Department for Transport

Traffic Advisory Leaflet 3/13
September 2013

Traffic bollards and low level traffic signs

Introduction

Traffic bollards provide a valuable contribution to road safety. This leaflet discusses the advantages of traffic bollards in certain circumstances, whilst recognising that their over provision can have an unduly negative impact on streetscape and energy consumption. It provides advice on the use of traffic bollards and associated signing for roads with a speed limit of 30 mph or lower. It also covers low level signs sometimes used as an alternative to traffic bollards. It does not cover bollards used to control access or to prevent footway parking/over-running.

Traffic islands, pedestrian refuges, and kerb build-outs

Traffic islands, pedestrian refuges, and kerb build-outs are features that, variously, direct flows, segregate flows, protect vulnerable road users, protect traffic management equipment, and calm traffic (among other things). Traffic islands are used to, for example, channel flows at junctions, narrow the carriageway and discourage overtaking.

Whilst pedestrian refuges can also perform some of the functions of a traffic island, they are primarily aimed at improving conditions for pedestrians by allowing people to cross in two separate movements. Refuges also provide a degree of protection for pedestrians between crossing movements.

Build-outs encourage lower traffic speed by narrowing the carriageway and by deflecting vehicle users from taking a more direct alignment along the road. They are sometimes used in conjunction with traffic islands or pedestrian refuges to create pinch points that reduce speed and facilitate pedestrian crossing movements. Build-outs can be similarly used to create traffic calming chicanes with opposing flows operating on a give and take basis. Build-outs sometimes incorporate a cycle gap which means they effectively become traffic islands.

All of these traffic management features can present a hazard to road users unless they are visible at all times, including at night and in adverse weather conditions. Traffic bollards are often used to highlight these features and typically the bollards will include keep left or keep right signs to guide traffic. However, there is no direct requirement for a traffic bollard or a traffic sign to be used, and there will be times when either or both can be reasonably omitted - see Figure 1.

Figure 1: Islands without bollards in Exhibition Road, London (Photo: Mark Treasure)

Legislative background

The Traffic Signs (Amendment) (No.2) Regulations and General Directions 2011[1], amended direction 41 of the Traffic Signs Regulations and General Directions 2002[2] (TSRGD) to clarify which signs may be mounted on traffic bollards.

A new sub-paragraph 3A was inserted in direction 41 as follows:

(3A) The signs shown in diagrams 606, 610, 611, 616, 951, 955, 956 and 957 may be mounted on—

(a) a bollard which—

(i) is illuminated by means of internal lighting; and

(ii) conforms to British Standard BS EN 12899-2:2007 or to a corresponding EEA Standard;

or

(b) a self-righting bollard which—

(i) is illuminated by the use of retroreflecting material; and

(ii) conforms to British Standard BS 8442:2006 or to a corresponding EEA Standard.

Figure 2 shows the traffic signs which may be displayed on a traffic bollard. Those to diagram 610 and 611 do not require a traffic order. Diagram 611 must only be used where traffic may pass either side to reach the same destination and in no other situation.

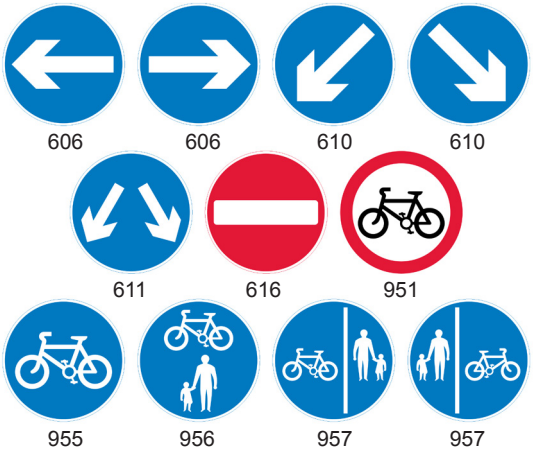

Figure 2 Signs permitted on a traffic bollard

The current illumination requirements for bollard bodies is covered by the amended direction 41. The current illumination requirements for traffic signs placed on bollards is set out in regulation 18(1), Schedule 17. Table 1 summarises the Schedule 17 illumination requirements for bollard mounted and low level traffic signs.

