Hampshire County Council

Economy, Transport and Environment Department

Technical Guidance Note
TG4-2 Signal Controlled Crossings

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0	09/11/2021	Initial Publication	Jonathan Mundy	Andy Wren

Stuart Jarvis BSc DipTP FCIHT MRTPI

Director of Economy, Transport and Environment, The Castle, Winchester

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1. Policy / Approach

1.1. The overall approach to the design of new traffic signal junctions needs to reflect a number of current and emerging policy developments.

1.2. The County Council declared a Climate Emergency in 2019 and at a national level, there is a requirement to achieve Net Zero Carbon by 2050. Within Hampshire, transport is the largest carbon emitting sector.

1.3. Local Transport Plan 4 (LTP4) is currently being developed, which will focus on meeting the Net Zero carbon target. It will include policies that reduce the need to travel and enable a significant increase in walking, cycling and public transport. Further policy developments include developing a Healthy Streets Toolkit and a Movement and Place approach to defining the appropriate design approach for different parts of the street and highway network.

1.4. Manual for Streets (MfS), which is the combination of MfS1 (2007) and MfS2 (2010), provides street design guidance for non-trunk roads. It is consistent with the emerging policy framework and has a fundamentally different design approach to DMRB, including:

- Applying a user hierarchy to the design process, with pedestrians at the top,
- A collaborative approach to the design of streets,
- Recognising the community function of streets,
- Promoting an inclusive environment,
- Reflecting and supporting pedestrian and cyclists desire lines,
- A locally appropriate balance between the needs of different user groups,
- Designing to keep vehicle speeds at or below 20mph in streets and places with significant pedestrian movement.
- Using the minimum of highway features to make the streets work properly.

1.5. LTN 1/20 “Cycle Infrastructure Design” provides guidance on the design of high quality cycling infrastructure that is suitable for most people to use. The fundamental approach in LTN 1/20 is to ensure that cyclists are separated from heavy traffic in space and / or time. LTN 1/20 provides specific guidance on cycle infrastructure at traffic signal controlled junctions and crossings.

1.6. Another important consideration in the provision of a new traffic signal junction is cost, particularly the ongoing maintenance costs and energy requirements, which are challenging in the current financial environment. It is important that alternative junction layout options are fully considered at the feasibility stage to ensure that the most appropriate and low maintenance junction type and layout is proposed. Where a decision is

made to implement a traffic signal controlled junction, the application of the MfS design principles to minimise the scale of the junction and associated street clutter where appropriate should also help to reduce the associated implementation and maintenance costs.

1.7. This Technical Guidance Note details how these national standards are to be used in Hampshire's local highway network in relation to Traffic Signal Junctions including when MfS, DMRB and other national guidance should be used. Reference should also be made to the associated Technical Guidance Notes as detailed in 3.2 which cover wider associated aspects such as cross sections, alignment and footway/cycleway provision.

1.8. The outline design for signal-controlled crossings may evolve in one of two ways. Either internally from the Intelligent Transport Systems Group (ITS) or externally from a Consultant representing a private Developer. For signal-controlled crossings the concept will be developed and verified by the ITS Group. This is to ensure it is in accordance with Hampshire County Council's (HCC's) Traffic Management Policy, prior to the outline design being produced.

1.9. For HCC schemes Commuted Sums will be secured by the scheme client. For external Developer schemes Commuted Sums will be secured through the S278/S38 Legal Agreement.

1.10. The ITS Group will be involved at all stages in the design, development and installation of signal-controlled crossings.

1.11. Each location for a signal-controlled crossing differs and as such there is no definitive design that can be applied to all sites. The aim of this document is not to provide guidance on how each signal-controlled crossing should be designed. It remains the designer's decision on how to design each installation. The purpose of this document is to provide outline guidance of the procedure and expectations for signal-controlled crossings. Ultimately specific site circumstances will determine the approach and suitability of individual designs. Refer also to Technical Guidance Note TG 17 - Departures from Standard which details the terminology used throughout the TGs and when Departures from Standard are required.

2. Definitions and Abbreviations

CLoS	Cycling Level of Services within Local Transport Note 1/20
CCTV	Closed Circuit Television
DMRB	Design Manual for Roads and Bridges
HCC	Hampshire County Council
ITS	Intelligent Transport Systems
ITS Group	Intelligent Transport Systems Group - Team within Hampshire County Council responsible for traffic signal technical design checks and ordering equipment for ITS installations. Also responsible for the operation and maintenance of ITS installations within the County.
MfS	Manual for Streets – published 2007 by Thomas Telford Publishing
MfS2	Manual for Streets 2 – Wider Application of the Principles Published September 2010 by CIHT
LTN1/20	Local Transport Note 1/20 which sets out design for cycling
MOVA	Microprocessor Optimised Vehicle Actuation – an advanced control method used at isolated signal junctions and crossings
PmV^2	Numerical assessment of traffic flow and crossing demand at a standalone crossing
RSA	Road Safety Audit
S278	Section 278 of the Highways Act (1980)
S38	Section 38 of the Highways Act (1980)
SCOOT	Split Cycle Offset Optimisation Technique – a central control system applied across multiple signal junctions and crossings to co-ordinate their operation.
SSD	Stopping Sight Distance – the forward visibility requirement to the nearside primary signal head
TG	Technical Guidance
TOPAS	Traffic Open Products and Specifications – The product specification and registration system for all traffic control equipment. Refer to the TOPAS Group

UTMC	Urban Traffic Management Control – overarching system which controls and monitors ITS equipment
VA	Vehicle Actuated – a fall back method of control at signal junctions and crossings
VMS	Variable Message Signs (Traffic Information and Car Park Occupancy)
WCHAR	Walking, Cycling and Horse-Riding Assessment and Report (Refer to TG19)

3. General

3.1. Design standards applicable in the design and installation of ITS systems include:

Traffic Signs Manual Chapter 6 (roads subject to speed limit of 40mph or under).

Chapter 6 shall also be applicable to any arm which has a speed limit above 40mph and where no other applicable guidance is provided in the Design Manual for Roads and Bridges.

