

4. Signs, Markings & Signals: Tramcars

4.1 Tram Signs

4.1.1 Current Standards and Guidance

Signs that apply to tramcars are diamond in shape to distinguish them from signs applicable to motor vehicles. *In Guidance on Tramways* it states that "signs that are not prescribed in [TSRGD] should be specifically authorised by the Department for Transport."

Speed Limits

In *TSRGD* there is one sign specified that applies to tram drivers only; the speed limit of trams, in kilometres per hour. It states that this sign may be used "both on and off the public highway" and that "further guidance on the use of the sign should be sought from HMRI" Since the HMRI is now part of the ORR, this refers back to *Guidance in Tramways* which states that the sign should be shown throughout the tramway, usually at the following locations:

- a. Where the maximum permitted speed on a section of tramway changes; or
- b. Where the maximum permitted speed of a tramway located in the carriageway differs from the limit for other road vehicles.

Point b. is reiterated in *Chapter 3* of the *Traffic Signs Manual* which states that the sign "might not be necessary where all traffic is subject to the same speed limit."

Guidance on Tramways states that the maximum permitted speed limit for integrated tramways "may be the same as, or lower than (but should not be higher than) that for other traffic" and for segregated on-street tramways "may be higher than that for other road traffic provided that the presence of the tramway is clearly indicated to other road users."

It is noted that the higher speed should be agreed with the Police, the Highway Authority and the Inspectorate and that a traffic regulation order may be required.

Figure 4.1: Sign diagram 978
'Maximum speed limit for tramcars
in km/hr'



Figure 4.2: ORR sign 'Give way to other trams or other road vehicles'



Other Signs

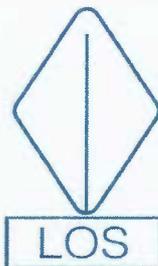
In *Appendix A of Guidance on Tramways*, guidance is given on further signs for use on a tramway. These have to be authorised by the DfT for use on the highway, as mentioned above.

The design and size of the signs must comply with Sign 978 given in TSRGD, and should usually be formed of a white background with a black boarder (although colours may be used with permission of the Inspectorate).

It is emphasised in *Guidance on Tramways* that the signs must be consistent throughout the tramway and that signs other than those in the guidance will need to be discussed with the Inspectorate.

In *Guidance on Tramways*, it states that "Where there is insufficient visibility of an approaching tram, an appropriate 'sound warning' sign should be provided for tram drivers." Since the design of this sign is not given in the standards or guidance, permission will have to be sought for its use.

Figure 4.3: ORR sign indicating the requirement to observe the instruction conveyed by the accompanying plate. The example plate shown indicates the 'limit of shunt'



Source: *Guidance on Tramways*

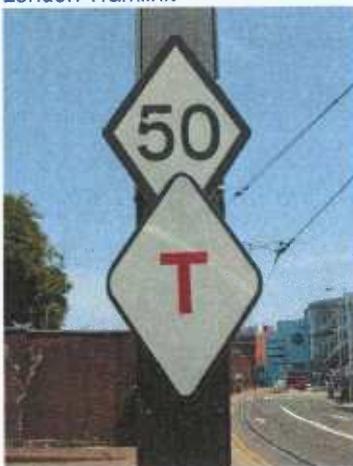
Figure 4.4: ORR sign 'Stop, and do not proceed until it is safe to do so'.



Source: *Guidance on Tramways*

4.1.2 Actual Practice

Figure 4.5: Speed limit in kilometres per hour (upper sign), London Tramlink



Source: Mott MacDonald

4.1.2.1

Figure 4.6: Curve design speed, Dublin



Source: Mott MacDonald

4.1.2.2

All tramways surveyed used white diamond-shaped signs to convey instructions to tram drivers, as recommended in *Guidance on Tramways*, except that on the Luas system speed limits were shown on square signs. The meanings of the signs shown in *Guidance on Tramways* are adhered to on all of the tramways. However, in *TSRGD* it states that speed limit signs for trams should be in kph, and this is not the case all of the tramways, for instance Sheffield Supertram and Manchester Metrolink, who display speed limit signs in mph.

[Figure 4.5](#) also demonstrates the difference in the design and size of tram signs, even on the same tramway.

Symbols used for signs other than those specified in *Guidance on Tramways* are similar from tramway to tramway, but the meaning of the symbols varies. For instance, on the London Tramlink system a diamond sign with a 'W' on it is a warning for a temporary speed restriction ahead, but on other tramways, Sheffield for instance, it indicates a point where an audible warning should be sounded. To complicate matters further, Manchester Metrolink uses a sign with an 'H' on it to indicate the sounding of an audible warning.

Tramway-specific Signage

London Tramlink reported that they had considered the introduction of a sign to indicate the approach to a set of points, but had decided against it, as they were unable to create a sign with a clear meaning.

In Dublin, it was reported that the design speed of some curves was signed as a plate under the 'observe instruction' sign.

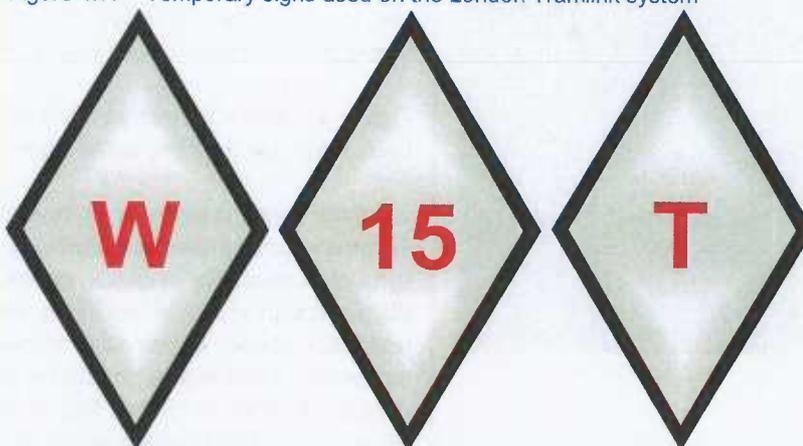
Manchester had several tramway specific signs, including signs instructing drivers when to change between 'street running mode' and 'segregated running mode', and diamond signs warning of possible leaf fall areas, adapted from Network Rail signs.

Temporary Tram Signs during Works

In Dublin, it was reported that temporary tram signs used by the operator are the standard diamond shape, but are coloured black on yellow. This causes a problem, peculiar to the Republic of Ireland, as this is similar to warning signs for motorists which are also black on yellow.

On the London Tramlink system, emergency or temporary speed restrictions are differentiated by the speed being displayed in red. In advance of the speed restriction, a 'W' sign is placed, warning of the need to brake. The end of the speed restriction is marked with a 'T' or termination board. Again, on both the 'W' and 'T' signs they symbol is red and the border is black. [Figure 4.9](#) shows these three signs.

Figure 4.7: Temporary signs used on the London Tramlink system



Source: London Tramlink

Other temporary signs used by London Tramlink include an emergency coast sign and an end of emergency coast sign.

4.2 Road Markings

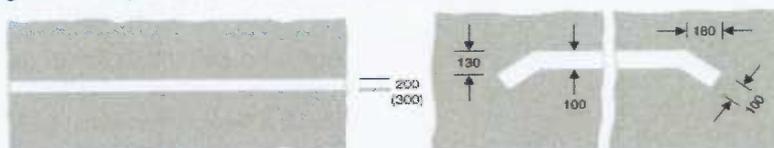
4.2.1 Current Standards and Guidance

The type of stop line to be used for tramcars varies, depending on whether the tramway section segregated or not. The line has the meaning that 'tramcars must not proceed beyond the line when required to stop by light signals'.

Where trams are running with other vehicles, both on an integrated section or a segregated section where buses are allowed, a stop line to diagram 1001 should be provided. *Chapter 5 of the Traffic Signs Manual* states that "The tram Stop line [diagram 1001.1] may be used in addition, either just in front of or just beyond the Stop line; this might be necessary to facilitate swept paths or where primary tram and other traffic signals are not co-located."

A transverse line to diagram 1001.1 should be provided in completely segregated sections.

Figure 4.8: (left to right) diagrams 1001 and 1001.1.



4.2.2 Actual Practice

4.2.2.1 Stop Lines

Tram stop lines, to diagram 1001 and 1001.1 were both observed to be on the tramways surveyed. They appeared to be being used as recommended by *Chapter 5 of the Traffic Signs Manual*, with road marking 1001 used where the tram shared running with other vehicles, and road marking 1001.1 used in on-street segregated sections and where tram signals in on-street integrated sections did not coincide with other traffic signals.