A street lit area is defined as being within 50 metres of any lamp lit by electricity which forms part of a system of street-lighting for that road furnished by means of at least three such lamps placed not more than 183 metres (in Scotland 185 metres) apart.

Schedule 17 Item	Sign diagrams	Mounting	Illumination requirements in street lit areas	Illumination requirements with no street lighting
1	606, 610, 611, 616.	Mounted on a retroreflective self-righting bollard or a low level sign	Shall be lit internally or externally either for so long as the system of street lighting is lit, or throughout the hours of darkness. May also be reflectorised in accordance with regulation 19.	Shall be reflectorised in accordance with regulation 19.
3	955, 956, 957.		Where the sign is a terminal sign, it shall be lit internally or externally either for so long as the system of street lighting is lit, or throughout the hours of darkness. Otherwise, it shall be reflectorised in accordance with regulation 19.	Shall be reflectorised in accordance with regulation 19.
4	951		May be internally or externally lit but, if not so lit during the hours of darkness, shall be reflectorised in accordance with regulation 19(3) and (4).	May be internally or externally lit but, if not so lit during the hours of darkness, shall be reflectorised in accordance with regulation 19(3) and (4).
7	606, 610, 611, 616, 951, 955, 956, 957.	Mounted on an internally lit bollard	Shall be lit throughout the hours of darkness by the bollard's internal lighting.	Shall be lit throughout the hours of darkness by the bollard's internal lighting.

Table 1 Illumination requirements for bollard mounted and low level traffic signs

The use of bollards and signs

The primary purpose of a traffic bollard is to increase the conspicuity of traffic management features. Bollards fulfil a secondary purpose in providing a convenient place to mount certain traffic signs, although there is no direct requirement for a bollard to display a sign.

In deciding whether or not a bollard is required, designers need to consider how visible the traffic management feature in question would be in the absence of a bollard. For example, traffic islands that accommodate traffic signals or pedestrian refuges with Belisha beacons might be sufficiently conspicuous to make traffic bollards unnecessary.

The primary purpose of a traffic sign is to convey information. Low level traffic signs (e.g. hoop mounted) are sometimes used as an alternative to traffic bollard mounted signs. They tend to have diameters greater that those normally used on bollards (270/300 mm), and as such they are often sufficiently conspicuous to make a traffic bollard unnecessary.

Whilst a number of traffic signs can be used on traffic bollards, this leaflet focuses on the use of the keep left (or keep right) sign. However, much of the advice in principle will apply to the other permitted signs.

The keep left sign is an important traffic management tool, but there is no specific requirement for one be used on traffic islands etc. Where it is clear which side of the feature a road user should pass, signs indicating this might not be necessary. In addition to reducing clutter, omitting keep left signs in street-lit areas means that power supplies for their illumination will not be required.

However, where there are concerns that road users might take advantage of the absence of a sign to pass on the wrong side, a keep left sign might be advisable, especially at pedestrian refuges.

The flow chart at Figure 3 is a simplified guide aimed at helping to decide whether or not bollards or signs are required. It is not an exhaustive representation of the decision process and the chart must not be used as a substitute for sound engineering judgement. Local experience, site history and unusual situations may demand considerations outside the scope of the flow chart, leading to different outcomes.

