



From mountain to sea

Pedestrian crossings

Manual

November 2020



| Revision Date | Previous revision date | Summary of changes |
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1 Introduction

The provision of safe crossing points can have a vital role in promoting pedestrian activity, helping vulnerable pedestrians feel more confident and reducing the impact of busy traffic routes severing our communities.

Different types of crossing are appropriate at different locations and factors such as road character, traffic speed, and vehicle and pedestrian numbers should be taken into consideration. Moreover, budget constraints limit the number of crossing facilities we are able to both provide and maintain so it is necessary to evaluate and prioritise requests for new installations.

This manual gives details on the types of pedestrian crossing facilities that may be used in Aberdeenshire and sets out the process for assessing and implementing proposals for these.

1.1 Legal & Policy Background

1.1.1 Legal background

Under Section 23 of the *Road Traffic Regulation Act 1984* (RTRA), local traffic authorities are permitted to establish, alter or remove pedestrian crossings on the roads they are traffic authority for, after consultation with the police and giving public notice of their proposal.

Sections 26 and 27 of the RTRA allow local authorities to appoint school crossing patrollers with powers to stop vehicles.

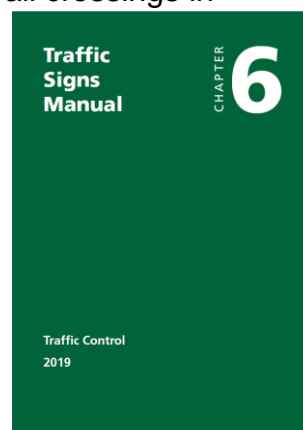
Schedule 14 of the *Traffic Signs Regulations and General Directions 2016* (TSRGD) prescribes the signals and road markings to be used for zebra crossings and signal-controlled crossings.

1.1.2 Policy Background

Aberdeenshire Council's Pedestrian Crossings Policy aims to achieve consistency in the assessment and provision of pedestrian crossings across the areas of Aberdeenshire, targeting locations where they are most needed. This manual is directly referenced in the Policy and shall be complied with for all crossings in Aberdeenshire.

National Guidance on the provision and design of pedestrian crossings is contained in *Manual for Streets* (2007), *Manual for Streets 2* (2010) and Chapter 6 of the *Traffic Signs Manual* (2019).

This manual should be read in conjunction with the guidance in Chapter 6 and aims to promote a consistency of application across Aberdeenshire by giving specific guidance in areas where Chapter 6 allows some discretion.



1.2 Types of Crossing

Table 1.1 below lists the type of crossing facilities (in roughly ascending order of cost) that may be installed, renewed or adopted in Aberdeenshire. The crossings are categorised for ease of reference later in this manual.

Table 1.1 Categorisation of Crossing Facilities

| Crossing Category | Facility |
|-------------------------|--|
| Uncontrolled | Dropped kerb crossing point Pedestrian Island Carriageway narrowing Raised entries Continuous footways |
| Controlled (standalone) | Zebra crossing Parallel crossing PEDEX crossing Far-side toucan crossing Far-side Pegasus crossing |
| Patrolled | School crossing patroller |
| Controlled (combined) | Signal controlled junctions with pedestrian phase |

2 General Principles

Chapter 6 of the *Traffic Signs Manual* identifies the three main objectives of any crossing as **safety, convenience and accessibility**, and states “a crossing that does not improve on all three to some degree is unlikely to be satisfactory”.

2.1 Location

Crossings should be provided at junctions to help pedestrians cross side roads and also at mid-block locations as necessary. They should be located as close as possible to pedestrian desire lines and should be as direct as possible. This should encourage pedestrians to use the provided facilities, minimise the potentially hazardous practise of crossing in the “shadow” of the crossing and avoid the need for guardrails.

Conflict points at uncontrolled junctions should be avoided however when crossings are needed on the approach to a side road the safe distance of 20m is required for signal controlled crossings and a minimum of 5m for a zebra crossing.

Controlled crossings located on the minor approach road should not be sited very close to the give way or stop line as drivers turning into the minor road need time to assess the crossing and space to stop.

Crossings should be provided to improve access to bus stops however stopped buses can obstruct visibility between drivers and pedestrians seeking to cross the carriageway. Bus stops should be sited downstream from pedestrian crossings with a minimum length of 15m from the rear of the stopped bus to the crossing point.

2.2 Visibility

Pedestrians must be able to see and be seen by approaching traffic. Visibility should not be obstructed by parked vehicles, trees or street furniture. Minimum distances for drivers are set out in Table 2.1. These account for a driver reaction time of 1.5s and a deceleration rate of 0.45g in wet weather conditions. The visibility is from the driver to the waiting pedestrian at the road edge. No new crossing should be installed if the absolute minimum visibility is not met and if relocation of the crossing is not viable then consideration to removing the obstruction should be given. A footway buildout or extension of the zig-zag markings may suffice to improve visibility.

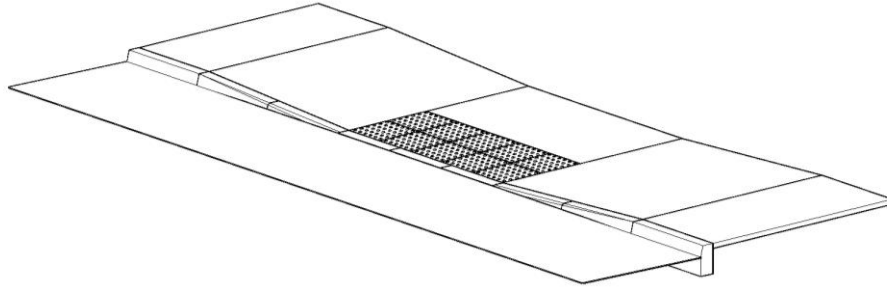
Table 2.1 Visibility at Pedestrian Crossings

| 85%ile Approach Speed (mph) | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
|-----------------------------|-----|-----|-----|-----|-----|-----|------|
| Absolute Minimum visibility | 25m | 33m | 43m | 53m | 79m | 95m | 113m |

2.3 Crossing approach surfaces

Crossings should have appropriate drainage to collect surface water from the crossing area. Both the footway and the carriageway should be free from surface obstructions such as access covers to services, gratings or gullies. Street furniture should also be located away from the pedestrian waiting area.

