Hampshire County Council

Economy, Transport and Environment Department

Technical Guidance Note
TG4-1 Traffic Signal Junctions

Revision	Date of Issue	Amendment Description	Prepared By	Approved/ owned by
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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 traffic signals 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 a signal junction the outline design will have been developed using modelling software to confirm that a signal solution is viable. It will identify basic geometric data about the junction, for example the number of lanes, the stacking lengths, staging, pedestrian crossings etc. However, this design will be in 2D, horizontal geometry will need to be checked against standards and the vertical alignment will need to be designed. Furthermore, utilities, lighting and other aspects of the junction design need to be developed and co-ordinated.

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 junctions.

1.11. Each location for an ITS installation 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 element of an ITS installation 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 ITS installations. 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
DoS	Degree of saturation – in traffic signal modelling a measure of how much capacity exists on an approach
FRT	Factory Release Test – software test of TR2500 forms
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.
MEWP	Mobile Elevated Working Platform
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
JAT	Junction Assessment Tool within Local Transport Note 1/20
LTN1/20	Local Transport Note 1/20 which sets out design for cycling
MMQ	Mean Maximum Queue – in traffic signal modelling the average maximum queue length for a lane
MOVA	Microprocessor Optimised Vehicle Actuation – an advanced control method used at isolated signal junctions and crossings
NFOV	Narrow Field of View
PRC	Practical Reserve Capacity – in traffic signal modelling a measure of the junction capacity
RSA	Road Safety Audit
RTIA	Right Turn Indicative Arrow – a signal used to provide right of way for right turning vehicles at a junction
S278	Section 278 of the Highways Act (1980)

S38	Section 38 of the Highways Act (1980)
SAT	Site Acceptance Test – on street commissioning of ITS hardware and software
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
TOPAS 2500B	Forms that define detailed operation of signals at a junction
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)

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 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 a 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

TG4-2 – Signal Controlled Crossings

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

TG21 – Traffic Regulation Orders

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 Developer-led schemes, a 'Pre-App' Review may be requested via HCC's Development Planning team prior to the planning application. Any comments issued at this stage will not constitute formal approval of the scheme but are made to assist the highways element of the planning application process.

4.1.2. The designer shall provide an explanation of other non-signal options that have been considered and why they have been rejected. The designer shall also provide reasoning for the selection of traffic signals as the preferred option.

4.1.3. The designer should be aware that while the design may be at the 'Pre-App' stage the expectation will be that the agreed junction design is robust and can be implemented without future fundamental amendments to the design. To achieve this the designer may be required to progress the design beyond the 'Pre-App' level of detail, if it is considered that there are elements of the design which form a significant risk to the deliverability of the signal scheme.

4.1.4. The information shown on a pre-app signal drawing is to include traffic signal poles/heads, road markings and a staging diagram.

4.2. Modelling

4.2.1. The current version of Linsig software shall be used to model any new or modified signal junctions and for signal-controlled crossings. This shall extend to include any adjacent priority junctions or give-way arms to partially signalised roundabouts. At give-way junctions, Arcady or Picady modelling software shall be used to obtain the give-way coefficients and slope for the priority arms.

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

4.2.3. The model is to include the AM and PM peak traffic periods for the year of opening as a minimum, regardless of development demand, and where appropriate other peaks as requested by the ITS Group. Future design years may also be required as directed by HCC. This is not to say that the junction should necessarily be designed to accommodate these peak traffic periods – this will be dependent on the scheme objectives/brief. Modelling of the peak traffic periods is still required to illustrate the likely impact of the scheme, particularly where provision for cycling and/or walking are primary objective of the scheme. Refer to TG4-2 regarding data and assessment of demand (including suppressed demand) for walking and cycling.

4.2.4. In particularly complex and/or congested networks the designer may be required to submit a microsimulation model in support of their proposals in addition to the Linsig modelling. This will be at the discretion of HCC. The microsimulation model shall use Paramics or Vissim software and cover at least the corresponding time periods used for the Linsig model.

4.2.5. In capacity terms for a new or modified existing signal junction, once having adequately considered the walking and cycling requirements (particularly any priority objectives detailed in the brief), the modelling should be considered. Ideally the modelling should demonstrate that it would operate within Practical Reserve Capacity (PRC) (positive % value) for all peak hours in the design year. The Degree of Saturation (DoS) should ideally not exceed 90% for any lane. Where no changes are proposed at an existing signal junction, the modelling should ideally demonstrate that the junction would operate without decreasing the existing PRC. This does not excuse the scheme promoter from designing a scheme which adequately accommodates the expected scheme traffic – HCC, as the Highway Authority, will have the final decision on whether the modelling is adequate.