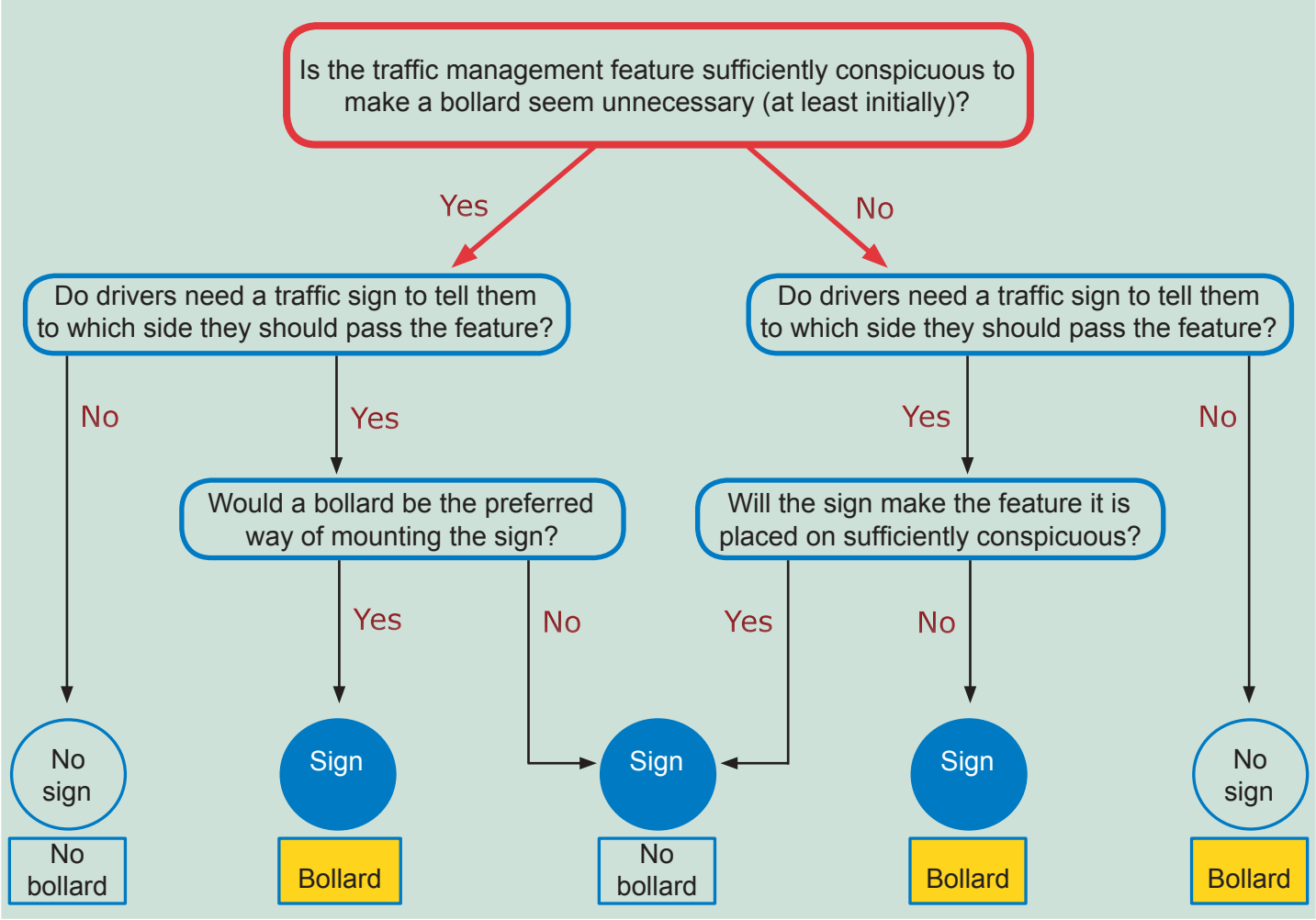

Figure 3: Basic decision process in determining requirements

Types of arrangement

This leaflet does not cover every type of traffic bollard or low level sign available as it is concerned with principles rather than individual products. It focuses on the following traffic bollard types:

- internally illuminated bollards; and
- retroreflective self-righting bollards (RSRBs) with or without an illuminated traffic sign;

and the following low level sign types:

- hoop mounted signs; and
- signs mounted on deformable posts.

The focus on these relatively common types is not meant to exclude other possibilities such as self righting internally illuminated bollards (see Figure 4) or low level traffic signs with solar powered lighting.

Bollards

An example of a mains powered internally illuminated bollard is shown at Figure 5. The translucent nature of these bollards allows them, and any signs mounted on them, to be lit from a single light source usually set in the base unit. The bollard is designed to detach from the base in the event of vehicle impact. In some cases, it can simply be manually reattached. However, where vehicle overrun has occurred, it might be necessary to replace the bollard, and possibly the base unit.