Dropped kerbs with an upstand of no greater than 6mm and tactile paving (see 2.4) must always be provided across the crossing width and that the section of footway between the flush kerb line. The gradient along the direction of travel should not exceed 1 in 20 while the crossfall perpendicular to the direction of travel should not exceed 1 in 40. This may not always be practical when retrofitting crossings into existing footways but should be achievable for new developments or major projects. Figure 2.1 illustrates one possible method of how, by dropping the full width of the footway, acceptable crossfalls can be achieved at dropped kerb crossings.

Figure 2.1: Full width of footway dropped

High skid resistance surfaces shall be applied on the carriageway (approach lanes only) to all controlled pedestrian crossings. The length over which the anti-skid should be applied is equal to the length of the zig-zags which will vary according to visibility and the approach speed of the vehicle. Cold applied epoxy resin with grey calcined bauxite shall be used for these high skid resistance surfaces. It is preferred that this is machine applied however this may not always be economically justified for small quantities and manual application may be considered.

2.4 Tactile paving

Blister surface tactile paving shall be provided at the following locations:

- crossings along or across distributor roads;
- mid-block crossings;
- controlled crossings; and
- crossing points on raised junctions or tables.

At other locations, tactile paving shall be considered but is not mandatory.

Red concrete tactile slabs should be used at controlled crossings and buff concrete slabs elsewhere. Natural slabs may be used in conservation areas however the selected colour/tone must provide a sufficient contrast against the surrounding surface.

Concrete tactile slabs shall be hydraulically pressed and laid on a 30mm thick mortar bed above a minimum of 100mm of ST3 concrete over the full extent of the tactile paving. Materials and installation shall otherwise comply with BS 7533-4:2006 clause 5.44.

Where tactile paving is provided it shall extend along the full extent of the dropped kerb and shall be aligned with the direction of crossing, with the back edge of the tactile surface at right angles to the direction of crossing. This may not necessarily be parallel to the kerb. The tactile surface should be laid to a depth of 1200mm where the flush kerb is in the direct line of travel. A depth of 800mm shall be used elsewhere.

2.5 Lighting

Good lighting of pedestrian crossings is required as pedestrian crossings are also used at night as well as during the day. Road lighting should be designed so it is adequate but if there is any doubt about the visibility of pedestrians then supplementary lighting can be provided in accordance with BS 5489. The pedestrian approach and the carriageway crossing area must be illuminated to a uniform level. Consideration should also be given to the effects of glare at crossings where the alignment may result in drivers being dazzled when the sun is low in the sky. Additional measures may be needed at such locations to increase the conspicuity of the crossing.

2.6 Guardrails

The use of guard rails should be avoided when designing the crossing as they may cause a hazard, potentially trapping pedestrians in the carriageway, and limit the available space for pedestrians waiting to cross which may cause congestion at the crossing. Other solutions to improve pedestrian safety should be sought before installing guardrails.

2.7 Signing and Road Markings

All road markings, road studs and signage must be in accordance with the *Traffic Signs Regulations and General Directions 2016*.

Advance warning signing may be required in areas where the visibility of the crossing is impaired or when high speed limits are high for the type of crossing e.g. where a signal controlled crossing is sited on road where the speed limit is greater than 50 mph.



Cold plastic Methyl Methacrylate (MMA) shall be used for all road markings at pedestrian crossings.

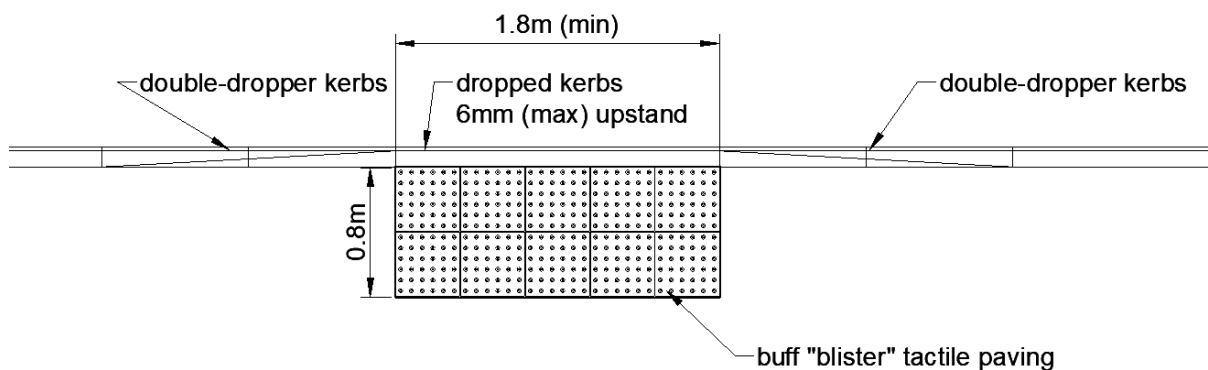
3 Uncontrolled Crossings

3.1 Dropped kerb crossing points

While pedestrians are free to cross the road where they wish, dropped kerb crossing points can be a relatively low cost option to make crossing easier for those with impaired mobility to cross the road.

Informal crossings do not require signs or markings and therefore do not add to visual clutter. Informal crossings work well in low speed traffic environments and may be emphasized through contrasting paving materials, street furniture and changes to the carriageway width or level. It is however important that these are located on or close to the pedestrian desire lines to encourage use.

Dropped kerbs should be installed in pairs directly opposite each other. The length of dropped kerb should be sufficient to accommodate the peak pedestrian flow and should be at least 1.8m (minimum width) while 2.7m is preferred. (Using multiples of standard kerb lengths or tactile slab widths avoids unnecessary cutting during construction and maintenance.) Care must be taken to ensure that slopes introduced to accommodate the dropped kerbs do not lead to excessive gradients for footway users crossing at or continuing beyond the crossing point.