4.2.6. Cycle time - The maximum cycle time shall not exceed 120 seconds. Where the proposals are located within a SCOOT region the existing typical cycle time shall be used for each appropriate modelled period.

4.2.7. Staging - Any use of non-cyclic stage sequences (e.g. double cycling or intermittent stage appearances) are to be documented and fully justified.

4.2.8. Where there is a significant proportion of right turning vehicles, or where they turn across 2 or more lanes of opposing traffic, then the right turn movements shall be separately staged. Where the opposing approach 85th percentile speeds are 45mph or more then the right turn movement must be separately staged. Under all these circumstances it would not be acceptable to allow right turning drivers to “gap accept” with or without a Right Turn Indicative Arrow (RTIA). Late start arrangements shall not be used for right turning movements.

4.2.9. Two opposing side roads should be separately staged from each other to eliminate any right turning safety conflict between opposing vehicles.

4.2.10. For operational flexibility, the use of fully signalled left turn phases should be used in preference to Left Turn Filter Arrow (LTFA) phases.

4.2.11. Phase minimum green times - Traffic minimum green times shall not be less than 7 seconds except Right Turn Indicative Arrows (RTIA) which shall not be less than 4 seconds. Pedestrian/cycling minimum green times shall be based on Traffic Signs Manual Chp 6.

4.2.12. Inter-greens - Where high approach speeds are expected (i.e. where the 85th percentile speed is 35 mph or above) an additional 2 seconds shall be added to the leaving phase inter-green within the model.

4.2.13. Saturation Flows - At existing sites where no geometric changes are proposed the saturation flows shall be measured from site observations. In this situation, observed data shall be provided to support any measured

saturation flows. For new approaches, saturation flows shall be derived from geometric RR67 measurements.

4.2.14. Queuing - Where there are internal links between stop lines the Mean Maximum Queue (MMQ) lengths shall not exceed two-thirds of the measured link length between the stop lines. Additionally, queues on any internal links shall not be modelled to extend back to obstruct traffic movements at an upstream signal node.

4.2.15. New traffic signal junctions are to operate on a full-time basis only. Part-time operation will not be considered.

4.3. Layout

4.3.1. On private unadopted roads at traffic signal junctions the extent of the public highway/S278 works shall extend back 10 metres from the stop line. A Wayleave will be required to allow the Local Authority to access and maintain all ITS infrastructure located on private roads/accesses.

4.3.2. The minimum lane width at the stop line and on its direct approach shall be 3.0 metres.

4.3.3. Central islands which accommodate signal equipment shall be a minimum of 1.8 metres wide. Where double signal heads are used the minimum width shall be 2.2 metres wide. Wherever possible the design shall seek to increase the width above these minimums for safer maintenance.

4.3.4. Nearside primary signal poles shall be 2.5 metres beyond the stop line.

4.3.5. The design shall take into account facilities for cycling, both on and off-carriageway. The inclusion of cycle facilities, as contained in LTN 1/20, will depend on the existing facilities, the level of cycle usage (existing and expected including any suppressed demand) and the safety record for cycling at the junction. Where cycle crossings are proposed there must be a continuation of the off-carriageway cycle route on both sides of the crossing. Refer also to TG4-2 Signal Controlled Crossings.

4.3.6. Signal controlled crossings would be expected across any arm where footways exist or are to be provided on both sides. In exceptional circumstances it will be at HCC's discretion whether uncontrolled walking or cycling crossings may be provided as an alternative.

4.3.7. Where a lane drop merge is required on the exit from a signal junction the offside lane shall merge into the nearside lane. The distance of the lane drop shall be at least 100 metres in a 30mph speed limit and increased in distance on road with higher speed limits (refer to Table 2-6 Traffic Signals Manual Chapter 5).

4.3.8. The design of signalised roundabouts shall include spiralised lane markings on the circulatory sections and lane tracking markings from the entry arms.

5. Preliminary Design Stage

5.1. Background

5.1.1. The information shown on a preliminary design signal/crossing drawing is to include traffic signal poles/heads, controller, maintenance vehicle hardstanding, road markings and a staging diagram. The intervisibility zones and Stopping Sight Distances are to be shown on the drawing. Refer to the example preliminary traffic signal design drawing.

5.1.2. Preliminary designs shall attempt to rationalise the use of signal equipment where possible to reduce the future maintenance costs.

5.1.3. Stopping Sight Distances (SSD) - Design Manual for Roads and Bridges CD109 SSDs shall apply on all approaches to traffic signals and pedestrian 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. The SSDs are to be annotated on all arms of the signal junction to the **nearside** primary signal on that approach. Refer to Technical Guidance Note TG3 – Stopping Sight Distances and Visibility Splays.

