



Network and Traffic Management

DEVELOPER INFORMATION PACK

TRAFFIC SIGNAL, INTELLIGENT TRANSPORT SYSTEMS AND ASSOCIATED CONTROL EQUIPMENT

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GENERAL STATEMENT OF REQUIREMENTS

Gloucestershire County Council has a requirement under the Traffic Management Act to ensure the expeditious movement of all road users and provide a safe environment for all. Developers are therefore advised that where signal control may be the preferred option, or the proposed development increases or alters traffic volumes or movement, Developers will be required to justify their decision to promote traffic signals both in the short and long term and provide comparison with alternative junction types. They will also be expected to provide proposals for mitigation measures on the wider highway network where appropriate.

This information pack has been prepared to assist the approvals procedure for developers and their agents when proposing traffic signal control and associated ITS solutions as part of development works. The processes and standards either set or referred to in this document are those reasonably expected by this Authority to provide best practice solutions and designs for traffic signal control and associated works.

All developers or their agents are encouraged to contact Gloucestershire County Council Network and Traffic Management (GCC) at the earliest possible opportunity (pre-planning application submission) to discuss the implications of the proposals on the highway network.

Intelligent Transport Systems (ITS) are an important tool in the monitoring and management of the Highway network. Gloucestershire County Council is committed to the installation where appropriate of ITS equipment including CCTV, Automatic Number Plate Recognition (ANPR), Journey Time Management Systems (JTMS), Car Park management systems, Variable Message Signs (VMS) and communication cable ducts at, or in the vicinity of any new junction or modified junction proposed for the highway. Where appropriate a financial contribution to GCC wider route / area based ITS strategy may be requested.

New signal-controlled junctions and pedestrian crossings situated in the Urban Environment may be required to form part of the existing Urban Traffic Control System (UTC). In these circumstances SCOOT control with either MOVA, CLF or VA fallback will be required. Standalone or isolated junctions will normally be expected to operate the MOVA operational strategy provided suitable site conditions are met. This will depend upon speed of road, capacity requirements and the practicalities of using loop based or alternative approved detection systems in constrained environments. At key junctions both UTC and MOVA maybe requested. Standalone pedestrian, cycle or equestrian crossings (NLU Crossings) shall operate Mova subject to the aforementioned criteria. Modifications to existing junctions may also require new or additional control strategies to be implemented as part of the development works and it must therefore not be assumed that alterations are like, for like. The final decision on the strategic mode of operation for any proposed installation shall rest with Gloucestershire County Council (GCC) or the Secretary of State for Transport where decisions on development proposals are referred.

Signal displays shall be LED type. Signal controllers and installations shall be Extra Low Voltage (ELV) unless otherwise agreed by Gloucestershire County Council (GCC). In addition, only equipment approved by Gloucestershire County Council

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Traffic Systems Section will be permitted for use on the highway.

Pelican crossings are no longer approved for new installations. Unless otherwise agreed, development proposals shall include nearside pedestrian / cyclist / equestrian facilities at signal intersections and stand-alone crossings.

Commuted sums for the ongoing maintenance of installations shall be paid by the developer to GCC covering a life expectancy period of 15 years. Commuted sum calculations shall be based on the ADEPT report Commuted Sums Levied For Traffic Signals September 2014.

Where a developer has received technical approval, this approval will be valid for a maximum of two years only. GCC reserve the right to request the developer to re-submit their proposals for approval if the design of the junction is altered prior to construction commencing or if the two-year approval period has expired.

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1 AIM OF THE INFORMATION PACK

- 1.1 This document sets the standards and requirements for the supply installation and maintenance of traffic signal equipment and associated minor civil engineering works. It is the intention that Developers should use the document as an aid to comply with the required standards set by Gloucestershire County Council, 'Best Practice' and National Standards. The document is not a prescriptive design guide and should be read in conjunction with the latest edition of Manual for Gloucestershire Streets – Traffic Management Systems and the Design Manual for Roads and Bridges (DMRB), technical advice and local transport notes.
- 1.2 One of the aims of this document is to ensure that any new type of junction proposed for the installation on the highway network is the most appropriate type of junction or combination of junction types both in the short and long term.
- 1.3 Developers and their agents are encouraged to contact Gloucestershire County Council Traffic Systems Team or Highways Development Management Department to discuss their proposals at the earliest possible opportunity. The preference of Gloucestershire County Council is to participate in these discussions prior to any planning application being submitted.
- 1.4 Gloucestershire County Council (GCC) or its Agents reserve the right to amend the requirements defined in this document in line with any new legislation, amendment to current working practices or modifications in performance specifications, at any time. It is the responsibility of Developers or their Agents to contact the Highway Authority regarding amendments to this document.
- 1.5 To ensure consistency of equipment, increased reliability and reduced maintenance costs, all developers will be expected to use only signal control equipment approved by Gloucestershire County Council.
- 1.6 For further information The Traffic Systems Manager can be contacted on **01452-328964**.

2 APPROVALS AND PROCEDURES

- 2.1 All designs shall be approved by Gloucestershire Council Network and Traffic Management Department or its Agents and may be the subject of a Highways Agreement. During the pre-planning discussions GCC will endeavour to liaise with the Developer and where viable, to share preliminary network and junction data and modelling details. Charges for supplied data may be applicable.
- 2.2 The information to be supplied for approvals shall be in addition to that required to conform to the latest edition of The Construction (Design and Management Regulations). It will be the duty of the developer to ensure that appropriate duty holders are appointed for highway works projects.
- 2.3 Submissions for junction control must be accompanied by a full Transport Assessment in agreement with GCC Highways Development Management Department, setting out the objectives to integrate planning and transport at the National, Strategic and Local level and to promote more sustainable transport choices both for movement of people and freight.
- 2.4 Designs for traffic signal junctions must consider capacity, safety and future maintenance liability. Developers shall ensure that Design Organisations follow design procedures defined in the DMRB document 'TA101 Traffic signalling systems', Road Liaison Group

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“Management of Electronic Traffic Equipment” Code of Practice (September 2011) and have design processes certified under ‘TA101 Traffic Signalling systems’.

- 2.5 Submissions shall also include an assessment of pedestrian, cyclist and mobility impaired facilities – NMU (Non-Motorised Users).
- 2.6 Submissions shall include speed of road assessment, 85thile vehicle speeds recorded in a suitable location relative to any proposed junction and where appropriate, MOVA cruise speeds, undertaken by a specialist MOVA validation engineer. These details should be included at Stage-1 design.
- 2.7 Submissions and works are required to be checked and safety audited at three stages. The level of information to be supplied at each stage is defined below.
- 2.8 Project works programmes shall be copied to Gloucestershire County Council at the various design and construction stages. The works program shall identify key milestones for installation, testing and commissioning procedures.
- 2.9 Fees owed to the Gloucestershire County Council under Highway Agreements shall include commuted sums for maintenance and operation of signal installations. For further details contact Traffic Systems Manager on 01452-328964.

3 SAFETY AUDITS

- 3.1 The Developer is required to arrange safety audits at Preliminary Design (Stage-1) Detailed Design (Stage-2) and Pre-Opening (Stage-3). Safety audits shall be undertaken in accordance with DMRB document ‘GG119 Road safety audit’ and current GCC Road Safety team audit policy documents
- 3.2 Design submissions shall also include the designers’ safety audit exemption report.

4 DESIGN CHECKS

4.1 Stage-1

- 4.1.1 The following information shall be submitted as a minimum for comment/approval at Stage-1 design. General Arrangement layout(s) presented at a scale of 1:500. Drawings to include CAD file and be prepared on an accurate base, indicating proposals for:

- a) Changes to alignment, levels and structures.
 - b) Traffic-lanes stop lines and island positions.
 - c) Signal equipment positions
 - d) Outline of pedestrian/cyclist/special facilities.
 - e) Capacity calculations including method of control with full input/output data, electronic file submission and an accompanying rationale of the assessment features.
- Approved assessment programmes are LinSig for isolated junctions and Transyt / LinSig for linked systems. A link node diagram as defined in the Transyt user guide manual must accompany Transyt assessments. LinSig assessments shall be accompanied by stage diagrams, traffic flow diagrams and a scale plan.
 - Transyt or LinSig assessments of Signalised Gyratory or Roundabout Control must be accompanied by full lane flow data assessments.