3.2 Pedestrian refuges

Pedestrian refuges consist of a kerbed island in the centre of the carriageway between dropped kerb crossing points on the adjacent footways. They can be sited at junctions or mid-block locations and, by reducing crossing widths and requiring concentration on fewer potential traffic movements at each stage of the crossing, are helpful to those who are wary of crossing wider roads or who have difficulties in assessing gaps in two way traffic flows. Pedestrian refuges may be used as standalone uncontrolled crossings or combined with controlled crossings.

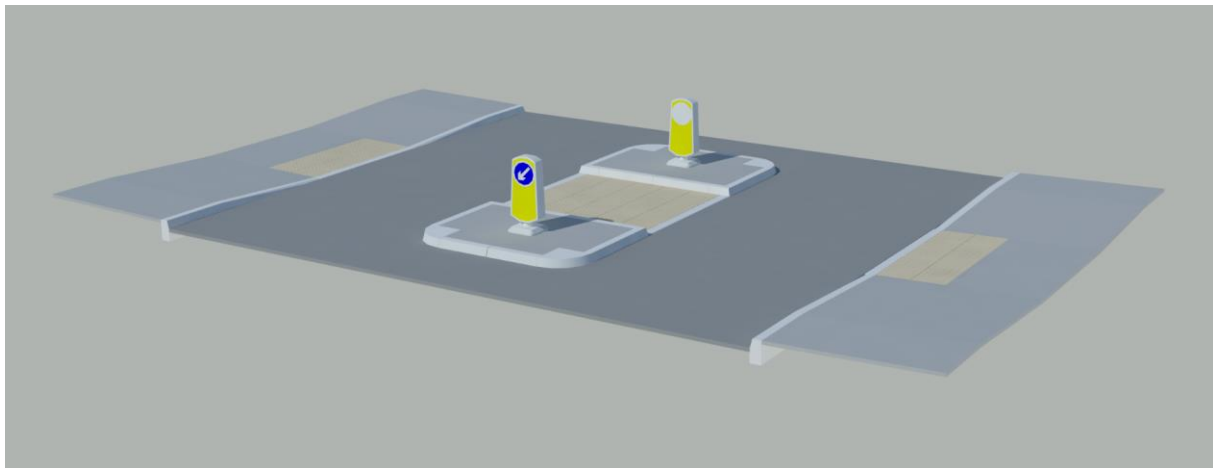
The depth (in the direction of pedestrian travel) of the refuge island should be based on the anticipated users. The absolute minimum depth of 1.2m is inadequate for anything other than pedestrians and, while a minimum of 1.8m can accommodate wheelchair users, mobility scooters, cyclists and pushchairs, a depth of 2m is preferable and should be the minimum provided if possible. On busy cycle crossings, a minimum depth of 3m should be considered to accommodate tandems

or cycles with trailers. The width of the crossing (along the direction of vehicular travel) should be adequate to accommodate peak pedestrian flows and be at least 2m.

To minimise the risk of loss of control of vehicles striking the island, kerb heights in the island should not exceed 75 mm.

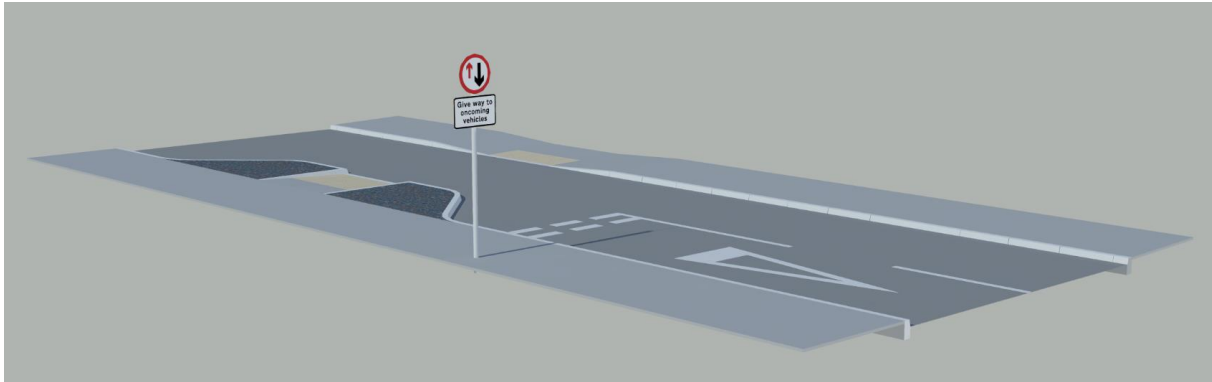
Non-illuminated retroreflective self-righting bollards shall be used (following the guidance given in Aberdeenshire Council's *Illumination of Traffic Signs* document) in pedestrian refuges. Central marker beacons may only be used at locations where it is necessary to enhance the visibility of the crossing. While these may occasionally be required in existing locations, for new developments, layouts must be designed to ensure adequate visibility to crossing points and central marker beacons shall not be permitted.

The installation of pedestrian refuges can lead to cyclists being endangered by motorists attempting to squeeze past them at or near to the islands. To minimise this risk, the clear carriageway width between kerbs should be at least 4m. Widths of between 2.75m and 3.0m may also be used where the speed limit is 20mph.



3.3 Carriageway Narrowings

Build-outs can be used to reduce the width of the crossing, reduce the time necessary to cross the road and improve visibility for both pedestrians and vehicles. Build-outs may be used to leave two narrower lanes or sufficient width for only one way traffic passing on a “give and take” basis. In the latter instance, the appropriate traffic signs shall be used to indicate priorities. As with pedestrian refuges, the use of carriageway narrowing can lead to safety issues for cyclists and full consideration should be given to this matter prior to installing such features.



3.4 Continuous footways/raised entries

The use of continuous footways or raised table crossings provides an increased level of pedestrian priority at crossings at junctions and should be considered where quiet residential streets form T-junctions (or crossroads) with other low speed roads.