As with all mains powered equipment, routine electrical testing is required. The light source in the base unit provides conspicuity at night if the bollard is displaced. LED gear trays are available as retrofit options to reduce energy costs and extend electrical maintenance cycles. These bollards offer good visibility at night, regardless of the angle of approach, and they are as visible from the sides as they are from the front or rear.

Figure 6 shows a typical example of an RSRB. The bollard body is not directly lit, and during the hours of darkness it relies on its retroreflective properties for illumination. Retroreflectivity relies on the incident angle from the vehicle headlights being within certain limits, and for some vehicles or road layouts, retroreflectivity may be diminished. Visibility from the side is relatively poor.

The bollard is attached to its base by a flexible connection designed to allow it to deflect and spring back to the vertical in the event of being struck by a vehicle. Higher energy collisions can sometimes cause the bollard to adopt a permanent set, or to detach completely. Should an RSRB become detached from its base, it is unable to provide any residual conspicuity.

Where a lit sign is incorporated into an RSRB, illumination is generally achieved using solar powered internal LED making a mains supply unnecessary.

Table 2 compares some of the qualities of the two main bollard types.

Figure 4: Self righting internally illuminated bollard

Figure 5: Mains powered internally illuminated traffic bollard

Figure 6: Retroreflective self-righting bollard

Type	Advantages	Disadvantages
Internally illuminated bollard (mains powered)	Internal, all round illumination makes it highly conspicuous, including from the side. Provides better sign and road layout visibility than a RSRB, when both are covered with the same level of road dirt. The bollard's internal lighting illuminates any sign mounted on it. Bollard shell can often be reused after minor vehicle impact. Relatively inexpensive to replace the bollard shell if the base unit has not been damaged. The light source in the base unit provides a measure of conspicuity at night if the bollard is displaced.	Requires an external power source and buried cable ducting. Subject to periodic electrical test certification. Where the bollard is fed from a lighting column on a loop system, it will be affected by a fault to the column or the loop system. Higher carbon footprint than retroreflective alternatives. Base unit can fill with water if cable glands have not been carefully tightened. The lamps need changing regularly to maintain full efficiency (although LED gear trays are available as retrofit options, extending electrical maintenance cycles). Requires an electrician on site for installation and, if the base unit is damaged, repair. Susceptible to displacement from minor vehicle impact, which requires manual intervention. Susceptible to vandalism.
Retroreflective self-righting bollard (solar powered sign illumination)	Needs no mains power source. Low installation costs - no excavation of the carriageway required for cable ducts. Does not need an electrician to install, maintain or repair. Lower carbon footprint than mains powered alternatives. Small physical footprint. Less susceptible to vandalism. Self-righting nature means that after minor impact: • bollard continues to make the traffic management feature conspicuous • manual intervention is less likely to be required.	Can separate from base in high speed collisions. At certain incident angles, retroreflectivity is diminished. In the event of separation, the bollard is unable to provide any residual conspicuity to the traffic management feature. Not very visible from the side. The solar panels and batteries need routine maintenance/replacement.

Table 2 Advantages and disadvantages of two commonly used bollard types

Low level signs

Hoop mounted signs (see Figure 7) are often used where aesthetics and clutter reduction have a high priority. The absence of yellow panels reduces visual intrusion and conspicuity is provided by the sign alone. The example shown is illuminated by a mains powered up lighter although other forms of direct lighting can also be used.

Hoop signs are vulnerable to vandalism and are likely to need replacement following vehicle impact (see Figure 8). Should a hoop sign become significantly damaged, it is unable to provide any residual conspicuity at night.

In common with bollard mounted signs, low level signs are susceptible to being obscured by pedestrians, and motor vehicles. For hoop signs in particular, the potential problem can be exacerbated because these signs present a convenient place to attach a bicycle (see Figure 9). Where a hoop sign is likely to be obscured, an alternative type of low level sign, or a conventional height sign might be more suitable.