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- Paramics Discovery Model is the recommended micro-simulation software. The developer shall request approval from Gloucestershire County Council for the presentation of alternative software assessments.
 - Where submissions evaluate existing traffic signal junctions, every effort shall be made to record current junction performance and to validate supplied base models. Where existing junctions operate MOVA, the MOVA TM (DA / DF) logs shall be utilised to establish base model saturation flows and average stage appearance and duration statistics.
- 4.1.2 GCC reserves the right to request more detailed design information during stage 1 assessments as required.
- 4.1.3 A signal works estimate shall be supplied sufficient for starting the Commuted Sum Calculation process.
- 4.2 **Stage-2**
- 4.2.1 The following information shall be submitted for comment/approval at Stage-2 design:
- Contract specifications for both Civil Engineering and Traffic Signal installation works. The Civil Engineering details shall include all relevant appendices as defined in the Highway Works Specification. The Traffic Signal details shall include ITS1827 (previously MCH1827) data forms, MOVA dataset and diagram and SCOOT details where applicable.
 - Specifications shall incorporate an Appendix 12/5 as defined in the Highway Works Specification and as generically presented in this document. If nominated for use, alterations to this Appendix 12/5 shall be made by way of reference to amended and supplementary clauses only. The document text shall not be substantially altered.
 - Design layout(s) shall be presented at a scale of either 1:200 or 1:250 (typically A1).
 - Detailed designs shall include but not be limited to the following:
 - a) All civil engineering construction works.
 - b) Duct runs, drawpit types and locations and pole foundations.
 - c) Guard railing drop kerbs and tactile slab positions.
 - d) Carriageway and footway surface treatments.
 - e) Road markings, studs and signs conforming to the latest edition of the 'Traffic Signs Regulations and General Directions' and the 'Traffic Signs Manual'.
 - f) Street Lighting.
 - g) Power supply details, including isolation and fuse discrimination details.
 - h) Signal head and pole positions, including passively safe specifications where applicable.
 - i) Controller position and maintenance area.
 - j) Detection proposals.
 - k) Telemetry facilities and connections.
 - l) Special features and facilities.
 - m) Standard Construction Details.
 - n) Test schedules
 - o) Cable schematic details
 - p) Urban Traffic Control specifications and systems
 - q) Remote monitoring specifications and systems
 - r) Mova cruise speeds, link diagram and assessment report.

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- A record of Design Considerations for the traffic signal layout, including any known issues, mitigation measures and outstanding issues shall be prepared.
- 4.2.2 The labelling of above ground detection on design drawings shall follow the format:
- 'PHASE-DETECTOR TYPE-POLE NUMBER'. *For example:*
BMVD2 is phase B microwave vehicle detector on pole 2
GOC2 is phase G on-crossing detector on pole 2
GKS2 is phase G kerbside detector on pole 2
This labelling shall correlate with the controller data forms detector notation.
- 4.2.3 The labelling of loop configurations shall follow the format:
- 'PHASE-TYPE-MOVA INPUT NO (if relevant)'. *For example:*
AIN1 indicates phase A, MOVA IN loop, input no.1
AX2 indicates phase A, MOVA X loop, input no. 2
ASL3 indicates phase A MOVA stop line loop, input no.3
AQ5 indicates phase A MOVA Q loop input no. 5
AX indicates phase A System D X loop
AY indicates phase A System D Y loop
XYZ indicates three System D loops on one phase connected to one channel of detection.
N11121E1 is a SCOOT loop and has its own 8-figure alpha-numeric mnemonic relevant to the UTC system area, region, node, stage and link.
(SCOOT 1,2,3 etc will not be accepted).
- The above list is not exhaustive but indicates the essence of the mnemonic configuration to be followed. This labelling shall correlate with the controller data forms detector notation.
- 4.2.4 Phase allocation for controller streams shall phase all vehicle movements first followed by pedestrian movements per stream. Dummy phase shall be allocated last in sequence.
- 4.2.5 Phasing and stream design of roundabouts shall normally follow the rationale of one stream per node with the circulating phase nominated first followed by the corresponding entry phase and then pedestrian and dummy phases. Where roundabouts are of a small inscribed circle diameter and due to dominant traffic movements are proven to follow a simplified format of control a single stream may be considered. Roundabouts must be controlled under the Mova control strategy and must be configured with CLF fallback.
- 4.2.6 A detailed signal works estimate to be agreed by GCC shall be supplied sufficient for concluding the Commuted Sum Calculation process.

4.3 **Stage 3**

The following documents shall be included in the Design File in accordance with 'TA101 Traffic signalling systems' and provided within one month of substantial completion or commission of installations. The scheme CDM details to be included in the Health and Safety File.

- a) As built drawings and records.
- b) Electrical safety test records and completion certificates.
- c) Controller configuration forms.
- d) Equipment settings.
- e) Cable layouts.
- f) Power Supply Details.

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- 4.4 Final assessment files preferably in LinSig, or if microsimulation then Paramics Discovery model software shall be used. The developer is required to request approval from GCC for any alternative software.
- 4.5 The information to be supplied under section 4 is in addition to that required to conform to The Construction (Design and Management) Regulations.
- 4.6 Where proposals either affect or are required to form a linked UTC signal system, all relevant information shall accompany details supplied under section 4. This additional information shall include:
- a) Method of control and translation strategy for SCOOT control.
 - b) Control and reply word data.
 - c) Instation system configuration data.
 - d) Data transmission system details.
 - e) SCOOT loop details.
 - f) Other ITS related infrastructure.
- 4.7 Where proposals either affect or are required to form a linked MOVA signal system, all relevant information shall accompany details supplied under section 4. This additional information shall include:
- a) MOVA dataset (pre-validation and post-validation)
 - b) MOVA license numbers, LIN, LIF, HIC and Red Card details or SIM Card details
 - c) MOVA link/lane diagram
 - d) Controller settings, linking statements and validation reports

5 STANDARDS FOR SIGNAL DESIGN

- 5.1 In addition to the guidelines and standard details contained in this document, all signal designs shall conform to the latest Department of Transport Specifications, Technical Directives, Technical Advice notes and Traffic Advisory Leaflets and TOPAS specification standards. Where TR or other specifications are superseded by TOPAS, the TOPAS specification shall be used.
- 5.2 Particular attention shall be given to the design requirements for NMU's, the visually impaired and mobility impaired.
- 5.3 The Developer shall note that all controlled pedestrian / cyclist facilities shall utilise near-side displays, and unless otherwise agreed with Gloucestershire County Council or his Agent, shall incorporate all detection facilities as defined in 'Traffic Signs Manual Chapter 6 Traffic Control' and TOPAS 2500.
- 5.4 Design processes shall conform to the Construction (Design and Management) Regulations and TA 101.
- 5.5 The Developer shall undertake the duties of the Client for the purposes of and in accordance with the definition set out in The Construction (Design and Management Regulations), or any amendment or variation of the same.
- 5.6 All new or significantly modified installations shall be ELV. All signal aspects shall be LED type.

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6 STANDARDS FOR SUPPLY AND INSTALLATION OF TRAFFIC SIGNAL EQUIPMENT

- 6.1 The Developer shall ensure that contracts conform with and refer to all Regulations, Acts and Specifications appropriate to the works, and that Contractors and Suppliers are fully approved to work on the Highway and are accredited to ISO 9000 or equivalent.
- 6.2 All personnel working on the Highway Authorities traffic control systems shall be accredited to the relevant level for the work being undertaken.
- 6.3 Installation works processes shall conform to The Construction (Design and Management Regulations) and TA101.
- 6.4 Factory and site acceptance tests shall be carried out in accordance with the test schedules contained in Appendix B. All electrical safety tests shall be carried out in accordance with and satisfy the latest requirements of the Electricity at Work Act Regulations.
- 6.5 The Developer shall give a minimum of 10 working days' notice to GG or his Agent of the test dates.
- 6.6 The Developer shall ensure that all construction works and activities on the Highway conform to the New Roads and Street Works Act (latest revised edition).
- 6.7 During the works, the Developer shall be responsible for providing information board signs. The signs shall advise the public, both vehicular and pedestrian of:
- a) The reason for the works
 - b) The anticipated start and end dates
 - c) Emergency telephone number
- 6.8 A list of contract clauses and standard details are contained in the attached appendices, these may be used to form the basis of the installation specification.
- 6.9 A generic Appendix 12/5 specification and standard details are contained in the appendices. These may be used to form the basis of the Developer's installation specification, which must be made representative of the proposed works and site-specific installation.
- 6.10 Where the Developer is proposing equipment new to the Authority or the equipment is requested by Gloucestershire County Council, all necessary test equipment and maintenance spares shall be supplied free of charge to the Gloucestershire Network and Traffic Management Department.

