

Long Pedestrian Crossings: Things to consider and how should we assess them?

Introduction

Signal controlled pedestrian crossings have been implemented in a wide range of lengths and types (Pelican, Puffin, Toucan). In recent times there has been a prominent desire to provide attractive and direct crossing facilities for pedestrians. As part of this, there has been the identification, assessment and sometimes implementation of pedestrian crossings of significant length in order that pedestrians can cross a road in one stage, rather than crossing the road in numerous stages.

A highly publicised example of the provision of long crossings was the implementation of the scheme shown below at Oxford Circus in November 2009, on which a paper was presented to the symposium last year. This high profile scheme has further increased the desire to consider long crossings at other locations.



Relevant Guidelines

LTN 2/95 says to consider stagger crossings if it would be longer than 11 metres and not to use a single direct crossing if this would be longer than 15 metres..

The Pedestrian Viewpoint

Unfortunately for traffic signal engineers pedestrians are not a single homogenous group. The requirements and priorities of the frail and elderly are likely to be significantly different to those of young adults or children. Add to this the fact that attitudes will vary depending upon the site specific conditions (e.g. during peak time periods people will often walk faster, if they are able to) it can be difficult to identify pedestrian viewpoints to take into consideration. The following are therefore a mixture of my own thoughts on this matter based upon observations of pedestrian behaviour at crossings, comments I have received from the public as well as some relevant media and journal reports.

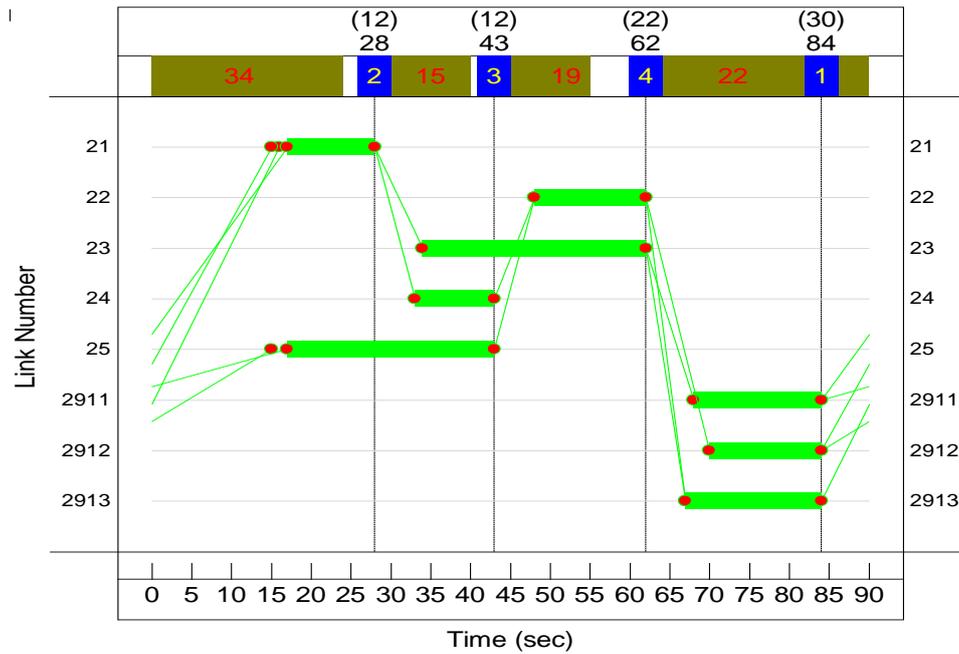
There is a proportion of pedestrians who dislike the fact that often with nearside display units they cannot see a green man (or a flashing signal) when they are on the crossing. They worry as they cannot see any indicator to show to them that the conflicting traffic will not be being given a green signal. The longer a crossing the further distance a pedestrian will need to cross without the reassurance of a signal to them that it is safe to cross. This uncertainty can cause hesitance and confusion. Equally where there is a green man visible to pedestrians as they cross there is a tendency for many people to believe that they should be able to complete the crossing during the steady green man signal. They therefore can become uncomfortable at long crossings where they can often be a long distance from completing their crossing when the steady green man signal is extinguished. This view is illustrated by some of the initial comments that were recorded in relation to the Oxford Circus scheme:

"Oh my, it's quite a distance," said the 69-year-old Canadian visitor as she reached the safe ground of the south-eastern pavement, just a couple of minutes after the redesigned junction was formally opened. "I didn't realise I was being such a pioneer. I just saw the green man and set off. It didn't seem like I had much time so I had to pick up the pace near the end. We had these sorts of crossings about 40 years ago in Calgary, but they got rid of them after a while as there were a few problems."

