



Signing and Marking of Tramways Guidance


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DESCRIPTION:				
THIS DOCUMENT PROVIDES GUIDANCE IN THE SIGNING AND MARKING OF TRAMWAYS.				
EXPLANATORY NOTE:				
LRSSB is not a regulatory body and compliance with this guidance document is not mandatory. This document reflects good practice and is advisory only. Users are recommended to evaluate this guidance against their own arrangements in a structured and systematic way, noting that parts of this guidance may not be appropriate to their operations. It is recommended that this process of evaluation and any subsequent decision to adopt (or not adopt) elements of this guidance should be documented. Compliance with any or all of the contents herein, is entirely at an organisation's own discretion.				
SOURCE / RELATED DOCUMENTS:				
LRG 1.0 Tramway Principles and Guidance (TPG) (LRSSB) LRG 2.0 Non-Motorised Tramway Crossing Guidance (LRSSB) LRG 8.0 Guidance in the Management of Vulnerable Persons (LRSSB) LRG 19.0 Cycle Tramway Interface Guidance (LRSSB) LRG 24.0 Pedestrian Safety Guidance (LRSSB) The Traffic Signs Manual (DfT) BS EN 12899: Fixed, Vertical Road Traffic Signs				
RELATED TRAINING COURSES:			RELATED LEGISLATION:	
N/A			Health and Safety at Work Act etc. 1974 Management of Health and Safety at Work Regulations 1999 Railways and Other Guided Transport Systems (Safety) Regulations (ROGS) 2006 (as amended) Traffic Signs Regulations and General Directions 2016 Traffic Signs (Amendment) (England and Wales) Regulations 2017	
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SIGNING AND MARKING OF TRAMWAYS GUIDANCE

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Revisions from Previous Issue

New LRG document template and other formatting.

Changes to Page 1 including the removal of the named preparer, reviewer and authorising person and insertion of an explanatory note in relation to the status of this guidance document.

Reference made to LRG 2.0 Non-Motorised Tramway Crossing Guidance, LRG 8.0 Guidance in the Management of Vulnerable Persons, LRG 19.0 Cycle Tramway Interface Guidance and LRG 24.0 Pedestrian Safety Guidance.

Figures and Tables listed in the Contents Page.

Additional abbreviations added to Table A: Terms and Table B: Abbreviations (from existing text).

Additional paragraph and changes to the Introduction to be consistent with other LRG documentation.

Creation of Scope section to be consistent with other LRG documents and moving existing relevant text from subsequent General Guidance on Signs and Markings for Tramways section to the Scope and subsequent renumbering of all figures and tables in the following chapters. Note of exclusion of consideration of cycles and pedestrians added.

Link to the Traffic Signs (Amendment) (England and Wales) Regulations 2017 inserted.

Changes made to Figure 6.1.

Additional guidance for delineation at Section 6.12.

Numerous minor presentational, minor factual and typographical changes.

Text added to aid clarification where required / appropriate.

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TERMS AND ABBREVIATIONS

Table A – Terms

Term	Definition
Human Factors Assessment	Human factors assessments consider environmental, organisational and job factors combined with human and individual characteristics, which influence behaviour in a way which can affect both health and safety.
Line of Sight	Operating mode where a tram should be able to stop before a reasonably visible stationary obstruction ahead, from the intended speed of operation using the service brake.
Swept Envelope	The speed dependent kinematic envelope of a tram that is unique to the particular location at a given speed.
Tramway Path	The area reserved for a moving tram in its environment. It is derived from the Swept Envelope by adding the minimum appropriate clearance.