3.4.1 Continuous footways

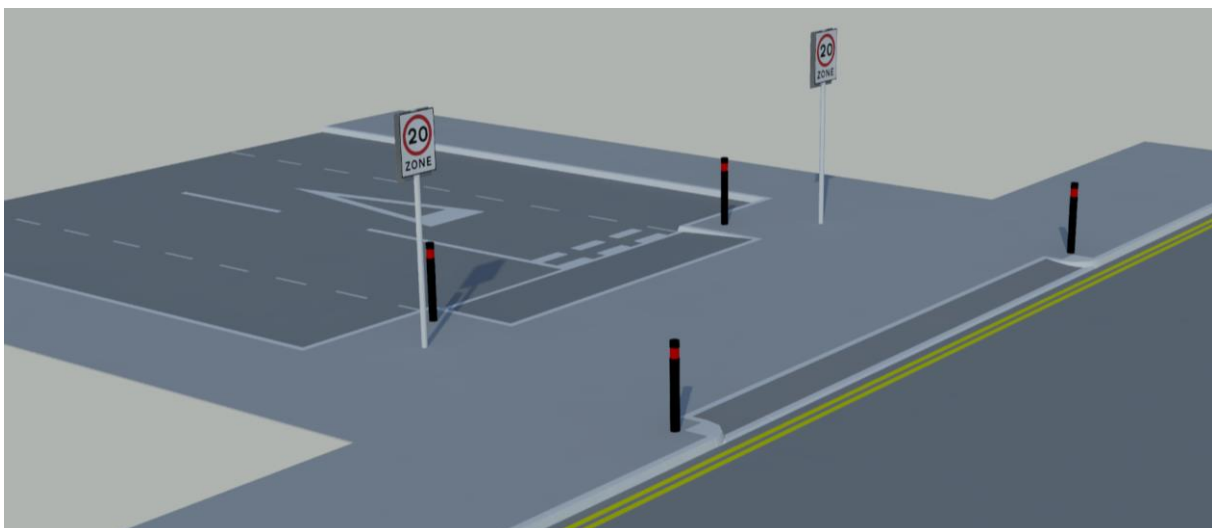
Continuous footways shall be considered where the following criteria are met:

Minor road:

- 20mph speed limit;
- <60 vehicles per hour (peak);
- Minimal HGV flows;
- Residential street;
- Not a bus route; and
- Carriageway category 4b (local access road).

Major road:

- Speed limit of 30mph or less;
- Footway category 3 (secondary walking routes) or higher.



3.4.2 Raised Entries

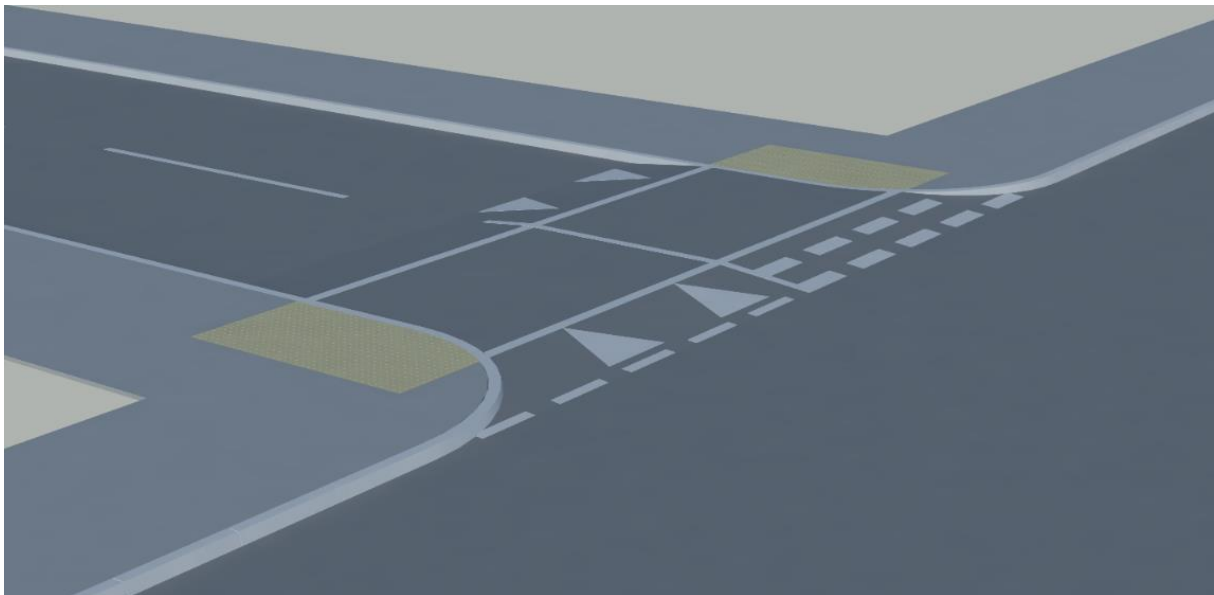
Raised entries shall be considered where the following criteria are met:

Minor road:

- 20mph speed limit;
- <120 vehicles per hour (peak);
- Minimal HGV flows;
- Residential street;
- Not a bus route; and
- Carriageway category 4b (local access road).

Major road:

- Speed limit of 30mph or less;
- Footway category 3 (secondary walking routes) or higher.