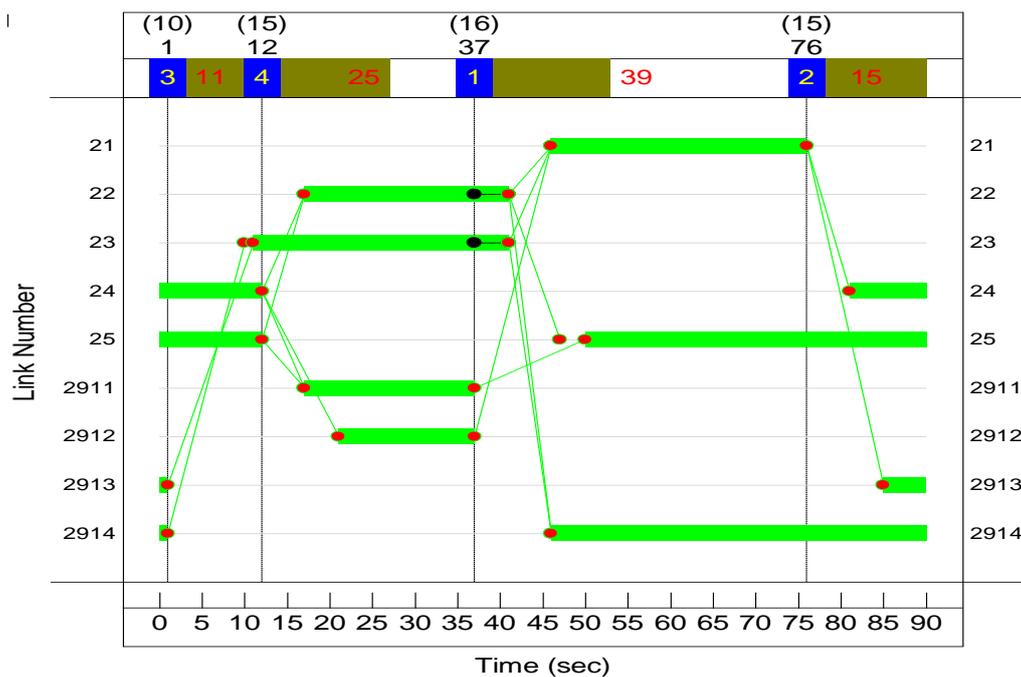
"It feels like a long way to go, and it's maybe a little bit frightening,"

Other pedestrians are likely to look at whether the provision is direct and quick to use. A crossing of a road that needs to be undertaken using various pedestrian phases, including the addition of the stagger distance between the crossings, can be extremely unattractive to pedestrians. Long pedestrian crossings will often require an 'All-Red' pedestrian stage as they will conflict with all traffic movements. Due to the nature of this stage requiring a significant length of time in order to ensure that pedestrians can cross the long distance safely, it is likely that the stage will only be able to be called once every signal cycle, or, if running vehicle actuation (VA) will have a lengthy pre-timed maximum period for vehicles. This may mean that pedestrians are faced with a significant delay waiting for a green man signal and that there may be a wider window of opportunity for pedestrians to cross the road if a more traditional staggered form of crossing was provided. An illustration of this is provided by the following examples from a junction where options for long straight across pedestrian crossings and for staggered pedestrian crossing facilities were examined and compared.

Straight across long pedestrian crossings option (pedestrian links are 2911 to 2913)



Staggered pedestrian crossings option (pedestrian links are 2911 to 2914)



In reviewing the comparative benefits of such alternative junction layouts for pedestrians we usually focus upon the likely delay for pedestrians before they will be able to complete their

crossing of the road. In undertaking this it is important to take into consideration the window that is available for the pedestrian phases to be called. A phase that will only operate within a short window once within a lengthy cycle time can cause significant delay for pedestrians. Equally a staggered crossing with pedestrian phases that allow poor progression for pedestrians crossing the road using a number of phases will result in significant delay for pedestrians. However, staggered crossing facilities that enable 'walk with traffic' can enable the pedestrian phases to operate for a longer green time within a stage and thereby provide a lengthy window in which pedestrians can cross.