Figure 4.9: Stop line to diagram 1001.1 (on right) in Dublin



Source: Mott MacDonald

Figure 4.10: Mark on tram stop platform in Dublin



Source: Mott MacDonald

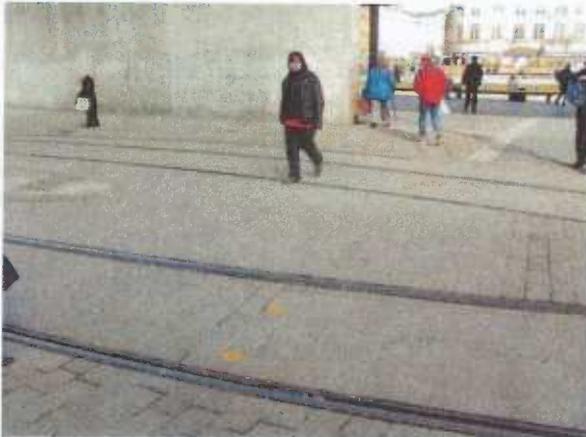
On the Luas system, a white mark has been placed on some tram stop platforms (as in [Figure 4.10](#)) which the tram driver aligns with the cab door. This enables the tram driver to stop more accurately than if the mark on the road were the guide (as the alignment would then depend on the height of the tram driver) allowing the tram doors to be in the correct positions on the platform and ensuring that the tram can be

detected by the loops. A similar practice is carried out in Sheffield, due to limited room for error in the platform lengths.

4.2.2.2 Fouling Point Indicators

As there is no official guidance given on the marking of fouling points, tramways use a variety of different methods. For example, on the Manchester Metrolink system yellow dots are placed across the tracks in on-street sections ([Figure 4.11](#)), and on the London Tramlink system yellow poles are placed beside the tracks on off-street sections ([Figure 4.12](#)).

Figure 4.11: On-street fouling point markers in Manchester



Source: Mott MacDonald

Figure 4.12: Off-street fouling point pole on the London Tramlink system



Source: Mott MacDonald

4.3 Signals

4.3.1 Current Standards and Guidance

In *TSRGD* 36 (3) it is stated that the standard red, amber, green signals do not apply to tramcars; the signals for the control of trams are to be found in diagrams 3013 – 3013.5. These signals are meant for use both in on-road and off-road tramway sections.

Figure 4.13: (left to right)

Aspect diagram 3013.1 'a tramcar shall not proceed beyond the stop line'

Aspect diagram 3013.2 'a tramcar may proceed beyond the stop line and proceed straight ahead'

Aspect diagram 3013.3 'a tramcar may proceed beyond the stop line and proceed to the left'

Aspect diagram 3013.4 'a tramcar may proceed beyond the stop line and proceed to the right'

Aspect diagram 3013.5 'a tramcar shall not proceed beyond the stop line except that, as respects a tramcar which is so close to the stop line that it cannot safely be stopped without proceeding beyond the stop line, it shall convey the same indication as the aspect which was shown immediately before it'



The appearance of point position indicators is not defined in *TSRGD*, and *Guidance on Tramways* merely states the requirement that the indicator should be "of a colour distinguishable from white (but not red or green)".

4.3.2 Actual Practice

4.3.2.1 Tram Signals

Figure 4.14: A signal head with PPI indicator below it in Dublin



Source: Mott MacDonald

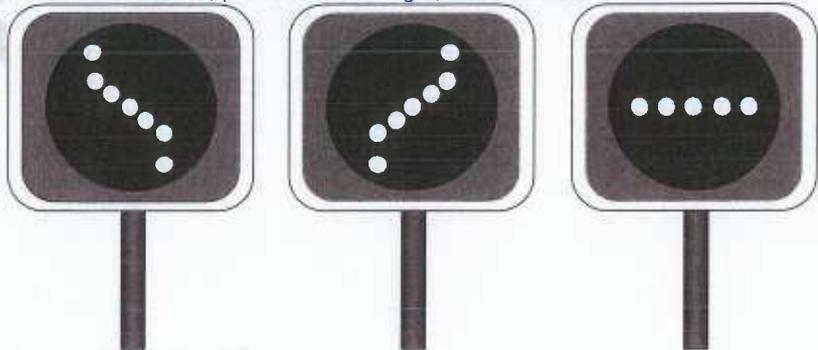
All tramways use the signals as specified in *TSRGD* as shown in [Figure 4.13](#), although some sections of the Manchester Metrolink system are controlled by railway-style red/green signals at present. It is understood that in the future the whole of the Metrolink system will be run by line-of-sight, at which time the railway-style signals will be replaced with LRT signals. Despite using the same style of signals, some tramways do not use the full set of aspects listed in *TSRGD*. For instance, London Tramlink and NET do not use either the 'proceed to the left' or 'proceed to the right' aspects, although they are used on other tramways, such as Manchester Metrolink.

London Tramlink noted their use of yellow backing boards to identify signals which are interlocked with points.

4.3.2.2 Point Indicators

Point indicators are of a similar design on most of the tramways, consisting of a row of white lights which form a 'dog-leg', as shown by the example from London Tramlink in [Figure 4.15](#).

Figure 4.15: A Point Position Indicator, showing the following aspects (l-r): Points set to the left, points set to the right, and no detection



Source: London Tramlink

On the Sheffield Supertram network (which noted in their questionnaire response that some PPIs on the system were signal heads), a further

aspect is added, which is identical to the signal for 'proceed straight ahead' shown in [Figure 4.14](#) which indicates that the points are set for the track straight ahead. The use of this aspect on a PPI was not found to be successful by Sheffield, however, and was noted as one possible factor in SPAS incidents.

Dog-leg PPIs are not used on the Manchester Metrolink system; instead aspects from the signal head are used. The PPI uses the aspect for 'proceed to the right' to mean that the points are set to the right and the aspect for 'proceed to the left' to indicate that points are set likewise. The aspect for 'no detection' is a horizontal.

All PPIs observed were of a colour indistinguishable from the white of the signals, which does not follow the recommendations in *Guidance on Tramways*.

5. Pedestrian Safety

5.1 Pedestrianised Areas

5.1.1 Current Standards and Guidance

In *Guidance on Tramways* it recommends “To help visually-impaired people, the preferred method of marking the tramway path in pedestrian zones is for it to be slightly lower than that of the surrounding area, and for there to be a suitable colour contrast between surfaces.” It must be remembered, however, that dropped kerb areas are required in the guidance for those with limited mobility and that these should be marked with the appropriate tactile warning to alert the visually impaired.

5.1.2 Actual Practice

Not all of the tramways surveyed had sections of tramway which run through pedestrianised areas, but London Tramlink and Manchester Metrolink are examples of those that do. In Manchester, the tramway is paved with block paving, with the area for pedestrians paved in flags, whilst in Croydon the tramway is paved in the same manner as the surrounding pedestrian area. Both tramways are lower than the surrounding areas, with dropped kerbs provided at intervals for the mobility impaired. Neither uses a colour contrast to emphasise the swept path of the tram.

Figure 5.1: The tramway running through a pedestrianised area in Manchester



Source: Mott MacDonald

Figure 5.2: A tram entering a pedestrianised area in the centre of Croydon



Source: Mott MacDonald

5.2 Pedestrian Crossings

5.2.1 Current Standards and Guidance

5.2.1.1 Signs

Figure 5.3: Sign diagram 963.3



Guidance on Tramways lists signage as one of the important features which should be used throughout the tramway to allow pedestrians to identify the safest place to cross.

In *Chapter 3* of the *Traffic Signs Manual*, it is advised that sign diagram 963.3 should be used “where the majority of pedestrians cross a tram route.” ‘Look Both Ways’ can be varied to ‘Look Left’ or ‘Look Right’ as appropriate. It can be used to sign both controlled and uncontrolled pedestrian crossings.

5.2.1.2 Road Markings

Figure 5.4: Diagram 1012.1



Source: TSRGD

Where a footway passes over a tramway at a crossing point, a line to diagram 1012.1 (shown in [Figure 5.4](#)) can be used to demarcate the edge of a footway.

Coloured surfacing to mark a footway crossing is discussed in [Section 0](#).

5.2.1.3 Signals

Figure 5.5: Diagram 4002.1



Source: TSRGD

Guidance on Tramways recommends that crossing points for the tramway should be co-ordinated with adjacent highway crossings where possible, although it is not necessary for the same sort of crossing to be used over both the highway and the tramway.

For places where the normal passive signing at pedestrian crossings is inadequate, special pedestrian signals should be used for the tramway crossing (shown in [Figure 5.5](#)). In *Guidance on Tramways* it states that “for consistency with highway practice, a conventional red/green man pedestrian signal should be used where there are signals controlling tram or road traffic at the location concerned.” Where these signals are used for a place where the crossing is over tram tracks only, e.g. separated from the remainder of the highway crossing by the provision of refuges, or where an off-street or segregated on-street tramway crosses or enters a road, the pedestrian signal should show the green man at all times except when a tram is coming.

Figure 5.6: Flashing orange pedestrian signals



Source: RPA

5.2.1.4

Layout

When designing an uncontrolled pedestrian crossing for a tramway, *Guidance on Tramways* stresses the need to make the crossing “obviously the safest crossing point”. This should be coupled with a study of pedestrian desire lines, as crossings out of the pedestrian desire line will be seldom used, no matter how safe they look!

The guidance recommends using features to aid the identification of safe pedestrian use, by the means of “the type of paving, signing, ... dropped kerbs, pedestrian guard rails or planters.” *Pedestrian Safety* states that “defined crossing points are to be provided at tram stops.”

