



# The Installation of Puffin Pedestrian Crossings

## Introduction

This leaflet recommends good practice that should be followed when installing a Puffin crossing and other crossings using near side signals. It should be read in conjunction with TAL 1/01 "Puffin Pedestrian Crossing". For general guidance on assessment, design and installation of pedestrian crossings, reference should be made to Local Transport Notes 1/95, 2/95 and 1/98. Adopting the recommendations in this leaflet should result in proper and safe operation of the Puffin crossing.

The Puffin pedestrian crossing strategy uses pedestrian detection, both to minimise delays to traffic, and to reduce conflicts between drivers and pedestrians during the crossing phase. It can also give more time to slower moving pedestrians. Pedestrian signals are mounted on the primary pole and positioned so as to encourage pedestrians to view the approaching traffic and the signals simultaneously. It is therefore essential to ensure that the primary pole is always mounted in the correct position. It is also important to ensure that the pole is sited close to the tactile paving edge, to allow wheel chair users and visually impaired pedestrians to push the button with ease.

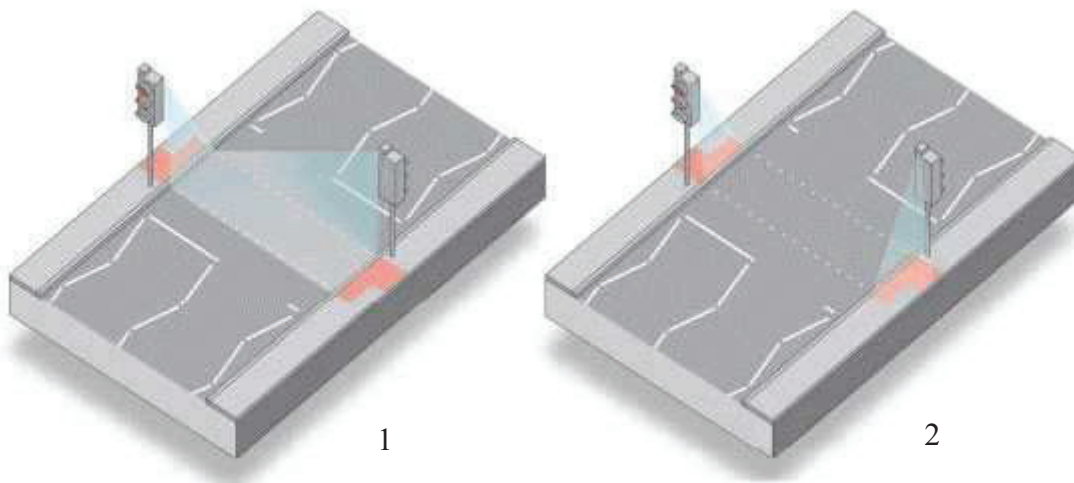
The kerbside and on-crossing detectors should be installed and aligned in accordance with the appropriate manufacturer's guidelines. Failure to comply will result in poor functionality and may even lead to an unsafe situation.

## Equipment

### On-Crossing Pedestrian Detectors

On-crossing pedestrian detectors are normally mounted one on each side of the carriageway and are focused on the crossing area between the two lines of studs. It is important to ensure that the detection zone provides adequate coverage between the lines of studs for the full carriageway width. Therefore, at some sites more than two detectors may be needed. On-crossing detectors respond to all pedestrians within the crossing area walking at speeds equal to half a metre per second and upwards. Following the green man period, the all-red "clearance period" can be extended by the pedestrian on-crossing detection.

A fault monitor algorithm in the controller checks for outputs from the on-crossing detector during the pedestrian and vehicular traffic stage. This is to ensure the correct operation of the detector. The operation of the on-crossing detector is checked between the end of one pedestrian clearance period to the start of the next. In normal operation, vehicles passing the detector would trigger operation. If nothing were detected, indicating a possible fault, the following pedestrian clearance period would be extended to a maximum pre-set value stored in the controller. This process is repeated each cycle.



**1. Schematic diagram showing on-crossing detectors**

**2. Schematic diagram showing kerbside detectors**

## Kerbside Pedestrian Presence Detection

Kerbside presence detectors may be either a surface laid pressure mat detector or an 'above-ground' detector mounted on a traffic signal pole. Their function is identical; they respond to a pedestrian standing in the wait area near the crossing. A site survey should be carried out to establish physical constraints, such as manhole covers, bollards, etc, which may limit the choice of detection system that could be used.