5.1.4. Intervisibility zones - Where objects such as buildings, walls and fences, service cabinets, signs, vegetation, trees with substantial trunks or low canopies exist within the intervisibility zone these shall be avoided within the preliminary design. Generally, slender objects such as a sign post, lighting column or telegraph pole may be acceptable within the intervisibility zone.

5.1.5. The designer shall comply with IHE Guidance Note - Traffic Control and Information Systems Section 2 . A scheme specific preliminary hazard assessment and Design File is to be submitted with the preliminary design package. Refer to the example preliminary design hazard assessment.

5.1.6. The preliminary design submission package is to include an AutoCAD version (current version) of the traffic signal drawing including all associated ‘xref’ drawings.

5.2. Layout

5.2.1. A full set of vehicle swept path movements are to be provided for all movements through the junction based on the agreed design vehicle travelling at no less than 5 mph. The vehicle swept paths shall not overrun into opposing traffic lanes unless agreed with the ITS Group. For cycleways around signalised junctions, 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.

5.2.2. A nearside primary signal must always be provided on an approach to traffic signals.

5.2.3. The designer is to contact the ITS Group to determine whether CCTV will be required to monitor the junction. Refer to TG4-3 CCTV, VMS and Journey Time Monitoring.

5.2.4. The designer is to determine whether the signal junction forms part of an abnormal load route at the preliminary design stage. For abnormal load routes it shall be necessary to consider varying the lateral positions of some of the signal equipment to allow for these loads to pass through with minimal disruption to the existing equipment.

5.2.5. Cycle facilities on-carriageway: The designer is to check whether any approaches feature an on-carriageway cycle route (existing or planned). Where on-carriageway cycle lanes exist on an approach the design shall seek to retain or enhance these and where they are planned the design shall look to include new facilities in line with LTN1/20 with appropriate assessments (i.e. LTN1/20 Cycle Level of Service assessment and the Junction Assessment Tool). The designer shall consider both the junction layout and signal operation when designing facilities for cycling.

5.2.6. Cycle facilities off-carriageway: Refer to TG4-2 Signal Controlled Crossings for guidance on the inclusion of cycle crossings within signal junctions.

5.2.7. Bus priority measures: The designer is to contact the ITS Group to discuss the inclusion of bus priority measures in the junction layout and signal operation. See also section 10.

5.2.8. Signalised roundabouts designs shall include lane destination road markings and supplementary roadside signing on the approaches and circulatory sections. These will supplement spiralised and tracking lane markings on the roundabout.

5.3. Modelling

5.3.1. The signal modelling shall be resubmitted/updated at the preliminary design stage to ensure that any changes to the design do not compromise the expected operation of the junction.

6. Detail Design Stage

6.1. Background

6.1.1. Bus priority measures: – The designer is to contact the ITS Group to discuss the inclusion of bus priority measures in the junction layout and signal operation. See also section 10.

6.1.2. The detail design signal drawing is to include the staging diagram, MOVA link/lane diagrams (where appropriate), pole socket schedule, signal head schedule, detector list, traffic signal equipment (heads, poles, push buttons, loops), signal ducting/draw pits, pole sockets, controller, road markings, intervisibility zones and SSDs. Loop dimensions and positions, pole socket position co-ordinates are to be omitted. Refer to the example detail design traffic signal drawing.

6.1.3. A scheme specific detail design hazard assessment and updated Design File are to be submitted with the detail design. Refer to the example detail design hazard assessment. The designer shall arrange for an independent safety case review to be undertaken (example safety case review). Where an independent review cannot be provided the detail design audit provided by the ITS Group shall form the independent safety case review.

6.1.4. The controller TOPAS 2500B forms will be completed by the ITS Group once the detailed design has been approved.

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

6.1.6. 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.

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

6.1.8. The designer is responsible for providing any Traffic Regulation Orders associated with the signal junction in advance of the scheme construction commencing. Refer to TG21 Traffic Regulation Orders.

6.1.9. Any elements not compliant with the Traffic Signs Regulations and General Directions shall be avoided. In the unlikely event that the proposal requires site specific authorisation from the Department for Transport the ITS Group will write to the Department for Transport on behalf of the scheme Developer.

6.2. Method of Control

6.2.1. At standalone junctions, MOVA shall be the normal method of control with VA fall back. The use of Compact MOVA may be considered for an individual approach where appropriate.

6.2.2. At closely linked junctions, linked MOVA or UTMC/SCOOT method of control is expected. In either case VA shall be provided as local fall back. Where UTMC/SCOOT control is used, the signals shall revert to VA operation overnight. The designer is to contact the ITS Group to discuss the appropriate method of control for each site.