With regards to the layout of crossings, *Guidance on Tramways* states that “Crossing points on a tramway should be co-ordinated with the crossing points of any shared or adjacent carriageways, though it recommends that in this situation, “the part of the crossing over the tram track should not be in-line with any other separately signalled pedestrian crossing or separate zebra crossings.”

On off-street tramways, the preferred arrangement recommended in *Guidance on Tramways* is to separate entirely the crossing points for any road and for the tramway, which should then be uncontrolled unless hampered by visibility problems, but if pedestrian crossings are alongside the road, the arrangements for pedestrian crossings of on-street tramways should be used.

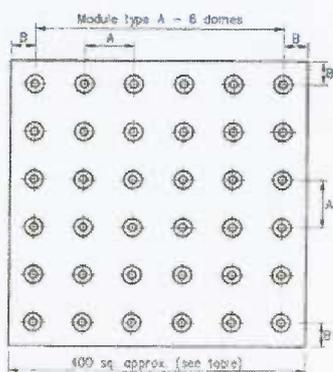
5.2.1.5

Physical Barriers

It may be necessary to provide some kind of physical guarding to prevent pedestrians crossing the tramway (and sometimes the road as well) in unsuitable places, both at controlled and uncontrolled crossings and *Guidance on Tramways* suggests that “Pedestrian guardrails may be used to direct pedestrians to safe crossing points”. However, in the Transport for London (TfL) document *Pedestrian Guard Railing: A*

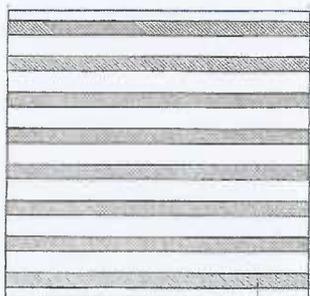
5.2.1.6

Figure 5.7: Blister Tactiles



Source: DfT

Figure 5.8: Corduroy Tactile



Source: DfT

Review of Criteria for Installation, it states that "The general philosophy is that the erection of new guard rails should not be considered if alternative safety measures could be used", but it also states that they are useful for encouraging pedestrians to use designated crossing points and "may also be helpful in guiding blind and partially sighted people to the crossing area." *Guidance on Tramways* states that "fencing or pedestrian guard rails should be provided where necessary, to guide pedestrians to face oncoming trams before they cross the track, or to direct their attention to pedestrian crossing lights".

Crossing Features for the Disabled

Guidance on Tramways emphasises the need to consider the disabled when designing crossings, by stating that "All designated crossings of tram tracks should be designed with the needs of mobility and visually-impaired people in mind."

In *Pedestrian Safety*, it says that "crossings should have dropped kerbs and appropriate tactile marking", while *Guidance on Tramways* makes it clear that "tactile surfaces should follow Department for Transport guidance." The DfT guidance referred to is the *Guidance on Tactile Paving*, which outlines various types of tactile paving to be used to assist the visually impaired.

This guidance does not specifically mention tramway crossings, but gives guidance on tactile types and layouts for pedestrian crossings of the highway, and at railway level crossings. For pedestrian crossings of highways, the guidance specifies red blister tactiles for controlled crossings and buff blister tactiles for uncontrolled crossings (refer to [Figure 5.7](#)).

At level crossings it recommends the use of corduroy hazard warning tactiles (see [Figure 5.8](#)). The guidance states that these tactiles can be used "for any situation (except at pedestrian crossing points...) where visually impaired people need to be warned of a hazard and advised to proceed with caution".

In *Guidance on Tramways*, it recommends the use of a distinctive audible warning for tramway crossings, either:

- Made by the approaching tram
- At the pedestrian signal, "to the appropriate specification issued by the Department for Transport", but such that the sound cannot "be confused with any other audible signal given to pedestrians"

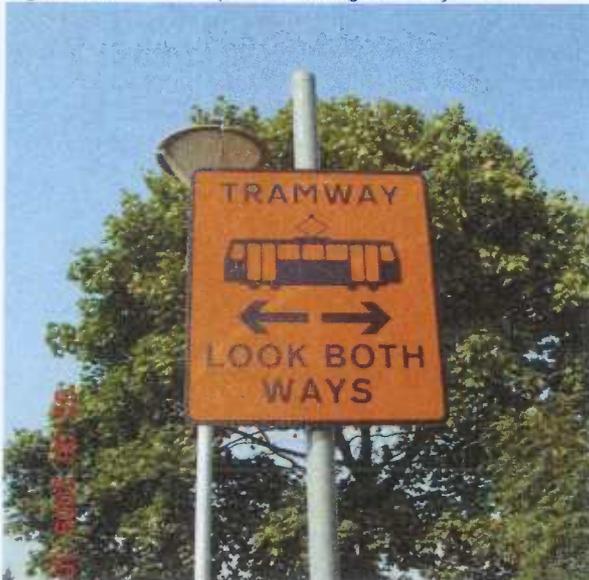
5.2.2 Actual Practice

5.2.2.1 Signs, Markings and Signals

On all tramways surveyed, the majority of tramway crossing points for pedestrians are signed with sign diagram 963.3, as shown in the example in Nottingham in [Figure 5.10](#), or its equivalent in Ireland. On most tramways, signs were also displayed at signalised crossings.

In pedestrianised areas, examples of crossings which did not have this sign were noted on the Manchester Metrolink and London Tramlink systems. In these areas, some defined points, with dropped kerbs for the mobility impaired, were provided, but most pedestrians crossed indiscriminately, meaning that any signs provided would have merely created clutter.

Figure 5.9: Yellow pedestrian sign in Croydon



Source: Mott MacDonald

Figure 5.10: Standard pedestrian sign in Nottingham



Source: Mott MacDonald

A noted variation to the standard version of the sign is a black on yellow version used on the London Tramlink system, shown in [Figure 5.9](#). The standard sign was replaced with this higher visibility version on the crossing to an island platform in response to some near misses with pedestrians. All crossings between tram platforms at stops were observed to be universally unsignalised, both for tramways driven by railways signals and those driven by line-of-sight. Accompanying these signs at crossing on some of the tramways was markings on the road

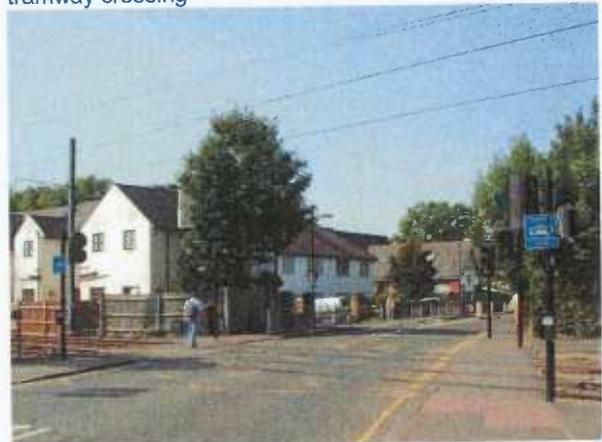
instructing pedestrians to 'look right' or 'look both ways' as appropriate. This was in evidence especially in places where pedestrians were required to cross the tramway and road separately or where the tramway ran in a contra-flow lane, causing confusion over which direction to look for oncoming traffic. In the response from Sheffield Supertram, it was reported that these road markings seemed to be more effective at guiding pedestrians than the equivalent blue sign.

Figure 5.11: Unsignalised tramway crossing on the London Tramlink network



Source: Mott MacDonald

Figure 5.12: Pedestrian signals as part of a signalled tramway crossing



Source: Mott MacDonald

Pedestrian crossings of segregated sections of tramway, both on- and off-street were observed to consist mainly of unsignalised crossings, except as part of a road junction, as in [Figure 5.12](#). At these crossings the green man is shown at all times except when a tram is approaching.

A pedestrian crossing of a tramway in between two crossings of roads can be seen in [Figure 5.13](#). Whilst the road crossings are signalled, the tramway crossing is not, as both pedestrian and tram numbers are low compared to the level of road traffic. However, a problem was identified with crossings of this kind, as pedestrians became confused about which way to look for oncoming traffic. The 'look right' etc. road markings were found to be useful in this situation, as can be seen from the example from Sheffield.

Figure 5.13: A pedestrian crossing in Sheffield



Source: Mott MacDonald

Signalised crossings of tramways were provided on tramways where visibility was poor, or where the tramway was shared with other road vehicles. In Manchester, limited use is made of orange tram wig-wag signals at pedestrian crossings of the tramway only where visibility is poor.

It is interesting to note that in their response to the questionnaire, Edinburgh Trams stated that they had come under pressure from the council to introduce signalised crossings to tram-only sections for no other reason than that pedestrian crossings of the road nearby were signalised.

5.2.2.2 Demarcation

The highlighting of crossing points by various means was observed on a few of the tramways, either with coloured surfacing or contrasting block paving, as the example in Dublin in [Figure 5.14](#). This was not widespread, however, with most using markings similar to road crossings.

Figure 5.14: Contrasting block paving at a crossing in Dublin



Source: Mott MacDonald

5.2.2.3 Physical Barriers

The use of pedestrian guard railing to funnel pedestrians to approved crossing points and to turn them towards oncoming trams was observed on all of the tramways surveyed, to greater or lesser extents.