When a pedestrian has pressed the button, calling the pedestrian stage, the controller checks the output of the kerbside detector to confirm the presence of the pedestrian and continues to do so until the pedestrian stage appears. If the detection area is unoccupied for a period more than a pre-set period, the call is cancelled and the pedestrian stage will not appear. The position in which pedestrians stand relative to the pole and the kerb edge will vary from site-to-site. Fixed zone detection systems provide a pre-defined detection zone. Site improvisation may be necessary to align the detectors to suit local requirements, i.e. biased towards where pedestrians are likely to stand. Detection systems that can be tailored, using an intelligent terminal, to suit site requirements are becoming available, and offer scope for resolving some of the difficulties experienced with fixed zone detection systems.

Where a crossing extends beyond the detector capability, extra detector(s) should be used.

## Pedestrian Demand Unit

The pedestrian demand unit comprises a conventional 'red standing man' symbol above the usual 'green walking man' symbol, a push button and a call confirmation indicator. Each symbol is 100mm high. The demand unit is normally fitted to the primary pole, directly between the waiting pedestrian and the approaching vehicular traffic.

Only two indications are given: the 'green walking man' is shown to indicate the start of the pedestrian period (with the meaning "You May Start To Cross"); and the 'red standing man', which is shown at all other times and means "Do Not Start to Cross". The only exception is where a crossing is installed with a central refuge island. The pedestrian signal in the central refuge area (only) switches to a blackout (neither red man nor green man illuminated) during the clearance period.

The pedestrian demand unit may comprise more than one unit, i.e., it can be a single composite unit, or a push button and a separate near-side signal. The Zebra, Pelican and Puffin Pedestrian Crossing Regulations and General Directions 1997 (SI2400) states that an additional pedestrian demand unit (a push button and/or a near side signal) may be provided where necessary. The centre of the push button should be between 1.0 and 1.1 metres above the footway. Where separate units are used, i.e. a near side signal and a push button, the near side signal should be mounted immediately above the push button box. This allows children and people in

wheelchairs to view the signal easily. It is not a good idea to mix near-side and far-side signalled crossing facilities, for example, at a junction where other crossings are close by. Please note that Puffin crossing installation in Wales should use bilingual legends where appropriate. Details of this can be obtained from the National Assembly of Wales.

## Installation

### General site requirements

Correct site layout is essential if the crossing is to operate successfully.

A sufficient area on the footway should be provided where pedestrians can gather. This should be sufficiently large to accommodate the number expected under normal conditions. It should not normally be less than 2 metres from the kerb to the back of the footway for a 2.4 metre wide crossing. If large volumes of pedestrians are anticipated, a wider crossing should be considered. Care should be exercised when converting Pelican sites to Puffin sites, to ensure that the site layout is suitable for proper operation.

Tactile paving should be provided at all crossing points between the crossing studs, in accordance with the advice contained in the DTLR's "Guidance on the Use of Tactile Paving Surfaces".

Additionally, adequate footway widths should be available for pedestrians to pass who are not intending to cross.

If the kerbside pedestrian detector is a pressure mat, the site must be free of manhole covers. The pressure mat profile should be similar to the tactile paving. The gradient at all crossing points should not exceed 1:12 (8%), and where space allows a gradient of 1:20 (5%) should be achieved. On very narrow footways it may not be possible to drop the kerb at this angle while keeping the majority of the pavement level. In this situation an alternative is to lower the whole pavement for the length of the dropped kerb.

As the existing large (far side) pedestrian signal head is no longer used at a Puffin

crossing, the signal pole can be installed closer to the edge of the footway when the three aspect traffic signals are offset mounted. For example, the primary pole can be orientated so that its signal bracket fixings are at 45 degrees to the kerb, with the traffic signal head medium arm brackets fitted facing away from the kerb at an angle of 45 degrees. Alternatively, the pole can be installed with its bracket fixings perpendicular to the kerb, and the traffic signal heads can be fitted to the end of the 250mm Dbracket, located on the rear bracket fixing of the signal pole. Please note that these arrangements have been implemented successfully in the past and other arrangements may also suffice, but care should be taken to ensure that the traffic signals are clearly visible to the drivers. A cranked pole is another option, but because of the upper signal head bracket fixings being offset away from the crossing area, the kerbside detector fitted to the pole would not be in an optimum position, which is directly above the pedestrian wait area. Where a duplicate push button or signal is needed, a short pole may be used. The recommended pole position is 0.5 metre from the line of pedestrian studs nearest to the stop line, and 0.5 metre from the kerb. The latter may need to be increased depending on local site conditions (refer to LTN 2/95). On narrow refuges, it may be desirable to offset the signal poles from the centre line of the refuge.

