Essex County Council

TRAFFIC SIGNAL CONTROL SCHEMES DESIGN AND INSTALLATION GUIDANCE FOR DEVELOPERS

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1. Introduction

This document details the requirements for all traffic signal control schemes submitted to Essex County Council (ECC) by developers. This document highlights the specific requirements of ECC which are to be included in all signal design and installation schemes.

In addition to this document all signal design drawings and specifications are to be formulated using all of the appropriate national standards with particular reference to the documents: -

- Designing for Cyclists (Essex County Council publication 2006)
- Designing for Pedestrians (Essex County Council publication 2006)
- Guidance on the use of Tactile Paving Surfaces
- LTN 1/09 Signal Controlled Roundabouts
- LTN 1/95 The Assessment of Pedestrian Crossings.
- LTN 1/98 The Installation of Traffic Signals and Associated Equipment
- LTN 2/95 The Design of Pedestrian Crossings.
- Manual of Contract Documents for Highway Works
- Puffin Good Practice Guide (Department for Transport 2006)
- TA 12/07 Traffic Signals on High Speed Roads
- TA 82/99 Installation of Traffic Signals and Associated Equipment
- TA 84/06 Code of Practice for Traffic Control and Information Systems
- TA 86/03 Layout of Large Signal Controlled Junctions
- TAL 1/01: Puffin Pedestrian Crossing
- TAL 1/02: The Installation of Puffin Pedestrian Crossings
- TAL 1/06: General Principles of Traffic Control by Light Signals
- TAL 16/99: The use of Above Ground Vehicle Detectors
- TAL 2/03: Signal Control at Junctions on High Speed Roads
- TAL 3/03: Equestrian Crossings
- TAL 4/98: Toucan Crossing Development
- TAL 5/05: Pedestrian Facilities at Signal-Controlled Junctions
- TAL 5/91 Audible and Tactile signals at signal controlled junctions
- TD 35/06 All Purpose Trunk Roads MOVA System of Traffic Control at Signals
- TD 50/04 The Geometric Layout of Signal-Controlled Junctions and Signalised Roundabouts
- TD 89/08 Use of Passively Safe Signposts, Lighting Columns and Traffic Signal Posts to BS EN 12767
- The Design Manual for Roads and Bridges
- The Traffic Signs Regulations and General Directions 2002
- The Zebra, Pelican and Puffin Pedestrian Crossings Regulations and General Directions 1997
- TR2206A Specification for Road Traffic Signals
- TR2500 Specification for Traffic Signal Controller
- Traffic Signs Manual

ESSEX COUNTY COUNCIL POLICY REQUIREMENTS

This section details specific ECC requirements under the following headings:

- **Signal-controlled junctions** - justification for providing signal control
- **Development proposals affecting existing traffic signals**
- **Signal-controlled crossings** - types of pedestrian crossings that may be provided at junctions and stand-alone sites
- **Pedestrian kerbside and on-crossing detection**
- **Control strategy requirements for signal-controlled junctions and crossings** – selection of appropriate method, including the use of UTC (Urban Traffic Control) and MOVA (Microprocessor Optimised Vehicle Actuation)
- **Remote Monitoring Systems (RMS)**
- **Bus priority equipment** - provision of equipment compatible with ECC's bus priority and real time passenger information system
- **Junction capacity calculations** - demonstration of adequate capacity for future traffic growth
- **Commuted maintenance sums** - advance payment to offset future maintenance, energy and communications costs

DESIGN CONSIDERATIONS

This section specifies items to be considered as part of the signal design and items to be included on the Signal Approval Drawing. Requirements are also specified for compliance with TA 84/06 'The Code of Practice for Traffic Control and Information Systems for All-Purpose Roads'.

EQUIPMENT REQUIREMENTS

This section specifies manufacturers' signal equipment approved by ECC for use in Essex. Details of specific equipment requirements common to all new or modified sites in Essex are also provided.

INSTALLATION REQUIREMENTS

This section specifies how traffic signals are to be installed with separate sections detailing the following items: -

- Cable ducting and chambers
- Detector loop installation
- Signal lamp dimming
- Tall signal poles, including approval process
- Remote Monitoring Systems and associated telecoms requirements
- Electricity Supply provision and installation process

FACTORY ACCEPTANCE TESTING

This section specifies the procedure for verifying that the operation of the traffic signal controller is in accordance with the Works Specification prior to installation on site.

SITE ACCEPTANCE TESTING

This section details the process for a traffic signal installation to be formally commissioned and accepted by ECC. Associated with this process is the mandatory requirement that an Earth Loop Impedance (ELI) test has been undertaken for the installation by the installation contractor and a certificate provided prior to commissioning and acceptance of the site.

POST-COMMISSIONING REQUIREMENTS

This section details all of the items that need to be provided by the developer once the signals have been commissioned.

DEVELOPER FUNDING

The Developer shall lodge funds with ECC to finance the following works associated with the development to be carried out by ECC's traffic control specialist:-

- Commission the equipment
- For schemes involving installations within UTC regions; update the UTC database to operate SCOOT and to validate the operation of UTC and SCOOT equipment.
- For non-UTC installations, including those with MOVA control; configure the Remote Monitoring System (RMS) database and update ECC's traffic control Asset Management database.
- Monitor traffic flows at junctions following commissioning and make adjustments to timings as necessary. Program revised timings into control equipment as permanent data, normally within 12 months of commissioning the signals..
- Staff time associated with the technical review and approval of the signal design drawings and signal specifications.