The introduction of long pedestrian crossings can result in a junction having to operate on a long cycle time, due to such aspects as an 'all –red to traffic' stage and the long intergreens after the pedestrian phases. This can impact upon performance of the junction as well as the attractiveness of the crossings to pedestrians compared to junctions operating on a shorter cycle time. This issue can be particularly significant in off-peak periods, when it would be advantageous to operate a short cycle time, but the presence of the long crossing(s) hinders such flexibility of cycle time. The negative effects of this can be particularly significant where the junction is operating within a UTC or other linked junction system or where pedestrian phases are not operating as demand dependant.

Assessment Issues

Where pedestrian crossings have fixed timings and are not demand dependant then an assessment of the impact of a pedestrian crossing facility upon capacity can be reasonably straightforward. The modelling and assessment can be undertaken in line with general good practice. However, if this is not the case then the following aspects may be worthy of consideration:

How often will the pedestrian crossing phase be operational?

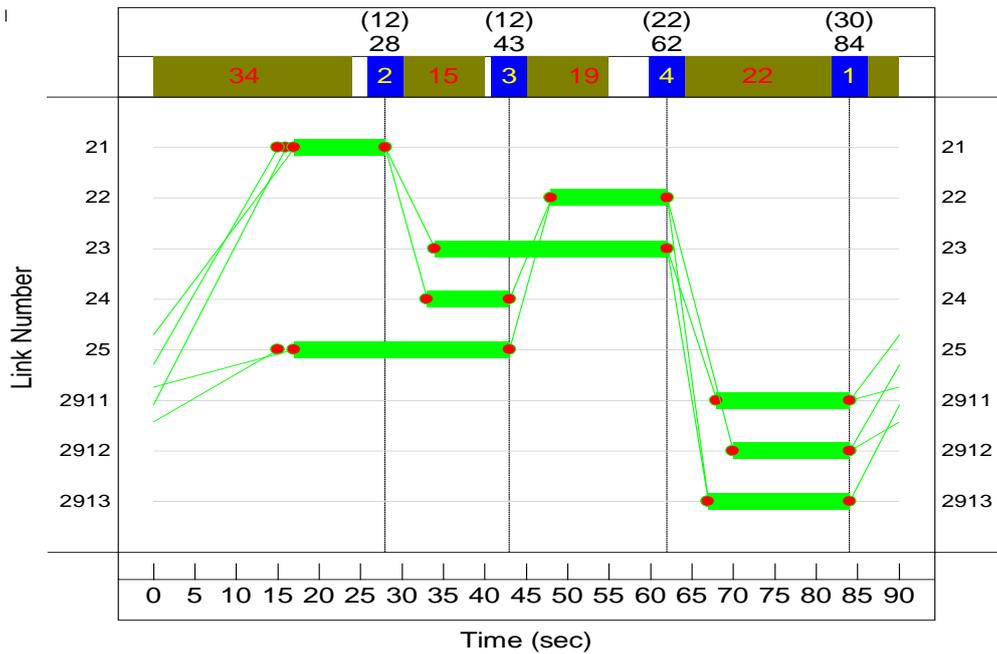
This is obviously site dependant. In addition to the number of pedestrians wishing to cross the road at that location, factors to be considered include:

- How attractive and direct the crossing is for potential users
- What will be the likely delay for users of the crossing
- Will pedestrians wait for the green man/will kerbside detection be provided to cancel the demand for the crossing
- How often can the pedestrian phase occur? If the crossing will operate in VA mode then what will be the likely pre timed maximum period for vehicles and is it likely to operate to that maximum period? If the crossing will operate with SCOOT then usually it will be limited to operate once within the cycle time during peak periods.