Table B – Abbreviations

Abbreviation	Definition
BS EN	British Standard (BS) adoption of a European (EN) standard
DFT	Department for Transport
Km/h	Kilometres per Hour
LOS	Limit of Shunt
LRSSB	Light Rail Safety and Standards Board
MPH	Miles per Hour
ROGS	Railways and Other Guided Transport Systems (Safety) Regulations 2006 (as amended)
S.I.	Statutory Instrument
SMS	Safety Management System
TPG	Tramways Principles and Guidance
TRO	Traffic Regulation Order
TSM	Traffic Signs Manual
TSRGD	Traffic Signs Regulations and General Directions 2016
UK	United Kingdom

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1. Introduction

- 1.1. This guidance supports the high level principles set out in LRG 1.0 Tramway Principles and Guidance (TPG) published by the Light Rail Safety and Standards Board (LRSSB).
- 1.2. This document provides high level guidance for the signing and marking of tramways for those delegated this responsibility in relation to tramways (Light Rail systems) based on 'line-of-sight' operations only. This is additional guidance on selected signs used on the highway to supplement the advice in the Traffic Signs Manual (TSM)¹.
- 1.3. As with all guidance, this document is based on the experience gained from existing tramways and from published documents. It does not prescribe particular arrangements adopted by any existing tramways. It is intended to give advice not to set a mandatory industry standard, and it is based upon goal setting principles as good practice. The design and positioning of tramway signs and markings is generally based on the application of standards, good practice and experience of tramway systems in the UK (etc.).
- 1.4. There may be situations where it is appropriate to use design parameters that are at variance to those described in this document when the use of such parameters has been assessed to ensure that the ongoing control of risk is managed to a level as is reasonably practicable. and is intended to give advice not to set a mandatory industry standard, and it is based upon goal setting principles as good practice.
- 1.5. This guidance is not intended to be applied retrospectively to existing tramway systems. However, owners and operators should consider and assess any implementation of this guidance and / or any subsequent revision, to ensure continual improvement in reducing risks related to signing and marking of tramways, so far as is reasonably practicable.

¹ TSM published 3rd March 2014 and last updated 21st March 2022, applies to England, Scotland, Wales and Northern Ireland (<https://www.gov.uk/government/publications/traffic-signs-manual>).

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2. Scope

- 2.1. The need for signage and road markings is linked intrinsically with the need for suitable training to provide tram drivers with appropriate route knowledge, and the need for the signs and road markings to remind drivers of safety related issues that they should already be conversant with.
- 2.2. All routes of a tramway should be subject to risk assessment before operations commence and then at regular intervals to determine what steps need to be taken to eliminate, reduce, minimise and manage risks to as low as is reasonably practicable.
- 2.3. SMS processes and procedures should ensure that the identified actions are recorded and carried out. This includes ensuring suitable actions taken if the assessment may indicate that signage and / or markings are an appropriate control measure at some locations.
- 2.4. Cycles and pedestrians are not considered specifically in this document. For guidance related to these users, please refer to LRG 19.0 Cycle Tramway Interface Guidance and LRG 24.0 Pedestrian Safety Guidance.

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3. General Guidance on Signs and Markings for Tramways

- 3.1. The risk assessment for a tramway system should initially follow the principles of a road safety audit from the viewpoint of a tram driver and should consider the following (not exclusively):
- How tram drivers might react to the constantly changing view in front of them at all times and conditions;
 - The interaction between elements of the environment that could present a potentially confusing indications to the tram driver;
 - The visibility of hazards, for example, tight radii curves or non-motorised user crossings (refer to LRG 2.0 Non-Motorised Tramway Crossing Guidance for further guidance); and
 - Opportunities to include risk-reducing elements, for example, advance warnings of hazards.
- 3.2. All traffic signs and road markings used for tramway systems on the highway must comply with the mandatory requirements set out in the Traffic Signs Regulations and General Directions 2016 as amended² (TSRGD).
- 3.3. The Department for Transport (DfT), the Scottish Government and Welsh Government publish the TSM that offers advice to traffic authorities and designers in the UK on the use of traffic signs and road markings on the highway network.
- 3.4. The Manual applies to the UK. References to 'the national authority' should therefore be interpreted as referring to the Secretary of State for Transport, the Scottish Government or the Welsh Government as appropriate. Any reference to the 'Department' is a reference to the DfT or the appropriate national authority for Scotland or Wales as described above.
- 3.5. The following chapters of the TSM are of particular note for signage and marking of tramways:
- Chapter 1 gives guidance on the reflection from traffic signs and the angle of reflection;
 - Chapter 3 explains the correct use of regulatory signs prescribed by the TSRGD. In particular it sets out guidance on signs and road markings specific to tramways;
 - Chapter 4 explains the use of the warning signs for tramways prescribed by the TSRGD; and
 - Chapter 5 explains the use of road markings for tramways prescribed by the TSRGD.
- 3.6. Signs that are not prescribed in the TSRGD should only be used on the highway when specific authorisation has been given by the relevant national authority.
- 3.7. Images of the traffic signs and technical drawings for use by those who manufacture signs for use on the tramway can be downloaded from the following:

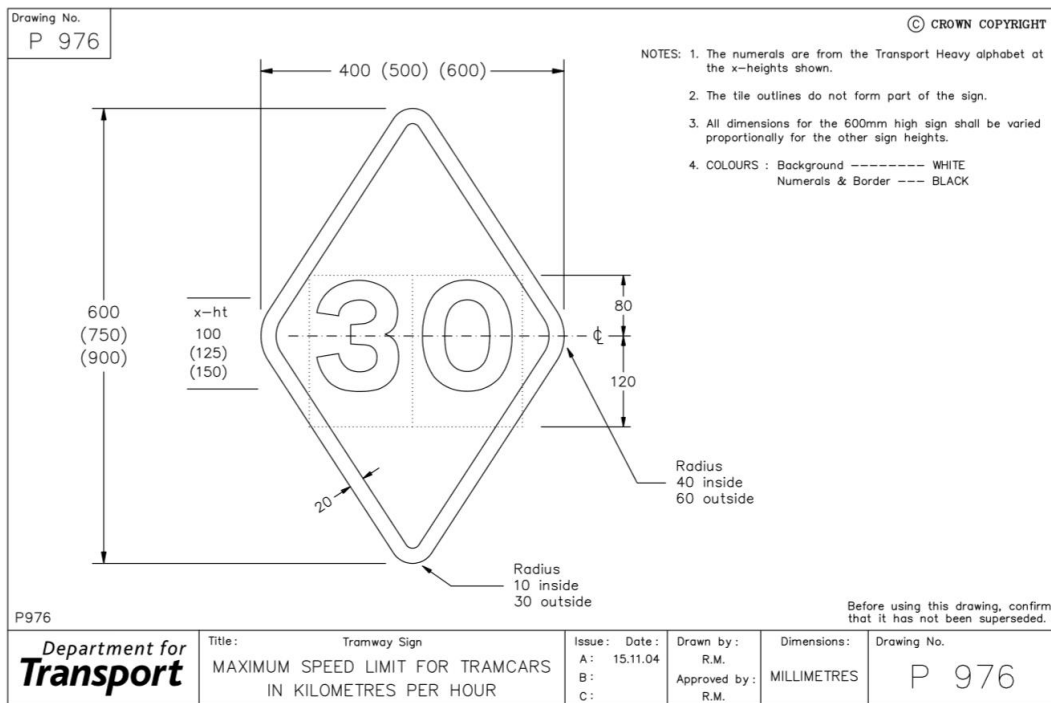
² The TSRGD (S.I. 2016/362) (<http://www.legislation.gov.uk/uksi/2016/362/contents/made>) applies to England, Scotland and Wales, amended by the Traffic Signs (Amendment) (England and Wales) Regulations 2017 (S.I. 2017/1086) which applies only to England and Wales (<https://www.legislation.gov.uk/uksi/2017/1086/made>).

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- <https://www.gov.uk/guidance/traffic-sign-images>; and
- <https://www.gov.uk/government/collections/traffic-signs-signals-and-road-markings#traffic-signs-images-and-drawings>.