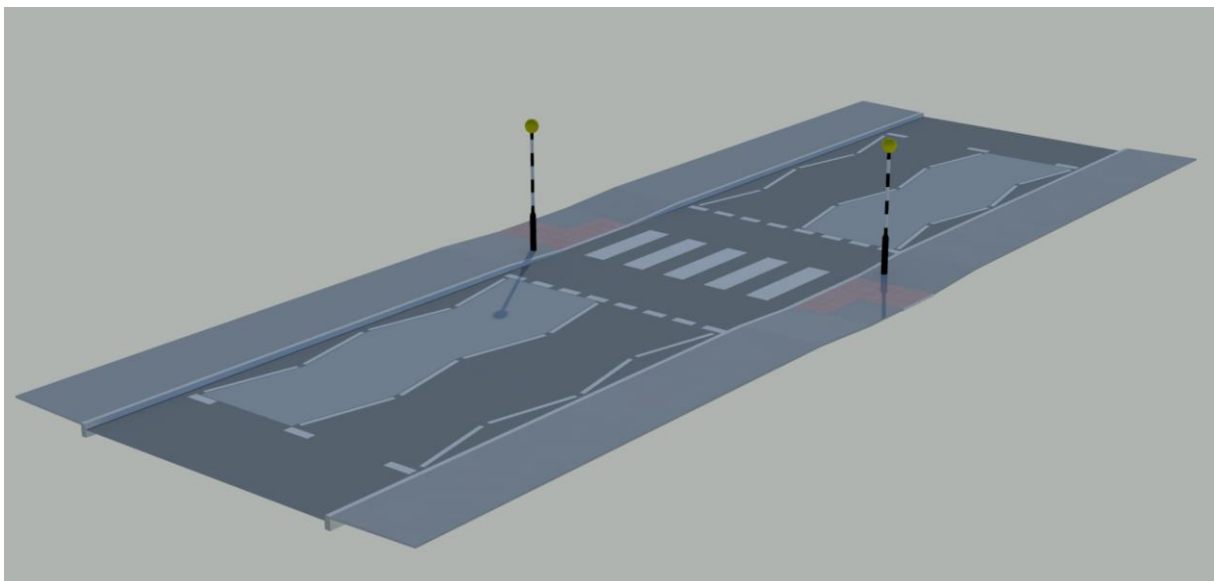
4 Controlled (standalone) crossings

4.1 Zebra/parallel crossings

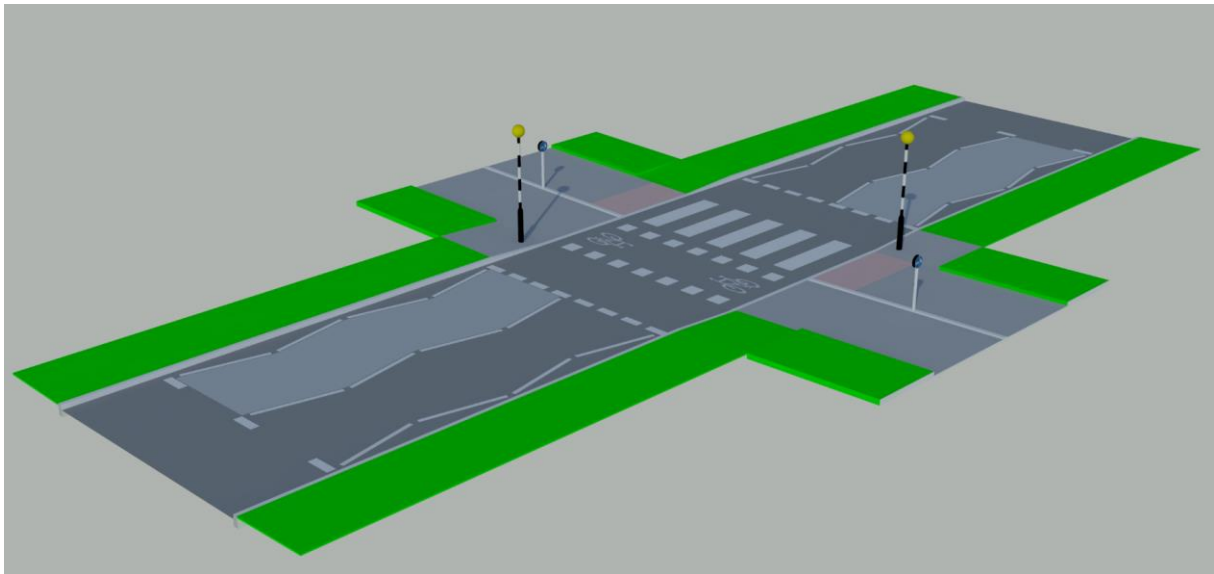
Zebra crossings may be considered where 85%ile speeds are less than 35mph, and traffic flows and pedestrian flows are moderate. Zebra crossings cause less delay to pedestrians than signal controlled crossings, but high pedestrian numbers may cause vehicles to be excessively delayed.



Zebra crossings are indicated by black and white bands painted on the road surface and by the flashing Belisha beacons. Crossing widths should be a minimum of 2.4m. On the approaches and exits to the crossing zig-zag markings must be provided along the edge of the carriageway to create a controlled area where waiting, loading and overtaking is prohibited. The regulations indicate a standard number of 8 zig-zag markings but this can be reduced to a minimum of 2 markings where appropriate.



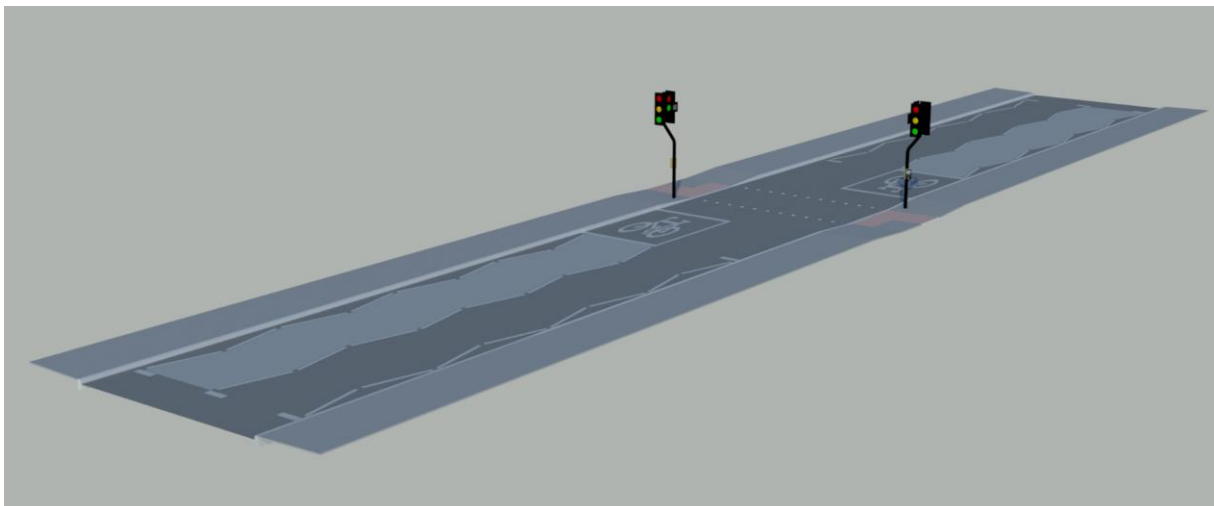
Parallel crossings must only be used where segregated cycle facilities exist at both sides of the crossing.