Figure 5.15: Extensive use of pedestrian guardrailing at a crossing on the London Tramlink network

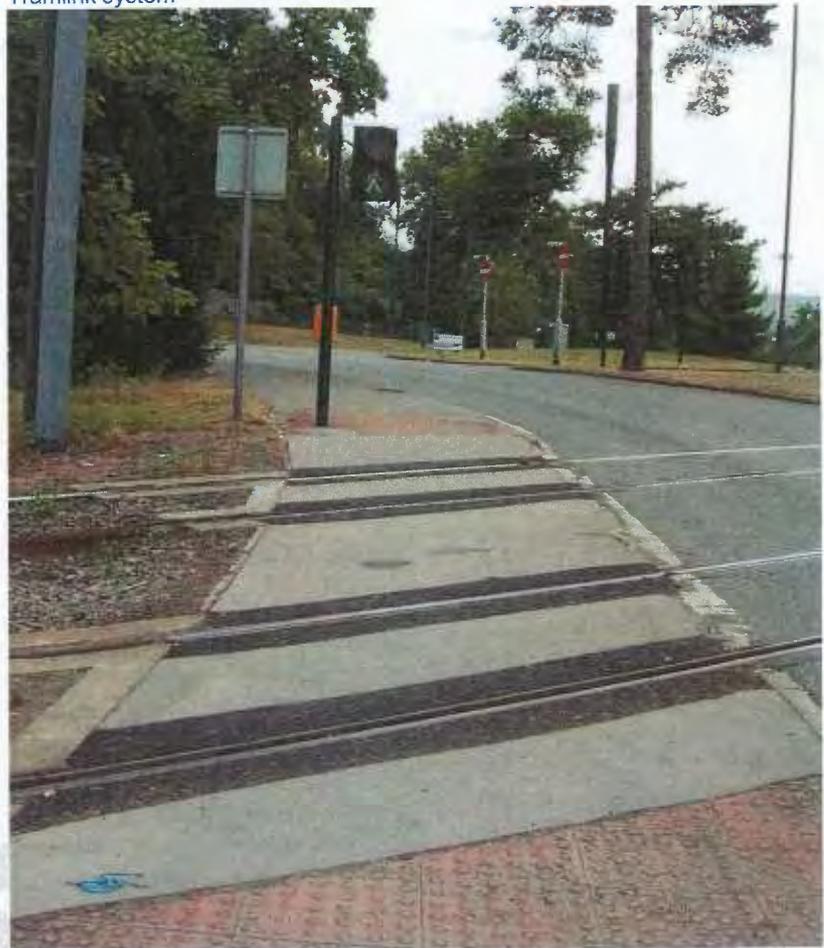


Source: Mott MacDonald

5.2.2.4 Crossing Features for the Disabled

Crossing points on the tramways surveyed had either no tactile paving, or blister tactile paving as used at dropped kerbs for road crossings. In general, red coloured tactile paving is used at controlled crossings and buff at uncontrolled crossings in heritage areas, such as in Dublin, where grey are used.

Figure 5.16: Red blister tactile paving at a controlled crossing on the London Tramlink system



Source Mott MacDonald

5.3 Tram Stops

5.3.1 Current Standards and Guidance

There are many areas of guidance available on tram stops, but this section discusses only on those which concern highway interface at tram stops, specifically pedestrian safety.

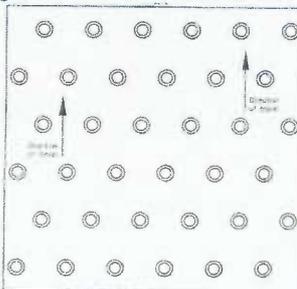
5.3.1.1 Tram Stop Layout

To allow safe circulation of pedestrians on tram stop platforms, *Guidance on Tramways* recommends that “the minimum width between the tramway edge of the platform and any structure on the platform, except for the roofs of shelters, should not be less than 1500 mm”. Where the tram stop is formed from an island platform, the minimum width of the overall platform “should normally be at least 3000 mm wide”. The guidance highlights the need to provide adequate platform width for wheelchair users, or those with pushchairs to board, as well as planning for possible queues around ticket machines.

In *Guidance on Tramways* it states that “Where a side platform has road traffic adjacent to the non-tramway side a fence or barrier should be provided”.

5.3.1.2 Tram Stop Design for the Visually Impaired

Figure 5.17: Offset Blister Tactile

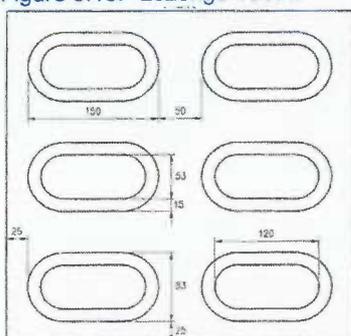


Source: DfT

On the subject of designing for visually impaired passengers, *Guidance on Tramways* states that “platforms should be provided with a tactile surface in a contrasting colour. Platform edges should also be clearly defined with a strip of lighter colour. Design of the tactile surfaces should follow Department for Transport guidance”, that is *Guidance on Tactile Paving*.

In *Guidance on Tactile Paving*, three forms of tactile paving are specified for use on tram stops. The first is a corduroy warning tactile paving (shown in [Figure 5.8](#)) which is used for “the foot of a ramp to an on-street light rapid transit (LRT) platform, but not at any other ramps” as a warning for visually impaired pedestrians that they are passing from a footway onto the platform of a light rail system. It should be noted that the Guidance also recommends the use of corduroy tactiles “where people could inadvertently walk directly on to a platform at a railway station”.

Figure 5.18: Lozenge Tactile



Source: DfT

5.3.1.3

Tram Stop Design for the Mobility Impaired

The other two forms of tactile paving recommended for tram stops are concerned with the edge of the platform. On off-street platforms, the guidance stipulates that offset blister paving (shown in [Figure 5.17](#)) is used, as on heavy rail and underground platforms. This paving may be “any colour other than red, but should provide a good contrast with the surrounding area to assist partially sighted people”. The guidance states that “It should not be used at on-street LRT platforms where the lozenge shaped platform edge warning surface should be used”.

The guidance gives the reason for using lozenge tactile paving (shown in [Figure 5.18](#)) to highlight the edge of on-street platforms as “This surface was developed because of the risk that the blister shape platform edge (off-street) warning surface ... could be confused in the street environment with the blister surface used to indicate the absence of a kerb upstand”. This form of tactile paving may be any colour other than red, though usually buff. It should be noted that this surface “is not recommended for use at raised bus stops” in the guidance.

Forms of tactile paving for use at tram stop crossing points is as discussed in [Section 5.2.1.6](#).

When designing tram stops for mobility impaired passengers (which includes not only those in wheelchairs, but also includes, for example, those with pushchairs), *Guidance on Tramways* states that “A safe and convenient access to tram stops should be provided for all, including mobility-impaired people”. The gradient of a ramp to a tram stop should “not be steeper than 1 in 20 (5%)” unless space is limited, where it can be up to 1 in 12 (8.5%). Ramps between 5% and 8.5% “should be fitted with a handrail”.

With regard to the tram stop itself, the guidance states that “differences in height between tram floor and platforms must not exceed 50 mm at doors which are intended to be used by mobility-impaired passengers” and that “where such access is only provided at some doors, adequate signage should be provided to indicate the door or doors which provide it”.

5.3.2 Actual Practice

5.3.2.1 Tram Stop Layout

Tram stops on-street varied, even within a tramway, depending on the road space available. [Figure 5.19](#) shows an example of a badly

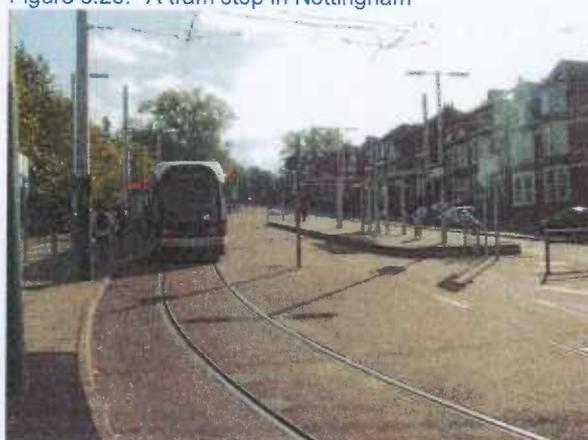
congested tram stop which is also a footway. There is a pedestrian safety issue here with pedestrians wanting to walk past stepping into the path of the tram in order to pass those waiting at the stop. [Figure 5.20](#) is an example from Nottingham where the road space allows the footway to pass behind the stop on the left, easing congestion.

Figure 5.19: Wellesley Road, Croydon



Source: Mott MacDonald

Figure 5.20: A tram stop in Nottingham



Source: Mott MacDonald

Circulation on the tram stops again varied. Some were cluttered with oversized ticket machines and excessive fencing, again causing obstruction where the tram stop was part of the footway.

