (SIGNALS AT JUNCTIONS)

System ‘D’

4.1 Loops shall be provided at either two or three points on each approach to the signals, and shall be spaced, as shown in Table 2. The loops shall be designated X, Y and Z, the X loop being that farthest from the intersection and the Z loop that nearest to the intersection.

4.2 Each Y and Z loop shall normally cover 1, 2, 3, or 4 traffic lanes as specified. Unless otherwise specified a common output signal shall be produced from the Y and Z vehicle detecting equipments.

4.3 When specified the output from the Y and the Z vehicle detecting equipments shall be commoned with the output from the X vehicle detecting equipment provided that: -

4.3.1 Only one X loop is provided per approach in addition to the Y and Z vehicle detecting equipment and

4.3.2 The variable maximum facility is not required.

4.4 This arrangement to common X, Y, and Z vehicle detecting equipment outputs is not appropriate where for example vehicles leaving the junction encroach on the “wrong” side of the carriageway and as a result, put in false demands for other phases e.g. where the junction radii are tight so that left turning vehicles cross and operate the Z detector or where the approach road is narrow and vehicles leaving the junction (from whatever direction) cross the loops on the narrow approach.

With Variable Maximum Facility

4.5 Where the relevant approaches to the controlled intersections are essentially a single traffic lane; or where the threshold values set for operating the variable maximum facility do not exceed 1,200 vehicles/hour, the X vehicle detecting equipment may consist of a single loop with associated detector. In all other cases individual X loops and vehicle detectors shall be provided for each traffic lane. The dimensions and dispositions of the loops in the carriageway shall be such as to achieve the highest accuracy of flow measurement without any significant risk of failing to detect the passage of any type of vehicle at the X loop point.

4.6 The Y and Z loops shall be arranged as in 4.2.

Distance from stop line to X loop	Effective extension distance	Number of loops	Distance from stop line to Y loop	Distance from stop line to Z loop
39m	42m	3	25m	12m
30m	33m	3	18m	7m
18m	21m	2	-	6m

TABLE 2

See Appendix A for method of marking out stop-line to loop distance.

Without Variable Maximum Facility

4.7 The X loop shall be in the form of a single loop arranged to cover 1,2, 3, or 4 lanes as specified or separate loops commoned together to produce one output signal at the X detector point.

4.8 The Y and Z loops shall be arranged as in 4.2.

Demands

4.9 Demands shall normally originate from the X detector but, where specified, it shall be possible to arrange that demands may, in addition, originate from the Y and/or Z detectors (4.3).

Vehicle Extensions

4.10 Subject to the limitation imposed by the maximum running period when a stage is running and irrespective of the termination of the minimum running period, the stage shall be held by the presence of a vehicle indicated by any vehicle detector associated with the stage, and following the departure of a vehicle indicated by any vehicle detector associated with the stage shall be extended for a fixed period in accordance with Table 3.

Distance from stop line to X loop	Effective extension distance	Duration of fixed extension period
39m	42m	1.5 seconds
30m	33m	1.0 seconds
18m	21m	1.0 seconds

TABLE 3

4.11 Exceptionally, when specified, it shall be possible to achieve longer effective extension distances than those shown in Table 3 by the provision of longer fixed vehicle extension periods selected from the range of timings given in the relevant clauses of the specifications listed in 9.3 (TR2210 - Microprocessor based Traffic Signal Controllers) as appropriate to the type of controller. The timing accuracy of the fixed vehicle extension periods is specified in the appropriate clauses of the specifications listed in 9.3 (TR2210 - Microprocessor based Traffic Signal Controllers)

Turning Traffic

4.12 When specified a loop shall be provided within the junction and in such a position that only vehicles entering the junction from one approach to make a right turning movement shall normally cross the loop. The output from the vehicle detecting equipment may be arranged to demand/ hold/extend a stage (as specified) associated with the display of a green arrow signal to the turning traffic.

4.13 Care should be taken when siting a loop within the junction area to avoid false operation of the vehicle detector by vehicles not executing the right turning movement in 4.12.