Design Manual for Roads and Bridges

CD 123	Geometric design of at-grade priority and signal-controlled junctions (junctions where any arm has speed limit above 40mph)
CD 143	Designing for walking, cycling and horse-riding
CD 116	Geometric design of roundabouts
CD 195	Designing for cycle traffic
CD 109	Highway link design
CA 185	Vehicle speed measurement
TD 101	Traffic signalling systems
TA 101	Traffic signalling systems (appraisal)
TM 101	Traffic signalling systems (maintenance and operations)

All roads:

Traffic Signs Regulations and General Directions

Puffin Good Practice Guide

Manual for Streets

HCC Model Contract Appendix 12/5 Traffic Control

HCC Model Contract Appendix 13/70 Closed Circuit Television

Traffic Management Policy and Guidance TM7 Pedestrian and Cycle Crossings

LTN 1/20 Cycle Infrastructure Design

LTN 1/09 Signal Controlled Roundabouts

IHE Guidance Note - Traffic Control and Information Systems

3.2. The following Technical Guidance Notes should also be referred to:

TG1 – Carriageway Cross Sections

TG2 – Alignment Design

TG3 – Stopping Sight Distances and Visibility Splays

TG4-1 – Traffic Signals

TG4-3 - CCTV, VMS and Journey Time Monitoring

TG10 – Footways / Cycleways / Shared Surfaces

TG14 – Road Restraint Systems and Passive Street Furniture

TG17 – Departures from Standard

TG18 – Road Safety Audit

TG22 – Temporary Traffic Management

3.3. Before the design of any ITS scheme is commenced, HCC's Highway Construction Details T series must be reviewed. These can be found on HCC's Highway Construction Standard Details web pages.

Other essential guidance/information includes:

- Typical signal layouts
- Requests for a Departure from Standard
- Technical Guidance
- Commuted Sums Policy
- Guidance Document on Surfacing Options
- The Traffic Management Policy

3.4. A Road Safety Audit (RSA) for the scheme as designed will be required. Technical Guidance Note TG18 provides information on the RSA process.

4. Pre-Planning Application (Pre-App) / Feasibility Design Stage

4.1. Background

4.1.1. For the purposes of this Technical Guidance Note signal-controlled crossings include Puffin, Toucan, Pegasus and cycle crossings both at standalone locations and within signal junctions.

4.1.2. Irrespective of any planning permission or national guidance (e.g. CD143, CD195, LTN1/20) the installation of new standalone signal-controlled crossings in Hampshire are subject to meeting the County Council's justification and technical criteria. This includes the above forms of crossing and also Zebra and Parallel crossings. The justification requirements are outlined in Traffic Management Policy and Guidance TM7 Pedestrian and Cycle Crossings.

4.1.3. Details of the traffic and crossing demand survey are to be submitted. The survey should relate to school term time and undertaken on a weekday (07:00 to 19:00). Only with the agreement of the ITS Group may it be appropriate in some cases to consider other days or times for the survey. Where there is no existing traffic or crossing demand (due to the road or development not existing) predicted traffic or crossing demand levels shall be provided. These are to be supported with evidence to justify the data used.

- For Developer-led schemes, Consultants shall agree at an early stage with the Highways Development Planning team details of the traffic data to be used including supressed walking and cycling demand due to severance. This may include use of the Propensity to Cycle Tool where appropriate.
- For HCC-led schemes, the scheme Client shall provide details of walking and cycling demand including likely levels of supressed demand due to severance.

4.1.4. The designer shall produce a spreadsheet detailing the PmV^2 calculation for the crossings' opening year, together with any associated justification details (e.g. expected opening of a new shopping centre, school or community provision). Refer to Appendix A for details of the PmV^2 calculation. This shall include details of expected future demand including suppressed demand, with the designer providing well-reasoned evidence of how the forecast demand would be achieved. Should the minimum PmV^2 criteria not be achieved then irrespective of the planning permission a signal-controlled crossing shall not be provided and an uncontrolled crossing shall be considered (unless a Departure from Standard is approved).

4.1.5. Where demand is reached in future years the decision on installing a signal-controlled crossing shall be deferred and reassessed at that time. In the meanwhile, the designer should consider providing an alternative form of crossing (uncontrolled). Funding shall be taken to ensure that a

controlled crossing could be provided when the demand is sufficient in the future.

4.1.6. Where demand is expected to be reached in future years, Developers shall liaise with the Highways Development Planning team to establish whether the crossing should be delivered under a S106 or S278 arrangement.

4.1.7. The provision of cycle crossings at traffic signal junctions, as contained in LTN 1/20, may be considered where the junction forms part of a wider cycle route network.

4.1.8. The remainder of this section is specific to Puffin, Toucan, Pegasus and cycle crossings only. It does not apply to Zebra or Parallel crossings.

4.2. Modelling

4.2.1. Modelling should be submitted in support of any new signal-controlled crossing. The model is to include the AM and PM peak traffic periods and where appropriate other peak crossing demand periods as requested by the ITS Group. The cycle time used shall be based around the demand levels. The current version of Linsig software shall be the preferred software used to model any signal-controlled crossings. This shall extend to include any adjacent traffic signal junctions.

4.2.2. The design submission is to include the Linsig file (.lsg3 file) for all scenarios and also the full model output results.

4.3. Layout

4.3.1. A layout drawing is to be produced showing the signal poles, road markings, tactile paving and footway/cycle way links on both sides of the crossing. The drawing shall be produced at 1:200/1:500 scale.

4.3.2. New signal-controlled crossings are to be designed with nearside facilities except in exceptional circumstances and in agreement with ITS Group. Pedex crossings (far sided pedestrian signals) shall not be considered.

4.3.3. The standard width of a Puffin crossing shall be 2.4 metres and a Toucan crossing shall be 4.0 metres. In some circumstances the ITS Group may allow a Toucan crossing width to be reduced to 3.0 metres. Increases above these standard widths will be considered where there is likely to be higher demand (as detailed in Traffic Signs Manual Chp 6 15.7.5) and shall only be with the agreement of the ITS Group.

4.3.4. Subject to site specific situations, generally in-line crossings are preferred to staggered crossings as they provide the most direct route for walking and cycling. Where a central refuge is provided with a two-stage in-line crossing, the refuge width shall be at least 5m wide (refer to Traffic Signs Manual Chp 6 18.3.1).

4.3.5. Crossings specifically for cycling should ideally cross in a single stage.

4.3.6. Where the overall carriageway crossing distance exceeds 11 metres the pedestrian crossings would be expected to be staggered. Where the overall distance exceeds 15 metres the pedestrian crossings shall be staggered.

4.3.7. The minimum width of a pedestrian island where staggered controlled crossings are provided shall be 3.0 metres to allow at least 2.0 metres between kerbs/guard railings . Staggering of Toucan crossings should be avoided (refer to Traffic Signs Manual Chp 6 12.18.1). Where staggered Toucans cannot be avoided, the minimum width shall be 4.0 metres to allow at least 3.0 metres between kerbs/guard railings. At sites with particularly high levels of crossing demand (e.g. near schools or town centre shopping areas) these widths should be increased (refer to Traffic Signs Manual Chp 6 18.3.13).