The main (non traffic bollard) alternative to hoop signs is the low level sign mounted on a deformable post. Figure 10 shows an example. These offer considerably increased resistance to damage from vehicle impact.

Table 3 compares some of the qualities of hoop signs and signs mounted on deformable posts.

Figure 7: Low level hoop mounted sign (Photo: Andy Cameron)

Figure 8: Damaged hoop mounted sign

Figure 9: Hoop mounted sign used as cycle stand

Figure 10: Low level sign on deformable posts

Type	Advantages	Disadvantages
Hoop mounted signs (mains powered illumination)	Less visually intrusive than a bollard. Where appropriate, can be sufficiently conspicuous to make a bollard unnecessary, especially where large signs are used.	Requires an external power source and buried cable ducting. Subject to periodic electrical test certification. Where the lighting unit is fed from a lighting column on a loop system, it will be affected by a fault to the column or the loop system. Requires an electrician on site for installation and, in some cases, repair. In the event of significant damage, the sign is unable to provide any residual conspicuity so the traffic management feature it is mounted on might become a significant hazard particularly at night. Limited tolerance to vehicle impact or vandalism. More likely to be obscured than conventional height signs. Very low visibility from the side.
Signs on deformable posts (mains powered illumination)	Less visually intrusive than a bollard. Where appropriate, can be sufficiently conspicuous to make a bollard unnecessary, especially as sign sizes increase. Better tolerance to vehicle impact or vandalism.	Requires an external power source and buried cable ducting. Subject to periodic electrical test certification. Where the bollard is fed from a lighting column on a loop system, it will be affected by a fault to the column or the loop system. Requires an electrician on site for installation and, in some cases, repair. In the event of significant damage, the sign is unable to provide any residual conspicuity so the traffic management feature it is mounted on might become a significant hazard particularly at night. More likely to be obscured than conventional height signs. Very low visibility from the side.

Table 3 Advantages and disadvantages of hoop signs and signs on deformable posts

Some design considerations

This section looks at a number of situations where bollards and/or signs are typically used, and discusses the technicalities of the various arrangements.

Traffic islands and pedestrian refuges

Islands with traffic signals are often accompanied by bollards and/or keep left signs. In some cases the signals themselves might be sufficient to alert vehicle users to the presence of an island making a bollard unnecessary. See Figure 11.

Where there is a series of traffic islands along a road separated by relatively small gaps, while it might be necessary to provide a traffic bollard and keep left sign on the first one, consideration could be given to omitting them on subsequent islands. The relatively long kerb runs tend to serve the purpose of guiding traffic and discourage passing on the wrong side of the traffic island.

Traffic islands are often provided to calm traffic. In the example shown in Figure 12, wide traffic island have been installed to narrow the remaining carriageway width, and traffic bollards have been provided together with keep left signs. Although the keep left signs are not essential, in cases like this it can be useful to provide them to discourage drivers and motorcyclists from passing on the right to overtake slower traffic, especially in congested conditions.