All Red Extending Detectors

4.14 Vehicle detectors shall when specified, be provided to extend clearance periods by the passage of vehicles over the loops (all red extending detectors). The siting of these loops will depend upon site conditions, and the extension clearance period(s) provided shall be selected from the range of timings referred to in the appropriate clauses of the specifications listed in 9.3 (TR0100 - Inductive Loop Vehicle Detecting Equipment). and 9.3 (TR2210 - Microprocessor based Traffic Signal Controllers).

Stop Line Loops

4.15 Where it is possible that traffic may enter an approach to the signals between the 'Z' detector and the stop line, consideration should be given to the installation of an additional inductive loop just in advance of the stop line. Each stop line loop will normally cover 1,2,3 or 4 lanes as specified. It is usual to position these loops so that their trailing edge is 2 metres from the stop line.

5 VEHICLE DETECTION – HIGH SPEED ROADS (SIGNALS AT JUNCTIONS)

General

5.1 On roads where vehicle approach speeds are between 35 mph and 45 mph the equipment specified in clause 5.3, 5.4 and 5.5 or 5.9, 5.10 and 5.11 shall be provided. Where approach speeds exceed 45 mph but do not exceed 65 mph the equipment specified in clauses 5.6, 5.7 and 5.8 or 5.9, 5.10 and 5.11 shall be provided. Clause 5.9, 5.10 and 5.11 provides the facilities described in Road Research Technical Paper No 74 'Traffic Signals for High Speed Roads'. In all cases the normal detector, demand and extension arrangements specified in 5.1 to 5.7 inclusive shall be retained.

5.2 The accuracy of the speed discrimination equipment in 5.3 to 5.8 inclusive and the accuracy of the speed assessment equipment, in 5.9, 5.10 and 5.11 are given in the appropriate clauses of the specifications listed in 9.3 (TR2210 - Microprocessor based Traffic Signal Controllers). The extra clearance periods specified in the appropriate clauses of the specifications listed in 9.3 (TR2210 - Microprocessor based Traffic Signal Controllers) must be automatically introduced when the signals on the approaches to a junction equipped with speed discriminating or speed assessing equipments lose right of way due to a "maximum" signal change and/or there is an interruption of the power supply to and/or a fault occurs on any speed discriminating or speed assessing equipment or on any vehicle detecting equipment associated with these equipments.

Double Vehicle Extensions with Speed Discrimination

5.3 Additional buried loops shall be installed at a point 79 metres before the stop-line; separate detectors with associated speed measuring equipments being provided for each traffic lane.

5.4 These additional equipments shall measure vehicle speed; if this is in excess of 30 miles/hour the green signals shall be held for a fixed period of 3.0 seconds.

5.5 The positioning of the additional loops shall be such that the leading edge of the loop nearest to the stop line shall be 79 metres from the stop line.

Triple Vehicle Extensions with Speed Discrimination

5.6 Additional buried inductive loops shall be installed at points 91 metres ("inner loops") and 159 metres ("outer loops") from the stop-line; separate detectors with associated speed measuring equipments being provided for each traffic lane.

5.7 These additional equipments shall measure vehicle speed; if this is in excess of 45 miles/hour at the outer loop or in excess of 35 miles/hour at the inner loop, the green signal shall be held for a fixed period of 3.5 seconds.

5.8 The positioning of the additional loops shall be such that the leading edge of the loop nearest to the stop line shall be 91 metres and 159 metres from the stop-line for the inner and outer loops respectively.

Double Vehicle Extensions with Speed Assessment

5.9 Additional buried inductive loops shall be installed at a point 151 metres from the stop-line; separate detectors with associated speed assessing equipments being provided for each traffic lane.

5.10 These additional equipments shall measure vehicle speed and produce a delay period, related to the measured vehicle speed, after which the green signals shall be held for a period of 5.0 seconds. The relationship between vehicle speeds and delay periods is specified in the appropriate clauses of the specifications listed in 9.3 (TR2210 - Microprocessor based Traffic Signal Controllers)

5.11 The positioning of the additional loops shall be such that the leading edge of the loop nearest to the stop line shall be 151 metres from the stop line.