7 STANDARDS FOR MAINTENANCE OF TRAFFIC SIGNALS

- 7.1 The Developer shall maintain the traffic signal installation for a period of either 28 days or 12 months (as required by Gloucestershire County Council); the level of maintenance shall be as defined in Appendix A.

8 CONTROL AND COMMUNICATION SYSTEMS

8.1 UTC SCOOT

- 8.1.1 The existing UTC/SCOOT control system is Siemens Hosted UTC-UX supporting UTMC, ADSL, Fibre & Wireless formats. Developers should note that Telecommand 12 is a 'life expired' system and is no longer supported by the supplier. In the event that proposals necessitate amendments or additions to sub-areas operating this system, the Developer

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will be required to upgrade either in part or whole, the instation and outstation data transmission system and connecting communications network. System requirements may vary throughout the life of this document.

- 8.1.2 New junctions to be added to the Urban Traffic Control system will require a Wireless communication system to be installed. British Telecom local end ADSL copper connection or local fibre connection to existing adjacent systems may also be supplied with prior discussion and approval of GCC.
- 8.1.3 Should communication capacity at the Instation be exceeded an additional ADSL / 4G connection at the Instation may also be required.
- 8.1.4 Any hard-wired local end connections shall be terminated with BT line termination units or equivalent, housed in the controller or NAL BT variant plinth.
- 8.1.5 The whole cost of communications medium shall be paid for by the Developer. This shall also include the first years' rental and 'Total Care' or similar support maintenance where appropriate.
- 8.1.6 All signal control and monitoring equipment must be compliant with UTM2 data objects directory and have the capability to be IP addressable at no cost to GCC.
- 8.1.7 Industrial 4G/ADSL/VDSL ruggedized router(s) as approved by Gloucestershire County Council shall be supplied & installed. Installation shall include the set-up of IP addresses, Sub-Net Masks and mapping at the Outstations and the setting up of system IP tunnels.
- 8.1.8 The Developer shall incorporate all aspects of UTC/SCOOT installation within his proposed works, with due allowance for additional testing and commissioning procedures, database preparation, SCOOT validation and fine tuning.
- 8.1.9 A report shall be produced documenting all actions undertaken. This report shall be copied to Gloucestershire County Council within 10 working days of completion. For large schemes, interim progress reports shall be provided.
- 8.1.10 Where Gloucestershire County requires both MOVA and UTC control strategies these shall be provided and set up by the Developer utilising optimal detection and equipment configurations.
- 8.1.11 Preference shall be given to Integral control systems. Hard-wired add on hardware may be refused by Gloucestershire County Council.

8.2 MOVA

- 8.2.1 MOVA will be required at all isolated junctions, roundabouts, and may be required at UTC/SCOOT intersections unless the site is low speed (30mph) and detection systems are proven to be compromised by site constraints.
- 8.2.2 MOVA will be required at stand-alone crossings where the speed limit or measured 85%ile speeds are greater than 35mph.
- 8.2.2 Any new MOVA controlled junctions shall be fully compatible with the current version of the Gloucestershire County Council RMS / UTC Instation system in terms of operation and fault monitoring (please contact GCC for details of latest system).
- 8.2.3 Specialist MOVA design and validation engineers shall be employed by the Developer to undertake pre-works assessment of junction proposals, MOVA design and MOVA validation.

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- 8.2.4 On completion of validation a report shall be produced documenting actions undertaken and any recommendations for improvement. The report shall be copied to Gloucestershire County Council within 10 working days of validation being completed.
- 8.2.5 Preference shall be given to Integral control systems. Hard-wired add on hardware may be refused by Gloucestershire County Council.

8.3 Remote Monitoring

- 8.3.1 GCC currently operates a telnet RMS solution. The Developer must contact GCC to ascertain details. Unless specified otherwise, all new junctions and controlled crossings (with the possible exception of those to be controlled or monitored under the UTC system) shall be connected to the remote monitoring system. Site configuration data shall be supplied and installed on the Remote Monitoring System at the time of works substantial completion.

8.4 Bus and Emergency Vehicle Priority

- 8.4.1 As part of ongoing commitment to improve public transport systems, GCC promotes the use of Bus Priority either via the SCOOT system or using local control techniques at isolated traffic signal junctions. The Developer shall consider the effect of any proposals on both bus and emergency vehicle routes. Where the local authority considers it necessary the Developer will be directed to provide systems as part of their works.
- 8.4.2 Gloucestershire County Councils approved specialist supplier is Trapeze.

9 TESTING AND COMMISSIONING PROCEDURES

- 9.1 Gloucestershire County Council representatives from the Traffic Management and Major Projects or their Agent will attend Factory and Site Acceptance Testing. A minimum of 10 days' notice shall be given to GCC or his Agent of Factory and Site Acceptance tests. A draft controller configuration shall be supplied in emulation and PDF formats for initial review and comment at the time of test notification.
- 9.2 Factory Acceptance Tests shall be carried out on the signal controller, detection system and monitoring systems at least 10 days prior to the date for installation on site. The Developer shall demonstrate to GCC or his Agent that the controller and any peripheral equipment conforms to Highway Agency specifications and standards, the TOPAS 2500 specification forms, design layout and the test schedule.
- 9.3 Site Acceptance Tests shall be performed on a date agreed between the Developer, and GCC or his Agent upon substantial completion of the whole of the works as identified in the specification.
- 9.4 The Developer shall be satisfied that the site is complete and safe for test purposes.
- 9.5 Tests shall be demonstrated in accordance with the site acceptance test schedule. If any Factory Tests are to be repeated as part of site testing, then these shall be administered in accordance with appropriate schedules. Repeat visits to complete FAT or SAT will be recharged to the Developer.
- 9.6 As well as tests on the controller as identified above, electrical safety and earthing site installation tests shall be carried out and documented on the appropriate forms. The results of all tests shall be submitted to Gloucestershire County Council or his Agent for approval within 10 days of works completion.

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9.7 The Developer shall ensure that the requirements of the current edition of BS7671, the Electricity at Work Act Regulations (SI 1989/635) and the Building Regulations 1991 (SI 1991/2768) amended by (SI 1992/1180) are complied with. Upon the completion of the installation, the Developer shall issue to GCC or his Agent an electrical completion certificate as identified in Appendix B3.

10 CIVIL ENGINEERING

- 10.1 All Civil Engineering works associated with the installation of traffic signals shall be undertaken in accordance with the Department of Transport Highway works specification and GCC Manual for Streets.
- 10.2 The Developer shall ensure that Contractors undertaking works on the Highway conform to the conditions of current Health and Safety legislation and Chapter 8 traffic safety and management requirements and the New Roads and Street Works Act.
- 10.3 All traffic management proposals shall be subject to approval by GCC or their Agent.
- 10.4 Notice periods for Applications for Consent are defined in Appendix D.
- 10.5 Civil Engineering works shall be subject to a 52-week maintenance period.
- 10.6 All works shall conform to the New Roads and Street Works Act 1991 (latest revised edition).
- 10.7 Temporary warning signs in accordance with 'Traffic Signs Manual Chapter 6 Traffic Control' shall be provided for a 3-month period following completion, if required by GCC. Proposals for type and position shall accompany Stage 2 design submissions. GCC to be consulted as to whether signs are required.
- 10.8 Gloucestershire County Council currently adopts a policy of full duct and drawpit systems at all signal installations. Standard construction drawings refer. NAL retention sockets (or equivalent with prior approval by GCC) shall be used at all pole locations with a connection of not more than 4m to the nearest drawpit. Exceptionally, pole-boxes may be used with prior approval from GCC if site conditions negate the use of retention sockets or modifications are being made to existing installations.
- 10.9 Detector boxes and main drawpits shall be supplied as per standard drawings. GCC policy also includes the requirement to separate low and extra low voltage cables by utilising separate duct runs. Duct system design must therefore accommodate this requirement. In new installations, only ELV cable systems shall be installed.
- 10.10 Each road crossing shall have a minimum of three ducts with at least one spare 100mm dia duct.
- 10.10 All drawpit footway covers shall be non-slip with a minimum average SRV of 84 wet and 50 dry.
- 10.11 Proposals shall include an appropriate area allocated for maintenance engineers to park their vehicles in close proximity to the controller location.
- 10.12 A hard standing or paved area shall be provided around the controller service area, including the power isolation pillar and needs to be a minimum of 2.0m from the edge of the equipment to afford easy access even when the controller door is fully opened. The whole area must be contained within the limits of the adoptable highway. Where required,

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a hard surface will be provided to connect the controller area with the parking area for the maintenance vehicle.