2. Essex County Council Policy Requirements

2.1 NEW SIGNAL-CONTROLLED JUNCTIONS

a) If Essex County Council (ECC) is minded to permit access to a development site from the existing highway network it will be necessary to determine the appropriate type of junction between the development access and the highway. This could typically take the form of a priority (give-way) junction, a roundabout or a traffic signal controlled junction.

b) It is possible that traffic signals may be considered as a suitable means of access to a site by the Developer at an early stage in the planning process. ECC will need to be satisfied that traffic signals are the appropriate solution over other types of junction control. To determine this, the Developer will need to demonstrate to ECC that the following factors have been fully considered:-

- Capacity of the proposed signal-controlled junction and its effect on any adjacent intersections, including existing signal controlled junctions and/or controlled pedestrian crossings
- Traffic approach speeds on the major (existing) and minor (development access) roads approaching the proposed junction
- Land constraints (development and highway land)
- Provision of facilities for non-motorised users (NMUs), including facilities for the mobility and vision impaired
- Requirement for large vehicles to negotiate the proposed junction
- Provision for public transport, including bus priority facilities
- Road safety
- Environmental impact, including air quality
- Future maintenance costs to ECC

c) The capacity of the proposed signals will need to be assessed using a suitable proprietary software package. The preferred software is LINSIG for isolated signal junctions, and LINSIG or TRANSYT for assessment of multiple linked signal junctions (including signal-controlled roundabouts).

2.2 DEVELOPMENT PROPOSALS AFFECTING EXISTING TRAFFIC SIGNALS

a) If a development proposal is likely to adversely affect one or more existing traffic signal installations ECC may require the Developer to fund or undertake improvements to those installations. This may be, for example, to ensure the reserve capacity of an existing junction is maintained with the addition of development traffic, or the provision of pedestrian crossing

facilities at an existing junction. ECC may also require that any new junction introduced within an existing network of signal controlled junctions is integrated within the existing network control strategy (e.g. UTC/SCOOT). Under such circumstances the Developer may be required to fund all necessary work to update the existing control strategy within the local network.

2.3 SIGNAL-CONTROLLED CROSSINGS

a) A development proposal may generate a requirement to provide controlled crossing facilities on a new or existing road for NMUs. Consideration of whether a signal controlled crossing is appropriate (in preference to an uncontrolled crossing, a Zebra crossing or grade-separated crossing) will depend on the following factors:-

- Likely pedestrian flow and desire line
- Requirement for a combined pedestrian and cycle crossing (Toucan crossing)
- Requirement for equestrian crossing facilities (Pegasus crossing)
- Traffic flow
- Traffic approach speeds
- Proximity of junctions, including other traffic signals
- Land constraints, including available visibility
- Road safety considerations
- Environmental considerations
- Future maintenance costs to ECC

b) Current ECC policy regarding the type of pedestrian facilities which may be installed at new or modified traffic signal sites are detailed below.

Pedestrian crossings within traffic signal junctions

- Traditional (far side) pedestrian signals will no longer be provided at traffic signal controlled junctions.
- Puffin nearside or Toucan nearside signals will be provided as appropriate.
- Existing far side pedestrian signals are to be replaced with Puffin nearside or Toucan nearside signals as appropriate when the equipment becomes obsolete, or if a junction requires refurbishment or modification.

Puffin crossings

- Will be installed where the crossing is for use only by pedestrians.
- May be installed as a standalone (mid-block) crossing, a dual staggered crossing or as part of a traffic signal-controlled junction.

Toucan crossings

- Will be installed where a crossing is shared by pedestrians and cyclists.
- May be installed as a standalone (mid-block) crossing, a dual staggered crossing or as part of a traffic signal-controlled junction.
- Nearside pedestrian and cycle signals are to be used instead of the older far side pedestrian and cycle signals.
- When existing Toucan crossings with far side signals are refurbished or modified nearside pedestrian and cycle signals are to replace the far side signals.
- If a signal-controlled crossing facility is required for equestrians this will normally be provided alongside a Toucan crossing facility (see below).

Equestrian Crossings

- These crossings (also known as Pegasus crossings) will be installed where ridden horses are to be accommodated, usually where a bridleway crosses a major route.
- They may be installed as single or dual carriageway crossings, or as part of a traffic signal-controlled junction.
- Nearside equestrian signals are to be used in preference to the far side type.
- An equestrian crossing will normally be provided in parallel with a Toucan crossing to allow pedestrians and cyclists using the bridleway to cross independently of equestrians.

Pelican crossings

- No new Pelican crossings are to be installed in Essex.
- Puffin or Toucan crossings are to be installed as appropriate.
- Existing Pelican crossings will be replaced with Puffin crossings when the equipment becomes obsolete and needs to be replaced, or the crossing requires modification.

2.4 PEDESTRIAN KERBSIDE AND ON-CROSSING DETECTION

a) For all Puffin and Toucan crossings pedestrian kerbside and on-crossing detection is normally required. Consideration will need to be given to the number of kerbside detectors to ensure that the configurable ‘footprint’ of the detector(s) will reliably detect waiting pedestrians over the full width of the tactile paving (the standard ECC width requirements are 2.8m for Puffin

crossings and 4.0m for Toucan crossings). Likewise, consideration will need to be given to the number of on-crossing detectors to ensure that the detectors will reliably detect pedestrians over the full crossing area. Exceptionally wide crossings may require additional detectors.

b) Kerbside and on-crossing detection may also be required at Puffin or Toucan crossings installed as part of a signal-controlled junction. Requirements will vary according to design considerations, such as provision of UTC/SCOOT or MOVA control. Precise requirements will need to be agreed with the ECC Project Manager and their representatives at the design stage.

c) Kerbside detection will not normally be required at standalone (mid-block) crossings on roads where speed detection is not required and Pre-timed Maximum Green strategy is used (see Section 2.15).