6 VEHICLE DETECTION (SIGNALS AWAY FROM JUNCTIONS)

General

6.1 The requirements for vehicle detecting equipment at the approaches to traffic signal-controlled pedestrian crossings (Pelicans, Puffins and Toucans) depend upon the location of the crossing; the vehicle flows over the crossing and on the vehicle approach speeds.

Roads subject to a speed limit of 30 mph.

6.2 Where a Pelican Crossing is sited on a road which is subject to a speed limit of 30 mph it may operate: -

6.2.1 On a fixed time basis.

6.2.2 With a single loop sited 39 m from the stop line with a 4.0 seconds extension time for vehicles. This is mainly for open free flowing sites with little or no congestion.

6.2.3 With a multi configuration such as System 'D' in accordance with Section 3 of this specification. This system is designed for roads where congestion is likely or speeds are inconsistent.

Roads where approach speeds are greater than 35 mph but less than 45 mph.

6.3 Where a Pelican Crossing is sited on a road where approach speeds are greater than 35 mph but less than 45 mph, vehicle actuation shall be provided with System 'D' loops with either: -

6.3.1 Speed Discrimination equipment (SDE) loops at 79 m from the stop line. Vehicles travelling in excess of 30 mph shall be granted a 3.0 seconds extension i.e. Double vehicle extension with SDE clause 5.3, 5.4 and 5.5

OR

6.3.2 Speed Assessment equipment with loops sited at 151m from the stop line i.e. Double vehicle extension with speed assessment clause 5.9, 5.10 and 5.11.

Roads where approach speeds are greater than 45 mph.

6.4 Where a Pelican Crossing is sited on a road where approach speeds are greater than 45 mph, vehicle actuation shall be provided with System 'D' loops with either: -

6.4.1 SDE loops at 91 m and 159 m with 35 and 45 mph discriminated speeds respectively granting a 3.5 seconds extension to vehicles i.e. TRIPLE VEHICLE EXTENSION with SDE clause 5.6, 5.7 and 5.8.

OR

6.4.2 Speed Assessment equipment with loops sited at 151 m from the stop line i.e. Double Vehicle extensions with speed assessment clauses 5.9, 5.10 and 5.11.

7 VEHICLE DETECTION IN FIXED TIME UTC SYSTEMS

7.1 Where demand dependent stages are used in fixed time urban traffic control (UTC) systems, a single loop shall be provided on all approaches served by such stages. The loop shall normally be sited 18m in advance of the stop line. Another option is to use a stop line loop (clause 4.15) at night to call the stage serving a side road, so that for the majority of the time the signals on the main road approach remain at green.

8 GLOSSARY

Definitions

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

Vehicle Detecting Equipment: the equipment provided at the installation by which the presence of vehicular traffic approaching or passing through the controlled area can be detected. This equipment shall usually comprise loop(s), feeder(s) and detector(s).

Loop: one or more turns of wire laid in or on the carriageway.

Inductive Loop and Loop Tails: those cables which form an inductive loop and the tails from that loop.

Loop Feeder Cables: those cables that are jointed to the loop tails to extend the tails back to the detector equipment.

Vehicle Detector: apparatus by which changes in loop parameters caused by a vehicle are detected.

Uni-Directional Logic (Ud Logic): equipment capable of detecting the passage of a vehicle in a specified direction only.

Abbreviations

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

PELICAN **(PE)destrian LIght CONtrolled crossing):** A pedestrian crossing using far-side pedestrian indicators with a flashing amber/flashing green man period where vehicles are permitted to move subject to giving way to pedestrians

PUFFIN **Pedestrian User-Friendly INtelligent:** A pedestrian crossing using near-side pedestrian indicators and pedestrian detection to confirm demand and to extend the pedestrian green time

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

HMSO Her Majesty's Stationary Office

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.