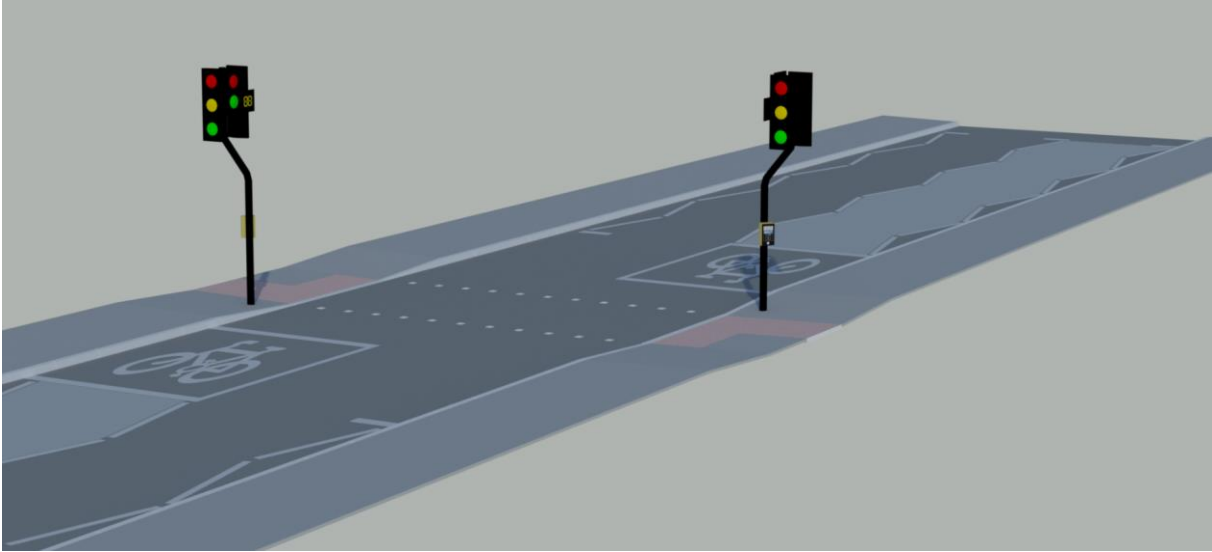


4.2 PEDEX/ Far-side toucan crossings

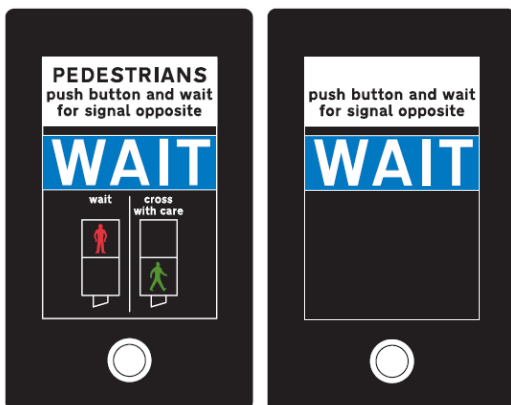
A signal controlled crossing such as a PEDEX or Toucan crossing will be most suitable where traffic and pedestrian counts are high and the PV^2 threshold is met.

New pelican crossings are no longer permitted, and Aberdeenshire Council no longer recommends the use of puffin crossings. PEDEX crossings are required for all new signal controlled crossings. As existing pelican and puffin crossings approach the end of their working lives they will gradually be replaced by PEDEX crossings.





PEDEX crossings are for pedestrian use only. They use far side pedestrian signals with red/green man figures along with a countdown, audible or tactile signal, and vehicles are controlled by standard traffic lights. A typical layout is shown above.



Toucan crossings are also signal controlled crossings which are shared by both pedestrians and cyclists and are only required when a clear cycle route or track crosses a busy road. The desired width for a Toucan crossing is 4m, or 3m as an absolute minimum, but if pedestrian flows are over 600 per hour a wider crossing should be used.

For all signal controlled crossings 2 signal heads must be provided on each approach to enable drivers to see 1 signal head clearly on approach and 1 while waiting at the stop line. All signal controlled crossings must use approved equipment and must comply with the current regulations regarding position and mounting heights. For PEDEX crossings the touch buttons should be mounted between 1.0 and 1.1m above the ground and on the right hand side from the point of view of the crossing pedestrian. For toucan crossings touch buttons should be provided on both the left and the right side of the crossing.

5 Identification and implementation of controlled crossings

The sections below detail the stages to be followed when considering and constructing controlled crossings within the existing network. For new developments, projected pedestrian and vehicular flows may be used to calculate the xPV^2 value and determine if a controlled crossing facility is required.

5.1 Identification of candidate sites

The Strategy Manager shall compile a list of possible locations for consideration as potential controlled-crossing sites. The list shall include requests from councillors and members of the public, and recognising that the areas where traffic management interventions are most required may not always match with the areas where they are most requested, the Strategy Manager shall also proactively identify potential sites by considering the following across Aberdeenshire:

- busy roads dividing communities or separating neighbourhoods from services;
- strategic pedestrian routes in towns;
- walking routes to schools;
- pedestrian accident clusters identified by the Road Safety Unit; and
- pedestrian desire lines in and around our town centres.

This initial list shall be sifted to remove sites which clearly would not satisfy the criteria and also those where site geometry or land constraints mean that it would not be feasible to install a crossing.

Once the list of candidate sites is compiled, an initial site survey shall be undertaken to identify the optimum location based on desire lines but also considering safety and other constraints. New sites can continue to be added to the list if further requests or suggestions are received after the initial compilation and sifting.

5.2 Assessment of candidate sites

For each candidate site, an xPV^2 value shall be calculated using Equation 1 which incorporates the following parameters:

- Pedestrian and vehicle count
- Accident history
- Carriageway width
- Vehicle speed

Equation 1: calculation of xPV^2 value

$$xPV^2 = M_{ac}M_{cw}M_{vs}uPV^2$$

This xPV^2 value is then used to determine if the provision of a controlled crossing is justified (see section 5.3).