3.8. An example of a technical drawing (TSRGD Diagram P976) is shown in Figure 3.1 below. This drawing shows the speed limit sign and illustrates the various dimensions that can be selected for tram speeds higher than 30km/h or where greater visibility is needed.

Figure 3.1 Example of a Technical Drawing for the Production of Signs



- 3.9. With relation to signage in Wales, the Welsh Government has issued some approved bilingual signs that apply to tramways³.
- 3.10. Any use of non-consistent prescribed or non-prescribed signage on a tramway system should only be used when a human factors assessment has shown there are no adverse effects expected for all road users including tram drivers, particularly where this might involve differentiation between speeds in km/h and MPH, or railway signage such as on tram-train sections. Designers should fully consider the unintended consequences of using non consistent signage, such as the need for authorisation and the ability to allow, where necessary, unambiguous enforcement of the signage.
- 3.11. In some circumstances it may be beneficial to have a non-standard warning sign. However, the use of any such signs must be underpinned by clear risk based evidence.
- 3.12. In order to provide as much consistency as possible, any sign used, whether on-street or off-street should still follow the requirements set out in the TSRGD and the TSM (i.e., use of diamond signs) to present consistent and uniform information and warnings to tram drivers. Therefore, care should be taken to ensure that on-street signage remains fit for

³ https://gov.wales/traffic-signs-and-road-markings?_ga=2.32579326.1131000951.1563784110-1918169149.1548346138

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purpose when being used in specific locations off-street, and that these signs represent the good risk control solutions.

3.13. In some instances, there may be a requirement for different signage for on-street and off-street locations. However, this should be in exceptional circumstances where a human factors assessment / risk based assessment has been undertaken. This may include the following (not exclusively):

- Do they comply with TSRGD or have DfT approval;
- Do they follow TSM guidance, particularly that for clear visibility; and
- Does the signing give a 'fair and reasonable' notification of the restriction.

3.14. In determining 'fair and reasonable', consideration should be given to providing advance warnings of the restriction ahead, giving a minimum of two points of reference for each restriction.

3.15. Local Highway or Roads Authority preferences for signage should be taken into account to ensure that there is consistency throughout the local highway network and the whole tram route.

3.16. All signs should be retroreflective and comply with BS EN 12899⁴. Guidance on the reflection and angle of reflection is given in Chapter 1 of the TSM.

3.17. A review of all signs and markings should be undertaken on a defined cyclical basis to ensure continuing visibility, correct placement (etc.) and to consider subsequent revisions (etc.) to ensure continual improvement in minimising risks related to signage and markings, so far as is reasonably practicable.

⁴ BS EN 128994: Fixed, Vertical Road Traffic Signs

4. Tram Only Sections of Highway

- 4.1. The TSRGD prescribes the use of the signs to Diagram 953.1 (as shown in Figure 4.1 below) for tram only sections of highway to designate a 'Route for use by tramcars only'. Traffic Regulation Orders (TROs) are also required alongside these signs to enable them to be displayed.

Figure 4.1: Diagram 953.1



- 4.2. Experience gained from UK tramways suggests that the sign to Diagram 953.1 (not the variants that include buses or cycles) is subject to being ignored by highway users. Compliance is sometimes not achieved by signage alone, and therefore further measures are needed to ensure long term compliance. The designer has many tools to assist with the highway users understanding of the restricted area, such as the following:
- Multiple entry signs;
 - Larger entry signs;
 - Backing boards;
 - Illuminated signs;
 - Entry surface treatments of colour or texture; and
 - Entry curbing re-alignment.
- 4.3. In situations where the risk of highway vehicles entering a 'tram only' section of the highway has been assessed to be high, for example, very limited inter-visibility with consequences of collision, the conventional 'No Entry' sign to TSRGD Diagram 616 with a supplementary 'Except Trams' plate (TSRGD Schedule 12 Part 20 Item 45) could be considered as illustrated in Figure 4.2 below. However, the following issues need careful consideration before using the Diagram 616 No Entry:
- There are limited exceptions for the supplementary plate. You cannot add licenced Hackney carriages (i.e., Except taxis) or 'Except Trams and Cycles' without DfT authorisation;
 - When using the 'Authorised Vehicles' supplementary plate the types of vehicles have different meanings between Highway or Road Authorities;
 - There are no exemptions for maintenance / waste / emergency service vehicles. A tram only street with No Entry at both ends cannot be legally accessed by other vehicles unless instructed to do so by the Police or the TRO is suspended; and
 - It may dilute the effectiveness of the Diagram 953/960 type signs allowing public challenge to enforcement.