2.5 CONTROL STRATEGY REQUIREMENTS FOR SIGNALLED-CONTROLLED JUNCTIONS AND CROSSINGS.

a) Puffin and Toucan crossings are to be configured to enable Pre-timed Maximum Green strategy for traffic where the 85th percentile approach speed is less than 35mph. Sites with approach speeds above this value will require appropriate speed detection equipment (see Section 3.13) and will operate in vehicle actuated (VA) mode. Depending upon the location of the crossing, sites situated within a UTC network may need to be configured to operate using UTC as the main control strategy. The appropriate control strategy will need to be agreed with the ECC Project Manager.

b) For all new or modified signal-controlled junctions the following control strategy requirements apply:

c) For junctions that are situated in isolated locations and are not in close proximity to other signal-controlled junctions the method of control will normally be vehicle actuation (VA), however ECC may require the use of MOVA as a control strategy to minimise traffic delays. If MOVA is to be implemented the fallback mode in the event of MOVA control failure is to be VA using the MOVA detector loops to control the junction.

d) For junctions that are located in an urban area and are in close proximity to existing junctions or crossings that are controlled using UTC/SCOOT, the proposed site(s) are also to be configured to operate under UTC/SCOOT control, with appropriate additional equipment installed to allow integration with ECC's UTC/SCOOT system.

2.6 REMOTE MONITORING SYSTEM (RMS)

a) ECC requires all traffic signal sites to be monitored to enable faults to be reported to the Fault Centre for prompt action. Consequently all sites not within a UTC/SCOOT region are to be provided with a Siemens Outstation Monitoring and Control Unit (OMCU) for communication with ECC's remote monitoring system. This will require the provision of GSM mobile communications or, in exceptional circumstances, a BT PSTN (dial-up) line (see Section 5.19 for further details).

Traffic signals with UTC/SCOOT Control

- If UTC/SCOOT control is required a high speed broadband line will be required in the signal controller. The current specification for the type of broadband equipment will need to be obtained from ECC's representatives, SA2000.

2.7 BUS PRIORITY EQUIPMENT

a) ECC operates a Real Time Passenger Information and Bus Priority system using GPS technology. It is a requirement that all signal-controlled junctions are fitted with appropriate bus priority equipment compatible with ECC's RTPI system. The specification for this equipment can be obtained from ECC 's representatives, SA2000 .

2.8 JUNCTION CAPACITY CALCULATIONS

a) Capacity calculations will need to be provided for all new or existing signal-controlled junctions associated with a development proposal. The type of signal control strategy proposed will determine which modelling software will need to be used.

b) For isolated junctions the latest version of LINSIG software is to be used, with capacity results normally provided for the AM and PM weekday peak periods. Should the busiest period be outside these hours then capacity results are required for the predicted busiest hour. The minimum Practical Reserve Capacity (PRC) to be achieved will need to be agreed with ECC. The LINSIG results sheet shall show the agreed PRC using a cycle time not exceeding 120 seconds.

c) For a network of junctions or multi-node signalised roundabouts the latest version of LINSIG or TRANSYT software should be used and results provided for both the AM and PM weekday peak periods. Should the busiest period be outside these hours then capacity results are required for the predicted busiest hour. The LINSIG or TRANSYT output should show the

optimised cycle time, together with predicted queue lengths on the links, which should not exceed available lane space for each link. A Link Diagram

should also be provided identifying all nodes, links and traffic flows to and from each link.

2.9 COMMUTED MAINTENANCE SUMS

a) The Developer will be required to provide a commuted maintenance sum to ECC in respect of new signal installations to offset future operational costs. The sum shall be for a period of 15 years from the date of acceptance and takeover of the signals by ECC. The value of this sum will be calculated having regard to the costs to ECC of maintaining the signal equipment, energy consumption and communications costs associated with Remote Monitoring or UTC equipment.

b) As an example of a 'typical' commuted maintenance sum for a 15 year period, a 3-arm junction with an extra low voltage (ELV) controller and GSM-based remote monitoring facilities would require a sum of the order of £40,000 at 2010/11 prices.

3. Design Considerations

3.1 TA 84: CODE OF PRACTICE FOR TRAFFIC CONTROL AND INFORMATION SYSTEMS FOR ALL-PURPOSE ROADS REQUIREMENTS

a) For each signal design scheme details are to be provided in accordance with the requirements of TA 84, which will include the provision of the following documents as a minimum:

- Scheme Specific Design Consideration document detailing every aspect of the proposed signal scheme including the proposed control strategy, design considerations and identification of any departures and measures used to compensate for the departures.
- Scheme Hazard Assessment and Risk Assessment (both of which would form the Safety case for the scheme), which would identify all risks and hazards associated with the installation and ongoing maintenance of the proposed scheme and the measures used to address the identified hazards. This should be included in the construction phase plan.

3.2 DESIGN REQUIREMENTS

a) The following are details of specific ECC design requirements where these may differ from national standards and guidance listed in Section 1.2. This is not intended to be an exhaustive 'design guide' but to highlight the more common design issues likely to be encountered.