5.2.1 Pedestrian and vehicle count

5.2.1.1 On-site count

The vehicle and pedestrian count should be carried out on a day when the flows would be expected to be representative of the location. This would typically be on a Monday, Tuesday, Wednesday or Thursday. School holidays should be avoided where school journeys could be expected to make a significant contribution to the flows. Counts should be repeated if adverse weather or atypical events are thought to have unduly influenced the results.

The count should take place between the hours of 07:00 and 19:00 however the duration may be reduced to a period of not less than 4 hours where local knowledge means that peak flow times can confidently be predicted. As the assessment is based on PV^2 results, surveyors should ensure that times with peak vehicular flows are included in the survey as well as those with greatest pedestrian movements. The survey should be broken up into 15 minute periods with both pedestrians and vehicles recorded for each period.

The pedestrian count should record every pedestrian crossing the road within a 100m length (extending from a point 50m upstream of the proposed crossing to a point 50m downstream of the proposed crossing). Two categories of pedestrian shall be recorded to allow extra weight to be given to those who may find crossing the road more challenging than others.

- P_a : visually impaired, mobility impaired, children under 12 years old and persons pushing prams or pushchairs.
- P_b : other pedestrians.

The vehicle count should record all vehicles travelling through (in any direction) the site of the proposed crossing. Two categories of vehicle shall be recorded to allow extra weight to be given to larger vehicles which may cause a greater psychological deterrent to pedestrians crossing at the site.

- V_a : large goods vehicles and buses.
- V_b : other vehicles (including cycles, mopeds, motorcycles, cars and light goods vehicles).

Surveyors should complete the standard count sheet and return it to the Strategy Manager for processing.

5.2.1.2 Unmodified PV^2

The count data shall be used to calculate an unmodified PV^2 value (uPV^2) in the following manner:

For each 15-minute period, the quarter hour PV^2 (qPV^2) shall be calculated using Equation 2.

Equation 2: quarter-hour PV²

$$qPV^2 = (2P_a + P_b)(2V_a + V_b)^2$$

The individual qPV^2 values shall be ordered from highest to lowest and numbered as q_xPV^2 where $x = 1$ for the highest value, $x = 2$ for the second highest value and so on. With the 4 highest values, the uPV^2 value can be calculated using Equation 3.

Equation 3: unmodified PV²

$$uPV^2 = 16 (q_1PV^2 + q_2PV^2 + q_3PV^2 + q_4PV^2)$$

5.2.2 Accident History

The accident modification factor (M_{ac}) shall be calculated using Equation 4, where the N_p is the number of accidents involving pedestrians in the previous D_a years within 50m either side of the proposed location. Normally this shall be 5 years but, where accidents at a site occurred prior to a significant change in the character (including geometry or function) of the road at the proposed location, only accidents in the period following the change shall be considered.

Equation 4: accident modification factor

$$M_{ac} = 1.2^{\left(\frac{3N_p}{D_a}\right)}$$

5.2.3 Carriageway Width

The carriageway width modification factor (M_{cw}) shall be 1.0 for widths of 6.0m or less. Equation 5 shall be used for widths (C_w) greater than 6.0m.

Equation 5: carriageway-width modification factor

$$M_{cw} = \frac{C_w + 4}{10}$$

5.2.4 Vehicle speed

The vehicle-speed modification factor (M_{vs}) shall be calculated using Equation 6, where V_{85} is the 85%ile speed of vehicles (in mph) at the proposed crossing site.

Equation 6: vehicle-speed modification factor

$$M_{vs} = \frac{V_{85} + 75}{100}$$

5.3 Selection of appropriate crossing type

The criteria for controlled crossings is set out below. Where the criteria is not satisfied, the outcome of the assessment shall be reported to the Local Roads and Landscape Manager who shall consider if works to install or improve an uncontrolled crossing are merited at the site.

It shall be appropriate to consider providing a zebra crossing (or parallel crossing if linking cycle facilities) where all the following apply:

- **$xPV^2 > 0.15 \times 10^8$;**
- **the speed limit is not greater than 30 mph;** and
- **$V_{85} < 35\text{mph}$**

It shall be appropriate to consider providing a PEDEX crossing (or toucan crossing if linking cycle facilities) where the following applies:

- **$xPV^2 > 0.8 \times 10^8$**

5.4 Prioritisation

Sites which meet the criteria for a controlled crossing in section 5.3 shall be prioritised based on the following parameters:

- xPV^2 value;
- proximity of other crossing facilities;
- total number of pedestrians crossing in the busiest 16 quarter hour survey periods;
- level of deprivation (using SMID data); and
- cost.

The highest scoring sites shall be further progressed as available budgets permit.

5.5 Design and review

Controlled crossings shall be designed in accordance with the requirements of this manual. In line with Aberdeenshire's Road Safety Audit Policy, detailed designs shall be subject to a Stage 2 Audit.

Detailed designs shall be submitted, along with the Stage 2 audit report, for approval by the Roads Policy and Asset Manager after consideration by the Roads Standards Group.

5.6 Implementation and operation

Prior to establishing (or altering or removing) a standalone controlled crossing, the traffic authority must consult with Police Scotland and publish notice of the proposal in accordance with sub-section 23(2) of the RTRA.

Ward members should always be notified prior to the introduction of controlled crossings and where proposals may be contentious (such as where new crossings may require the removal of town centre parking spaces) it is recommended that these are presented to the appropriate Area Committee for approval prior to the notice publication.

A stage 3 safety audit shall be required following the installation of a new controlled crossing and, for signalised crossings, commissioning checks must be completed to the satisfaction of the Street Lighting officer prior to the crossing being added to the Traffic Signals maintenance contract schedule.

All controlled crossings shall be re-evaluated prior to replacement or major renovation to ensure that the crossing type is still appropriate and that they are positioned at the optimum location. Crossings which do not meet the current criteria shall be removed.