- 10.13 A hard standing or paved area shall be provided surrounding all traffic signal poles and be a minimum distance of 2.0m from the pole in all directions to ensure a firm base for ladder work.
- 10.14 Non-standard height, mast arms and folding traffic signal poles shall be provided with a hard-standing area as noted in clause 10.13 and in addition shall include a hard standing area to accommodate the pole in its horizontal or rotated maintenance position.
- 10.15 Drawpits covers shall have a suitable concrete surround where located in soft verges.

11 INTELLIGENT TRANSPORT SYSTEMS (ITS)

- 11.1 As part of its commitment to monitor and manage the network and to enable it to fulfil its duties under the Traffic Management Act (TMA) Gloucestershire County Council is committed to the deployment of ITS solutions.
- 11.2 The Developer will need to consider the impact of their proposals on the network and include within their proposals, options for meeting the above aims. To aid the Developer GCC have developed route-based strategies identifying locations of ITS equipment. This strategy is available upon request from the Traffic Signal Manager on **01452 328964**
- 11.3 GCC currently use Automatic Number Plate Recognition (ANPR) for Journey Time Management (JTM), CCTV systems in use are Siemens Telscan, WCCTV and telent fixed. Swarco- car park management and multi text Variable Message Signs are also used.
- 11.4 ANPR equipment will be dual purpose and provide both journey time measurement and Automatic number plate recognition capability.
- 11.5 VMS signs will be 4-line multi text 18 to 20 characters per line or as required by GCC.
- 11.6 Full specification details can be obtained from the traffic systems manager.
- 11.7 In addition to the above, GCC may seek non-specific contributions from the Developer towards the expansion of the ITS network and the development of fibre optic or other communication networks, or alternatively request that the Developer installs a communications duct route as part of his works.
- 11.8 GCC use a combination of communications modes on its existing ITS equipment including Wireless, Private circuits, Radio, Fibre, PSTN, and ADSL. Some of these are now obsolete and may need to be replaced as part of any works. Developers should note that it is the aim of GCC to minimise its revenue liability as far as is practicable when considering the maintenance of existing or new communications systems and all proposals must be agreed with them.
- 11.9 GCC recommend that the developer contacts the Traffic Systems Manager at an early stage to determine project requirements.

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12 CCTV

- 12.1 Unless otherwise agreed with Gloucestershire County Council, all new traffic signal junctions shall include CCTV. CCTV may also be required at new crossings and existing traffic signal junctions as directed.
- 12.2 Gloucestershire County Council currently utilise Telent IP based fixed CCTV units. It must be assured that sufficient cameras are installed to allow the whole junction to be viewed. Product details to be obtained from Gloucestershire County Council.
- 12.3 It should be noted that GCC's Telent CCTV system uses the same communications as the Telent RMS (remote monitoring system).

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Appendix A

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Network and Traffic Management**

WORKS INFORMATION

Traffic Signal Appendix 12/5 Specification

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1.0 INTRODUCTION

- 1.1 This Appendix references the specification requirements for the procurement, supply, installation and commissioning of traffic signal equipment. Unless specified otherwise, work supplied under this Contract shall comply fully with the latest standards as detailed in the Department for Transport (DfT) Highway Works Specification. Where differences arise between the content of this Appendix and any generic / referenced specifications or documents the contents of this Appendix shall be followed.
- 1.2 Specific civil engineering requirements are provided with respect to the erection of traffic signal street furniture and associated service duct and drawpit systems. These requirements are additional and supplementary to any other engineering requirements or specifications detailed in the general works Contract.
- 1.3 The Overseeing Organisation shall issue to the Contractor site specific design drawings and schedules, providing information relating to the traffic signal installation and the location of the traffic signal equipment.
- 1.4 The Contractor shall be responsible for ensuring that any Sub-Contractor(s) employed under this Contract are identified to the Overseeing Organisation for approval, and that all works are fully supervised and checked to be in accordance with the specification.
- 1.5 The Contractor shall be deemed to have inspected the site at the time of preparing his tender and to be satisfied on all matters relating to the requirements of the works specification.
- 1.6 The Contractor should note that the Overseeing Organisation does not allow new traffic signal installations to be commissioned on Fridays, Saturdays, Sundays or Bank Holidays, unless identified in site specific works information and/or agreed with GCC.

2.0 TRAFFIC CONTROL HARDWARE

2.1 General

- 2.1.1 All traffic signal control hardware shall have been granted type approval. Self-Certification shall be in accordance with TOPAS 0600. The level of approval shall be stated providing details of any limitations imposed on its use. Where full type approval has not been granted, the Overseeing Organisation may seek to obtain references for any equipment proposed to be used.

2.2 Controller Specification

- 2.2.1 Traffic Signal Controllers (Junction or Pedestrian Crossing) shall conform to the latest issue of TOPAS 2500 "Specification for Traffic Signal Controller".
- 2.2.2 Wig-wag controllers conform to the latest issue of TOPAS 2513 "Performance Specification for Wig Wag Signal Control Equipment"
- 2.2.3 Controller cabinets shall be fitted with a type RKA27c main door lock and top and bottom compression bolts. The manual panel shall use a Yale type 900 lock. Two sets of each key, including 'T' key, shall be supplied at SAT. The controller shall have a front opening door and a means of accessing equipment to the rear of cabinet to permit access to all parts of the controller.
- 2.2.4 Controller cabinets shall include space for the addition of an Outstation Transmission Unit (OTU), an Outstation Monitoring & Control Unit (OMCU) or a Microprocessor

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Optimised Vehicle Actuation Unit (MOVA). Space shall also be available for Trapeze or equivalent compatible Bus Priority Unit (approved by GCC) and CCTV/ Fibre router and communication interface.

- 2.2.5 Adequate provision shall be made for the safe storage of controller documentation in the cabinet by the provision of a door pocket.
- 2.2.6 Cabinets shall be black in colour and include an anti-graffiti coating.
- 2.2.7 Miscellaneous Equipment Cabinets shall be used to ensure that adequate space is provided for all specified equipment and rationalisation of cable and add-on facility connections. Generally, MEC's shall be used to rationalise lamp cables and not detector racks/packs. MEC's without detector racks/packs shall be fitted with a thermostatically controlled heater. MEC's may also be used as remote validation stations which shall incorporate 13amp 23v maintenance sockets and multi-port Ethernet extenders.
- 2.2.8 Unless otherwise specified, two 13 amp 3-pin electricity supply outlets to BS1363 shall be provided inside each controller cabinet and MEC and shall be protected by a residual current device of maximum rating 30mA. Separately fused supplies shall be provided as required for the use of the OTU / OMCU / Router / detection and other ancillary components. A minimum of two fused auxiliary power supplies shall be provided as standard. A minimum of two additional fused auxiliary power supplies shall be provided over and above those used for the initial installation, to be reserved for future use.
- 2.2.9 All traffic signal controllers (including pedestrian and wigwag) shall have an externally accessed manual panel and external DFM indicator. All manual panel switches and indicators shall be clearly labelled with their function (including special facilities). A stage diagram shall be provided on the inside of the manual panel door, with clearly labelled stages and phases, by means of silk-screening or suitable weatherproof adhesive label. For multi-stream junctions, the label should indicate the stages called by which manual buttons. LED's associated with stage buttons shall light to show which stage is active on street in all modes with the manual panel door open, without the requirement of plugging in a handset.
- 2.2.10 Traffic signal controllers shall be configured in accordance with a site specific TOPAS ITS1827 (previously MCH1827) specification data issued by the Overseeing Organisation as part of works information / specification.
- 2.2.11 Traffic signal junction controllers shall be supplied with a minimum number of 16 phases and shall be capable of a 32-phase configuration.
- 2.2.12 Controller and MEC setting out shall ensure all doors can fully open with adequate and appropriate clearance to any adjacent street furniture. The location of the cabinets must provide safe working distances from edge of carriageway, routes used by NMU's and any Road Restraint System. Good visibility of the junction or control facility must be provided.
- 2.3 Factory Testing (Junction Controllers)
- 2.3.1 Configured junction controllers shall be made available for testing at the signal company's local depot or the Overseeing Organisation Offices. The Contractor shall ensure that any controller is made available for factory acceptance testing no later than four weeks from the issue of the works specification forms and 10 working days prior to site installation, unless agreed otherwise by the Overseeing Organisation. The Contractor shall give the Overseeing Organisation at least 10 working days' notice of the controllers being ready for depot/factory acceptance testing. A copy of the configured specification in PDF and Emulation Format shall be given to the Overseeing Organisation at this time.