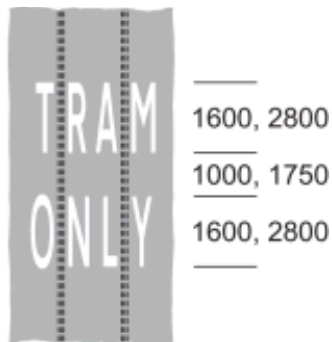
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Figure 4.2: Diagram 616 with Supplementary Schedule 12 Part 20 Item 45 Plate



- 4.4. The upright sign should be supplemented by the 'TRAM ONLY' road marking to TSRGD Diagram 1048.2A as shown below in Figure 4.3. The application of this is fully described in the TSM.

Figure 4.3: Diagram 1048.2A



- 4.5. In some circumstances, such as when there is a change to ballasted track, it may also be beneficial to place bollards (potentially incorporating the appropriate traffic sign) between the two tracks in addition to the nearside and offside signs if this has been assessed to assist to further control the risk.

5. Speed Warning Signs for Curves Not on Highway

- 5.1. A particular area where there may be the need to minimise potential risks which can be partially mitigated by the use of signage is at curves not located on the highway.
- 5.2. Where the risk of overspeed has been identified, chevron warning signs to TSRGD Diagram 515 should be fitted around the curve. The sign should be fitted with a yellow backing board as demonstrated below in Figure 5.1. The width of the yellow area should not be less than half the horizontal width of the white chevron.

Figure 5.1: Diagram 515



- 5.3. The 'X' (vertical) height of a sign should be a minimum of 600 mm (as seen in Table 5.2 below) and the normal mounting height should be 1000mm to the lower edge of the sign. Greater mounting heights may be appropriate to meet particular circumstances of visibility. The sign should be mounted 600mm from the swept envelope of the trams.
- 5.4. For curves with limited visibility of approach, and where an assessment has identified that additional warning is required, the advance warning signs to TSRGD Diagram 512 should be installed as shown below in Figure 5.2.

Figure 5.2: Diagram 512



- 5.5. It is advisable to mount the above warning sign on the same pole as the advance speed limit sign to TSRGD Diagram 976 and to a size compatible with sighting distance.
- 5.6. Any warning sign should be located at the distances from the start of the curve as stated in the TSM and shown below in Table 5.1.

Table 5.1: Warning Sign Distances

Tram speed approaching sign (km/h)	Minimum clear visibility (m)	Distance from curve (m)
30 to 50	60	Not less than 45
50 to 60	60	45 - 110
60 to 80	75	110 -180

