



## Pedestrian Facilities at Signal - Controlled Junctions

### INTRODUCTION

Traffic signal control uses time to separate conflicting traffic flows. The term "traffic" includes all road users: motorists, cyclists, pedestrians (including those who are more vulnerable, i.e. those in wheelchairs, the more elderly etc.) and equestrians. TD50/04, "The Geometric Layout of Signal-Controlled Junctions and Signalised Roundabouts"<sup>1</sup>, states that, at a traffic signal installation, "where a pedestrian need is established then appropriate signal controlled facilities should be provided". The "need" can be the result of local measured pedestrian/vehicular volumes, or accident data. However, it could be: part of a plan to encourage walking and/or cycling, part of the local plan, or other local strategy - see Traffic Advisory Leaflet (TAL) 5/03, Walking Bibliography<sup>2</sup> for further information. When a traffic signal installation is being designed, or modified, the extent of traffic usage must be determined and specific measures included unless site considerations warrant their exclusion. No specific details have been included on facilities for cyclists or equestrians. Information is available in TAL's 4/98 Toucan Crossing Development<sup>3</sup> and 3/03 Equestrian Crossings<sup>4</sup>.

Crossings are generally provided as amenities to give access and easier movement. They may be provided specifically to improve an otherwise poor accident record. TA84/01, "The Code of Practice for Traffic Control and Information Systems"<sup>5</sup>, is recommended to designers so that safety aspects are fully considered and documented. However, the provision of specific facilities for pedestrians will not necessarily lead to a safer place for them to cross.

There are a number of ways to provide facilities and this leaflet describes the main options. The designer has to consider the pedestrian flow patterns, degree of saturation and the topographical layout to decide on which option is best suited to a particular site. In addition to deciding

on a crossing type, the designer needs to choose between farside and nearside signalling for pedestrians. In general terms, it is anticipated that nearside signalling will become the standard form but there may be situations where farside signalling may be necessary. However, consistency is important. A move to nearside signalling should be part of a plan to convert other signal-controlled facilities in the vicinity.

This part of the leaflet should be read in conjunction with Parts 2, 3 and 4. Some of the advice for stand-alone pedestrian crossings in Local Transport Note (LTN) 2/95, "The Design of Pedestrian Crossings"<sup>6</sup>, is relevant to signal-controlled junctions. In addition, there are common references in TD50/04<sup>1</sup>. For brevity the advice is not repeated here. There is also useful information in TAL's 1/01 Puffin Pedestrian Crossing<sup>7</sup>, 1/02 The Installation of Puffin Pedestrian Crossings<sup>8</sup> and 2/03 Signal-control at Junctions on High-speed Roads<sup>9</sup>.



## BACKGROUND

This Leaflet supersedes TA15/81, Pedestrian Facilities at Traffic Signal Installations<sup>10</sup>. This gave numerical criteria for the provision of pedestrian facilities. Summarising, justification could be achieved if either the number of pedestrians crossing was high or the headway of vehicles turning into the section was short and there were at least a minimum number of pedestrians crossing. Otherwise, the assumption was that pedestrians would choose to cross, either during an intergreen period, or when vehicles were turning into the section being crossed, when volumes and speeds were likely to be lower. (An intergreen is the period when other movements are stopped.) With more sophisticated control methods, with perhaps unexpected movements, and in many cases more complex layouts and higher vehicular flows, generally this assumption is not now thought to be reasonable, or realistic.

While the overall road safety record in GB is one of the best in Western Europe, performance on pedestrian safety is only near average, and accident rates for child pedestrians, although improving rapidly, are still higher than in many other comparable Western European countries. This may be due to a number of factors. Until recently, the key design issues to resolve at signal-controlled junctions involved vehicular movement, delay and congestion problems. The initial justification for signal control may still be a vehicular one but all road users must be taken fully into account when the design is taken forward. There has been over the years a greater emphasis on encouraging walking and cycling. The provision of better crossing facilities is an essential part of this.

Pedestrian compliance with the red man signal is thought to be generally poor. Pedestrians are more likely to disregard the red man signal if they consider the distance they have to walk, or the time they have to wait, unreasonable. (When waiting at a junction, in bad weather, a driver may be frustrated but is generally warm and dry. A frustrated, cold and/or wet pedestrian is more likely to take what otherwise they would consider an unacceptable risk.)

## OPTIONS

The drawings referred to are in Part 2.

### Underpasses and overbridges

Removing the potential conflict between pedestrians and vehicles must be the ultimate goal and this can be achieved by the use of under-passes or overbridges. However, these are always expensive and often not practicable or convenient for pedestrians, who also often feel vulnerable using them. Unless a well-designed accessible installation is possible, that would be accepted by all pedestrians, other options should be considered.