Stop Lines

- Stop lines should be located 2.6m from the centre line of the primary signal pole. The stop line should be located 3m from the nearest pedestrian crossing studs. Where there is no crossing in front of the stop line the distance to the primary pole should be 2.5m. These distances may be increased in exceptional circumstances.

Pedestrian/Cyclist Crossing Widths

- The recommended crossing width between studs is 2.8m for Puffin crossings and pedestrian only crossing points at junctions and 4.0m at Toucan crossings with shared use by pedestrians and cyclists. These minimum widths may need to be increased where pedestrian/cyclist volumes are high.

Pedestrian equipment and facilities

- Where a pedestrian crossing is being provided, indicators for blind and partially sighted pedestrians must also be provided. The equipment to be provided will consist of audible signals and/or tactile rotating cone signals mounted within the push button units. The type of indicators to be used will depend upon site conditions; however it is both a national requirement and ECC policy to use both audible and tactile signals at crossings wherever safety considerations permit.

- Above-ground kerbside detectors are normally required to detect waiting pedestrians/cyclists at crossings (see Sections 2.12 to 2.14). Kerbside detectors should be installed on the primary signal poles with the nearside signal and pushbutton demand unit. Should the width of the crossing exceed the detection zone 'footprint' of the unit, an additional kerbside detector should be installed at the opposite end of the crossing point.

- Above-ground on crossing detection should be installed to detect crossing pedestrians. The on crossing detector should normally be installed on the same signal pole as the kerbside detector. Should the length and/or width of the crossing exceed the available 'footprint' of the detector additional units will need to be installed.

Provision for Maintenance Vehicles

- As part of the signal design, parking provision for maintenance vehicles needs to be considered. This is to be provided in a safe location near to the signal controller. Wherever possible at all new sites, this should be provided in a suitable surfacing material that will not encourage indiscriminate parking by other users. Typically, a grass paving system within a grass verge has been used at many sites. A suitable dropped or splay kerb should be provided to allow access from the carriageway.

High Friction Surfacing

- **T**he use of High Friction Surfacing (HFS) should be considered as part of the measures to reduce the risks of accidents. This should be installed in accordance with the requirements of TD 50/04. It is ECC policy to provide HFS on all approaches to a junction with a crossing facility immediately ahead of the stop line and on all approaches to standalone pedestrian crossings. The HFS should extend from the stop line to the first row of pedestrian crossing studs. For sites without crossing facilities requirements for HFS will need to be reviewed on a site specific basis having regard to the factors detailed in Sections 3.11 and 3.12.

- The minimum length of HFS measured from the stop line shall be 50m. For high speed sites with speed detection the length of HFS should increase in accordance with the 85th percentile traffic speed having regard to the following minimum guideline values:

  30mph: - 50m HFS, 40mph: - 60m HFS,
  50mph: - 70m HFS, 60mph: - 80m HFS,

- HFS should also be provided on approaches where there is a significant downward gradient or poor horizontal alignment or visibility irrespective of the approach speeds.

- Furthermore, the approach speed, accident record, average queue length, proximity of side roads and mix of traffic are all relevant when determining the overall length of HFS. Any of these factors may result in an increase beyond the minimum length specified above.

- At sites with new carriageway construction or where the wearing course requires replacing ECC may recommend the use of a wearing course with a Polished Stone Value (PSV) of 68 or greater as an alternative to standard HFS.

Speed Detection Equipment

- It will be necessary for the Developer to provide data to confirm the 85th percentile speed of traffic on each approach to a proposed traffic signal installation. A speed survey will be required in accordance with the requirements of TA 22/81 *Vehicle Speed Measurement on All Purpose Roads* using appropriate speed detection equipment to be agreed with ECC. For sites with MOVA control a survey should be undertaken in accordance with MCH1542C *Installation Guide for MOVA* to determine the mean cruise speed on each approach to ensure loops are correctly placed having regard to traffic approach speeds.

Street Lighting at Crossing Points

- All signal-controlled crossings should be provided with adequate street lighting in accordance with BS 5489-1:2003 and to current ECC standards. Confirmation of how this requirement will be met should be provided in the Developer's proposal submission for review by ECC's street lighting engineer.

Traffic Signal Specification Requirements

- As part of the design process the following information will also need to be submitted for technical approval: -

  - Controller Works Specification conforming to the requirements of TR2500 for all junction controllers. The use of the MCH 1827B blank specification forms is acceptable for this purpose.
  - Cable schematic diagram indicating the proposed cabling of the signal equipment. This will need to be updated if the subsequently installed (as built) cabling differs from the design.
  - Traffic Signal Installation Specification incorporating MCHW Appendix 12/5 requirements. This will need to detail the procedures and measures used to install the various elements associated with the traffic signal installation, including provision of electricity supply and communications equipment.