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- 2.3.2 The tests shall be undertaken by the Contractor with the Overseeing Organisation present as witness. The Contractor shall demonstrate compliance with the TR 2500 works specifications and drawings. Suitable signal lamp mimics, adequate means of simulating detector inputs and an interface to simulate Urban Traffic Control and or Mova control shall be provided during the tests.
- 2.3.3 Safety critical tests including green conflicts and red lamp monitor tests shall be carried out on the actual controller and not on a software emulator.
- 2.3.4 A certificate shall be issued as evidence of test compliance. The Contractor shall supply to the Overseeing Organisation a copy of the controller configuration upon successful completion of the depot/factory tests in hard copy, PDF and configuration file formats.
- 2.3.5 Repeat tests shall be offered within 10 working days of the initial test failure. All costs incurred by the County Council in attending the retest will be met by the contractor.
- 2.4 Factory Testing (NMU Controllers)
- 2.4.1 Normally, there is no requirement to factory/depot acceptance test pedestrian controllers. However, GCC reserve the right to request and attend FAT under certain circumstances.
- 2.4.2 All testing by the Overseeing Organisation will be carried out within the site acceptance test procedures. Timings for the crossing sequence will be provided by the Overseeing Organisation no later than 10 working days before the controllers are required on site.
- 2.4.3 The controller configuration for crossings with MOVA or any special requirements must be submitted to GCC for checking not less than 10 working days prior to the controller being delivered to site. Exceptionally, GCC may request attendance at FAT.
- 2.4.4 Following configuration of the controller and completion of FAT the Contractor shall deliver and install the controller in its permanent site location provided a permanent 230v main supply is available for connection. The controller shall be installed in accordance with the agreed programme of works and in agreement with the Overseeing Organisation.
- 2.5 Detection Specification
- 2.5.1 Loop detector units shall conform to the latest issue of MCE 0108 "Siting of Inductive Loops for Vehicle Detecting Equipment at Permanent Road Traffic Signal Installations", MCH1542 "Installation Guide to MOVA" and MCH1352 "Technical Guide to SCOOT loop siting"
- 2.5.2 Above ground vehicle detection, shall conform to the latest issue of TOPAS 2505 "Performance Specification for Above Ground Vehicle Detector Systems for use at Permanent Traffic Signal Installations".
- 2.5.3 Above ground on-crossing pedestrian detectors, shall conform to TOPAS 2506 "Performance Specification for Above Ground On-Crossing Pedestrian Detection Systems".
- 2.5.4 Above ground kerbside pedestrian detectors, shall conform to the latest issue of TOPAS 2507 "Performance Specification for Kerbside Detection Systems for use with Nearside Signals and Demand Units".

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2.6 OTU Specification

- 2.6.1 Outstation Transmission Units (OTU) shall conform to the latest issue of TOPAS 2523 'Traffic control Equipment Interfacing Specification'
- 2.6.2 Full compatibility with the Network and Traffic Management Environment Directorate Urban Traffic Control System shall be guaranteed.
- 2.6.3 Preference shall be given to the use of integral UG405 compliant facilities. The use of hard-wire add-on units may be refused by the Overseeing Organisation.

2.7 OMCU Specification

- 2.7.1 Outstation Monitoring & Control Units (OMCU) shall conform to the latest issue of TOPAS 2522 "Remote Monitoring and Control of Traffic Control Equipment via a Telecommunications Network".
- 2.7.2 Full compatibility with Network and Traffic Management Environment Directorate Remote Monitoring System (currently telnet RMS solution) shall be guaranteed. Full monitoring shall be provided, complete with current sensing transformers, detector input leads and the appropriate link cable for add-on/semi-integral installations. The TRN-RS232 connecting cable shall provide full handset communications via the OMCU to the controller both locally (on site) or from the RMS instation. Both controller and MOVA interrogation shall be possible.
- 2.7.3 Each site specific OMCU shall be supplied fitted and tested as part of the controller installation tests for new or refurbishment installations. The RMS configuration file including live update diagrams shall be supplied and loaded prior to works completion ready for testing.
- 2.7.4 Unless fitted to a third-party controller, an integral IP addressable platform shall be supplied. The use of hard-wire add-on units may be refused by the Overseeing Organisation.

2.8 MOVA Unit Specification

- 2.8.1 Microprocessor Optimised Vehicle Actuation Units or Integral facilities (MOVA) shall conform to the latest issue of MCH1542 "Installation Guide for MOVA".
- 2.8.2 MOVA systems are to be supplied as integral, being compatible with the remote monitoring system. The use of hard-wire add-on units may be refused by the Overseeing Organisation.

2.9 Router Specification

- 2.9.1 In order to comply with Network and Traffic Management Environment Directorate UTMC or OMCU system networks, ruggedized ADSL or 3/4/5G routers shall be supplied. This shall include all network cables and ADSL filter units and suitable Ethernet port/connections and switches for additional equipment and remote laptop connection and interrogation.
- 2.9.2 Where more than one controller is to be connected utilising the same communications link, ethernet connections using multi-port ethernet amplification systems, shall be supplied and connected with either armoured 16c cable or 10pr CAT5e powder filled BT type cable.

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- 2.9.3 In circumstances as defined above the controller, UTMC / OMCU / MOVA system shall be capable of remote (MEC) or (system) IP addressable interrogation.
- 2.9.4 The Contractor shall take full responsibility for the setting up of Instation and Outstation routers, including the setting of IP tunnels for full UTMC compliant system communications.

3.0 TRAFFIC SIGNAL STREET FURNITURE

3.1 General

- 3.1.1 All traffic signal street furniture shall be fully type approved and shall conform to TOPAS 2523 "Traffic Signal Equipment Interfacing Specification" and any other current approved standards.

3.2 Signal Pole Specification

- 3.2.1 All traffic signal poles shall be low-level access with vented caps. Poles shall be galvanised prior to the application of **black** plastic coating. They shall not be supplied with pre-drilled holes for push button units. Holes shall be drilled on site as required in accordance with the design or Overseeing Organisation's site instructions.
- 3.2.2 Where a signal pole is to be used in a retention socket the Contractor shall supply the appropriate length signal pole and cable entry system.
- 3.2.3 Where a passively safe pole is specified, the contractor shall supply and install an automated electronic disconnection device for each cable serving that pole. Details of these devices shall be provided to the Overseeing Organisation prior to procurement and installation. The mechanism shall be appropriate to the expected impact failure of the pole; that is, whether the pole will fail by bending or by break-away on impact. A risk assessment shall be provided giving details and including any reasons why passively safe poles are not to be used, if this is the case. It should be noted passively safe poles should be considered for all sites, including those with pedestrian crossings, and not solely restricted to those deemed as high speed.
- 3.2.4 The Contractor shall supply 114mm (base) expanding to 145mm dia poles or similar equivalent with vented caps and lower access door assemblies with integral backing boards. The base of the pole shall be sealed to prevent the ingress of moisture after cable installation or a suitable IP rated enclosure shall be provided.
- 3.2.5 Stub push button unit poles shall be supplied with welded caps and earthed bonded via a brass stud, tapped into the push button unit. Where stub poles carry a nearside display and push button the pole must extend up the whole length of the display unit.
- 3.2.6 All cantilever poles shall be swan neck design with smooth formed internal sections.
- 3.2.7 Tall poles between 6-8m in length shall have vented top caps and large (165/168mm) bases complete with access door and fitted backing board. The base of the pole shall be sealed to prevent the ingress of moisture after cable installation or a suitable IP rated enclosure shall be provided. Where appropriate, hinged type poles compliant to BS EN12767 and EN12899 should be considered for ease of maintenance. Risk assessments should be used to determine any requirement. It should be noted that certain suppliers utilise a 165mm base post. Where these are to be installed in conjunction with NAL RS168DF retention sockets, suitable reducing shims shall be installed.