4.3.8. The minimum offset distance on an island between staggered crossings shall be 3.0 metres.

4.3.9. The distance between stop lines and pedestrian studs shall be 3.0 metres. Only in exceptional circumstances shall this distance be increased.

4.3.10. Street lighting is to be provided at all signal-controlled crossings.

4.3.11. Stand-alone signal controlled crossings shall not be located closer than 40 metres to the exit from a roundabout (measured from the roundabout exit to the stop line). At standalone staggered crossings only, the crossing on the roundabout approach shall be located no closer than 30 metres from the give way (measured from the stop line to the give way). This supersedes the guidance contained in CD 116 Geometric Design of Roundabouts and CD195 Designing for Cycle Traffic. Parallel crossings may be considered instead if the traffic speeds are suitable.

4.3.12. Stand-alone signal-controlled crossings shall not be located closer than 40 metres to where the road gives way to another. Parallel crossings may be considered instead if the traffic speeds are suitable. Where only a signal controlled crossing is suitable but this requirement would move the crossing away from the desire line, a detailed justification report and associated risk assessment shall be provided by the designer, including details of suitable detection provision proposed.

4.3.13. Stand-alone signal-controlled crossings shall not be located within 20 metres of a side road junction. The distance shall be measured from the driver's position on the side road to the stop line. Parallel crossings may be considered instead if the traffic speeds are suitable. Where only a signal controlled crossing is suitable but this requirement would move the crossing away from the desire line, a detailed justification report and associated risk assessment shall be provided by the designer, including details of suitable detection provision proposed and expected turning movements.

5. Preliminary Design Stage

5.1. Background

5.1.1. All new or modified crossings (e.g. conversions between types of crossing, crossing relocation) are subject to a formal public notice procedure undertaken by the ITS Group. The public notice procedure has to be completed before preliminary design approval is given. This requirement is in addition to any planning permission previously granted and any public consultation held during the scheme development / WCHAR process. The ITS Group will produce a public notice which is to be displayed at the site and on-line for a period of 28 days.

5.1.2. The S278 preliminary design submission package is to include an AutoCAD version (current version) of the signal-controlled crossing drawing including all associated 'xref' drawings. This will be used by the ITS Group to produce a public notice.

5.1.3. Should any objections or comments be received as part of the public notice procedure, where considered appropriate by the ITS Group, amendments will be required to the crossing design. These will be included in the preliminary design audit comments. Depending on the number and nature of any unresolved objections it may be necessary for HCC to report these to the Executive Member for a final decision on the installation of the crossing. This process is irrespective of any planning permission requirement.

5.1.4. Preliminary S278 design approval will not be given until the public notice process has been completed.

5.2. Layout

5.2.1. Stopping Sight Distances (SSD) - Design Manual for Roads and Bridges CD109 SSDs shall apply on all approaches to signal-controlled crossings where the 85th percentile speed is over 64kph. The Traffic Signs Manual Chp 6 SSD requirements shall apply where the 85th percentile speed is 64kph or less. Refer to Technical Guidance Note TG3 – Stopping Sight Distances and Visibility Splays.

5.2.2. For cycleways connecting to the crossing location, the minimum radii detailed in LTN1/20 shall be provided – refer to LTN1/20 5.4.2, 5.9.3 and Tables 5.1 and 5.7. Should these minimum cycleway radii not be provided, tracking of the cycle design vehicle shall be provided. Designers should also ensure that cycles and people waiting to cross at crossings don't inadvertently block walking/cycling routes that pass the crossing location. Refer to TG10 Footways, Cycleways and Shared Surfaces.

5.2.3. The required levels of street lighting shall be provided at all signal-controlled crossings referring to BS5489 and Technical Guidance Note TG13 – Street Lighting.

6. Detail Design Stage

6.1. Method of control and detection

6.1.1. The design submission is to include the Linsig file (.lsg3 file) for all scenarios and also the full model output results.

6.1.2. The normal method of control shall be VA using Microwave Vehicle Detectors where 85th percentile speeds and speed limits permit. Otherwise loop detection with Speed Discrimination detection shall be used. MOVA control may be considered at high speed sites, with supplementary VA and Speed Discrimination detection, subject to discussions with the ITS Group.

6.1.3. The use of magnetometers will not be permitted except in exceptional circumstances and only at the instruction of the ITS Group.

6.1.4. Where the signal-controlled crossing is located within a UTMC/SCOOT region the method of control shall be SCOOT with VA fall back.

6.1.5. Where a crossing is located within 150 metres of a signal junction physical linking (i.e. hardwired in a duct network) shall be provided between each to allow the operation to be co-ordinated unless otherwise agreed with the ITS Group.

6.2. Layout

6.2.1. At traffic signal junctions the use of two stage right turn movements for cycling would not be considered.

6.2.2. Generally the use of cycle gates at traffic signal junctions would not be considered due to the increased maintenance costs and street furniture.

6.3. Equipment Requirements

6.3.1. The equipment requirements are as described for traffic signals with the addition of the following.

6.3.2. Signal-controlled crossings shall use near side equipment and ‘on crossing’ detection. In general, kerb side pedestrian detection shall not be used at standalone crossings. However kerbside detectors may be required at any non ‘walk with traffic’ crossings at signal junctions.

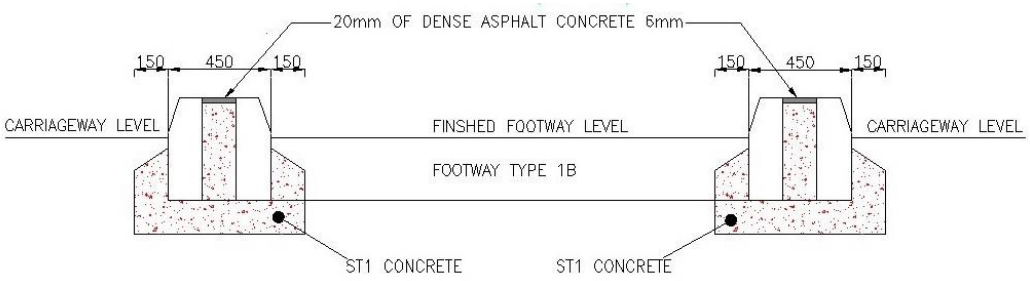
6.3.3. The preference is for the use of combined nearside signals and push button units. Where a central refuge is provided within a controlled crossing, a combined pedestrian nearside signal and push button shall be provided on the refuge.

6.3.4. Tactile devices must be included on all push buttons. Audible units should only be specified at standalone crossings or at junctions with all round pedestrian stages.