3.3 REQUIREMENTS FOR TRAFFIC SIGNAL APPROVAL DRAWINGS

Applicable To All Traffic Signal Approval Drawings:

a) All traffic signal design drawings are to include the following details in order to gain technical approval from ECC:

- Signal layout showing all signal equipment at a scale of 1:500
- A 1:200 scale enlargement extract of the central section of the junction or crossing location. The area of the enlargement extract shall include all stop lines, stud lines and all pole-mounted signal equipment.
- A key depicting all symbols used, which shall be in accordance with TR2206A *Specification for road traffic signals* with the exception that the push button symbol shall be shown as solid black, not in outline.
- All traffic signal equipment symbols shall be clearly shown. It may be necessary to remove tactile paving infill detail to allow equipment symbols to be clearly identified.
- Traffic signal poles are to be numbered in a clockwise direction starting with the pole nearest to the signal controller.
- All kerb lines and dropped kerbs associated with the signal installation. All old kerb lines and survey details not relevant to the final junction layout shall be omitted.
- Tactile paving to be shown and installed in accordance with the latest version of the DfT document *Guidance on the use of Tactile Paving Surfaces*

- A north point.
- All carriageway markings including stop lines, lane lines and arrows, lane destination markings, yellow box markings, keep clear markings and pedestrian crossing studs. Yellow line parking restrictions should not be shown.
- All relevant signs shall be shown such as Regulatory box signs, No Entry signs, Diagram 543 signs, Diagram 7014 temporary signs, signs and markings for buses when special facilities are being provided for them at junctions; signs and markings for cyclists at junctions or Toucan crossings.
- The location of cable ducts and access chambers including the size and number of ducts shall be clearly shown and referenced in the key.

b) The location of the site must be clearly marked on the plan to enable easy identification of the site on a street map. For all sites the signal approval drawing shall show the street names and road classification numbers and include the names of any other roads in the vicinity.

c) The title of the signal approval drawing shall include the road names and road classification numbers as indicated above. A local colloquial name can also be included in the title for the site but only to complement the formal title. For standalone pedestrian crossings a reference in the title is required to the name of the nearest side road and its compass direction in relation to the crossing point (e.g. High Street northwest of Kings Road).

Applicable to traffic signal junction approval drawings:

a) Junction layout drawings shall show the following diagrams and tables -

- Stage and Phasing Diagram (Method of Control) indicating which phases operate in the respective stages.
- Detector Functions Table
- Phase Intergreen Table
- Phase Timings Table

b) Detector loops and all types of above ground detection shall be identified on the plan with a name that can be cross referenced to the Detector Functions Table. For above ground detection the font of the detector label is to be small enough so as not to obscure more important detail. The detector reference relates directly to the type of detection as follows:

- For standard VA detection the phase letter should be used followed by the detector type, e.g. AX, AYZ.
- For vehicle above ground detection and associated vehicle demand loops the unit type should be followed by the phase letter, e.g. MVDA, DEMA.
- For Call/Cancel loops the phase letter should be followed by the presence loop number, e.g. AP1.
- For MOVA detection the type of vehicle loop should be followed by the phase letter and then the MOVA detector number, e.g. INA1, XA2, SLA3.
- For Kerbside detection the phase letter should be followed by PKD and then the unit or pole number for that phase, e.g. BPKD1.
- For On crossing detection the phase letter should be followed by PCD and then the unit or pole number for that phase, e.g. BPCD1.

c) The Detector Functions Table should include; distance from the stop line to the detector loop; phases demanded and extended. Call/Cancel facilities and timings are also to be referenced.

d) Junction layout drawings shall include a 'Phase Intergreens' table calculated in accordance with TAL 1/06. When all red loops are being provided the intergreens being extended by the loops shall be identified in note format below or adjacent to the Phase Intergreen table. The "all red extensions" and the "maximum additional all red" shall also be shown in note format.

e) The following details shall be shown on the Phase Timings Table. These timings will vary depending on facilities provided at the junction: -

- Minimum Green times and Vehicle Extension times are to be included for each phase:
- For junctions with pedestrian facilities the method of calculating the pedestrian timings should be accordance with TAL 5/05.
- The table is to be expanded to include a 'blackout' timing column if 'far side' pedestrian signals are provided at the junction or where nearside signals are located on a central refuge for a single 'straight across' crossing.
- Where nearside pedestrian signals are provided (Puffin or Toucan) at a junction the Phase Timings Table should be expanded to include all Puffin timing periods in accordance with LTN 2/95 and TAL 5/05.
- Separate columns headed "SD and/or SA extensions" and "Extra clearance period" to show the speed extensions and extra intergreen time are required for the relevant phases. The phases extended by each pair of loops shall be included in the Detector Function Table.

Applicable To Pedestrian (Puffin and Toucan) Crossing Signal Approval Drawings:

a) The pedestrian crossing layout drawings shall show the following timings:-

- Timings to be provided in accordance with the specific periods for Puffin and Toucan Crossings detailed in the LTN 2/95 and to be depicted indicating the respective signal to vehicles and pedestrians with the corresponding duration of period.
- For dual (staggered) crossings a set of timings is to be produced for each crossing point and clearly identifying which timing set relates to which crossing.

b) Other timings to be identified:

- Pedestrian push button demand delay period (normally 0 secs)
- Pedestrian push button hold period (normally 2 secs)
- Pedestrian kerbside detection hold period (normally 2 secs)
- Pedestrian demand cancel period (2 secs)
- All red extensions
- Vehicle extensions
- SD/SA extensions
- Max vehicle green timings for Peak and Off Peak periods.

Technical Approval of Traffic Signal Control Schemes

a) The signal design drawing, controller works specification (where required) and traffic signal installation specification (Appendix 12/5) will be checked by ECC and their representatives.

b) When the signal design drawing is considered satisfactory with regard to ECC requirements and has been confirmed as satisfactory in terms of road safety and other engineering considerations, it will be forwarded to the ECC Project Manager for formal authorisation. When this is received the Developer will be notified in writing. Technical approval for the entire scheme will only be given by the ECC Project Manager once all elements of the scheme receive technical approval.