6 Patrolled crossings

6.1 School crossing patrollers

School crossing patrols (SCPs) are used to offer safer crossing points for primary and secondary school children at busy school route locations. Aberdeenshire Council will manage and operate sites in accordance to the *School Crossing Patrol Service Guidelines* (SPCSG) produced by the Road Safety GB School Crossing Patrol Advisers Group.

In line with these guidelines, sites having fewer than 15 children crossing the road in the busiest 30 minute period should not be considered for establishing a SCP.

SCP sites shall be assessed independently from controlled crossings and the provision of one shall not preclude the provision of the other.

6.1.1 Process for assessing potential SCP sites

In accordance with the SPCSG the following stages shall be followed when assessing potential school crossing patrol sites:

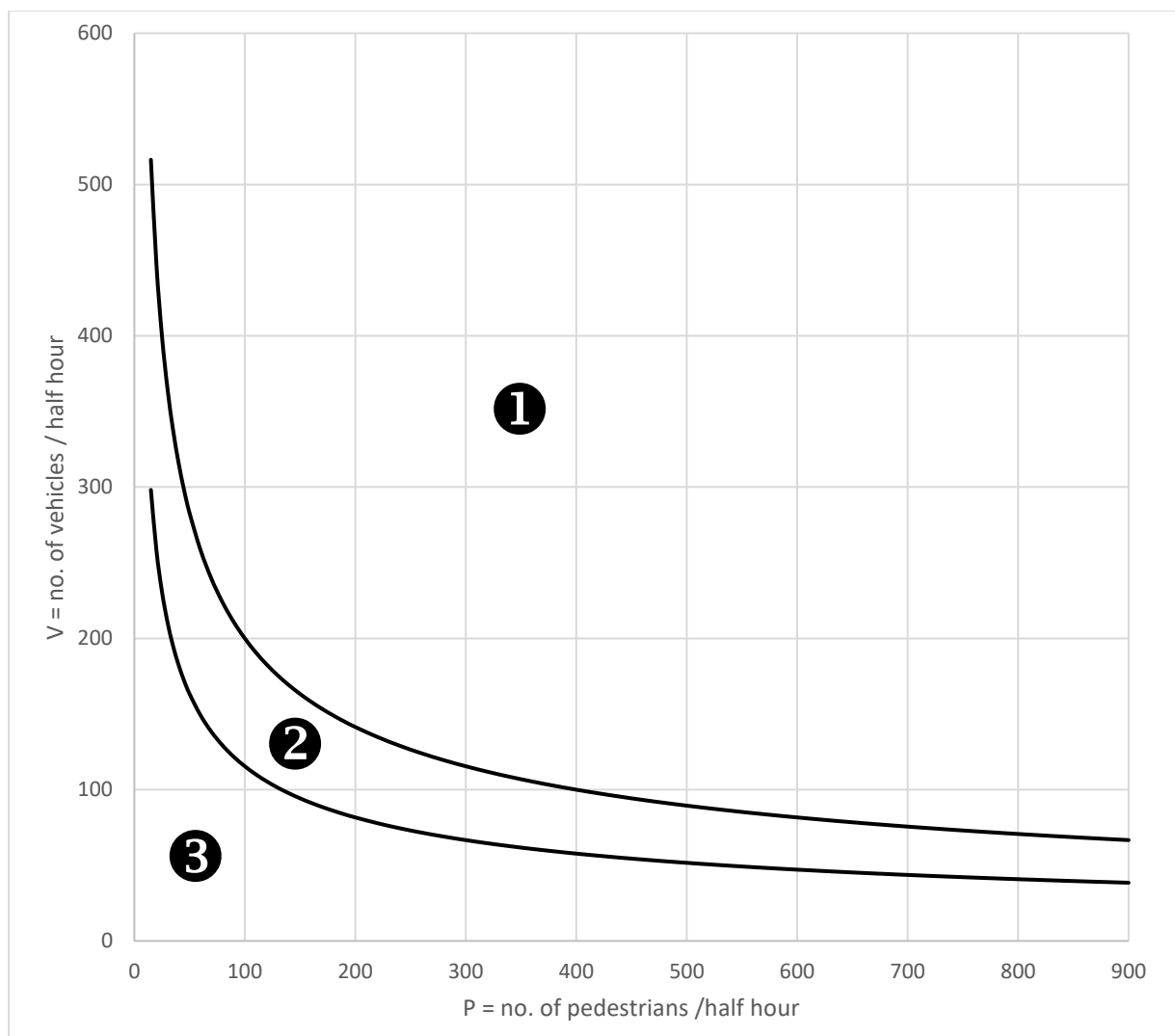
1. Count of pedestrians and vehicles
2. Calculation of PV^2 rating
3. Comparison with criteria threshold level
4. Consideration of 'Adjustment Factors' and selection of Multipliers (where appropriate)
5. Recalculation and recheck against threshold level
6. Consideration of additional facilities where heavy traffic flows or speeding exists.



The method used for calculating PV^2 for potential school crossing patrol sites shall be that stated in the SPCSG. **It should be noted that is quite different from that used in this manual for controlled crossings and that the values are not directly comparable.**

Table 6.1: Criteria for SCP

| Position of point in Figure 6.1 | PV^2 | Action to be taken |
|---------------------------------|---|--|
| 1 | $4 \times 10^6 < PV^2 < 1 \times 10^8$ | SCP site justified |
| 2 | $1.33 \times 10^6 < PV^2 < 4 \times 10^6$ | SCP not justified at initial assessment – apply additional factors to see if modified PV^2 meets threshold |
| 3 | $PV^2 < 1.33 \times 10^6$ | SCP definitely not justified at initial assessment – if exceptional circumstances apply additional factors to see if modified PV^2 meets threshold |

Figure 6.1: SCP threshold graph

7 Signal controlled junctions with pedestrian phase

Pedestrians often find it easier to cross at traffic signals and as such a pedestrian phase should be incorporated into the design of the junction as per Chapter 6 of the *Traffic Signs Manual*. Pedestrian phases should be provided in all cases except where no pedestrian footway exists.

Countdown aspects should be installed on all new signal controlled junctions with pedestrian phases and to existing facilities when these are being replaced. At appropriate locations, an all green pedestrian phase shall be considered to allow diagonal crossing.