Short sections of guard railing will normally be required in order to discourage pedestrians from crossing in the shadow of the crossing, often a cause of accidents. This should also help to ensure that pedestrians cross within the range of the on-crossing detectors. The crossing will not function properly if pedestrians cross outside the limits of the crossing.

Guard railing may also be helpful in guiding blind and partially sighted people to the crossing area. Any pedestrian guard rail should extend up to but not beyond the signal pole in the direction of the crossing.

The pedestrian demand unit should be aligned to face waiting pedestrians, and not parallel to the kerb. The red and green man figures on the pedestrian demand unit can

be seen over a wide angle in the wait area and hence the installer should aim to reduce their visibility to drivers waiting at the stop line and approaching the crossing. An angle between 25 to 30 degrees to the kerb line is recommended to ensure maximum field of view to pedestrians in the wait area and reduced visibility elsewhere.

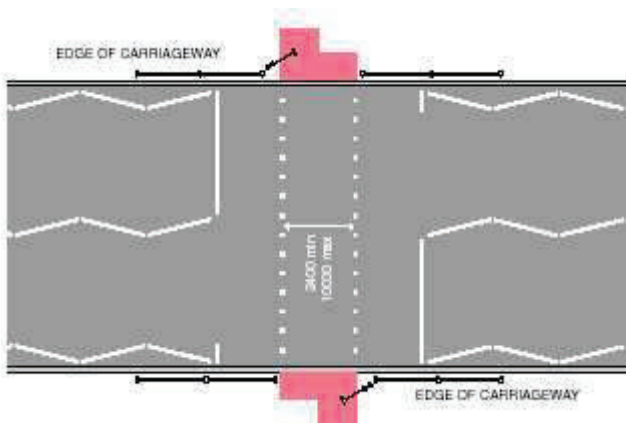
The position of the controller requires careful consideration. If it is located near the kerb on the approach side of the crossing it will obstruct both the pedestrian's view of the traffic and the driver's view of pedestrians, particularly children. Ideally it should be located on the exit side of the crossing, preferably at the back of the footway.



Typical layout of a Puffin crossing showing the detectors and offset mounted traffic signal ahead

## Examples of installations

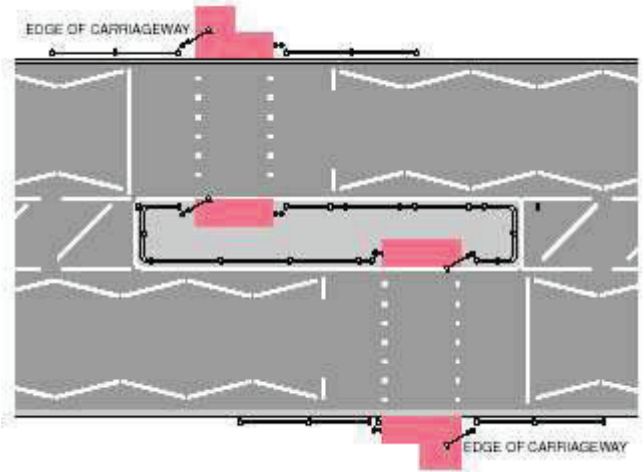
### Single carriageway crossing (vehicle signal omitted for clarity)



### Dual Carriageways

Puffin crossings can be provided on a dual carriageway, either as a single crossing or as two crossings. The demand unit should

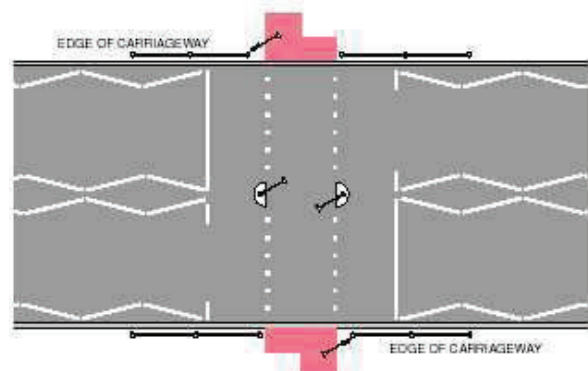
be mounted on the signal poles and close to the line of studs nearest the stop line.