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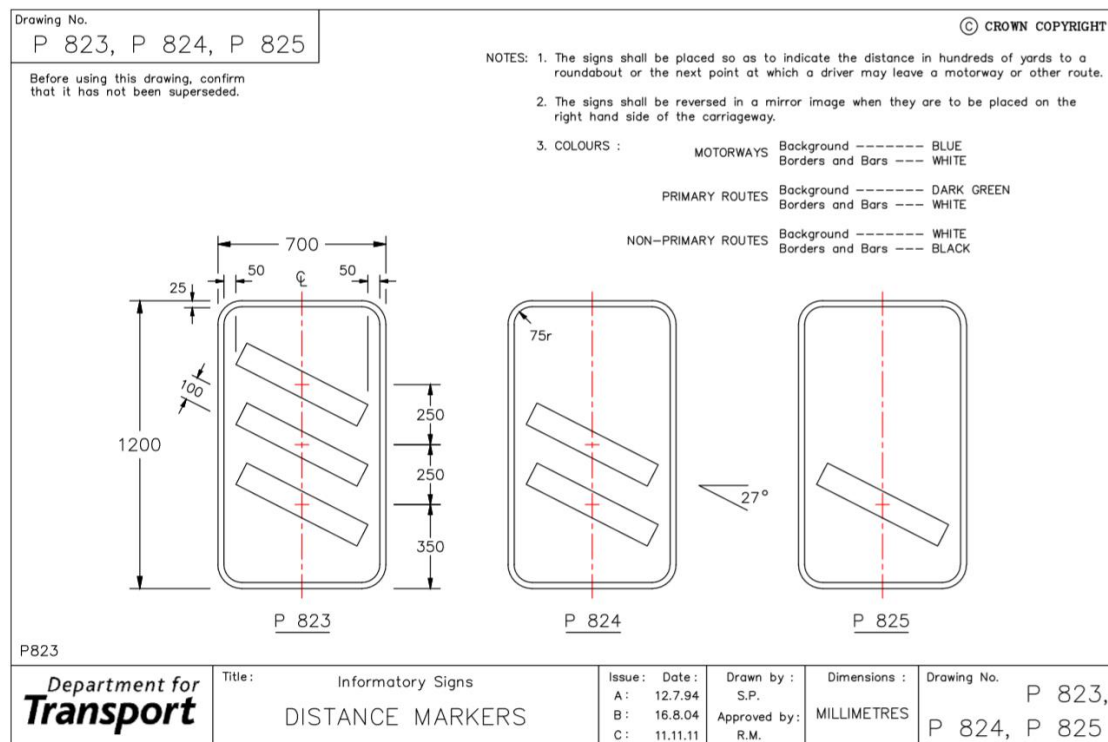
5.7. The recommended 'X' (vertical) height for signs to TSRGD Diagrams 512, 515 and 976 is stated in the TSM and shown below in Table 5.2.

Table 5.2: Recommended Vertical Height

Speed (km/h)	Up to 30	31 to 50	Above 50
X Height (mm)	600	750	900

5.8. If the risk assessment has indicated that countdown markers should also be fitted on the approach to a curve to give an additional visual trigger to the tram driver, a series of signs such as TSRGD Diagrams 823, 824 and 825 can be used as seen below in Figure 5.3. Black bars on either a white or yellow background may be substituted on off-carriageway sections if this improves visibility and is consistent across the tramway.

Figure 5.3: Diagrams 823, 824 and 825





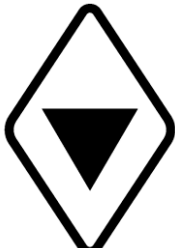
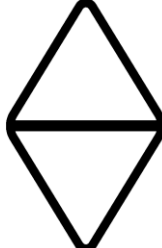
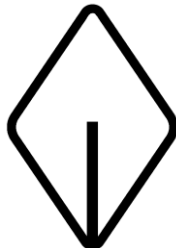




5.9. Fixed signage should always be the first consideration. However, should the risk assessment suggest that active signage may provide greater mitigation, the human factors elements of the warning-system-failure conditions should also be considered in this risk assessment.

5.10. Dependent on the assessed ability of tram headlights to illuminate the retroreflective signs in all environmental conditions, there may be a need to illuminate the off-street safety critical signage.