9.2 Road Research Technical paper No 74 – HMSO

Specifications

9.3 This Specification should be read in conjunction with the under-mentioned current DTLR Specifications as appropriate: -

TR 0100	Inductive Loop Vehicle Detecting Equipment.
TR 2210	Microprocessor based Traffic Signal Controllers
TR 2029	Inductive Loop cable for Vehicle Detection Systems
TR 2031	Armoured feeder cable for Inductive Loop Systems
TR 0161	Uni-Directional Logic Equipment

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10 HISTORY

1st Draft January 1972

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Issue B June 1975

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

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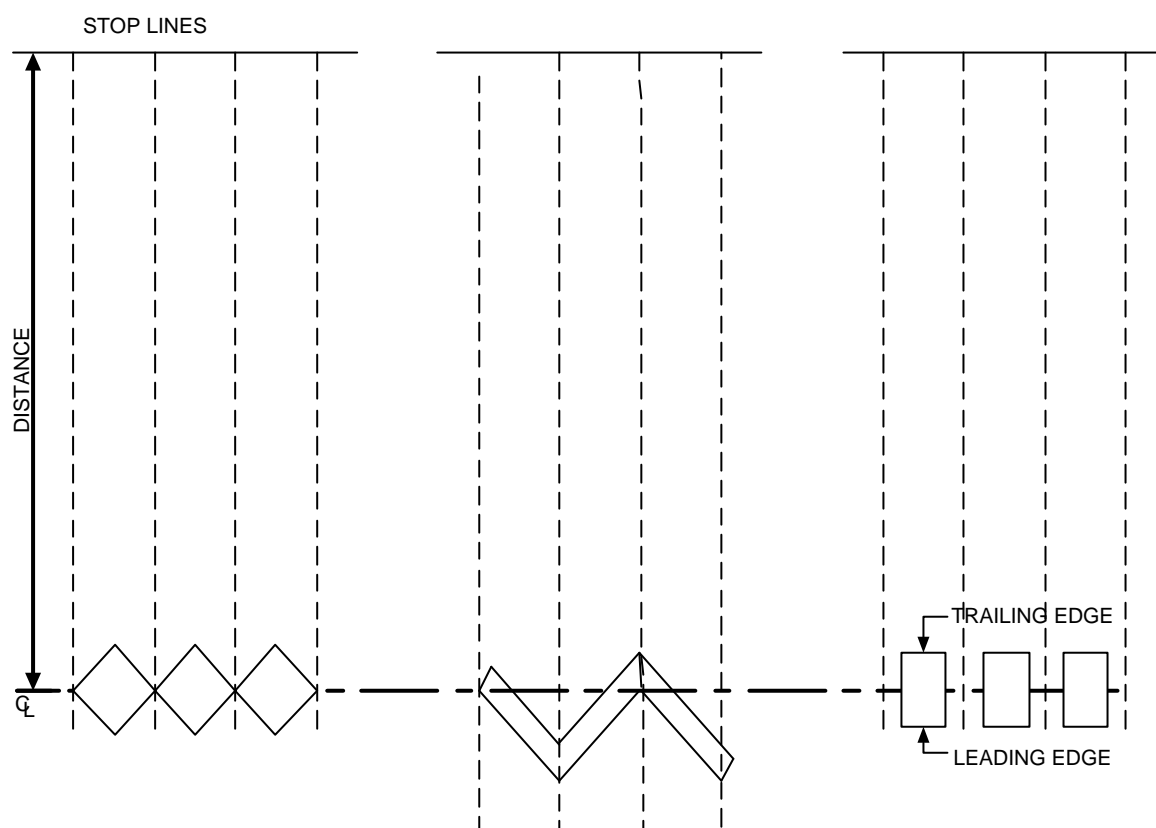
M.J. SMITH

Team Manager

Traffic Control Systems & Lighting

APPENDIX A DETERMINATION OF DISTANCE FROM STOP LINE TO LOOP(S) FOR VARIOUS LOOP CONFIGURATIONS IN SYSTEM 'D'.

A1.1 The method of measuring the distance from the stop line to the loop(s) is shown below and shall be consistent each time the measurement is made regardless of the number and the widths of traffic lanes. The measurement shall be made at the kerbside and relate to the near-side loop. In a multi-lane carriageway, where the near-side lane has a separate stop line (e.g. left filter) then stop line to loop distances shall be measured from individual stop lines.



LOOPS MAY BE ONE PER CARRIAGEWAY OR ONE PER LANE
END OF APPENDIX A