Pedestrians in the wait area should have the pedestrian signal and the oncoming traffic in their field of view for each crossing. Where a duplicate push button is needed, it should be mounted on a pole mounted close to the line of studs furthest from the stop line on both sides of the crossing. A duplicate near side signal is not recommended on these poles, because it would encourage pedestrians to look in the opposite direction to the oncoming traffic. Careful consideration needs to be given to the kerb side detection area. It is important to ensure that pedestrians are encouraged to stand in the detection zone. Careful siting of the pedestrian push button and the near side signal will encourage this.

### Crossings with a central refuge

A pedestrian demand unit should be mounted on both sides of the central refuge island, unless vehicular traffic is approaching from one side only, e.g. on a one-way one-way street. In this case, a demand unit should be mounted on the approach side, and a push button only on the other side.



Careful consideration should be given to the position of the demand unit in the central area. The near side pedestrian signals should be mounted so that a driver waiting at the stop line or on the approach cannot confuse the pedestrian signal with the vehicular signals. This may be accomplished by mounting the pedestrian signals biased between 25-30 degrees towards the carriageway, as illustrated. The operation of the signals in the central area is described in Traffic Advisory Leaflet 01/01.

## Wide Crossing

At crossing points where large numbers of pedestrians want to cross, a wider crossing is needed. Careful consideration should therefore be given, at the design stage, to ensure adequate facilities are provided at the crossing. Additional demand units (pedestrian signal/pushbutton) and detectors may be needed to improve the conspicuity of the pedestrian signal and also to provide suitable detection coverage. In most cases short poles may be deployed where additional detectors are not required. It is important to ensure that any additional signals also follow guidance mentioned earlier with respect to the mounting angle.



An example of a wide crossing



An example of a crossing on a wide carriageway

## A crossing on a wide carriageway

Wide carriageways can be intimidating for pedestrians to cross and a refuge can be helpful. Local Transport Note 2/95 recommends that where the carriageway width is 15 metres or more, a staggered refuge layout should be provided. If the width is greater than 11 metres, a staggered layout should be considered. The reason for the staggered layout is due to the operation of Pelican crossings. A Pelican crossing with a straight refuge is legally a single crossing, and pedestrians have precedence while the flashing amber signal is shown to drivers. If a Pelican crossing is interrupted by a refuge, drivers tend to drive forward when pedestrians are crossing the adjacent carriageway. A staggered crossing avoids this by clearly establishing two crossings.

Because Puffin holds drivers at a red signal while pedestrians are crossing, a refuge can be incorporated into a single, straight crossing without introducing the problem described above. However, pedestrians may become stranded on a central refuge, for example if they pause for too long and the crossing clearance period is terminated. Push buttons and pedestrian signals should be provided on the refuge to deal with this situation. To avoid showing pedestrians a red signal as they cross towards the refuge, the signal display should be suppressed.

Particular consideration needs to be given to vulnerable road users, such as elderly people, disabled people, young children, people with baby buggies, etc, when deciding to put a straight across crossing on a particularly wide carriageway. Care should be taken to ensure that the on-crossing detectors provide sufficient coverage between the studs and across the length of the crossing.

## Narrow Footways

Many footways are narrow, less than two metres wide, which makes it difficult to position the primary pole in the desired position, which is ideally 0.5m from the kerb edge. Other site constraints may include shallow services by statutory undertakers. Consideration should always be given to ensuring adequate clearance between the

pole and the back of the footway for people with a double baby buggy, manual and electric wheel chair (taking into consideration also the turning movement), etc. The following options should be considered before installation:

- Widen footway by providing a build-out.
- Use cranked pole to get closer to the edge of the footway.
- Relocate crossing to a more suitable position.
- Mount the signals on existing structures, such as lighting column, building wall, etc.
- Use a duplicate short pole for the pedestrian demand unit, which may need to be mounted closer than the recommended 0.5 metres from the kerb edge.
- Position the primary pole at the back of the footway (this should be the last option). The difficulty with this approach is that the pedestrian signal will then point towards the drivers.