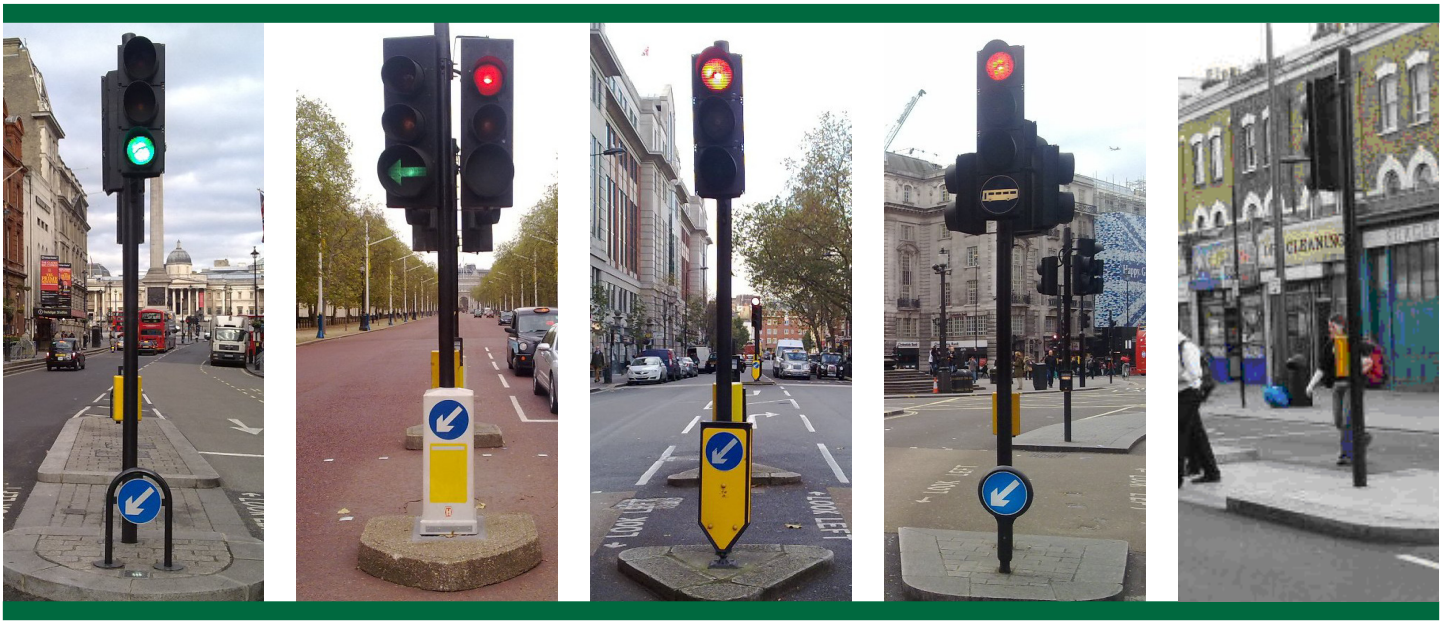

Figure 11: A variety of arrangement at traffic signals

Figure 12: Traffic islands provided for calming traffic

Build-outs

Apart from minor intrusions into the carriageway such as at bus boarders, build-outs need to be clearly visible to road users. Where a build-out accommodates items such as a planter or a tree, the feature itself might be able to serve this purpose. However, such arrangements might need to be complemented by some other form of visual highlighting. This could comprise reflective material fixed directly to the feature, or an edge-of-carriageway marker post with a reflector, for example.

In the absence of such features, a traffic bollard, with or without a traffic sign, is often all that is required.

Hatching, using road markings to diagram 1040.4, is often used to guide traffic past the build-out, see Figure 13. In many circumstances the emphasis provided by hatching is unnecessary and the simplest means of guiding traffic past a build-out is to use road markings to diagram 1004 in a similar manner as for central refuges. Chapter 5 of the Traffic Signs Manual provides guidance on the use of these road markings.

It is worth putting the need for hatching into perspective; a build-out highlighted with a traffic bollard often presents no more of a hazard to road users than does a parked car. This is not to say hatching is never appropriate but designers should avoid installing it by default, especially on low speed roads with street lighting.

Placing signs on build-outs can, however, introduce a problem - the possibility of incorrect installation is a fairly common error (see Figure 14). The problem can be avoided by omitting the signs which, after all, are unlikely to contribute to the safe operation of the road.

Cycle gaps

Where a traffic island is used to create a cycle gap, it is never appropriate to use a keep left/right sign on the island.

The keep right sign in Figure 15 essentially prohibits cyclists from using the cycle gap and a plain traffic bollard would have been more appropriate.

Figure 13: Keep right sign with hatching at a nearside build-out

Figure 14: Incorrect use of a keep left sign

Figure 15: Cycle gap with an inappropriate keep right sign

Other considerations

RSRBs are often installed with retroreflecting material on the rear faces - see Figure 16. This can be detrimental to the streetscape, especially where there are several bollards in close succession. Visual intrusion can be reduced by specifying a black or grey finish on the rear faces - see Figure 17.

However, in some situations, there are benefits in reflectorising the rear face of RSRBs. Where the site is prone to accident damage it can help maintain conspicuity in the event of one of the bollards becoming detached.