5.3.2.2 Tram Stop Design for the Visually and Mobility Impaired

Despite the *Guidance on Tactile Paving* recommending the use of offset blister paving on the edge of off-street tram stop platforms, only London Tramlink and Manchester Metrolink utilise this form of paving, and then only at some off-street tram stops (as in [Figure 5.21](#)), using lozenge paving at most tram stops. All other tramways surveyed use lozenge tactile paving on all platforms, both on- and off- street (as [Figure 5.22](#)) and this is intended to be the case for the Edinburgh tramway. Lozenge tactile paving was observed being misused for the edging of a bus stop in the centre of Birmingham (see [Figure 5.23](#)), potentially causing great confusion to blind or partially sighted people.

Figure 5.21: Offset blister paving on the London Tramlink system



Source: Mott MacDonald

Figure 5.22: Lozenge and ladder tactiles in Sheffield



Source: Mott MacDonald

Several of the tramways use tactile paving to indicate where tram doors will be located on the platform. [Figure 5.22](#) shows ladder tactiles laid in a strip on a platform in Sheffield, and [Figure 5.25](#) shows similar ladder tactiles marking the position of the door to be used for access to the wheelchair space on board.

Figure 5.23: Lozenge tactile paving being misused at a bus stop in Birmingham



Source: Mott MacDonald

Figure 5.24: Corduroy tactile paving at the bottom of an on-street platform in Nottingham – note the exemplary cover infill



Source: Mott MacDonald

The marking of the bottom of an on-street ramp to the tram stop platform with rows of corduroy tactile paving was also observed on many of the tramways (as shown in [Figure 5.24](#)), though it was absent from platforms on the Midland Metro and Sheffield Supertram systems.

Access for the mobility impaired is available to all tram stops on all tramways surveyed. All the tramways surveyed have level boarding, most along the full length of the tram stop. Manchester Metrolink is the exception as some of the city centre tram stops has only level boarding in the centre, the rest of the platform being sloped up to the central area.

Several of the tramways use a wheelchair icon on the platform to indicate which door wheelchair users should board at in order to use the dedicated wheelchair space on board.

Figure 5.25: Location of the door with wheelchair space on a platform in Manchester



Source: Mott MacDonald

Figure 5.26: Location of the door with wheelchair space on a platform in Nottingham



Source: Mott MacDonald

DRAFT

6. Cyclist Safety

6.1 Cyclist Tramway Crossings

6.1.1 Current Standards and Guidance

6.1.1.1 Signs

Figure 6.1: Diagram 966



Source: TSRGD

There are no specific signs specified in the *TSRGD* to warn cyclists of the hazards of tramways, although at the worst hazards the sign 'cyclists dismount' (shown in [Figure 6.1](#)) could be used. The use of this sign is, however, discouraged in many guidance documents on cycling facilities. *Cycle Infrastructure Design*, published by the DfT, describes this as "an over-used sign. On a well-designed cycling facility, it is very rarely appropriate" and has been likened in other publications to asking a motorist to get out and push! *Chapter 3* of the *Traffic Signs Manual* outlines the rare cases where it may be necessary as:

- where cyclists are required to use a pedestrian crossing facility that they cannot legally cycle on,
- at the entrance to a pedestrian area
- at a location with a low headroom or width restriction (e.g. a subway or bridge)
- at places where visibility is restricted to such an extent that cycling would be unsafe

6.1.1.2 Signals

Figure 6.2: Diagram 3000.2



Source: TSRGD

In *TSRGD*, signals (diagram 3000.2, as shown in [Figure 6.2](#)) are shown which are specifically for the use of cyclists. Since adequate cycle provision is an important part of the design of a tramway, the use of these signals may be considered as part of the cycle scheme.

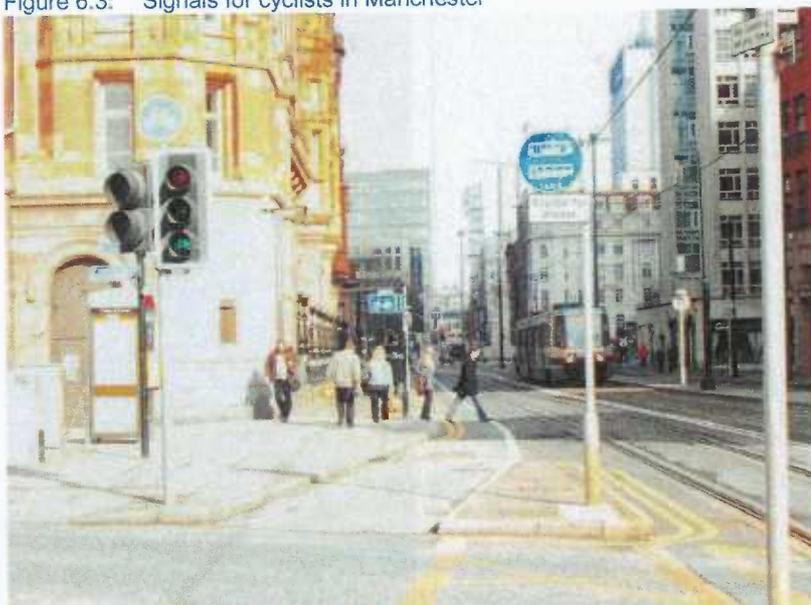
6.1.1.3 Alignment

Cyclists are at risk of an accident from catching a wheel in the rail's groove, or slipping on the rails, particularly in wet or icy conditions. In *Guidance on Tramways*, it recommends that where cyclists need to cross the rails they should be able to do so "as far as possible, at right angles to the tracks. Where the achieved crossing angle is less than 60°, consideration should be given to alternative crossing layouts and other measures that mitigate the risks faced by cyclists."

6.1.2 Actual Practice

Toucan crossings to enable cyclists to cross tramways with pedestrians were found on several of the tramways as part of their wider cycling provision and in Manchester, cycle specific signals were observed to be used, as shown in [Figure 6.3](#)

Figure 6.3: Signals for cyclists in Manchester



Source: Mott MacDonald

The signing and marking of cycle facilities was generally as recommended by the *Traffic Signs Manual*.

On the London Tramlink system, however, pedestrian and cyclist crossings of off-street sections of the tramway have been made extremely unfriendly to cyclists, in reaction to a cyclist fatality at an off-street tramway crossing. The RAIB issued an Improvement Notice requiring Tramtrack Croydon Ltd to assess the risks to users at footpath crossings on its system, and identify any further actions required to reduce risk. The result is a mass of guardrailing which is an annoyance for pedestrians as well as cyclists, as can be seen in [Figure 5.15](#).

Crossing facilities that allow cyclists to cross the tram rails at a better angle were observed in some places. An example is shown in [Figure 6.4](#), in Dublin, which has good and bad qualities. The resulting crossing is at an angle which minimises the risk of cyclists slipping or getting caught in the rails, and does not take cyclists too far out of their way.

Not so good are the angle at which cyclists must enter the bypass from the carriageway, and the need for cyclists to look back over their shoulders to check for turning traffic.

Figure 6.4: A cycle crossing in Dublin



Source: Mott MacDonald

6.2 Cycling on and around On-street Tramways

6.2.1 Current Standards and Guidance

6.2.1.1 Signs

Cycle lanes are signed on-street using signs to diagram 958.1 for mandatory cycle lanes, and signs to diagram 967 for advisory cycle lanes. When providing a combined footway/cycleway, it should be signed with diagram 957 for segregated and 956 for unsegregated cycleway/footways.

Figure 6.5: (l-r) Diagrams 958.1, 967, 956 and 957



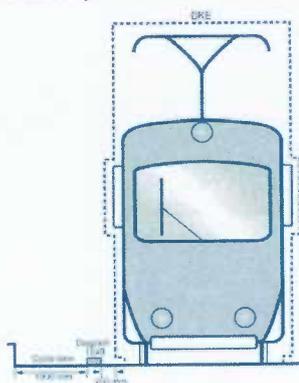
Source: TSRGD

6.2.1.2 Road Markings

There are no tramway-specific cycle markings specified in the *TSRGD*, but on-street cycle lanes may be present. Cycle lanes can be either mandatory (where other vehicles are excluded for at least part of the day) or advisory (where other vehicles may enter if necessary and when it is safe to do so). Mandatory lanes (which require an order) are edged with a longitudinal white line to diagram 1049, while dashed white lines to diagram 1004 or 1004.1 are used to edge advisory lanes.

6.2.1.3 Alignment

Figure 6.6: Cycle land adjacent to tramway.



Source: *Guidance on Tramways*

Guidance on Tramways recommends that, for a section of cycleway running parallel to the tramline, a distance of 200mm should be maintained between the edge of the DKE and the tram side of the cycleway line, as well as a width of 1000mm for the cycleway, measured from the kerb face to the nearest edge of the cycleway line. However, *Guidance on Tramways* also recommends that the cycle lane is a maximum of 1000mm wide, "to avoid the risks from unauthorised parking of vehicles fouling the DKE".

Likewise, for situations where no specific cycle lane can be provided, "the clearance between rail and kerb should be a minimum of 1000 mm, and consideration should be given to the removal of obstacles from that area". This would not allow a cyclist to be passed by a tram and would also leave them very little room to manoeuvre around obstacles in their path. In *Guidance on Tramways* it says that "where a tram cannot pass a cyclist safely on the carriageway, provision should be made for cyclists where reasonably practicable." It does not give any guidance on what the provision should consist of.