4. Equipment Requirements

4.1 TRAFFIC SIGNAL EQUIPMENT

a) All proposed traffic signal equipment must be Type Approved in accordance with the requirements of TRG 0600A and conform to the Traffic Signs Regulations and General Directions 2002.

b) Currently ECC permits the installation of signal equipment manufactured by Siemens Plc, Peek or Telent (Microsense).

4.2 TRAFFIC SIGNAL CONTROLLERS

a) All new traffic signal controllers for junctions and standalone crossings shall be of extra low voltage (ELV) type such that all connected traffic signal equipment including signal heads operate at ELV.

b) All vehicle and pedestrian signals shall be of light emitting diode (LED) type and operate at ELV as per 4.3 above.

4.3 PEDESTRIAN FACILITIES

a) Wherever audible or tactile facilities are provided interlocking facilities are to be installed to ensure that the audible or tactile device only operates in conjunction with the green man.

b) Where pedestrian facilities are provided red lamp monitoring will be required, details of which will need to be specified within the signal specification document.

c) Audible signals are to incorporate a means of adjusting their volume. It is also ECC practice to provide a timetabled facility within the controller configuration to allow the signals to be disabled overnight at sites close to residential properties. In this situation the tactile rotating cone signals must not be disabled overnight.

4.4 KERBSIDE DETECTION

a) All Kerbside detector units shall use digital video technology, whereby the detection zone ‘footprint’ can be configured during the signal commissioning using a handheld device.

4.5 SIGNAL POLE REQUIREMENTS

a) Consideration will need to be given to determine if the requirements of TD 89/08 *Use of Passively Safe Signposts, Lighting Columns and Traffic Signal Posts to BS EN 12767* apply to the site and subsequently to determine the type of signal poles required. As part of the process for determining the type of poles required consideration needs to be given to the issue of secondary accidents as well as the impact on non-motorised users. Evidence of this consideration with regard to the requirements of TA89/08 needs to be provided as part of the design submission.

b) Each signal pole is to be installed within a NAL RS115 pole retention socket fitted with a lockable anti-rotation device. Larger diameter poles, for example for passive safety, should also be fitted in suitable pole retention sockets.

c) Cranked offset poles, where required, are to be of the “swan neck” type with no internal welds.

d) Tall poles (of 5m in length or greater) may need to be considered on approaches to junctions or crossings where visibility of the signal heads may be compromised, for example by adverse horizontal or vertical road alignment, or on wide multiple lane approaches where vehicles in one lane may obstruct visibility of the signals to drivers in other lanes.

e) Where tall poles (of 5m length or greater) are specified, details regarding the type of pole and the foundation need to be provided on either the signal approval drawing or on a separate drawing. The mounting height of signal heads should be clearly shown. Currently any signal heads mounted with the amber signal at a height of 4.0m or greater above carriageway level requires specific authorisation from the Department for Transport (DfT). These details are to be submitted to ECC who will arrange for formal authorisation from the DfT. The installation of such schemes may only proceed once this authorisation has been granted.

f) Tall poles shall not have cable terminations at the top of the pole. All cable terminations should be accessible from ground level without use of ladders or steps (e.g. a wide-based pole with a lockable access door). A suitable concrete foundation will be required for each tall pole and retention socket, the design of which shall take account of the weight of signal equipment and its wind loading. The tall pole foundation design will need to be submitted to for approval.

g) Where passively safe signal poles are provided an electrical disconnection system is to be installed which will disconnect the power to the pole in the event of the pole being struck. Details of the electrical disconnection system are to be provided as part of the design submission for ECC to approve.

4.6 SIGNAL HEAD BACKING BOARDS

a) All signal heads are to be provided with backing boards fitted with white reflecting border strips. This border shall also be provided around green arrows and regulatory box signs mounted adjacent to signal heads.

5. Installation Requirements

5.1 CONTROLLER ACCESS

a) A concrete hardstanding at least 1 metre wide is to be provided adjacent to the front door of the controller and to a width of at least 0.5 metres at the sides and rear, where the controller is not already located within hard surfacing.

b) A vehicle maintenance bay should be provided wherever possible close to the controller to allow off-road parking of a maintenance engineer's vehicle (refer to Section 3.2).

5.2 CABLE DUCTING & INSPECTION CHAMBERS

a) All cable ducting and inspection chambers are to be installed in accordance with Essex County Council Master Folio Drawing EI101 and in accordance with the following requirements:-

- All ducts to be uPVC, orange in colour and have the legend "Traffic Signals"
- All ducts shall have a smooth internal bore.
- 50mm diameter flexible ducts are to be used between loop joint chambers and edge of carriageway for detector loop cable.
- Flexible 100mm diameter ducts to be used between signal pole retention sockets and the nearest inspection chamber and from signal controller to nearest inspection chamber.
- Single or multiple sections of rigid 100mm diameter ducting are to be used between inspection chambers.
- A minimum of 2 no. ducts are to be provided on all road crossings, increasing as necessary depending on number of cables to be installed.

b) The location of each inspection chamber and loop joint chamber shall be shown as follows:-

- 600mm x 450mm inspection chambers are to be installed along the ducting route which links the signal controller with all traffic signal poles. An inspection chamber is also required on either side of all carriageway crossing ducts.