### No Pedestrian Phase or Stage

This will be the least popular with pedestrians. They can be intimidating, especially for the more vulnerable pedestrian and this option should be seen very much as an exception.

Refuges, with illuminated bollards, offer some assistance. They will simplify the crossing, as pedestrians can concentrate on one approach at a time. Crossing studs can be used, whether refuges are installed or not. Although of use to partially sighted pedestrians, crossing studs alone generally offer little help to pedestrians. Trials at one site suggested that the addition of a coloured surface between the studs may highlight the crossing position to both pedestrians and drivers and might give an advantage by marginally lowering the speed.

Without a pedestrian phase, most pedestrians will try to cross during the intergreen period and it is important to check that the settings are correct. Guidance can be found in TA16/81, "General Principles of Control by Traffic Signals"<sup>11</sup>. An extended intergreen to assist pedestrians, however, is generally not recommended. This practice can lead to increased delays to vehicles and driver disobedience, and lacks the clarity provided by red and green man displays.

An alternative is to provide a key switch, under the control of an authorised person, to introduce an extended all-red period, say, where a school crossing patrol operates for a short period of the day. A means of over-riding the facility should the key be left in may be desirable. A problem with this type of operation is that a pedestrian used to crossing during the increased intergreen may make an error of judgement when crossing using a normal intergreen.



### Full pedestrian stage

*(all vehicular approaches are stopped whilst pedestrians are signalled across all junction arms.)*

This option has both advantages and disadvantages. For example, it is simple and easily understood by pedestrians and audible and/or tactile devices are possible in most cases. However, of all the options it has the worst effect on junction capacity, as the additional time lost to vehicle movement is made up of an intergreen plus the crossing time. Also, it can produce a long cycle time and a pedestrian arriving at the end of the invitation period has a lengthy wait. Providing two pedestrian stages per cycle can ease this but in turn will have an even greater effect on junction capacity.

Normally, the facility should only be called by demand from push buttons. This encourages pedestrians to use push button facilities in general and in the case of nearside signals, look at the pedestrian signal and towards oncoming vehicles. However, the use of permanent demands may be considered where there is thought to be a greater advantage by not delaying pedestrians unnecessarily and there is not thought to be a safety problem. Permanent demands can be introduced by time-of-day. Whichever method is chosen push buttons should be provided at all points where pedestrians may cross. Drawing 1 shows the typical arrangement and stage diagram.

Refuges may be employed but these will be the straight across type, without a stagger. Nearside signal operation should overcome the uncertainty felt by some pedestrians following the green man period.

Diagonal crossings (crossing the centre of the junction, say, from north east to south west) are largely untried but a small number do exist. There are important design aspects to be incorporated. Diagonal crossings are not considered appropriate for many disabled users, particularly those who are visually impaired. Also, road safety education generally teaches children not to cross diagonally at junctions. Conventional orthogonal crossing places should therefore always be provided with flush dropped kerbs, tactile paving and audible/tactile signals. Flush dropped kerbs, tactile paving and audible and tactile signals should NOT be provided on the diagonal crossing part. If a lowered kerb is provided, there should be a minimum upstand (after possible re-surfacing) of at least 25mm. Careful thought also needs to be given to the use of markings or coloured surfacing at the junction so that partially sighted pedestrians are not misled. Crossing times for pedestrians must cater for the longest crossing distance. Advice can be found on audible/tactile signals in Part 3.

When considering a diagonal crossing it is particularly important to fully consult with the relevant organisations for disabled pedestrians and road safety officers/trainers involved with local schools.

### Parallel Pedestrian Facility

The provision of green man signals "in parallel" with vehicular movements can make junction operation more efficient. In addition, it will often reduce pedestrian delay and ambiguity caused by long red man periods.

Where it is possible to prohibit some turning movements a combination of pedestrian and vehicle stages can be installed, see Drawing 2. By using banned turns, pedestrian facilities can be provided across appropriate arms. In order to reduce the possibility of vehicles turning illegally, advance signs to diagram 818.2/818.3 and possibly additional signs at the junction, should be used and kerb radii squared off.

Where space permits, parallel pedestrian facilities can be accommodated by designing appropriate splitter islands, see Drawing 5. These can also be usefully employed at a "T" junction with a one way street. Drawing 3 illustrates this facility. The left and right turning movements from the side road pass either side of the island and pedestrians can cross safely from the island across the main road between the segregated flows when the side road traffic has the right of way.