In *Chapter 5* of the *Traffic Signs Manual*, it is recommended that the minimum width of a cycle lane is 1.5m as "widths less than this give cyclists very little room to manoeuvre around debris, surface defects or gully gratings." It also recommends 2m wide lane in areas of high

cycle traffic, but cites this lane width as being susceptible to parking abuses.

6.2.2 Actual Practice

Provision for cyclists varies considerably from tramway to tramway, both in quality and quantity, as well as the approach to cycle facilities.

NET, for instance, has an overriding policy of providing optional facilities for cyclists on roads parallel to the tram route. But due to consultation with local cycling groups during the design phase, a fairly coherent cycling network, some on-street alongside tramways, and some on alternative parallel streets, is in evidence. This has been coupled by various public information campaigns (an example is shown in [Figure 6.8](#)) to publicise routes and facilities and to help cyclists identify potential hazards. Incidents with trams do occur, but in the responses these are reported as being in 'no cycling' areas. [Figure 6.7](#) is an example of planning for cyclists within the overall re-modelling of the streetscape to incorporate the tramway. A contra-flow cycle lane has been provided when this street was closed to motor vehicles.

Figure 6.7: Contra-flow cycle lane, NET



Source: TSRGD

Figure 6.8: NET cycling public information leaflet



Source: NET

Manchester Metrolink reports having no shared running of cycles with trams, although some stretches of cycle lanes adjacent to on-street cycle lanes were observed. In Sheffield it was noted that some conflict occurs where cyclists delay trams of the streets, having no room to pass them.

Cyclists are at risk of an accident from catching a wheel in the rail's groove, or slipping on the rails, particularly in wet or icy conditions. This has caused several of the tramways to search for an appropriate warning sign. Many of the tramways surveyed used some kind of sign or markings to warn road users, especially cyclists, about the slipperiness of the rails. In Sheffield standard sign diagram 557,

normally used to mean 'slippery road' has had an advisory speed limit plate added to it, as well as a plate warning of the presence of slippery rails.

Figure 6.9: 'rails slippery when wet' plate added to a 'slippery road' sign in Sheffield



Source: Dave Skirrow, Sheffield Supertram

In consultation with local cycling groups, a new sign was designed for use on NET to warn cyclists of the slippery rails, as shown on the left in [Figure 6.10](#), and this has been adapted by several other UK tramways. In Dublin, it was adapted by the RPA to the style of other RoI warning signs for use on the Luas system.

Figure 6.10: 'Rails slippery for cyclists' in Nottingham (left) and Dublin (right)



Source: l-r: NET, RPA

7. Highway Interface: Special Paving

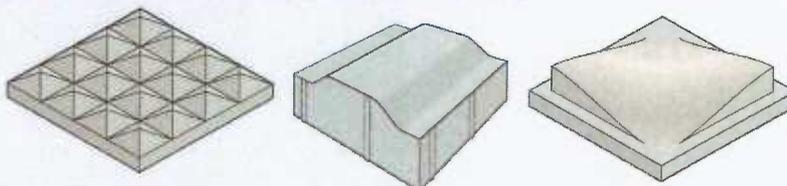
7.1 Pedestrian and Vehicle Deterrent Paving

7.1.1 Current Standards and Guidance

One type of special paving which may be utilised on tramways is deterrent paving, which is paving that forms a textured surface for the purpose of discouraging access.

In *Guidance on Tramways*, it states that “appropriate forms of deterrent paving may be used to discourage both pedestrian and vehicular access”. Particularly, it notes that “Suitable treatment of the road surface leading to a wholly segregated section of track, e.g. ballast, raised rough stonework or isolated cobbles set into the surface, would help to encourage compliance with the signs.”

Figure 7.1: Examples of available deterrent paving



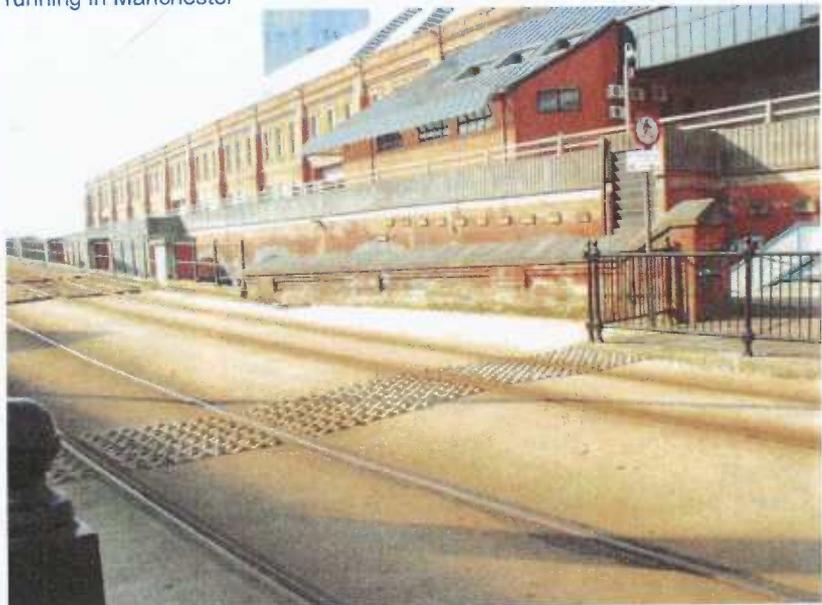
Source: <http://www.marshalls.co.uk/>

7.1.2 Actual Practice

7.1.2.1 Deterrent Paving

The use of deterrent paving was observed on most of the tramways at locations where the tramway crossed a road, or at a tram gate (as in the example in [Figure 7.2](#)). RPA gave an interesting summary of their experience with using deterrent paving on the Dublin Luas system. They said that ‘sharks teeth’ were the most effective pavement for deterring unauthorised vehicles from entering the system (see [Figure 7.3](#)), but that they could be dangerous for pedestrians and were hated by landscape architects as being ‘not aesthetically pleasing’. Ruted concrete was the least visually intrusive but also the least effective as a deterrent, but that cobbles or concrete blocks laid in bands and different height were a happy medium for acting as a deterrent and pleasing the landscape architects!

Figure 7.2: Deterrent paving at the transition between on-street and off-street running in Manchester



Source: Mott MacDonald

The use of unevenly laid cobbles as a deterrent to motorists and pedestrians was mentioned in the response from Sheffield Supertram. This is potentially more visually appealing than preformed concrete blocks.

7.1.2.2 Other Deterrent Surfaces

As well as paving which is specifically designed to be used as a deterrent, there are other surfaces which perform the same function. Grass track was observed on the Dublin Luas and Manchester Metrolink systems. Although on the Luas system deterrent paving is used in advance of the grass track, as in Figure 7.3, in Manchester it is not. The grass acts as a visual deterrent to driving down the segregated tramway, and looks attractive at the same time.

Ballast is also a visual deterrent, though less attractive on grass track. Where the road crosses a segregated section of tramway, the ballast can act as a visual deterrent for turning into the tramway by mistake, as in the example in [Figure 7.4](#). In the response from London Tramlink it was reported that there was a problem with motorists driving onto the ballasted track by accident at two locations, however, in these

instances the ballast is not in view from the junction as the segregated sections are initially surfaced with block paving.

Figure 7.3: Deterrent paving and grass track in Dublin



Source: Mott MacDonald

Figure 7.4: Ballast either side of a junction on the London Tramlink system



Source: Mott MacDonald

Another form of deterrent, used widely on the tramways, is wooden slats, designed to deter pedestrians from walking on ballasted sections of the tramway. This form of deterrent was most often found adjacent to crossing points at tram stops, as shown in Figure 7.5, but was also observed at junctions between a road and an off-street tramway.

Figure 7.5: Pedestrian deterrent on the London Tramlink system



Source: Mott MacDonald

7.2 Coloured and Textured Surfacing

7.2.1 Current Standards and Guidance

Another highway interface option for tramways is the use of coloured surfacing. In *Chapter 5* of the *Traffic Signs Manual*, it states that the swept path of a tram may be shown by road marking, or “indicated by the use of colour, texture or differences in level.” The colour can be achieved in a similar manner to that used for bus or cycle lanes, or alternatively could be formed with a contrasting paving type.

7.2.2 Actual Practice

7.2.2.1 Tram Lanes and On-street Segregated Sections

The use of coloured surfacing to mark tram lanes or on-street segregated sections of the tramway was widespread on the tramways surveyed. The same colour was not used from tramway to tramway and sometimes even within the same tramway. For instance, on the Midland Metro system, where the tram shared a lane with a bus, red surfacing was used to emphasise this, but where the tram ran in a reserved track in the centre of the road, green surfacing was used. In Dublin, newer tram only lanes were laid with setts, while the adjacent road carriageway was black top, as shown in [Figure 7.7](#).