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- 3.2.8 Mast arms shall comply to Highway Agency design and installation standards. Mast arms may be root fixed or mounted on specifically designed foundations with bespoke holding-down assemblies. Mast arms shall be supplied in segments for site assembly and in accordance with site specific specifications to be provided in works information. The base of the mast arm shall be sealed to prevent the ingress of moisture after cable installation or a suitable IP rated enclosure shall be provided. Rotating type poles compliant to BS EN12767 should be supplied for ease of maintenance. Risk assessments should be used to determine any requirements.
- 3.2.9 Supplier fabrication, erection and wind loading details of tall poles and mast arms must be undertaken and may be requested from the Contractor during the design stage of the project. These details shall be supplied as part of the As Built information.
- 3.2.10 Pole setting out shall take into account adequate and appropriate clearance to all equipment and safe working distances from edge of carriageway and any Road Restraint Systems.
- 3.3 Cabling Specification
- 3.3.1 Low voltage/extra low voltage cabling shall conform to the latest issue of BS EN50525.
- 3.3.2 Inductive loop cable and loop feeder cable shall conform to the latest issue of BS6195.
- 3.3.3 The Contractor shall be responsible for the design of the electrical installation, conformance to standards and specifications and shall issue certificates as required by the regional electricity company and the Overseeing Organisation.
- 3.3.4 Low voltage / Extra low voltage power cable shall be supplied as 1.5mm² and shall be subject to the Contractors review and recommendation for cable specifications for site specific circumstances. Lamp cables shall be 16 core (minimum) steel wire armoured copper cable, PVC insulated sheathing shall be coloured ORANGE and be marked TRAFFIC SIGNALS at 1m intervals. Additional core such as 20 core cable shall be provided as required for installations requiring extra connectivity whilst maintaining a minimum of 4 spare cores or 25%, whichever is greater, on each cable run. Each and every pole shall have its own cable, with the exception of adjacent linked stub poles. Where the contractor can demonstrate that suitable armoured cable terminations can be made, an independent cable run shall be used.
- 3.3.5 Inductive loop feeder cable shall be supplied as 2.5mm² 1/1.38 plain annealed circular copper conductor with 0.7mm radial polyethylene insulation with four cores (2 pairs). Cores shall be laid up in pairs and twisted together, right hand lay, with 5 to 10 turns per metre, bedded in natural polyethylene of 0.8mm nominal radial thickness. An outer sheath of orange polyethylene of 1.4mm nominal radial thickness shall be applied.
- 3.3.6 Two-pair feeder shall be installed unless otherwise agreed with the Overseeing Organisation, with a separate cable allocated to each and every loop. Feeder cables shall be terminated in suitable terminal blocks fixed in the base of the controller with a minimum of 1.0m untrimmed excess feeder cable tied back neatly in the controller case or termination cabinet. The feeder cable cores shall then be soft wired into the controller I/O connectors.
- 3.3.7 Inductive loop cable shall be supplied as 1.5mm² 30/0.25 tinned annealed copper conductor insulated with 0.8mm radial thickness of ethylene propylene rubber (EPR) and sheathed with 1.4mm radial thickness of Polychloroprene (PCP). Overall diameter shall fall within a tolerance of 6.8mm (minimum) of 7.2mm (maximum).

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- 3.3.8 Controller to controller or to miscellaneous cabinet link cabling shall be to the same specification as 16-core extra low voltage power cable or CAT5 Ethernet cable, or other suitable cable to fulfil specification requirements.
- 3.4 Signal Head Specification
- 3.4.1 All traffic signal aspects (excepting regulatory aspects) shall be fitted with either primary or secondary cowls. All backing boards shall have a border of Class 1 retro-reflective material (white) pressure sensitive or vacuum application may be used in accordance with manufacturer's procedures. Application of pressure sensitive material shall take place on dry surfaces. An ambient temperature of 15°C minimum is recommended for satisfactory adhesion. The material shall have a 50mm width throughout. Where the continuous border bridges each backing board/signal head a distinct cut edge shall be made to avoid any subsequent stretching/shrinkage of dissimilar surfaces. The finished border shall be of a neat appearance and not made up of short lengths of cuttings.
- 3.4.2 Regulatory aspects on signal heads shall comply to the latest issue of BS EN12368. Aspects shall be individually fused with an in-line chassis mounted fuse holder within the head. The fuse shall be rated at no more than 1 Amp and shall be easily accessible. Illumination shall be provided by low energy long life type ES or BC lamps.
- 3.4.3 Signal head mounting brackets shall be long enough to provide a minimum of 125° rotational adjustment. Head arrangements susceptible to rotation shall be secured with supplementary fixing brackets. The use of offset brackets shall be minimised and only used with the approval of the Overseeing Organisation.
- 3.4.4 Far side pedestrian heads shall only be used with prior agreement from GCC and shall generally be 'side mounted' wherever possible in order to increase carriageway clearance.
- 3.4.5 Signal lamp dimming to 160V (LV) and 30V (ELV) shall be provided. A software command shall be provided to override dimming settings.
- 3.4.6 Signal aspect lamps shall be M32 or M32L 12V 50W GY6.35 4000 hour or centrally sourced LED's for either LV or ELV voltage installations. Full lamp and red lamp monitoring shall be available for all lamp types. Only ELV lamps shall be installed at new or substantially upgraded installations.
- 3.4.7 The Contractor shall be responsible for installing vehicular signal heads on overhead mast arms and tall signal poles (exceeding 4 metres long) including the hiring of lifting equipment and traffic management. The lamp transformers shall be located in the base of the column of the overhead mast arm and the door and column shall be earthed to current edition wiring regulations. Where signal heads are mounted on lighting columns or mast arm shafts, only one hole shall be drilled for cable entry. Heads shall be mounted by using purpose made clamp brackets. Any holes drilled in columns for cable entry shall be de-burred and a rubber grommet used to seal the edge prior to cabling. Where cables are required to be looped from one head to another, protective tubing such as 'kopex' shall be used, securely fixed and glanded at each end entering the head. Cable terminations shall be fixed in weatherproof housings.
- 3.4.8 It is not standard practice to use street lighting columns for mounting traffic signal heads, however, where lamp columns are approved for use the power supply to the column must be connected to the same mains phase as the traffic signal controller and shall be ELV LED design. Signal heads should only be mounted on lighting columns with prior permission from GCC.

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3.4.9 Where refurbishment works or site-specific details determine that controllers and signal heads from different suppliers may be used, the Contractor shall provide a statement on the performance and compliance of such installations with respect to longevity, maintenance, lamp monitoring and red lamp monitoring. Secondary lamp monitoring systems may only be used with approval from GCC.

3.5 Tactile Equipment Specification

3.5.1 Rotating cone tactile devices shall conform to the latest issue of TOPAS 2508 "Performance Specification for Tactile Equipment for use at Pedestrian Crossings".

3.5.2 The tactile equipment shall consist of a tactile unit and power supply. The power supply shall provide an extra low voltage output to energise the drive mechanism of the tactile unit.

3.5.3 Tactile equipment shall be of the brushless variety and shall be capable of terminating after a pre-determined time without controller conditioning.

3.6 Push Button Unit Specification

3.6.1 Push button units shall be constructed in durable vandal resistant non-combustible material.

3.6.2 Push button switches, 'WAIT'/demand indicators, audible units and rotating tactile devices shall be capable of operating on 48 volts or less.

3.6.3 Push button units are to be fitted with audible units as specified and be capable of accepting rotating tactile devices in addition to the audible unit. A facility shall exist to inhibit the audible signal between 22:00 and 07:30 each day or at any other times as specified. Units shall be in accordance with the latest issue of TOPAS 2509 "Performance Specification for Audible Equipment for use at Pedestrian Crossings".