6.3.5. Generally Low-Level Cycle Signals (100mm diameter aspects) shall be used for cycling phases.

6.3.6. In general, pedestrian guard railing would not be expected at standalone signal-controlled crossings or signal junctions. Exceptions include at staggered crossings where guard railing would be required on centre islands and on either side of the crossings when the speed limit is 40mph or above, or when the 85th percentile exceeds 35mph or the orientation of the crossing is not on the main desire line.

6.3.7. At staggered crossings without full guard railing on the centre islands, double kerbs should be used (see diagram below) on the island with a single guard railing panel on the far side of the island to prevent pedestrians inadvertently walking on to the second part of the road. Refer to 15.11 in Chapter 6 Traffic Signs Manual.



6.3.8. Generally, passively safe signal poles would not be used adjacent to where people walking/cycling could be expected to wait.

6.3.9. There are no specific design requirements or relaxations for signal-controlled crossings located in conservation areas.

6.3.10. Technical requirements for the installation of the ITS equipment/hardware form part of HCC's term contract for the supply and installation of ITS equipment. The equipment will be procured by the ITS Group and therefore the design package does not need to refer to this information.

6.3.11. Details of the communications are to be discussed with the ITS Group. The communications for the junction will be arranged by the ITS Group and charged against the scheme/scheme promoter.

6.3.12. All new equipment provided under the contract shall comply with the latest issued TOPAS technical specification and be registered with TOPAS Ltd.

6.4. Infrastructure

6.4.1. The signal ducting system must be completely independent of all other ducts and services. No other services must use or pass through any part of the signal duct system.

6.4.2. The re-use of the existing signal duct system is only to be with the agreement of the ITS Group. Where the designer is considering re-using signal duct system at an existing signal-controlled crossing they are to

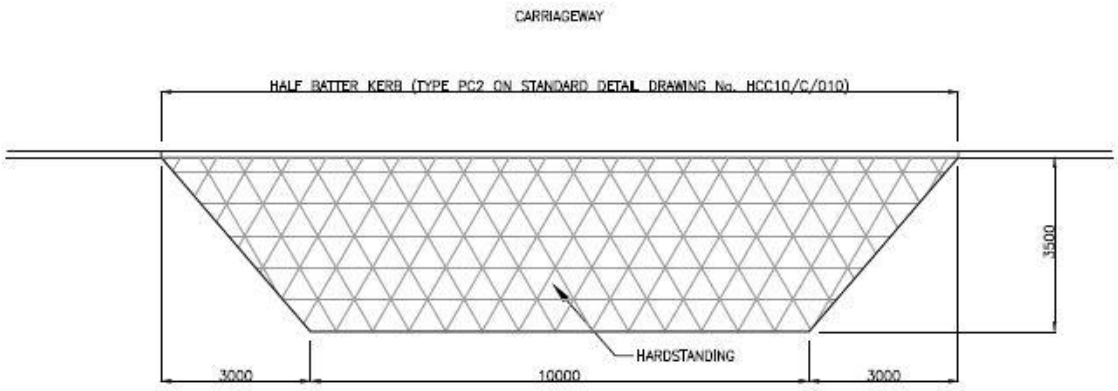
contact the ITS Group to arrange for a duct survey. No other parties are to carry out the duct survey. The survey cost will be charged against the scheme. For externally funded schemes the scheme promoter is required to provide written confirmation of their acceptance of the survey cost prior to the survey.

6.4.3. The extension of an existing cross road signal duct will not be permitted. Where a cross road duct needs to be extended the designer is to provide a new full duct run.

6.4.4. Pole retention sockets and controller plinths shall be used as standard as detailed in HCC Model Contract Appendix 12/5 and HCC standard detail drawings.

6.4.5. The controller must not be located on a centre island, including a roundabout island, central reservation or refuge due to lack of DNO mains supply to these locations.

6.4.6. A maintenance vehicle hard standing, with half batter kerbs, shall be provided in close vicinity to the signal controller and shall not obstruct any Stopping Sight Distance/Visibility Splay. Dimensions shall be as shown in the diagram below unless agreed otherwise with ITS. Refer also to HCC's Standard Details - Notes for Guidance. Where the controller and maintenance hardstanding are located in a rural verge where the grass is unlikely to be regularly cut, the ITS Group may require a narrow footway to be installed between the controller and hardstanding. The footway specifications will be dependent on the site location and length required.



6.4.7. The construction of the hardstanding shall be suitable for the existing ground conditions and application proposed. Suggested systems can be found within Appendix 11/1 of HCC's Model Specification and should be included within that appendix or within the contract drawings.

- Where the maintenance vehicle hardstanding is located such that it is likely to be used by vehicles as a parking area, a 'Authorised vehicles only' sign (Diag 829.6) with a 75mm x-height shall be installed at the back of the bay.
- Where a permeable product is used for the vehicle hardstanding and the hardstanding is surrounded by grass/vegetation, a white

line to Diag 1010 is required along the channel for the length of the hardstanding to help denote its location. Where Diag 1010 can't be installed (i.e. where there are other lines required along the channel), the kerb batters along the length of the hardstanding are to be painted white instead.

6.4.8. Hard standing areas must be provided around all signal poles placed in the verge and around the controller and feeder pillar as shown on the standard detail drawings HCC11/T/025 to HCC11/T045.

6.4.9. Where a private power supply is required the ITS engineer is to be contacted at the detail design stage to discuss requirements.

6.4.10. Where the controller is served by land line telecommunications its duct run shall be included on the drawing.

6.4.11. Signs 543 'Traffic Signals Ahead' are to be used where the Stopping Sight Distance cannot be achieved or on roads subject to a speed limit of 50mph or greater.

6.4.12. The detail design submission package is to include an AutoCAD version (current version) of the signal-controlled crossing drawing including all associated 'xref' drawings. This will be used by the ITS Group to obtain a quotation for the signal crossing equipment.

6.5. Detection

6.5.1. Vehicle detection shall use either inductive loops or above ground detectors. The use of magnetometers will not be permitted except in exceptional circumstances and only at the instruction of the ITS Group.

6.5.2. Loops shall be cut individually per lane although loops may be 'commoned together' at the detector joint where appropriate.

6.5.3. Loops shall be cut through the kerb joint as standard. Carriageway loop boxes shall only be used where no hard kerb exists or drainage kerbs are used.

6.5.4. The use of Speed Discrimination Equipment shall be used in preference to Speed Assessment equipment.

7. Procurement

7.1. The costs incurred in the design, procurement and commissioning of the ITS equipment shall be charged against the scheme. For externally funded schemes the scheme promoter is to provide written confirmation of their acceptance of the equipment costs provided by the ITS Group prior to the order being placed by the ITS Group. An interim invoice may be issued for the supply of materials. The costs will be invoiced to the scheme promoter for payment after commissioning of the equipment.