### Staggered Pedestrian Facility

Where carriageway widths permit it is possible to economise on cycle time by the provision of a larger refuge. The pedestrian movement, which is normally staggered, can then be integrated with vehicular staging. A minimum size of 10m x 3m for the central refuge is recommended, although widths over 3m may be required to meet the needs of those crossing. At some refuges, such as shown in Drawing 3 (in Part 2), there may be a number of pedestrian routes to cater for and the designer will need to consider the size of the waiting area carefully.

The recommended stagger at stand-alone crossings is left/right, as shown in TAL 1/02<sup>8</sup>. However, a right/left stagger, as shown in Drawing 4, is probably more common at junctions. There are advantages and disadvantages with both and the designer will need to assess each site. See Table 1 (in Part 4). It should be remembered that the staggers should as nearly meet the pedestrian desire lines as possible. If staggers are dividing two flows of vehicles travelling in the same

direction, such as at a bus gate, signs to diagram 1029 should be provided. Other signs can be provided, dependent on the situation, such as to diagram 963 and 810.

Sites located close together should have the same layout to save confusion to vulnerable groups. The guidance in TD 50/04<sup>1</sup> on intervisibility between drivers and pedestrians should always be part of any assessment.

Pedestrians can negotiate one half of the carriageway at the entry stop line when traffic on that approach is held on red. Normal pedestrian signals are shown during this period. The other pedestrian phase can utilise a parallel stage stream, as shown in Drawing 4. This type of arrangement can work well if the route follows a natural pedestrian desire line. It would cater for a busy peak hour pedestrian route utilising phases K and G. The facility would be demanded by push buttons associated with the two phases.

As vehicles could be turning towards the crossing from the side road it is important that the facility is controlled by separate signals as shown. The conditioning needs to take into account the reservoir length and the observed speed of turning vehicles. There can be a see-through problem and care is needed with the alignment of the vehicular heads.

The drawing also shows a vehicular all-red stage for general off-peak use. The all-red would be called by push buttons associated with phases E, F, H and I.

Drawing 5 shows phases H and J commencing with the start of a non-locking right turn stage. In this way staggered facilities can be incorporated on both approaches. A right turn early cut-off arrangement can be used to give a single staggered facility.

The drawing also shows a left turn parallel stage stream. Care is needed with this facility. It is crucial that there is an adequate distance between the second set of studs, on the leaving side and the give way marking to give the driver

time to assess the situation and give way to vehicles that may be approaching from the right. Good intervisibility is essential. A "give way" sign to diagram 602, with the associated road markings, is recommended as standard. One such sign either side of the slip lane is often necessary. See Traffic Signs Manual Chapter 3 for advice.

In this example, assuming sufficient time is allowed for vehicles to clear the crossings at the end of the main road green, pedestrian phases H and J can be run in parallel with vehicular phases A and D. This obviates the need to stop turning side road vehicles at additional vehicular signals close to the crossings, removes the need to provide storage reservoirs at these crossings and removes any problems of "see through". It also results in more scope for positioning the crossing nearer to the desire line.

### Displaced Pedestrian Facility

A displaced facility can be used where there is no pedestrian demand at a junction but there is a need close to it, or perhaps where it is not practical to have the crossing on one arm of the junction because of inadequate inter-visibility. It also may have capacity advantages, which in turn will mean a shorter waiting time for pedestrians on the arm in question. Drawing 6 shows a parallel stage stream arrangement. The displaced facility must be as close as possible to the desire line, or it will increase inconvenience and decrease the likelihood of the crossing being used. If for the use of pedestrians at the junction it should be no more than 50m from it. The conditioning for the parallel stage stream should be specified so that the main vehicular flow is not interrupted and vehicles turning out of the side road are not impeded by a queue. The problem of see-through should be examined. The displaced crossing will need separate detection if the installation is operating under vehicle actuation.

Details of Traffic Advisory Leaflets available on the DfT website can be accessed as follows: [www.dft.gov.uk](http://www.dft.gov.uk)

From the DfT homepage, click on Roads and Vehicles, then Traffic and Parking Management and then Traffic Advisory Leaflets.

The Department for Transport sponsors a wide range of research into traffic management issues. The results published in Traffic Advisory Leaflets are applicable to England, Wales and Scotland. Attention is drawn to variations in statutory provisions or administrative practices between the countries.

The Traffic Advisory Unit (TAU) is a multi-disciplinary group working within the Department for Transport. The TAU seeks to promote the most effective traffic management and parking techniques for the benefit, safety and convenience of all road users.

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