6. Signs and Markings for Tram Drivers

- 6.1. There are particular highway signs that are for tram drivers only and some of these are highlighted below.
- 6.2. The diamond sign to TSRGD Diagram 976 has been designed to reduce the risk of confusion for other road users and is applicable only to tram drivers.
- 6.3. The design and size of signage must conform to TSRGD Drawing P976 in Figure 3.1 of this guidance.
- 6.4. The signs in Figure 6.1 below should be used and variants avoided. The 'Instruction below' sign is fitted with a white rectangular subsidiary plate with a black border to conform to TSRGD Schedule 12, Part 20, Item 45. The wording should be concise, for example, 'horn' or 'bell' and to always use standard abbreviations, for example, LOS for Limit of Shunt.

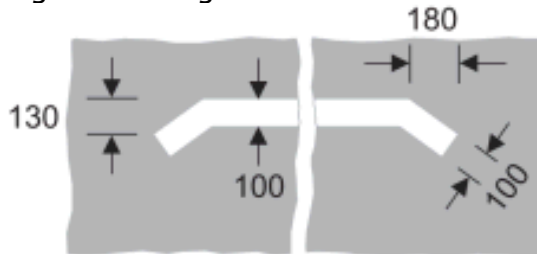
Figure 6.1: Tramway Signs

 Speed Limit	 Temporary Speed Limit	 Give Way	 Stop	 Instruction below on a rectangular plate
 End of Temporary Speed Limit (Termination Board)	 Section insulator		 Coasting Sign	 End of Coasting

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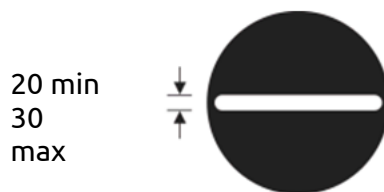
- 6.5. The tram stop line marking to TSRGD Diagram 1001.1 must be used in conjunction with traffic signals as in Figure 6.2 below. The marking must be reflectorised.

Figure 6.2: Diagram 1001.1



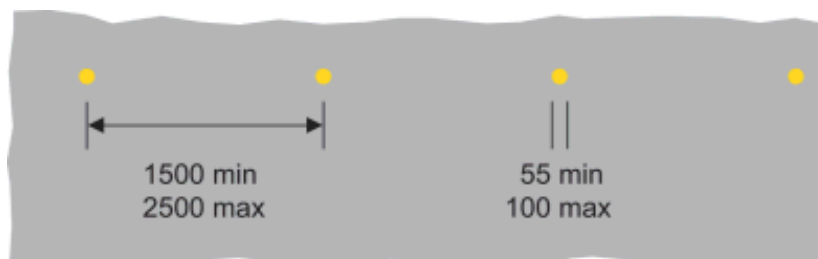
- 6.6. The tram driver must not proceed beyond the line when required to stop by a tram signal displaying a 'bar aspect' sign to TSRGD Diagram 3013.1 as seen in Figure 6.3 below.

Figure 6.3: Diagram 3013.1



- 6.7. The tram stop line marking may also be used in other locations to assist the tram driver, for example, at platform stopping points.
- 6.8. Yellow reflectorised dots to TSRGD Diagram 1066 should be applied where the risk of other highway vehicles encroaching on the tramway path has been assessed to be high. The tramway path is normally the tram swept envelope plus an additional clearance of 300mm as illustrated in Figure 6.4 below.

Figure 6.4: Reflectorised Dots



- 6.9. The tramway path markings should be shown where it is not apparent or clearly defined from the carriageway or kerbs. Where there is on-street parking, it is essential that the tramway path is visible to ensure that highway vehicles are not parked in a position where they would obstruct the operation of trams.
- 6.10. Existing marking(s) on the highway should be reviewed where dots are to be applied so as not to cause confusion, or a resulting non-prescribed marking, when two line types are combined.

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- 6.11. Marking of the tramway path also allows the tram driver to have a clear understanding that the tram will be able to proceed without striking adjacent vehicles. This could be provided using cat eyes or lights.
- 6.12. Measures to delineate where the tramway leaves the highway can also assist tram drivers, drivers of motor vehicles and other highway users and could include measures such as road markings, coloured cats eyes, active road markings (led lights) or frangible bollards etc.