7.2. The ITS Group will arrange for a quotation for the ITS equipment and installation for all schemes (HCC and Developer led). This will only be arranged once the detail design has been approved. Once the quote has been verified the ITS Group will inform the scheme promoter of the overall quote value. It should be noted that the quote will exclude VAT and an administration fee. Please be aware that for commercial sensitivity reasons only the quantity of items and overall cost will be provided to the scheme promoter.

7.3. Specifically excluded from the quotation will be all civil engineering works including supply and installation of pole sockets, ducting, draw pits, power supplies, pillars and traffic management. The designer is to arrange for these works. The design shall include for the installation of the controller plinth but not its supply, which will be issued by the ITS Group.

7.4. On receipt of the quote value, the scheme promoter is to provide a written letter of acceptance (containing the quote value) to the ITS Group accepting the cost. Other information to be included is:

- Billing address for the invoice
- VAT and company registration number
- Accounts payable telephone number
- Accounts payable e-mail address
- Work number or purchase order number

7.5 From receipt of the above letter of acceptance the typical lead-in time for the delivery of the signal crossing equipment will be **8 to10 weeks**. It should be noted that the lead-in time for specialist equipment may be longer and the ITS Group should be contacted for further information.

8. Construction Stage

8.1. The scheme promoter is to contact the ITS Group to determine the duration of the signal crossing equipment installation prior to issuing the works programme. This duration is to be included in the programme of works and take into account any interrelated works. Where the contractor requests condensing of the signal installation works (e.g. additional resources, overnight, or weekend/bank holiday working), subject to agreement by the ITS Group, this would incur additional costs which will be passed on to the scheme promoter/Developer. The signal installation will be undertaken in one continuous period of work. Where it is feasible and the contractor requests separate visits to undertake different sections of the installation there may be additional costs involved with this arrangement.

8.2. The scheme promoter's contractor is to ensure that traffic management is provided for any slot cutting. The contractor should be aware that the slot cutting work may be postponed due to wet weather. The lane markings or their setting out markings shall be laid prior to the slot cutting. Refer to TG22 Temporary Traffic Management.

8.3. The ITS Group is to be invited to attend the pre-start meeting and any subsequent progress meetings. It may be useful to hold additional ITS specific meetings to enable the contractor to understand in greater detail the requirements and procedures for the signal crossing installation. This may be arranged by contacting the ITS Group engineer.

8.4. The ITS Group will set out the position of all pole sockets, controller and signal draw pits. These shall not be set out using co-ordinates. The setting out will only be done once the kerb lines/dropped kerbs at the crossing have been installed.

8.5. The designer is to contact the ITS Group engineer to obtain the signal contractor's current Risk Assessments and Method Statements.

8.6. 'New Traffic Signal Ahead' signs are no longer a requirement at new installations.

8.7. The ITS Group engineer is to be contacted to arrange for the switching off/on of any existing traffic signals/pedestrian crossings. **A minimum of 14 calendar days advance notice shall be given.** Existing traffic signals and pedestrian crossings must only be switched off by the ITS Group and under no circumstances are the signals to be covered over when still working. Refer to TG22 – Temporary Traffic Management for further guidance.

8.8. An unmetered power supply is to be arranged by the scheme promoter for S278 schemes. For HCC capital schemes the unmetered power supply is to be arranged by the main design engineer. Confirmation of the site-specific power supply requirements shall be obtained from the ITS engineer for both S278 and HCC led schemes.

8.9. It should be noted that no signal installation work will commence until the power supply has been energised at the ITS equipment and confirmed by the signal contractor. A power supply pillar and supply shall be provided within 5 metres of the signal controller. Refer to standard detail drawing HCC11/T/070 for power supply requirements. It is the scheme promoter's responsibility to ensure that the correct cut out fuse rating has been installed.

8.10. Where draw pits are likely to be overrun by vehicles type D400 draw pit lids and frames shall be used.

8.11. Draw pits lids are not to include screws, fixings, screw holes or keys. The lids are to be a single construction and not jointed or in two parts.

8.12. The use of recessed draw pit covers will not be permitted.

8.13. The use of 'stick down' tactile paving shall only be used where a significant proportion of the tactile area is occupied by service chamber covers. This will be assessed by HCC's ITS Group and Road User Audit team as part of the design audit.

8.14. Where High Friction Surfacing is specified, any vehicle detector loops are to be cut and sealed prior to the application of High Friction Surfacing.

9. Commissioning and Maintenance Stage

9.1. All construction work associated with the crossing is to be completed prior to the commissioning and switching on of the signal-controlled crossing.

9.2. The commissioning and switch on of the crossing installation shall be undertaken by the ITS Group and the signal contractor.

9.3. The scheme promoter's contractor shall be on site for the commissioning to remove/alter any traffic management to allow the crossing to be switched on.

9.4. The maintenance of the crossing signal equipment will pass immediately to HCC's ITS Group following switching on. However, the associated infrastructure shall be subject to a minimum 12-month Maintenance Period.

9.5. The Stage 3 Road Safety Audit shall be undertaken 2 weeks after the signal-controlled crossing has been switched on. The ITS Group shall attend this Audit. No 'pre-opening' Safety Audit would normally be required for a signal-controlled crossing. Refer to Technical Guidance Note TG18 – Road Safety Audits.

10. Further Support

10.1. Should you have a specific query or feedback about any of the content of this Technical Guidance Note 4-2, please send an email to technical.guidance@hants.gov.uk with the start of the email title as "TG4-2 – [subject of email]".

10.2. Should you have a query about applying this to your particular project, please contact:

- the Design Audit Engineer dealing with your S278 or S38 application (if you are a Developer or Developer's Consultant)
- the Technical Guidance Note Specialist(s) (if you are a working within Hampshire County Council)

10.3. Associated Technical Guidance Notes:

- TG1 – Carriageway Cross Sections
- TG2 – Carriageway Cross Sections Alignment Design
- TG3 – Stopping Sight Distances and Visibility Splays
- TG4-1 – Traffic Signals
- TG4-3 - CCTV, VMS and Journey Time Monitoring
- TG10 – Footways / Cycleways / Shared Surfaces
- TG14 – Road Restraint Systems and Passive Street Furniture
- TG17 – Departures from Standard
- TG18 – Road Safety Audit

Appendix A - Assessment of pedestrian & cycle crossings

The assessment method detailed below if the Level 2 Guidance for HCC Highways & Transport Staff for the calculation of PmV^2 and the associated assessment of whether a standalone controlled crossing would be suitable at a particular location (Version 1, March 2014).