Where bollards and signs are being audited for condition, damaged equipment should not be replaced without first considering the continuing need for it. Figure 18 shows a closely grouped pair of RSRBs (each with a keep left sign) on a short traffic island before and after sustaining vehicle damage.

An assessment of the site might have shown that one or both signs could have been dispensed with. In this case, a single bollard would have sufficed, making replacement of the damaged one unnecessary. Alternatively, a single internally illuminated traffic bolllard could have been used (although this would option would require an external power supply).

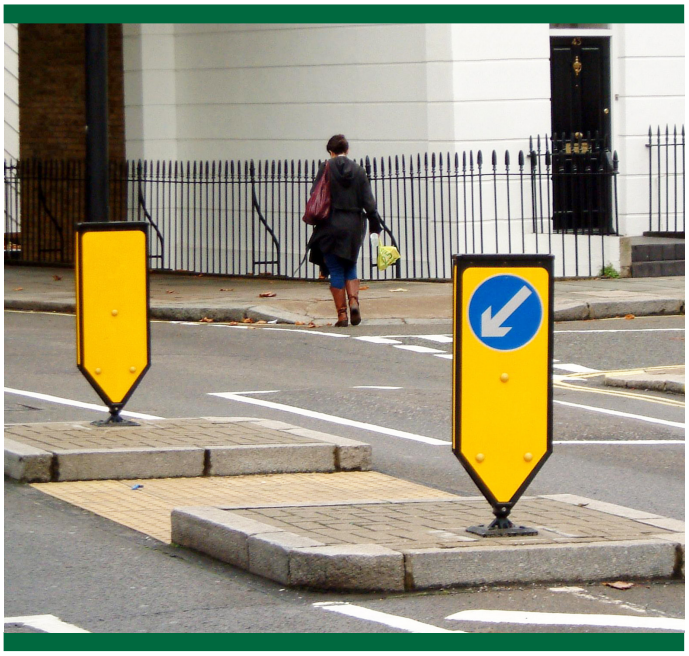

Figure 16: RSRBs with retroreflecting material on the rear faces

Figure 17: RSRBs with dark finish on the rear faces

Figure 18: Check damaged equipment is still necessary before replacing

References

1. Traffic Signs (Amendment) (No. 2) Regulations and General Directions 2011 http://www.legislation.gov.uk/uksi/2011/3041/contents/made
2. The Traffic Signs Regulations and General Directions 2002 http://www.legislation.gov.uk/uksi/2002/3113/made

Recommended further reading

- Traffic Advisory Leaflet 1/13 Reducing Sign Clutter (DfT 2013) https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/43525/tal-reducing-sign-clutter.pdf
- Traffic Advisory Leaflet 1/12 The Traffic Signs (Amendment) (No.2) Regulations and General Directions 2011 (DfT 2012) https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/7964/tal-1-12.pdf
- Traffic Advisory Leaflet 5/11 Quality Audit (DfT 2011) https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/4394/5-11.pdf
- Local Transport Note 1/11 Shared Space, TSO (DfT 2011) https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/3873/ltn-1-11.pdf
- Local Transport Note 2/09 Pedestrian Guardrailing, TSO (DfT 2009) https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/3806/ltn-2-09.pdf
- Local Transport Note 1/08 Traffic Management and Streetscape. TSO (DfT 2008) https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/3810/ltn-1-08.pdf
- Manual for Streets. Thomas Telford (DfT, CLG, Welsh Assembly Government 2007) https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/3891/pdfmanforstreets.pdf
- Manual for Streets 2 Wider Application of the Principles. CIHT (2010) http://www.ciht.org.uk/en/publications/index.cfm/manual-for-streets-2--wider-application-of-the-principles-2010
- Traffic Signs Policy Paper: Signing the Way (DfT 2011) https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/4346/signing-the-way.pdf
- Transport Research Laboratory Client Project Report 727 Reducing Traffic Sign Clutter http://assets.dft.gov.uk/publications/signing-the-way/traffic-sign-clutter.pdf
- The Traffic Signs Manual https://www.gov.uk/government/publications/traffic-signs-manual

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