6.2.3. SCOOT design/commissioning/validation is to be undertaken by the ITS Group to ensure compatibility with the existing SCOOT network. These works will be charged to the scheme/external Developer.

6.2.4. Where a new junction is to be provided within 200 metres of an existing signal junction or 150m of an existing signal controlled crossing, the design shall link both sites together.

6.2.5. The traffic signals shall be linked using a hardwired connection within a ducted network.

6.2.6. The provision of bus priority at traffic signals is to be discussed with the ITS Group at an early stage of the design to determine appropriate measures and the form of technology to be used.

6.2.7. Generally, fully signalled left turn phases are preferred to left turn filter signals to provide greater operational flexibility off peak.

6.3. Equipment Requirements

6.3.1. Detail designs shall attempt to rationalise the use of signal equipment where possible to reduce the future maintenance costs.

6.3.2. All traffic signal and pedestrian crossings are to use Extra Low Voltage signal equipment throughout. Where modifications are required to the signal equipment at existing Low Voltage installations, the whole site is to be converted to Extra Low Voltage including any associated civil engineering works.

6.3.3. Low level access signal poles are required where poles are greater than 2.0 metres tall. They shall also be required where signal poles are located on centre islands less than 3.0 metres wide.

6.3.4. On approaches with 3 or more lanes, the use of high-level duplicate signal(s) would be expected. The use of 6 metre tall poles with low level access terminations would be expected. On approaches with 4 lanes, the use of outreach mast arm signal may be considered. Where considered appropriate by the ITS Group, a rotating outreach mast arm shall be provided with suitable off carriageway maintenance hardstanding for a Mobile Elevated Working Platform (MEWP) to access the rotated signal head without the need for lane closures.

6.3.5. Passively safe equipment: - Where stipulated in Technical Guidance Note TG14 - Road Restraint Systems and Passive Street Furniture the designer shall consider the use of passively safe traffic signal poles.

6.3.6. The use of passively safe traffic signal poles is to be assessed individually around a site. A site-specific assessment is to be included with the design package which assesses the benefits/disbenefits of passive safety for each individual signal pole. Generally, passively safe signal poles would not be used adjacent to where pedestrians/cyclists could be expected to be waiting to cross. Where passively safe signal poles are included, they may form part of a traffic signal electrical safety disconnection system.

6.3.7. The designer is to consider the issue of driver or pedestrian 'see through' to other non-concurrent phases beyond. Adjustable louvred cowls shall be used on green traffic signal aspects to address driver 'see through'. The use of Narrow Field of View (NFOV) nearside pedestrian signals shall be used at staggered or closely situated pedestrian crossings which run independently and where 'see through' may occur.

6.3.8. The inclusion of any box signs on the traffic signal equipment must always be supported by a Traffic Regulation Order which must be in place prior to the traffic signals being switched on. The designer is responsible for arranging any Traffic Regulation Orders. Refer to TG21 Traffic Regulation Orders.

6.3.9. There are no specific design requirements or relaxations for traffic signals located in conservation areas.

6.3.10. 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 shall be completely independent of all other ducts and services. No other services shall use or pass through any part of the signal duct system.

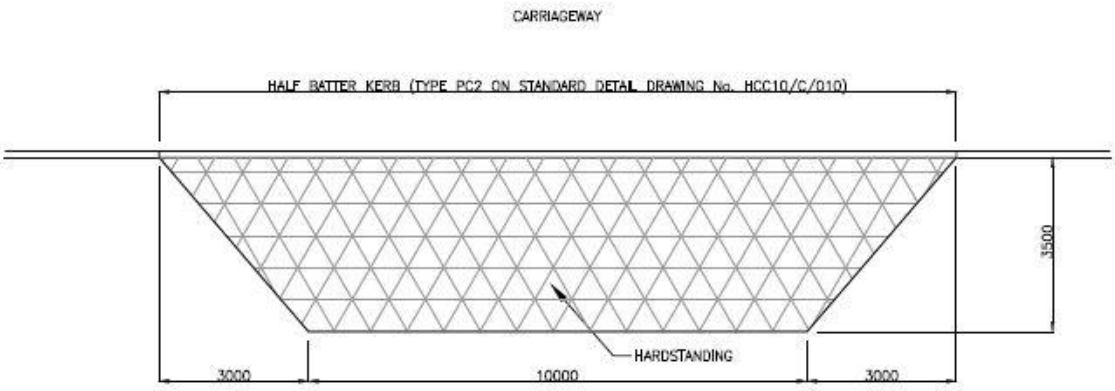
6.4.2. The re-use of the existing signal duct system is only to be with the agreement of the ITS Group. Where the designer is considering re-using signal duct system at an existing signal junction they are to contact the ITS Group to arrange for a duct survey. No other parties are to carry out the duct 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 shall be located outside of the intervisibility zone. The controller shall 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 hardstanding, with half batter kerbs, shall be provided in close vicinity to the signal controller but outside of the intervisibility zone 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. Hardstanding areas are to 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 (e.g. to service equipment located on islands or roundabouts) 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.