Signal controlled crossings

- Background
- Scope
- Legislation
- Previous PV^2 assessment
- P_mV^2 assessment
- Ranking
- Crossings for cyclists
- Crossings for equestrians
- Other considerations

Zebra crossings

- Assessment

Signal controlled crossings

Background

The County Council has a well established policy for considering requests for new pedestrian crossings based on an objective numerical assessment known as PV^2, which is intended to indicate to decision makers the difficulty pedestrians would be expected to encounter crossing a road, where 'P' is the number of pedestrian and 'V' the number of vehicles. The current policy states that for a controlled crossing to be justified the value of PV^2 should be greater than or equal to 1.0×10^8 over the four busiest hours.

This policy, which was approved in January 2001, retained this method of assessment and threshold value from an earlier policy dating from 1978, but introduced a new flexibility by permitting controlled crossings where the PV^2 is greater than, or equal to, 0.5×10^8 where special circumstances exist. This was in line with revised guidance published by the then Department of the Environment, Transport and the Regions in 1995, but also reflected the consideration already given in Hampshire to the needs of vulnerable pedestrians when determining the appropriate type of crossing to be provided.

This policy has been reviewed in light of experience from responding to requests for new crossings since this policy was introduced in 2001, and in considering expected budget pressures that will require future requests to be prioritised and the value for money robustly assessed.

The amended procedure described in this revised guidance provides a standardised methodology for assessing these requests and for prioritising schemes for subsequent implementation.

This procedure supersedes the previous policy from 2001 and expands on the established use of PV^2 to broaden the assessment beyond a simple numerical analysis of P and V, which has been recognised as inflexible, and will be used to assess all requests for controlled pedestrian, cycle and equestrian crossings within the jurisdiction of the County Council.

Scope

The assessment process described here uses a modified form of PV^2 to assess the degree of difficulty likely to be experienced by users crossing as a function of the vehicle flow (V) along a road, and assesses the justification based on this and the number of people (P) crossing, so that an informed decision can be made on the most appropriate facility and prioritised according to need.

Legislation and guidance documents

The statutory requirements for controlled pedestrian crossings are set out in the Zebra, Pelican and Puffin Pedestrian Crossing Regulations and General Directions, and in the Traffic Sign Regulations and General Directions.

In addition, Section 23 of the Road Traffic Regulation Act 1984 imposes statutory requirements for consultation when new controlled crossings are proposed, and when existing controlled crossing facilities are altered or removed, including that a public notice be produced and displayed on street.

Previous PV^2 assessment

PV^2 as an assessment tool is not included in Local Transport Note 1/95: The Assessment of Pedestrian Crossings, and its use by local authorities appears generally to be qualified. One reason may be that a numerical measurement that simply multiplies the number of pedestrians and vehicles (squared) does not necessarily quantify either the value for money of a facility as it provides no information on the number of potential beneficiaries or the degree of difficulty currently experienced. For instance, if a crossing were generally considered justified where PV^2 is greater or equal to 1.0×10^8, then a crossing could be installed in either of the following circumstances:

	Pedestrians per hour (P)	Vehicles per hour (V)
Example 1	40	1,590
Example 2	180	750

The 40 pedestrians would be expected to experience significantly more difficulty crossing against a flow of 1,590 vehicles than the 180 crossing against 750. The likely gaps in a flow of 750 vehicles also suggests a crossing would be unlikely to be used by all 180 pedestrians, while the lack of crossing opportunities presented by 1,590 vehicles would probably ensure it was used by the majority of the 40 pedestrians. It is also conceivable that a higher volume of traffic combined with the absence of a crossing facility is a significant deterrent to crossing, and that there may be a suppressed demand.

The assessment is based on an average figure to ensure a crossing is justified for more than just a short period of the day. This is a reasonable approach to determining the value for money of a facility, but may exacerbate the tendency to ignore the barrier effect of a busy and difficult to cross road. Taking an average of the four busiest hours could result in a request being rejected despite a demonstrable need. For instance, if as above a crossing would be justified where PV^2 is greater or equal to 1.0×10^8, then a crossing could be rejected in the following circumstances:

	Pedestrians per hour (P)	Vehicles per hour (V)	$PV^2 \times 10^8$
Busiest hour	40	1,590	1.01
Next busiest hour	35	1,550	0.84
Next busiest hour	35	1,550	0.84
Next busiest hour	35	1,550	0.84
		Average over the four busiest hours =	0.88

The average PV^2 for the four busiest hours is 0.88×10^8, and on this basis the request would be rejected, yet the numbers of pedestrians do not vary dramatically, and the marginally lower vehicle flow is not likely to make it any easier to cross. The use of the discretionary threshold, agreed in 2001, for PV^2 values of 0.5 to 1.0×10^8 reduces the likelihood of this problem occurring in practice.

P_mV^2 assessment

PV^2 is a useful measure for sifting requests for crossings to either limit further costly assessment work, or as an indicator of the likely appropriate facility given anticipated pedestrian behaviour.

Those seeking new crossings will want to be assured that their requests are treated fairly. Adopting a clearly documented and consistent approach to assessing applications is more likely to demonstrate this. PV^2 provides the desired consistency, but the rigid numerical assessment lacks the flexibility to deal with an increasingly diverse built environment, or to support an enabling strategy seeking to improve accessibility or promote walking and cycling. For this reason, a more flexible approach to assessment is being used.

Using the P_mV^2 assessment should provide a transparent and logical framework for assessing and prioritising requests for new crossings, which is also able to be used by the local authority to determine whether to include new crossing facilities as part of other schemes, that is, not in response to a specific request. This latter consideration is important if the system of assessment is to be seen by the public as being applied fairly. The assessment framework can also provide guidance to developers preparing planning submissions.

The two step procedure described below shall be used by the Intelligent Transport Systems Team for assessing the need for a pedestrian, cycle and equestrian controlled crossing:

Step 1 - Initial site survey and preliminary assessment

Step 2 - Assessment of need

Further guidance for officers is also provided for borderline cases.

Step 1: Initial site survey and preliminary assessment:

An initial site survey shall be undertaken to determine whether a crossing could be physically constructed at the requested location, and to assess whether the likely usage and degree of difficulty currently experienced crossing the road justifies a costly full assessment.

As a basic premise, encouraging pedestrians or cyclists to cross a road in a particular place, whether using a formal, controlled crossing or an informal crossing place, should make crossing the road safer. Pedestrians and/or cyclists waiting to cross should be clearly visible to approaching drivers. Crossings located too close to bends, roundabouts, in dips or over crests, are unlikely to have adequate visibility, reducing drivers' ability to respond to people in the road, leading to late braking or drivers failing to stop entirely. Any problems are likely to be exacerbated where speeds are higher.