- 450mm x 450mm joint chambers are to be installed where feeder cables are jointed to detector loops.
- The maximum length of duct runs between chambers is 50m and intermediate chambers should be installed if necessary to ensure this is not exceeded.

c) Draw cords are to be installed in all ducts and are to remain or be replaced after cables have been installed.

5.3 SIGNAL POLE REQUIREMENTS

a) Use of passively safe signal poles should be considered in accordance with Section 4.5a above.

b) All signal poles are to be installed in suitable pole retention sockets in accordance with Section 4.5b above.

c) Standard traffic signal poles shall be 114 millimetres diameter, hot-dip galvanised steel, protected with a coloured plastic coating. Poles may also be re-painted with a suitable plastic based product if necessary. Damage to poles may be rectified by removal of plastic or metal burrs, treatment of exposed metal with a suitable primer and finished with a two-part epoxy plastic coating in a colour to match the rest of the street furniture. All treatment shall be applied to the manufacturer's recommendations. The use of primers alone or lead-based products is not acceptable.

d) Where passively safe traffic signal poles are required, they shall be of a construction that meets the requirements of the Design Manual for Roads and Bridges (DMRB).

5.4 SLOT CUTTING AND INDUCTIVE LOOPS

a) The minimum dimensions for slot cutting in asphalt road surfaces shall be 8.0mm wide by 92.5mm in depth for the actual loop perimeter and for the ‘cut back’ for single and double loop tails. Where three pairs of loop tails share a single ‘cut back’ slot the depth shall be increased to 110mm. On concrete road surfaces the depths specified may be reduced by 30mm.

b) All loops shall be cut individually in each lane but may be jointed together at the nearest chamber if a single detector is required across multiple lanes. Loop tails for multiple loops may share the same slot cut. Tails of loops cut across other lanes shall be twisted together in the slot.

c) Slot cutting is to take place outside of restricted hours. The permitted times for undertaking slot cutting works will need to be determined in liaison with the ECC Project Manager who will consult with the New Road and Street Works Team.

d) The back fill for the loop cable shall be a two part process, comprising of a layer of two part epoxy resin followed by hot pour bitumen. This layer of resin is to provide a 5mm cover for all loop cables in the slot. When more than one pair of loop tails share a common 'cut back' slot, a layer of two part epoxy resin shall be poured over each pair to avoid entrapment of air amongst the loop cables.

5.5 LOOP JOINTS

a) Only re-sealable loop jointing kits are to be used for all signal sites installed in Essex.

5.6 LAMP DIMMING

a) Lamp dimming facilities should be provided in the controller for possible future use but should be disabled following testing as part of the commissioning process. A photoelectric cell shall be installed on the nearest pole to the controller.

5.7 ABOVE GROUND DETECTION

a) All above ground detectors are to be installed in accordance with the manufacturer's instructions.

b) Where an above ground detector is mounted on a pole with no signal heads the plug and socket connectors on the detector's flying lead are to be mounted within a suitably drilled hole near the top of the pole. It will not be acceptable for the connectors to be removed and the detector hardwired directly into the pole cap assembly.

5.8 COMMUNICATIONS AND REMOTE MONITORING SYSTEM REQUIREMENTS

a) The Developer shall make arrangements for the provision of remote monitoring or UTC/SCOOT facilities at the proposed traffic signal sites in accordance with ECC requirements (see Section 2.18). This will include arranging for all necessary civil works, ducting and sealing of the controller base if an external communications line (e.g. broadband line) is required.

b) A Siemens Remote Monitoring System (RMS) is currently used by ECC and new signal sites are to incorporate a Siemens Outstation Monitoring and Control Unit (OMCU) using GSM (mobile telephone) communications, subject to adequate network signal strength at the proposed controller location. This will be determined by ECC and their representatives (see Section 5.21).

c) For all sites with GSM communications ECC will issue a SIM card to the Developer. Approximately 4 weeks should be allowed for ordering of SIM cards. The Developer's signal installation contractor will then be responsible for the installing the SIM card in the OMCU. The Developer is also responsible for arranging the necessary mounting arrangements for the GSM equipment and correct installation, details of which are to be obtained from Siemens Plc.

d) Should the GSM network signal strength prove inadequate at any site, a BT PSTN (dial-up) line will be required as an alternative. The Developer shall make the necessary arrangements for the provision of the PSTN line.

e) All necessary mounting equipment and racking shall be provided by the Developer to enable each OMCU to be suitably installed within the controller.

f) The Developer shall supply and install all necessary cabling/interface leads between the traffic signal controller and the OMCU to provide the required monitoring facilities.

g) The OMCU shall be supplied with facilities to enable interrogation of the traffic signal control equipment remotely by the instation operator. This shall enable the instation operator at the instation terminal (via the OMCU) to communicate with the control equipment to carry out 'manual' checking and amendment if necessary of, for example the controller Master Time Clock, timings and detector functions, etc via the RS Engineer's port.

5.9 PROVISION OF ELECTRICITY SUPPLY

a) For traffic signal-controlled junctions the electricity supply to the cabinet will be 230 V at 50 Hz incorporating a 60 Amp lockable double pole isolator with single pole fuse. A secondary isolation fuse incorporating a 32 Amp fuse shall also be within the mini pillar connected to the Electricity supply via a 6mm² double insulated cable.

b) For standalone crossings the electricity supply to the cabinet will be 230 V at 50 Hz incorporating a 25 Amp lockable double pole isolator with single pole fuse. A secondary isolation fuse incorporating a 20 Amp fuse shall also be

within the mini pillar connected to the Electricity supply via a 6mm² double insulated cable.

c) The Developer shall provide a suitable electricity feeder pillar together with electricity supply in the location shown on the Signal Layout Drawing. The Developer shall also be responsible for all liaisons with the electricity supply company in the procurement and connection to the Control Cabinet of this 230 volt supply. The cable connecting the supply to the controller cabinet shall be provided and installed by the Developer, but the final connection and installation of the Electricity supply companies' cartridge fuse may only be undertaken by the Electricity Company's authorised staff.