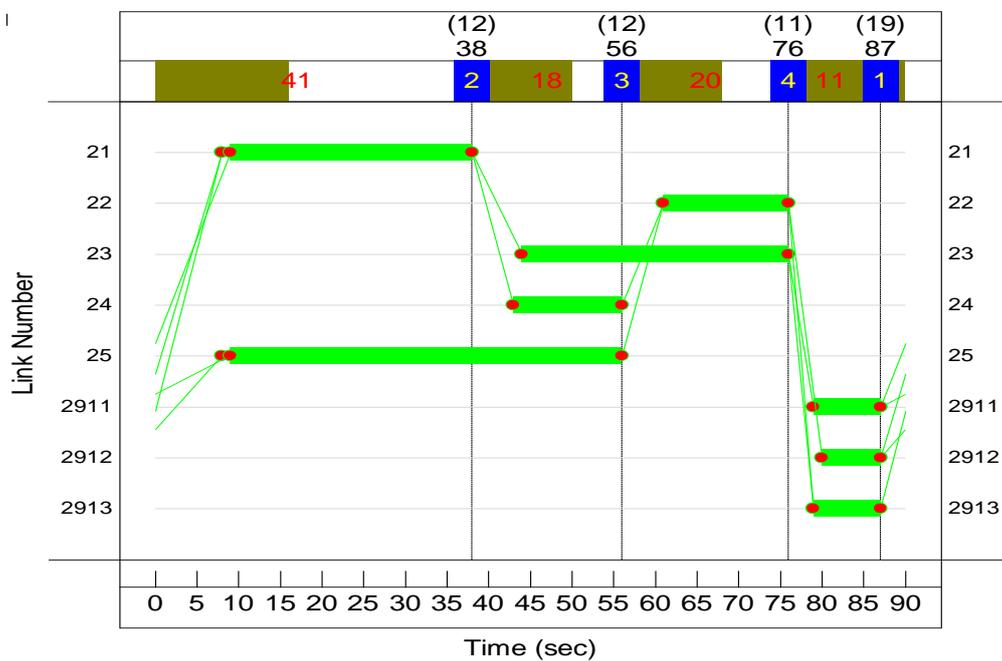
If we are considering long crossings, with resulting lengthy pedestrian greens and intergreens, then the frequency of the pedestrian stage being demanded can be extremely significant. An example of this is provided by the following analysis for a proposed junction

with extremely long pedestrian crossings and an 'all-red' pedestrian stage to accommodate those phases.

Pedestrian stage occurring every cycle (pedestrian links are 2911 to 2913)



Pedestrian stage occurring every other cycle



For simplicity of comparison the modelling of the pedestrian stage being called every other cycle has been undertaken by reducing the relevant green times and intergreens by half. In the above case the effect of the pedestrian stage being assumed to be demanded only every other cycle is that there is an additional 22 seconds available every 90 second cycle for the other stages. This is an extreme example that involves crossings in the region of 26m in length, but it illustrates the possible effect upon an assessment of how often a pedestrian phase is called up.

When will pedestrians cross the road and how long will they take?

Often when undertaking an assessment of a crossing we allow for the green man time and then the full intergreen before traffic is given a green signal. Therefore we are allowing for the 'worst case' scenario of a pedestrian starting to cross the road at the end of the steady green man signal. Obviously where the pedestrian crossing is part of a signal controlled junction and there is no on-crossing detection then there will be no variation in these pedestrian related timings and this worst case assumption for any assessment will be appropriate. However, if there is on-crossing detection this intergreen could be reduced in practice, and if the crossing is an old style pelican crossing then traffic will proceed during the flashing amber period if the crossing is clear.

In busy pedestrian locations there can be a tendency for pedestrians to continue to start crossing after the green man has been extinguished. The on-crossing detection enables such pedestrians to cross in safety, but the likelihood of such lengthy pedestrian stages will need to be taken into consideration within any assessment. In the majority of circumstances however, the pedestrians will be waiting to commence crossing the road and will therefore finish crossing the road significantly before the 'worst case' scenario intergreen period.

There has been considerable research into the speed of pedestrians as they cross a road. The overall consensus is that such speeds average 1.3 metres per second, but with significant variations to reflect age, physical condition, sex etc. I have undertaken some selective surveys of a variety of pedestrian crossings in Derby (ranging in length from 8.2m to 11.6m) and this has illustrated that where pedestrians are confident of their safety and are crossing at the beginning of a green man then 1.3 metres per second is the average speed. As per other research these surveys indicated that where pedestrians are crossing on a red man signal, or not at the start of the green man signal, then they walk at a quicker speed.