A crossing on a narrow footway

### Crossing on a one-way street

The pedestrian demand unit should be mounted on both sides of the carriageway so that pedestrians can see the approaching traffic and the signals simultaneously. LTN 2/95 refers to the importance of having a push button to the right of the crossing area, for visually impaired pedestrians. This may mean erecting an additional post, which could be just high enough to take the push button



One-Way traffic flow

### Pedestrian facility using near side signal at a junction

Pedestrian facilities at junctions using the Puffin concept can be implemented in a similar way to stand alone Puffins, except there are no zig-zag markings. Junctions, however, vary considerably in complexity compared with stand-alone Puffins, and may require special consideration at the design stage. Pedestrian detection and demand units, including their use at central refuge islands, are installed in a similar way to the stand-alone Puffin.

Some variations that may be encountered at a junction include:

- All-arms pedestrian phase, with red signal to all traffic.
- "Walk with traffic", where non-conflicting pedestrian movements occur concurrently with vehicular traffic movements.
- Complex vehicular traffic movements.
- Separately phased arms, for example where two or more arms of a junction may be linked together on the same phase.

Pedestrian on-crossing detectors respond to moving vehicles and pedestrians. The fault monitor algorithm in the controller relies on this information to check the detector status during the pedestrian and vehicular stages, as explained earlier. There may be situations when one arm of the junction incurs low pedestrian/vehicular traffic flows, which could happen during quieter times of the day and /or during holiday periods, and also where there is restricted vehicular access. If all arms of a junction are connected to the same phase, a request to cross from the

predominant arm(s) during such conditions may force the controller to extend the pedestrian clearance period to the maximum pre-set value in the controller. This would occur if no vehicular/pedestrian movements took place between the previous cycle and the start of the new clearance period. One way of alleviating this problem would be to put the arm(s) experiencing this symptom on a separate phase.

















Near side facility at a junction

## Timing chart

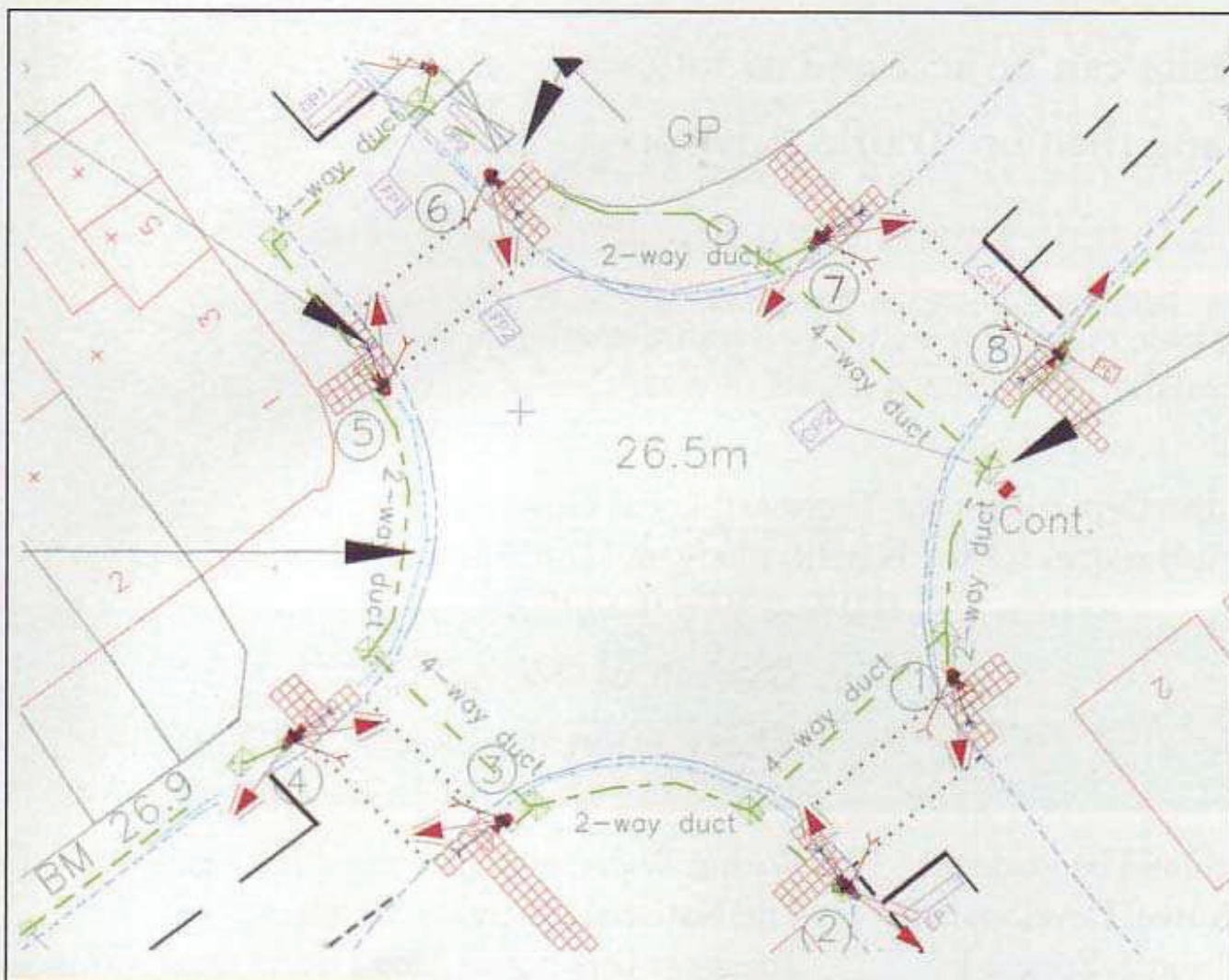
	Carriageway width	4	5	6	7	8	9	10	11	12	13	14	15
All-Red Period	1 Or up to 3 seconds for a forced change												
Green Man Period		4	4	4	4	5	5	5	6	6	7	7	7
Clearance Period	Minimum (see note)	3	3	3	3	3	3	3	3	3	3	3	3
	Maximum	4	5	7	9	10	12	14	15	17	19	20	22
	Forced	7	8	10	12	13	15	17	18	20	22	23	25
<b>Total Period</b>	Minimum	9	9	9	9	10	10	10	11	11	12	12	12
	Maximum	13	14	16	18	20	22	24	26	28	31	32	34