3.7 Nearside Signal & Demand Unit Specification

3.7.1 Pedestrian nearside signal heads shall be in accordance with the latest issue of TOPAS 2511 "Performance Specification for Nearside Signal and Demand Units". Pedestrian, cyclist and equestrian aspects shall be LED design and fitted with 3M masks or other equivalent means of limiting phantom effects and restricting view angle.

4.0 INSTALLATION STANDARDS FOR TRAFFIC CONTROL EQUIPMENT

4.1 General

4.1.1 All traffic signal equipment shall be set out by the Contractor in accordance with the positions shown on the Contract Drawings with due consideration to the specification. Positions shall be verified on site in conjunction with the Overseeing Organisation prior to the commencement of work. Pole and Cabinet setting out shall take into account adequate and appropriate clearance to any adjacent street furniture, comply with minimum clearance standards to edge of carriageway and safe working distances from Road Restrain Systems.

4.1.2 Responsibility for safe working whilst on site shall lie with the Contractor. Adherence to site specific rules and health and safety documentation issued by the Principal Contractor under CDM is mandatory. In addition, the following working practises, regulations and specifications shall be adhered to:

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- a) Electricity at Work Regulations 1989
- b) Health and Safety at Work Act 1974
- c) Management of Health and Safety at Work Regulations 1999
- d) The Construction (Design and Management) Regulations 2015
- e) COSHH regulations
- f) Latest Edition IEE Regulations for Electrical Installations (BS 7671:2018 IET Wiring Regulations 18th Edition)
- g) Chapter 8 Traffic Signs Manual.
- h) Chapter 6 Traffic Signs Manual.
- i) CD 123 Geometric design of at-grade priority and signal-controlled junctions.
- j) CD 116 Geometric design of roundabouts.
- k) TA 101 Traffic signalling systems (appraisal)
- l) TD 101 Traffic signalling systems
- m) TM 101 Traffic signalling systems (maintenance and operation)
- n) TS 101 Traffic signalling systems (inspection and assessment)
- o) The Traffic Signs Regulations and General Directions
- p) MCE 0108 Siting of Inductive Loops for Vehicle Detecting Equipment at Permanent Road Traffic Signal Installations
- q) MCH1352 Technical Guide to SCOOT Loop Siting
- r) MCH1542 Installation Guide for MOVA
- s) EMC Regulations

4.2 Controller

- 4.2.1 The controller shall only be installed once a permanent mains power supply is available.
- 4.2.2 The controller shall be installed on a NAL root foundation (Black finish) or with prior agreement on a standard root foundation at the location detailed on the Contract Drawings. The NAL foundation shall be fitted with a BT variant integral housing. The Contractor shall ensure that the detector fault monitor lamp is visible from the main carriageway without the need to open any doors and that when standing with the controller door open, optimum view of the junction is obtained. Access to controller cabinets shall be free from any obstruction. The Contractor shall provide a separate 50mm diameter duct (grey) for a telemetry connection, which shall terminate above the final base seal level. The duct entry shall be sealed to prevent the ingress of moisture, but the seal shall be removable to allow telemetry equipment to be installed subsequently. This duct should terminate in an adjacent BT network chamber, subject to approval by British Telecom and be supplied for incoming services or future service use.
- 4.2.3 Sealing grommets shall be used with NAL foundations. Controllers mounted on a root-based plinth shall be sealed at base level. Following the termination of all signal cables the standard base void shall be backfilled with dry compacted sand. This shall be sealed by a 6mm thick epoxy resin to form a water and airtight seal.
- 4.2.4 All traffic signal controller cabinets shall be permanently numbered externally with the site maintenance number as advised by the Overseeing Organisation. Numbers shall be self-adhesive with a character height of 50mm and coloured black on white. Numbers shall be positioned such that they are visible from the adjacent road network.
- 4.2.5 The Contractor shall arrange for training to be given for any new software or modifications to the controller or any other item supplied which has not been previously used.

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- 4.2.6 The Contractor shall supply a suitable schedule of spares and replacement spares to cover all proprietary equipment supplied.
- 4.2.7 Where controller configuration is to be carried out by the contractor, they shall also include the supply of the configuration data in electronic format issued by email to the Overseeing Organisation. Two hard copies of the controller specification printout, (1no to be left in the controller) shall be supplied to the Overseeing Organisation on completion of the FAT. The Contractor shall also supply a draft configuration in test file format and PDF format 10 working days prior to the FAT to enable a review by the Overseeing Organisation.
- 4.3 Detection
- 4.3.1 The Contractor shall install all vehicle detector units in accordance with the manufacturer's instructions ensuring that operational tolerances are achieved. Loop detector units shall be installed and terminated in the controller's intelligent backplane and detector racking. Detector units specific to SCOOT UTC shall be installed in the detector racking integral to the Outstation Transmission Unit (OTU) or clearly segregated if integral systems are installed.
- 4.3.2 All loop detector units shall be suitably labelled on the adjacent racking identifying each channel with its associated input.
- 4.3.3 Detector sensitivity and frequency settings shall be adjusted to achieve optimum performance for the detection system in operation. Crosstalk between adjacent channels shall be eliminated. The Contractor shall adjust the sensitivity and presence time of each detector channel to the requirements specified by the Overseeing Organisation within the ranges specified in TOPAS 2512. The Contractor shall demonstrate the correct operation of the detector at the sensitivity for all classes of vehicles including cyclists.
- 4.3.4 Adjacent stop line loops (particularly those designed as rectangles) shall be call delayed in the phase red period. Where these detectors are also used as MOVA detectors the call delay shall be applied to the MOVA detector output (Mdetxx).
- 4.3.5 Vehicle detection may also be specified as above ground detectors, either digital view, image-processed, microwave or infrared technology. These detectors shall conform to TOPAS 2505. Power supplies to above ground detection shall be 24 volts and located in controller.
- 4.3.6 Other detection systems such as 'magnetometers' or above ground systems may also be specified. Details of specialist suppliers and products may form part of site-specific works information, with products either free issued to the Contractor for installation, separated into specialist contracts or as nominated contractors. The Contractor may be consulted during the design stage with reference to such systems, however, it is GCC's preference that loop based systems be used wherever possible and the Developer must validate his reasons for deviating from this standard. GCC reserve the right to not accept certain systems on a site by site basis or if the reason for non-use of loops is due to financial considerations only.
- 4.4 OTU
- 4.4.1 The Contractor shall install Outstation Transmission Units (OTU) / UG405 or integral systems, including associated SCOOT detection and router in its appropriate cabinet. The configuration of each unit site address and data mapping shall be carried out by the Contractor in accordance with the specification.

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4.4.2 Functionality of the unit shall be demonstrated fully during the SAT including the checking of SCOOT detector inputs and Force/Reply bits. Production and downloading of the .CSV files shall be the responsibility of the Contractor.

4.4.3 A semi-integral unit shall have its own fused auxiliary power supply, suitable rated and marked accordingly.

4.5 OMCU

4.5.1 The Contractor shall install the Outstation Monitoring Unit (OMCU) or integral facility in its appropriate controller cabinet as identified in the scheme specific details. All connections/torroids shall be made on the controller side of incoming cable terminations. The configuration of each OMCU shall be carried out by the Contractor to the Overseeing Organisation's requirements at the time of commission, including instation configuration, and working graphic mimic.

4.5.2 A semi-integral OMCU shall have its own fused auxiliary power supply, suitably rated and marked accordingly.

4.5.3 The OMCU may be specified as ADSL/Wireless or GSM module as detailed in works information. Where the unit is GSM/Wireless, the Overseeing Organisation shall free issue a data enabled SIM card. Stratos or telent RMS equivalent IP addressable monitoring shall be supplied and set up using a suitably configured router.

4.5.4 Supplied units shall be fully compatible with the current version of Remote Monitoring Instation software and hardware. Currently telent RMS solution.

4.5.5 Where the unit is also configured for MOVA the following clauses shall also apply.

4.6 MOVA UNIT

4.6.1 The Contractor shall install Microprocessor Optimised Vehicle Actuation (MOVA) unit or integral facility in its appropriate controller cabinet as defined in the scheme specific details.