Signal controlled crossings are not a means of overcoming poor visibility, and design standards specify the appropriate forward visibility for the prevailing speed of traffic. An initial site assessment shall establish whether these basic site conditions are met, and whether other features, such as adjoining roads and accesses to premises, would prevent a crossing from being constructed in that location.

New crossings should be located as close as possible to where pedestrians and/or cyclists are already crossing. People are unlikely to use them if not. Where this cannot be done, perhaps because of visibility, vehicle accesses or similarly limiting factors, then measures to persuade pedestrians to use the crossing where it can be constructed may need to be considered. Pedestrians and/or cyclists crossing through gaps in the traffic in the immediate vicinity of the crossing put themselves at a greater risk as drivers will not anticipate them crossing. The degree of difficulty crossing a road is likely to be the deciding factor in whether or not they will walk to a formal crossing. If crossing the road is not generally a problem, then people are likely to cross without diverting to use the formal crossing. Consideration therefore needs to be given to the overall safety of the pedestrian/cyclist environment rather than relying on a formal crossing that may not be used.

Where a crossing could be physically constructed then an initial one hour survey shall be undertaken, and an indicative PV^2 value obtained. The period chosen shall be an hour when a large number of pedestrians and/or cyclists are anticipated to cross, and coinciding with peak traffic volumes. Pedestrians and cyclists shall be counted crossing 50 metres either side of the proposed crossing location. For simplicity no weighting factors shall be applied to this initial site survey. An assessment of suppressed demand, either because of the barrier effect of a busy road, or pending a new development, should be included in this initial assessment. Guidance on the assessment of suppressed demand is provided in the following section, 'assessment of need'.

A further assessment is generally only appropriate where the initial PV^2 is greater or equal to 0.25×10^8. This ensures that requests that do not warrant further

consideration are quickly discounted, saving both officer time in undertaking a detailed assessment and the cost of a full 12 hour survey.

In exceptional cases a further full assessment may be appropriate where the indicative PV^2 is less than 0.25×10^8, for instance where the road is an abnormal load route and other informal crossings such as footway build-outs or pedestrian refuges cannot be provided, or where there has been a serious accident involving a pedestrian or cyclist crossing at that location.

Where a crossing is requested across a dual carriageway the PV^2 value shall be applied to each carriageway independently. Both values would need to meet the criteria to be considered further and an initial combined PV^2 value of 0.5 should be achieved to warrant a full assessment to be made.

Step 2: Assessment of need:

(a) Traffic and pedestrian/cycle/equestrian survey

A survey will be carried out at the location to determine the numbers of pedestrians, cyclists and equestrians crossing and the number of passing vehicles. The survey will normally be carried out over a 12 hour period between 07:00 and 19:00 on a weekday outside of the school holidays, taking care to avoid planned events or road works that could alter the numbers of crossing movements and passing vehicles at the location.

Pedestrians, cyclists and equestrians shall be counted crossing 50 metres either side of the proposed crossing location. The figure for the total number of users crossing shall be adjusted to take account of vulnerable pedestrians/cyclists and equestrians in the following way:

- Children (under 16 years) on foot or cycling, weighted by a factor of 4
- Older people (aged 65 years or above) on foot or cycling, weighted by a factor of 4
- Equestrians weighted by a factor of 4
- Pedestrians with a disability weighted by a factor of 6

NB Only one weighting factor shall be applied per user. The highest applicable weighting factor shall be used.

$$P_A = (P^{<16} \times 4) + (P^E \times 4) + (P^H \times 4) + (P^D \times 6) + (P^T)$$

Where

P_A = Number of users adjusted for vulnerability

$P^{<16}$ = Number of pedestrians and cyclists aged up to 16 years

P^E = Number of older pedestrians and cyclists aged 65 years or above

P^H = Number of equestrians

P^D = Number of pedestrians with a disability

P^T = Total number of users crossing minus $P^{<16}$, P^E, P^H, P^D

(b) Quantifying the barrier effect

Modelling the barrier effect of a busy, difficult to cross road is less straightforward, but making an allowance for traffic volume, speed and carriageway width will provide a basic indication of degree of difficulty to cross.

Speed

An assessment of vehicle speed shall be based on the speed limit in place as follows:

30 mph = 1.0

40 mph = 1.5

50 mph = 2.0

Controlled crossings will not be installed on roads with speed limits in excess of 50 mph (30 mph for zebra crossings).

Width

The carriageway width (excluding any islands) shall be measured and a figure obtained as follows:

Less than or equal to 7.3 metres = 1.00

Greater than 7.4 metres and less than 10.2 metres = 1.50

Greater than 10.3 metres and less than 14.9 metres = 1.75

Greater than 15 metres = 2.00

(c) Injury accidents involving pedestrians

$$A=\frac{(1+N)}{10}$$

Where N = the number of pedestrian injury accidents in last three years

Example

The values of the individual assessments of vehicle speed and carriageway width shall be summed and averaged to determine the value for the barrier effect of a busy or difficult to cross road. For example a 12 metre wide carriageway subject to a 40 mph speed limit, and with an average waiting time to cross of 25 seconds, would have a barrier effect obtained as follows:

Actual measured value	Policy range	Value
12 metre carriageway	greater than 10.3 metres and less than 14.9 metres	1.75
40 mph	A 40 mph speed limit	1.50
Total weighting factor		3.25
Average value of difficulty to cross (Q)		1.63

This factor shall be used to adjust the value of P_A determined in the assessment of need as follows:

$P_m = P_A \times Q \times A$, where

P_m = Modified pedestrian/cyclist/equestrian value

P_A = Number of pedestrians/cyclists/equestrians adjusted for vulnerability

Q = Average value of the barrier effect of a busy or difficultly to cross road

A = Accident weighting factor

The value obtained shall be used to determine a value for P_mV^2 averaged over the four busiest hours. Controlled crossings are only appropriate where this value is greater, or equal to, 1.0×10^8. This ensures that crossings are only provided where the degree of difficulty pedestrians and/or cyclists would experience is assessed over a sufficiently long period to reduce the likelihood that they would generally cross without waiting for the crossing to operate.

Where the P_mV^2 averaged over the four busiest hours is less than 1.0×10^8 a crossing may be appropriate where there are specific site circumstances. Guidance provided for officers will enable a number of these specific site circumstances to be quantified.

Ranking

Requests for new crossings will need to be prioritised where the number of locations where new crossings are justified exceeds the available funding. Requests will be ranked in ascending order of their P_mV^2 value, with the highest values receiving priority for implementation.