Figure 7.6: A riot of coloured surfacing in Sheffield with red for buses only and green for bus/taxi/cycle/tram only



Source: Mott MacDonald

Figure 7.7: Contrasting setts on a new tram lane in Dublin



Source: Mott MacDonald

In Sheffield, the use of different coloured surfacing for tram and bus lanes has led to a rather cluttered and overpowering streetscape in Hillsborough, as shown in [Figure 7.6](#).

Coloured surfacing is also used to highlight crossing points to pedestrians, for instance in Dublin, where crossings are either coloured white or picked out in a contrasting surfacing type.

7.2.2.2 Skidding

Several tramways use road markings, coloured surfacing, or a combination of both to try to minimise skidding incidents. In Dublin and Sheffield, red surfacing is used in places at the edge of the road to discourage motorists from taking 'the racing line' around corners and skidding on the rails. An example of this is also shown in [Figure 7.8](#) in Sheffield.

Figure 7.8: Red surfacing in Sheffield



Source: Dave Skirrow, Sheffield Supertram

In Dublin, anti-skid surfacing is laid on the roadway where there is a junction with the tramway.

8. Recommendations

The recommendations fall into two categories:

- Guidance to be produced on behalf of UKTram, either for inclusion in guidance produced by others, or for publication as a tramway technical note.
- Proposed amendments to the *Traffic Signs Regulations and General Directions*, and accompanying publications.

Each recommendation highlights key areas which need to be included to the new guidance. Some of the recommendations stem from a lack of guidance, or of clarity in existing guidance, which has led to significant variations in current practice, some safer and of a higher quality than others. Other recommendations will enable standards and guidance to catch up with the expansion and evolution of tramways in the UK.

8.1 Recommended Changes to Guidance

The current guidance available on signs for tramways and pedestrian and cyclist safety provides little in the way of practical recommendations for design. In order to reduce variability in design and highlight best practice from tramway to tramway, it is recommended that all new guidance produced is centred on examples. The inclusion of case studies would serve to highlight best practice. These documents would also provide guidance to Local Authorities who may have little experience of associated issues.

8.1.1 Guidance on Signs Applicable to Tramcars

Other than the four signs identified in *Guidance on Tramways*, signs applicable to tramcars vary from tramway to tramway. At present, tramways use different symbols to represent the same meaning, or the same symbol to represent different meanings. Size and style of the signs is also inconsistent. On some older tramways, constructed prior to the publication of the latest *TSRGD*, speed limits for trams are shown in mph.

At present there is no guidance available on the siting of tram signs which takes into account the stopping site distance of trams, which is longer than that of a road vehicle. And, although three sizes of sign are specified for diagram 976 in *TSRGD*, clarity is needed on which size to use in a particular situation.

It is recommended that the following are produced to clarify these issues:

An expanded set of standard signs applicable to tramcars

This could either consist of an update to Appendix A of *Guidance on Tramways* or a separate guidance document. A study of drivers' manuals from the UK and Ireland should be undertaken in order to identify which signs are required by operators. It should include temporary signs for use during works on the tramway.

Guidance on the positioning and sizes of signs applicable to tramcars, taking into account tram stopping sight distances (SSD), should also be included. Factors to be considered when calculating an average tram SSD would be driver perception and reaction times, tram brake response times, average deceleration rates and the impact of longitudinal gradients on the rate of deceleration.

8.1.2 Guidance on Cycle/Tramway Interface

Guidance on the provision of cycle facilities on and around tramways is minimal at present. *Guidance on Tramways* provides some direction, but it is recommended that amendments should be made to this, and a technical guidance note be produced to cover the broader scope of cycle/tram interface.

It is recommended that the following areas should be addressed in this guidance:

Guidance on the widths of cycle lanes adjacent to tramways

The widths suggested in *Guidance on Tramways* are less than absolute minimum widths stated in various other sources of cycle infrastructure guidance, for instance Local Transport note 2/08 published by the DfT, and are designed to allow trams to pass cyclists. It is recommended that the guidance should identify desirable and absolute minimum widths for cycle lanes in different circumstances (e.g. which allow a tram to pass or is on a longitudinal gradient which exceeds 5%).

Note: Measurements in the guidance should give widths to the centre of the line bordering the lane; currently *Guidance on Tramways* states the lane width to the edge of the line, leaving room for confusion.

Guidance on cycle provision in tram lanes

Tram lanes have become widespread in tramways around the UK and Ireland, but guidance has not kept pace with this development. It is recommended that the guidelines should be provided for the safe provision of cycle facilities within tram lanes.

Guidance on facilities for cyclists leaving and joining the carriageway

There is guidance available from non-tram-specific sources on this topic, but consolidation and application in tramway situations should be included. This is especially relevant for presenting options for the interface between cycleways and tram stop platforms. As before, a range of solutions should be incorporated in the guidance, with discussion about where each layout may be appropriate.

Guidance on cycle lanes positioned adjacent parking spaces or bus lay-bys

Guidance on the provision of a lateral clearance between cycle lanes and parking spaces should be included as provision of this kind is even more desirable where cycle lanes run adjacent to a tramway. Guidance should also be provided for cycle lanes running adjacent to bus lay-bys, with considerations for localised cycleway widening.

Guidance on other cycle infrastructure issues

Although not within the scope of this report, it is recommended that any cycle guidance produced addresses other cycle infrastructure issues, such as cycle parking provision at tram stops or cycle carriage on trams, to provide a one-stop guide to cycle/tramway interface.

It is not recommended that further development be carried out on the 'slippery rails' warning sign for cyclists, shown in [Figure 8.1](#). Many of the tramway operators mentioned liaising with their local cycling groups, and several have produced literature for cyclists as part of a public information campaign. It is this approach which is recommended, partnered with driver training and good cycle facility design, as this highlights system-wide good practice for cyclists and reduces the pitfall of litigation when a cyclist falls off in an area without a sign!

Figure 8.1: 'Slippery rails' warning sign for cyclists



Source: <http://www.thetram.net/>

8.1.3 Guidance on Pedestrian Safety

A technical guidance note on pedestrian safety has been produced as a companion to *Guidance on Tramways*, but it is recommended that it is updated to include issues that are causes of regular conflict between tramway stakeholders:

Guidance on the use of Pedestrian Guardrailing

This should discuss the use of alternatives, such as dense, low vegetation, and highlight possible hazards with its installation. A clearly defined set of criteria for installation would be helpful.

8.1.4 Guidance on Tramway-specific Signs, Road Markings and Signals

Guidance on the use of signs and road markings on and around the tramway can be found in various chapters of the *Traffic Signs Manual*, but it is recognised that this does not include more recent usage of signs and road markings (which it is recommended should be added to *TSRGD* in Section 8.1.6). Existing guidance is also not in a position to holistically discuss solutions to difficult junctions using signs and road markings.

It is recommended that *Guidance on Tramways* be updated to present in more detail integrated solutions combining signs, road markings and signals. The current innovative practice discussed in this report, which results from experience of common problems, should be used as a starting point. This should include:

Guidance on defining tram lanes

Though not currently included in *TSRGD*, unsegregated lanes marked for trams, or trams and buses, are widespread. Guidance on their use should include:

- A discussion on contrasts in surfacing colour or texture. Various forms of this are used in tramways around the country and the guidance should discuss the deterrent benefits versus visual intrusion.
- Provision for cyclists in tram lanes. The guidance should discuss the suitability of cyclists using tram lanes, and the clearance required if they do.

Figure 8.2: A 'tram only' sign – the meaning of which is unknown to many drivers



Source: TSRGD

- The use of swept path markings, where the edge of the DKE is not contiguous with the kerb or the line bounding the lane, for the benefit of tram drivers.

Guidance on defining the boundary between shared and segregated running

Current guidance focuses solely on signs and road markings as a means of marking the boundary between shared and segregated tram running, but it is recommended that guidance should discuss a range of integrated solutions which have been found, from this report, to be effective on existing tramways. The guidance should consider options for minimising both deliberate misuse of on-street segregated sections, e.g. as a short cut, and accidental entry into segregated sections, especially where the road diverges and the tramway continues straight ahead. This guidance, especially, would benefit from the inclusion of UK-based case studies.

The guidance should include:

- The impact of local driver education (e.g. advertising the meaning of the more unusual signs such as 'tram only') on tramway misuse.
- The use of ballast as a visual and physical deterrent, considering maintenance requirements and aesthetics.
- Grass track solutions, balancing the benefits of reduced tram noise and appearance with maintenance issues.
- Deterrent paving and raised plinths, discussing the purposes of different types (e.g. as a visual deterrent or to stop vehicles) and where they might be installed, possible visual intrusion and options for heritage areas.
- Other visual clues to minimise accidental entry, such as bollards placed between tracks with reflective stripes or additional 'tram only' signs on them.

Guidance on road markings for shared running

The study of current practice has identified the use of hatching to offset the centre of the traffic lane from the centre of the tram tracks on several tramways. Whilst this has been identified as successful in its intended aim of reducing loss of control incidents, further research needs to take place to hone its use. Therefore, it is recommended that guidance be issued, addressing the following issues:

- Understanding the legality of the tram swept path overhanging the hatching. – There is a risk that motorists may assume that the edge of the tram’s swept path is the edge of the hatching and enter the area believing it is safe to do so. If the motorist is then hit by a tram in the hatching, both the tram and the road vehicle could potentially be at fault.
- Provision of swept path markings within hatching. – This could be considered to try to prevent the above concern, but what impact does it have on the legal meaning of the white hatching?
- Provision of traffic islands at the end of areas of central hatching. – The current standards appear to require either a taper or a traffic island at the end of hatching. Where the tram DKE overhangs into the hatching this could be problematic, so this issue should also be addressed.