6.5. 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. Where above ground detection is used a supplementary stop line loop is to be provided.

6.5.3. At MOVA sites a supplementary 'System D' loop shall be provided in each lane at 12 metres from the stop line to demand and extend in VA mode.

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

6.5.5. 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.

6.5.6. Loops shall not be cut within pedestrian stud areas.

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

6.6. Signal Controlled Crossings

6.6.1. Refer to TG4-2 Signal Controlled Crossings for guidance on the detailed design of pedestrian, cycling and equestrian crossings within signal junctions.

6.6.2. Pedestrian studs shall not be used at uncontrolled crossings within junctions.

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. It should be noted that the quote will exclude VAT and an administration fee. Once the quote has been verified the ITS Group will inform the scheme promoter of the overall quote value. 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 traffic 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 traffic 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 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 junction 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. Where 'Signal Priorities Changed' or 'Signal Timings Changed' signs are used the scheme shall include for their removal no later than 3 months after the change was introduced.

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. For private power supplies please see section 6.4.9.

8.10. 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.

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

8.12. 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.

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

8.14. 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.

8.15. 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. The ITS Group will undertake the Factory Release Testing (FRT) for the controller and controller configuration.

9.2. The Site Acceptance Testing (SAT) of the signal installation will be undertaken by the ITS Group and HCC's term contract traffic signal contractor.

9.3 Prior to commissioning/switching on a new signal junction the scheme promoter is to arrange for an interim Stage 3 Road Safety Audit to be undertaken. This will identify any safety concerns or elements of the work which have not been completed and are essential prior to the signals being switched on. The ITS Group shall attend the interim audit. Refer to TG18 – Road Safety Audits.

9.4. The Stage 3 Road Safety Audit shall be undertaken 2 weeks after the traffic signals/pedestrian crossing have been switched on. The ITS Group shall attend this Stage 3 Audit.

9.5. All construction work associated with the traffic signal junction, including any work identified in the 'pre-opening' Stage 3 Road Safety Audit, is to be completed prior to the commissioning and switching on of the traffic signals.

9.6. The scheme promoter's contractor shall be on site for the commissioning and switch on to remove/alter any traffic management to allow the traffic signals to be switched on.

9.7. Any MOVA validation work will be undertaken/arranged by the ITS Group following switch on and the costs charged against the scheme/Developer. This will form part of the S278 design audit costs.

9.8. SCOOT instation database work and on street validation will be undertaken/arranged by the ITS Group following switch on and costs charged against the scheme/Developer. This will form part of the S278 design audit costs.

9.9 The design shall include for a full review of the signal operation, including where appropriate MOVA and SCOOT, at approximately 6 months and 12 months post-commissioning. The costs associated with this shall be included as part of the scheme.

9.9. The maintenance of the traffic 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.

10. Signal Controlled Bus Gates

10.1. Signal controlled bus gates apply to sections of road that are restricted by Traffic Regulation Order to buses only.

10.2. The ITS Group is to be contacted at the Pre-App stage to discuss any bus gates which are controlled by traffic signals.

10.3. Hampshire County Council do not support the use of physical measures at bus gates. These include but are not restricted to, rising bollards, rising arm barriers, sump busters, etc.

10.4 The use of bus lane enforcement cameras may be considered by the County Council. The Traffic Management Team should be contacted to discuss the use of bus lane enforcement cameras.

11. Further Support

11.1. Should you have a specific query or feedback about any of the content of this Technical Guidance Note 4-1, please send an email to technical.guidance@hants.gov.uk with the start of the email title as "TG4-1 – [subject of email]".

11.2. 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)

11.3. Associated Technical Guidance Notes:

- TG1 – Carriageway Cross Sections
- TG2 – Carriageway Cross Sections Alignment Design
- TG3 – Stopping Sight Distances and Visibility Splays
- TG10 – Footways / Cycleways / Shared Surfaces
- TG14 – Road Restraint Systems and Passive Street Furniture
- TG17 – Departures from Standard
- TG18 – Road Safety Audit
- TG21 – Traffic Regulation Orders