The effect of when people start to cross and the average pedestrian crossing speed can be illustrated by the following example from an 11.6m length crossing. In broad terms, using TA16/81 would suggest a pedestrian green man time of 7 seconds followed by a 12 second intergreen. In reality the on-site observations were that the average pedestrian commenced crossing within a second of the green man appearing and they took 9.5 seconds to cross. Therefore if we use TA 16/81 to provide us with timings when considering how we can provide for pedestrians then, if we have variable intergreen, we may not be making a realistic assessment of the implications of those options for providing for pedestrians.

These conclusions are further supported by a survey we have undertaken of an existing pelican crossing in Bournemouth. This brief survey found that the majority of pedestrians were waiting for the green signal and therefore commenced crossing immediately upon receiving the green man signal. They therefore completed crossing the road shortly after the steady green man was extinguished and traffic was therefore able to proceed during the flashing amber period. An assumption within any modelling that traffic would be stopped for the entire flashing amber period of such crossings would therefore seem to be usually inappropriate and unduly robust.

What will be the effects of on-crossing detection?

Ian Routledge has outlined to the Symposium at various times the importance of setting up puffin crossings so that the crossing operates in a tight and effective manner, with wasted time minimised. There are still however significant variations in the set up and operation of such crossings. Therefore the assessment of the operation of these crossings would need to be significantly different in order to reflect the variations in their operation on site. The same is undoubtedly true of variations in set up for pedestrian phases within traffic signal junctions

On-crossing detection should, if set up in an effective manner, enable the intergreen period between pedestrians crossing and traffic being given a green signal to be minimised. The modelling of this variable intergreen can now be undertaken within SCOOT, and there is evidence (TAL 2/09) that where there is an all-red pedestrian stage and this is called every cycle, the benefits are likely to be in the order of a 10% saving in delay to vehicles.

Modelling Software

There are a number of pedestrian modelling software programmes on the market. These can be extremely helpful where we are dealing with considerable flows of pedestrian traffic and we wish to include such factors as the interactions between pedestrians. Waterman does undertake a range of such pedestrian modelling, and would recommend that this is undertaken if the site is a congested urban centre location with high levels of complex pedestrian movements. In those circumstances specialist pedestrian modelling can assist in reflecting the complexity of the situation.

In the majority of circumstances however, modelling is undertaken using software such as LINSIG, TRANSYT, VISSIM or Paramics and there is no quantifiable information in relation to pedestrian movements. As engineers we need to consider the realities of pedestrian movements at a location and reflect these within our modelling and in the consideration of detection equipment.

Conclusions

Long pedestrian crossings can provide an attractive facility for pedestrians that reflects the increasing importance that is being given to providing for and encouraging people to walk. However, just because there are good examples of these crossings does not mean that they are suitable in all locations and circumstances. We need to remember that there are also some pedestrians who will not favour these crossings as they will be concerned about crossing such long distances without any physical separation of themselves from traffic.

Often the balance that will be considered will be the increased attractiveness of a single long crossing to pedestrians against the probable increased delay to traffic. However, there is also the consideration that to provide a long pedestrian crossing will often require an 'All-Red' pedestrian stage. Due to the nature of this stage requiring a significant length of time in order to ensure that pedestrians can cross the long distance safely, it is likely that the stage will only be called once every signal cycle. This may mean that pedestrians are faced by a significant delay in waiting for a green man signal and that there may be a wider window of opportunity for pedestrians to cross the road if a more traditional form of crossing was provided.

As with most subjects there is no right or wrong answer with regard to the provision of long pedestrian crossings. However, when we are considering and assessing whether long crossings are appropriate at a particular location we need to ensure that this is undertaken on a realistic assessment of how often, and for how long a period of time the pedestrian crossing will be called.

Bibliography:

X Marks the Spot, The Guardian 2 November 2009

The Assessment of Pedestrian Crossings, Local Transport Note 1/95

The Design of Pedestrian Crossings. Local Transport Note 2/95

Pedestrian facilities at Signal controlled junctions. Traffic Advisory Leaflet 5/05

Integration of Pedestrian Traffic Signal Control within SCOOT UTC Systems. Traffic Advisory Leaflet 2/09