Note: The minimum period can be adjusted to be between 1 and 3 seconds. The value chosen will depend on the detector's response time to pedestrians when they step onto the carriageway. Care should be taken to choose a value which is appropriate for the detection system, because this period is a fixed-time burden on the overall pedestrian stage.

## Recommended Symbols to use for Puffin crossing design/plans

	Primary 3 aspect traffic signal		Pedestrian demand unit
	Vehicular traffic approach detector		3 aspect traffic signal with long visor
	Vehicular traffic stop line detector		3 aspect traffic signal fitted with green arrow (straight ahead arrow)
	3 aspect traffic signal fitted with green arrow filter (with straight ahead arrow)		Traffic signal offset or bracket mounted
	Guard railing		Pedestrian pushbutton
	Pedestrian on-crossing detector		Pedestrian nearside signal
	Pedestrian kerbside detector		Surface mounted pedestrian Kerbside detector

## An example of a Puffin site plan



## Type approval

It is a statutory requirement that all equipment placed on the public highway shall be type-approved by the relevant Approving Authority. The Highways Agency acts through delegated powers to grant Statutory Type Approvals as the Approval Authority in England. The Scottish Executive Development Department, the National Assembly for Wales and the Department for Regional Development for Northern Ireland undertake similar roles. Equipment installed prior to the availability of type approved equipment should be upgraded within a reasonable time scale.

Although modern microprocessor controllers may be capable of being converted to Puffin operation, the highway authority should consult the Highways Agency regarding the type approval of modified equipment. Earlier controllers are not capable of economic conversion, and it is recommended that these are replaced by new fully type approved controllers specifically designed for Puffin operation.

## References

Local Transport Note 1/95  
The Assessment of Pedestrian Crossings

Local Transport Note 2/95  
The Design of Pedestrian Crossings

Local Transport Note 1/98  
The Installation of Traffic Signals and Associated Equipment

Traffic Advisory Leaflet 1/01  
Puffin Pedestrian Crossing The Zebra, Pelican and Puffin Pedestrian Crossing

Regulations and General Directions 1997  
Guidance on the use of Tactile Paving Surfaces issued by the DETR (now the DTLR)

## Enquiry information

The Highways Agency  
QS TSS (TCSL) Traffic Control Systems and Lighting  
Temple Quay House  
2 The Square  
Temple Quay  
Bristol  
BS1 6HA

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