Guidance on traffic light controlled crossings

Guidance on Tramways already calls for the need to “take into account likely deliberate actions and errors of judgement by other road users” at intersections, but it is recommended that the guidance be expanded to include practice which is widespread, such as:

- The use of an arrow filter on the green aspect of signals to indicate that traffic should proceed across the crossing only. This has been found to reduce the numbers of vehicles accidentally turning onto tram tracks.
- Omitting ‘tram only’ signs and deterrent pavement at signalised crossings where the tramway runs on ballasted track either side of the crossing as the ballast acts a visual deterrent.

8.1.5 Guidance on Facilities for the Disabled

Research carried out for this report has identified a disparity between *Guidance on Tactile Paving* and actual practice. At present, two different tactile paving types are listed in *Guidance on Tactile Paving* for edging platforms on tram stops. It specifies offset blister tactiles for the edge of off-street platforms and lozenge tactiles for the edge of on-street platforms. However, following consultation with local disability groups, many Tramways use lozenge tactiles for all platforms.

The argument for using lozenge tactiles for on-street platforms at present is “because of the risk that the blister shape platform edge (off-street) warning surface ... could be confused in the street environment with the blister surface used to indicate the absence of a kerb upstand”. However, most off-street tram platforms have at least one track-level

crossing, using blister tactiles to highlight it to pedestrians, meaning the issue of confusion is not altogether avoided. It is also considered by some tramways that the use of lozenges on all platforms improves system coherence and enables the visually impaired to distinguish between train and tram platforms at shared stations.

In order to clarify this issue and promote consistency of use across the systems, it is recommended that the following guidance is issued:

An update to Guidance on the Use of Tactile Paving

This should follow further consultation with national disability groups and the Department for Transport and establish which system in use is the preferred solution.

Consultation should also be sought from disability groups, to investigate the suitability of using blister tactile paving at track and highway crossings, as this is not currently mentioned in available guidance.

8.1.6 Guidance on Enforcement

Enforcement (or a lack of it) was felt to be a significant problem by many tramway operators, so the following is recommended to aid operators and local authorities alike:

Guidance on enforcement options

This should include guidance on the legal requirements for the signing of camera enforced routes, and an investigation into provisions within Transport & Works Acts. This should involve consultation with the British Transport Police.

8.2 Changes to TSRGD

The design of tramways has evolved since the last edition of the Traffic Signs Regulations and General Directions, and many signs and road markings which are commonly used on tramways are not included. A reduction in the number of traffic signs needing special authorisation can only be a positive development for those developing new tramways, and extending existing systems. It is therefore recommended that negotiations are initiated with the Department for Transport with a view to an amendment being added to the TSRGD.

8.2.1 Defining Tram Lanes

Figure 8.3: Contra-flow tram & bus lane sign designed for Edinburgh Trams



Source: TIE

A tram lane differs from a section of segregated on-street tramway in that there is no physical barrier or level difference between the tramway and other traffic lanes. *Chapter 3* of the *Traffic Signs Manual* states that "There are no prescribed signs for a bus lane that is used also by trams. Where such provision is required, an application for sign authorisation should be submitted to the Department [for Transport]". Following feedback from the tramways surveyed, the following recommendations are made to simplify the process for including tram lanes as part of a tramway system:

An update to bus lane signs to include a tram symbol as a permitted variant

This will potentially affect sign diagrams 958, 959, 960, 962 and 962.2 in *TSRGD*.

An update to road markings to include the text 'Tram' as a permitted variant

This will affect the road marking to diagram 1048, 'tram and bus lane' in *TSRGD*.

8.2.2 Point Position Indicators

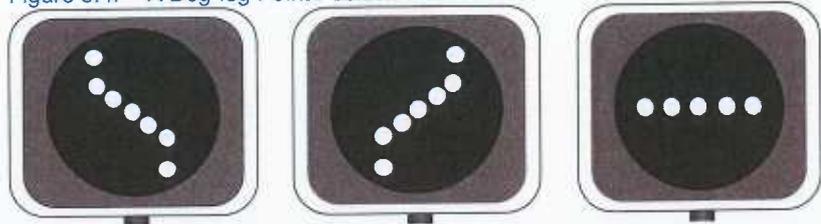
Point position indicators are used to indicate which way points are set on the system. Most PPIs of the systems are dog-leg indicators (as shown in [Figure 8.4](#)) which fit in the same size signal head as the normal tram signals.

Figure 8.5: A 'proceed' aspect or 'points set strait ahead'?



Source: TSRGD

Figure 8.4: A Dog-leg Point Position Indicator



Source: London Tramlink

A few PPIs are used which are identical to tram signals heads and include an aspect which is identical to the 'proceed' aspect of the tram signals. This is not recommended due to possible confusion with the signal aspect. The following recommendation is made for inclusion in a proposed update to *TSRGD*:

Propose a standard point position indicator for inclusion in *TSRGD*

It is recommended that a standard form of Point Position Indicator and its aspects be developed and proposed for inclusion within *TSRGD*. Standardisation of the design will aid procurement and will ensure that clarity is maintained across all systems.

The form of the dog-leg PPI, being used on many of the existing tramways, is a likely candidate for adoption but it is recommended that a different coloured LED to the tram signal be considered for further differentiation, since *Guidance on Tramways* recommends that the PPIs should be "of a colour distinguishable from white (but not red or green)".

8.2.3 Signs Applicable to Tramcars

It is recommended that, if the guidance is produced as recommended in Section 8.1.1, appropriate changes should be made to *TSRGD* (and the *Traffic Signs Manual*) to allow the full set of signs to be erected on the highway without special permission. These changes might include:

An update of the dimensions

Following research into visibility issues for tram drivers, the sign sizes given in *TSRGD* may need to be changed.

An update of the permitted symbols

At present, symbols in accordance with HMRI requirements are permitted, but following the publication of guidance on further signs, reference will need to be made to the publication as the new source.

9. Next Steps

This section offers suggestions for the Activity 3 Working Group's next steps for Phase 2 and beyond.

9.1 Prioritise Changes to Guidance / Legislation

It is recognised that financial constraints may limit the number of changes to be made immediately, so it is suggested that the recommended changes to guidance or legislation should be ranked according to the level of need and cost of introduction.

There are several considerations to be made when deciding which guidance should be developed first. Some of the guidance recommended is more important, from a safety perspective, whilst other guidance will be able to be produced more quickly and at a lower cost.

Those which have greater safety implications are the standardisation of Point Position Indicators and signs applicable to tramcars, and the development of guidance on cycle infrastructure. Guidance which would potentially be able to be developed more quickly may include guidance on pedestrian guardrailing and guidance on facilities for the disabled.

9.2 Complete Phase 2

This will be to fulfil the aim of the activity group by producing changes to guidance or legislation which have been identified through Phase 1. It is suggested that early consultation is made with relevant third parties, to aid acceptance of the final guidance.

9.3 Decide on an Ongoing Role

It is envisaged that the Activity 3 Working Group could have a role beyond the production of the recommended guidance, for instance:

Acting on recommendations from RAIB reports

Where accident reports produced by the Rail Accident Investigation Branch make recommendation about aspects of tram infrastructure covered by the remit of the group, practical guidance on the recommendations could be disseminated to tramways. This could also be incorporated into the guidance, where appropriate, as part of their ongoing maintenance.

Disseminating lessons learned

As part of the research undertaken for this report, tramway operators were asked to identify incident 'hot-spots' on their systems, and to note changes made using tram signs and highway interface to try to reduce incidents. A periodic survey of this kind would help spread knowledge of what does and doesn't work, and prove invaluable for designing a tramway from scratch.

Other key information which could be gathered and shared in this manner relates to legal aspects, such as successfully overturned fines or compensation claims following accidents.

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Appendix A. Original Activity 3 Scope

This scope was included in the activity report for the workstream in September 2005.

ACTIVITY REPORT SEPT 2005

Activity Number	3 (Phase 1)
Activity Name	Highway Interface
Activity team Leader	Andy Morris
Other Team Members	Colin Robey (CENTRO) Steve Hunt (Nottingham City Council) David Skirrow (Sheffield Supertram) Gerry Higgins (RPA) Jim Snowdon (TCL) Ian MacKenzie (Mott MacDonald) Paul Robbins (Railway Systems Consulting) Stephen Firth (Independent)

Description of Problem:

Concern exists in the industry as to whether there exists a satisfactory approach to safe and efficient provision of traffic and pedestrian management arrangements on tramways. Inconsistencies on many of the UK's operational tramways, with regard to the 'signing and lining' issue, has given rise to an increasing worry that tramway promoters/operators have not yet established a common set of standards. There are worries that client organisations have yet to properly engage with the respective highway authorities when projects are being developed and that legislative requirements, in certain