6. Factory Acceptance Test (FAT) Requirements

a) The Factory Acceptance Test (FAT) requirements are normally only applicable to TR2500 traffic signal junction controllers although some standalone crossing controllers can also be pre-configured. Where this applies standalone crossing controllers shall also be subject to FAT.

b) The Developer shall provide to ECC a copy of the Controller Works Specification or similar document indicating the controller specific data at least two weeks before the Factory Acceptance Test is scheduled. Following successful commissioning, the Developer's Signal Installation Contractor shall supply ECC with an electronic copy of the controller specific configuration data and shall retain sufficient records to provide replacements at reasonable cost, in the event of the EPROMs becoming damaged or requiring modification.

c) The Developer's Signal Installation Contractor shall make all necessary arrangements for ECC's representative to attend a FAT (at the local depot of the Contractor) and shall give at least five working days notice of the proposed FAT date. On successful completion of the tests, both sets of the EPROMs supplied shall be programmed with the controller specific data ready for installation

d) The Developer's Signal Installation Contractor shall ensure that the control equipment on test during the FAT is the actual hardware and software that is proposed to be installed for this contract. ECC's representative reserves the right to uniquely mark parts of the Control equipment (following successful FAT) to ensure this requirement is met.

e) Should it not be possible during the initial FAT for ECC's representative to accept the control equipment due to the failure of facilities/test gear or control equipment supplied by the Developer's Signal Installation Contractor, all reasonable costs incurred by ECC to attend subsequent FAT(s) may be recovered from the Developer's Signal Installation Contractor prior to settlement of the final account.

7. Site Acceptance Test (SAT) and Commissioning Requirements

7.1 Earth Loop Impedance (ELI) Test Certificate

a) Prior to formal site acceptance the traffic signals are to be pre-commissioned by the Developer's Signal Installation Contractor. As part of this process a formal Earth Loop Impedance (ELI) test shall have been undertaken covering the electricity feeder pillar, the controller and each signal pole. Failure to do so will result in ECC's representative postponing the site acceptance test until confirmation has been received that the ELI test has been undertaken and a certificate produced.

7.2 Site Acceptance Test

a) Site acceptance testing will require the Developer Signal Installation Contractor's Commissioning Engineer to demonstrate to ECC's representative the compliance of the installation with the Specifications in all respects. Such testing equipment as may be necessary shall be provided by the Developer's Signal Installation Contractor.

b) A "Traffic Signal Site Acceptance Certificate" will be signed by ECC's representative and the Developer Signal Installation Contractor's representative when the installation has been shown to comply with the Specifications and all documentation is complete.

c) Commissioning of the site will only take place if all signal equipment, electricity supply, remote communications and all associated civils works including road markings, signing, high friction surfacing and street lighting have been installed. Failure to complete the commissioning due to incomplete works will result in either the postponement of the commissioning or a partial commissioning with the traffic signals left switched off and bagged over. Should an additional commissioning visit be required the Developer will be responsible for the additional costs incurred for ECC's representative to complete the formal commissioning process.

d) Commissioning of the OMCU is to be carried out in the presence of ECC's representative. Interrogation of the OMCU shall be demonstrated by the Developer's Signal Installation Contractor to the satisfaction of ECC's representative by means of a suitable interrogation device.

e) The Developer's Signal Installation Contractor shall complete and forward a copy of the completed "OMCU Installation Details Certificate" form to ECC's representative either prior to, or during the OMCU Commissioning.

f) The Developer's Signal Installation Contractor shall test the OMCU in the presence of ECC's representative to demonstrate that the details provided in the "OMCU Installation Details Certificate" are correct with respect to the number of lamps being monitored per phase and detector input locations, etc.

g) The Developer's Signal Installation Contractor shall supply the controller with two sets of previously unused configured configuration EPROMs of each type, with holders where required. The controller shall also be supplied with appropriate insertion and extraction tools for each type of EPROM. The Developer's Signal Installation Contractor shall supply to ECC an electronic copy of the EPROM configuration(s).

8. Post-Commissioning Requirements

a) As part of the commissioning process it is the requirement of ECC's representative to undertake post-commissioning checks of the site to determine the final controller timings. This will require a revised EPROM to be configured and installed by the Developer's Signal Installation Contractor incorporating all temporary controller data. The revised configuration data required will be provided by ECC's representative who will then be present on site together with the Developer's Signal Installation Contractor to install the revised EPROM. If required this process shall be repeated by ECC's representative within the next twelve months with all costs to be borne by the Contractor. For each EPROM reconfiguration the Developer's Signal Installation Contractor shall supply to ECC an electronic copy of the revised EPROM configuration(s).

b) Once the signal scheme has been installed the Developer is to produce an 'as built' drawing detailing the specific locations of all signal equipment and associated ducting system. This drawing should be a suitably revised version of the original approved signal layout drawing. A revised Cable Schematic diagram showing the actual cabling used as part of the installation shall also be provided. An electronic copy of the above documents shall be supplied to ECC.