(a) Sites exceeding 1.0×10^8

Where the revised value of P_mV^2 equals or exceeds 1×10^8, then a crossing is considered to be justified, and subject to physical constraints on site, be added to a primary list for consideration as part of the works programme.

(b) Sites between P_mV^2 0.5 and 1.0×10^8

Where this value is between 0.5 and 1.0×10^8, then the crossing would be added to a secondary list for review and monitoring as part of a forward programme.

As under the previous policy, dual carriageway sites will require double the level of justification, i.e. P_mV^2 to equal or exceed 2.0×10^8 for consideration on the primary list, and 1.0×10^8 for adding to the secondary list.

(c) Sites between 0.2 and 0.5 x10^8

Where the value of P_mV^2 is between 0.2 and 0.5 x 10^8, then a controlled crossing would not normally be recommended, and alternatives such as a pedestrian refuge or zebra crossing should be considered.

(d) Sites below 0.2 x 10^8

Where the value of P_mV^2 is below 0.2 x 10^8, then a crossing facility would not normally be justified, but the site may be reviewed on its merits with regard to local and/or special needs and may be considered subject to funding.

Crossings for cyclists

Toucan crossings allow cyclists to cross roads between cycle routes. The crossing facility is shared with pedestrians. Cyclists are not permitted to use Pelican, Puffin or Zebra crossings unless they dismount.

Crossing facilities for cyclists shall be evaluated using the two step process outlined in the P_mV^2 assessment. It will only be possible to provide a Toucan crossing when the P_mV^2 value is met and the crossing location forms part of a designated cycle route.

Crossings for equestrians

Signal controlled crossings for equestrians are known as Pegasus crossings. These crossings can be for horse and rider only or provided alongside pedestrian and/or cycle facilities.

Crossing facilities for equestrians shall be evaluated using the two step process outlined in the P_mV^2 assessment. It will only be possible to provide a Pegasus crossing when the P_mV^2 value is met and the crossing has a clearly evident level of equestrian usage.

Other considerations

The following areas should be included in a full assessment of borderline cases:

(a) Is there a clear need for the crossing?

The assessment of need should examine the degree of difficulty experienced crossing the road, along with an analysis of likely pedestrian/cyclist behaviour. The following questions may help clarify this:

- Will users divert to a crossing if it is away from the immediate desire line?
- Will users approaching the crossing ignore opportunities to cross? Users walking or cycling towards a crossing may see a gap in traffic and cross at the first opportunity rather than continuing to the crossing. This is more likely where the crossing is farther from the desire line;

- Will pedestrians/cyclists wait to cross the road if there are clear gaps in traffic? A person may press the pushbutton, but then cross before the crossing operates, causing delay and frustration for motorists.

The aim of this assessment of need is to establish whether the crossing is fit for purpose given observed pedestrian/cyclist behaviour.

(b) Are there any site specific features to be considered?

The assessment should highlight the impact on the local road environment of providing alternative crossing types, for example, loss of parking, removal of trees, relocation of bus stops, banned turning moves at adjacent junctions or other local access difficulties.

Different options are likely to have varying impact both on the local road environment and on different road users. For instance, building out the footway into the carriageway will reduce the crossing width and may improve visibility in tree lined streets or where there is on-street parking, but narrowing the carriageway may be unpopular with on road cyclists. Pedestrian refuges, may be effective in reducing the crossing width and increasing the opportunities to cross, but may be equally unpopular with on road cyclists if it creates a local constriction. If the road is an abnormal load route, then this too will limit options that reduce the carriageway width.

Speed is another consideration. Current advice from the Department for Transport is that controlled crossings are inappropriate on roads where the 85th percentile vehicle speed is 50 mph or higher. On roads subject to a 40 mph speed limit where speeds regularly exceed 50 mph in the vicinity of the crossing for example, on long, straight, downhill gradients with good visibility beyond the proposed crossing, or in rural locations where the crossing would be in an area that provides an opportunity for overtaking, then further engineering works could be required to reduce speeds to less than 50 mph.

New crossings would not normally be justified where there is another crossing facility within 100 metres of the proposal. This general exclusion does not include facilities provided at signal controlled junctions, or where there may be special circumstances, for example, alternative exits from a centre that generates significant pedestrian or cycle movements.

(c) Does the proposal directly support an agreed corporate policy or strategy?

The following statements may help clarify this:

- If implemented, this proposal is expected to increase the numbers of pedestrians and cyclists, helping to reduce reliance on the private car;
- If implemented, the proposal will support the use of public transport by facilitating a safe access route to a public transport interchange;
- The proposal is included in a school travel plan and provides a safe route to school;
- The proposal is included in a workplace travel plan and provides a safe route to business premises;
- The proposal is a specific accident remedial measure, or part of a casualty reduction programme.

Supporting evidence will be readily available where a proposal is included in a school or workplace travel plan. Where a proposal is part of a strategy aiming to encourage walking or improve pedestrian permeability, then local development frameworks or similar may be useful.

(d) Is the proposal likely to improve road safety?

A risk assessment of current crossing activity should be carried out, with accident records examined to identify any existing road safety issues to ensure any proposal takes into account known difficulties. The risk assessment should quantify how long pedestrians wait, and the extent to which they cross in inappropriate gaps, or cross in two halves where there is no physical island (for example, at ghost islands).

A scheme design will have a developed safety case (road safety audit, hazard assessments) demonstrating how road users will interact with the facility. In determining whether the proposal will improve road safety, the assessment should consider people crossing in the shadow of the facility.

Hazard assessments should be undertaken to determine the impact of known safety issues, and to identify appropriate measures to remove or control these hazards. This is likely to be particularly appropriate where a school crossing patrol is proposed to operate.

(e) What is the traffic impact of the proposal?

New crossings are likely to increase short-term congestion as vehicles will be required to stop and wait whilst the crossing is in operation. Traffic modelling based on the traffic flows and numbers of users crossing recorded in the survey can predict the average queue and additional journey time for vehicles. The maximum time a vehicle would normally be delayed in free flow conditions is approximately 16 seconds, and would occur if a vehicle is forced to stop just as the signals are changing to the pedestrian phase. Puffin and Toucan crossings provide a variable stop period that allows for variations in the time that different

pedestrians take in crossing from one footway to the other. This normal maximum will therefore increase in some circumstances.

The traffic impact assessment should also determine the extent to which drivers are likely to divert to less suitable roads to avoid excessive delay. At the other extreme, the assessment should consider whether drivers will ignore the crossing or become complacent if it operates infrequently.

Zebra crossings

The guidance above for controlled crossings shall also apply to zebra crossings, taking account of the additional factors highlighted in the Supporting Information section for Policy TM7.