4.6.2 The MOVA unit shall be either integral or communicate with the controller via the RS232 port. The detector inputs shall be made directly from the detector units to the MOVA equipment for add on installation. For serial / integral installation, all detector inputs shall be nominated in the controller I/O allocation.

4.6.3 The MOVA unit shall have its own fused auxiliary power supply, suitable rated and marked accordingly.

4.6.4 The Contractor shall supply MOVA licence details where appropriate to the Overseeing Organisation.

4.6.5 Preference shall be given to Integral control systems. Hard-wired add on hardware may be refused by GCC.

4.7 Router

4.7.1 The Contractor shall install the router in an appropriate position in the controller racking ensuring that Ethernet connections are available for laptop interrogation.

4.7.2 The Contractor shall be responsible for connecting the router and setting up BT or similar connections and terminations including where necessary UTC IP tunnels. Internal

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settings such as I.P. addressing, shall be carried out in conjunction with the Overseeing Organisation.

4.7.3 The router shall have its own fused auxiliary power supply, suitably rated and marked accordingly.

4.8 Signal Poles

4.8.1 Signal Poles shall be installed at the positions shown on the Contract Drawings. Position and pole types shall be verified on site in conjunction with the Overseeing Organisation.

4.8.2 All traffic signal poles shall be permanently numbered. Pole numbers shall be self-adhesive, incorporating a character height of 50mm and coloured white on black. The numbers shall be sited at a minimum height of 2.1m and located so that they are visible from the controller.

4.8.3 Where signal poles are to be installed in retention sockets, the Contractor shall be responsible for erecting the poles unless otherwise agreed with the Overseeing Organisation. A suitable method / machine shall be used to erect the poles safely and ensure verticality. Waterproof grommets and reducing shims shall be installed at pole and socket interface as required. The pole restraint system, as issued by the manufacturer, shall be installed.

4.9 Cabling

4.9.1 For modification works all LV and ELV voltage cable runs between the controller and signal poles or an adjacent controller or termination cabinet, shall include for a minimum of 4 spare cores or 25% whichever is greater throughout their length. All cables shall connect directly between the controller and each pole, except where termination cabinets are employed. For new installations the same capacity standards shall apply, but only ELV systems shall be utilised.

4.9.2 Extra low voltage cores shall be terminated on separate terminal blocks to low voltage cores.

4.9.3 For modifications works, low voltage cables shall not utilise the same ducts as extra low voltage cables. For new installations, only ELV supplies shall be used.

4.9.4 Signal cables shall not pass through ducts or inspection chambers used for or by any other services. Similarly, no other service shall utilise the traffic signal duct and chamber system. The contractor shall bring to the attention of the Overseeing Organisation any deviation from these standards.

4.9.5 Two turns of all signal cables shall be left in the traffic signal access chamber at the base of each signal pole. Two turns of loop and feeder cable shall be left in each traffic signal access chamber at each joint location.

4.9.6 With the exception of cable joints between loop and feeder cables or terminations made in MEC's, no other joints shall be permitted in the cable runs.

4.9.7 All unused cores returned to the controller shall be neatly secured and connected to earth. All unused cores between pole cap terminations shall be connected to earth at one pole top. Sufficient terminals and termination points shall be provided at the controller to accommodate neutral and earth connections.

4.9.7 All cables including detector loop feeders and push button supplies, shall be permanently labelled at the controller as to their function and destination. Cable core terminations at

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all other locations shall be permanently labelled as to their function, origin and destination.

- 4.9.8 Cable identification shall be provided at each road crossing or controller drawpit using a pull-tag or equivalent approved system.
- 4.9.9 All draw ropes shall be replaced in each duct following/during cable installation procedures.
- 4.9.10 The Contractor shall complete and return to the Overseeing Organisation details of the cable layout proposals or confirm any cable design details issued on drawings or works schedules at least four weeks prior to each installation. Final As-Built record sheet shall be submitted for approval at the time of site acceptance.

4.10 Signal Heads

- 4.10.1 All signal heads shall have a minimum vertical clearance of 2.1m from finished ground level unless overhanging a cycleway in which case a minimum vertical clearance of 2.4m shall be provided. The minimum clearance between any signal head arrangement to the nearest kerb edge shall be 600mm (40mph or greater roads) or 450mm (30mph roads).
- 4.10.2 The alignment of signal heads shall be carried out in accordance with the Overseeing Organisation's siting instructions at the time of commissioning. The Contractor shall ensure that all cable and kopex links between signal heads and poles are of sufficient length to allow correct alignment.
- 4.10.5 The contractor shall be aware that designs may utilise various techniques to achieve clearance of signal apparatus from the carriageway edge. This may include side mounting equipment on straight poles or rotating straight poles by 45 degrees in the retention socket. Swan neck poles may also be specified. The contractor shall ensure that adequate rotation of heads for correct alignment can be achieved especially where close associated offside signals are erected.
- 4.10.3 During installation and up until the time of commission, all signal heads, pedestrian heads and demand units not in use shall be securely covered using purpose made orange opaque bags. Covers shall be removed at the time of commissioning in accordance with the Overseeing Organisation's instructions. Covers shall be re-applied should the signals not be accepted or the signal switch-on delayed to an alternative date.

4.11 Tactile & Audible Equipment

- 4.11.1 Tactile and audible unit power supplies shall be mounted in the nearest pedestrian signal head displaying the relevant signal phase.

4.12 Demand Units and Nearside Displays

- 4.12.1 Push button units or demand units shall be mounted so that the centre of the push button is between 1.0m and 1.1m above the finished footway level. Except where installed in islands, they shall be angled away from the kerb slightly (normally at 25°) to enable pedestrians standing at the kerbside to see the "WAIT" or 'Demand' indicator or nearside red man / green man display. In islands, the units shall be installed parallel to the kerb. Reference should be made to the Contract Drawings and the Overseeing Organisation's siting instructions for individual site requirements. Any potential for 'see-through' shall be reported to the Overseeing Organisation at the time of installation.

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4.13 Slot Cutting Operations

- 4.13.1 Installation shall not commence until carriageway surfacing and road marking refresh / installation is complete, and positions have been verified by the Overseeing Organisation. The Contractor shall be responsible for determining number of turns per loop for all detection systems unless otherwise informed by the Overseeing Organisation. The Contractor's supervisory staff shall check the quality of workmanship before laying cable and backfilling.
- 4.13.2 In order to minimise damage and contamination to their mains supply, water companies require that Contractors use a double non-return valve assembly on their standpipe when it is connected to a hydrant. The Contractor shall arrange for a water supply from a nearby fire hydrant to be made available for slot cutting operations. Five working days' notice of intention to use a hydrant must be given to the water supply company in order that the necessary permission may be obtained.
- 4.13.3 A water bowser will be required where a hydrant is not available or where a carriageway crossing is necessary. Hoses must not be laid across the carriageway unless it is closed to traffic.
- 4.13.4 Slot cutting shall not be conducted in wet weather, or when the ambient temperature or road surface temperature is below 0°C.
- 4.13.5. Loop positions shall avoid areas of poor reinstatement in the road surface. Slots shall be cut at least 1 metre from any such disturbance or from any ferrous objects such as manhole covers.
- 4.13.6 Slots for loop cables shall have a width of 10.0mm with a tolerance of +2.0mm/-0.0mm. The slot width shall exceed the maximum diameter of the loop cable by at least 2.0mm. The depth of each slot shall be checked by the Contractor with a depth gauge at intervals along the whole length of the slot. The depth of loop slots shall be (65 + 7.0n)mm with a tolerance of +10.0mm/-0.0mm. In concrete surfaces the depth shall be (25 + 7.0n)mm with a tolerance of +5.0mm/-0.0mm where 'n' is the number of cables and the first figure is the minimum depth of cover.
- 4.13.7 Where an angle of 100° or more acute is formed at the junction of two adjacent loop slots, the slot junction shall be truncated with a saw cut at the apex of the junction.
- 4.13.8 Slots for loop tails shall be 15mm wide, with a tolerance of ± 3mm. The slot width shall exceed the maximum width of the loop tails by at least 2.0mm. The depth of the slot shall be 65mm in bituminous surfaces (45mm in concrete surfaces) with a tolerance of + 10/0mm/-0.0mm.
- 4.13.9 Slots for loop tails shall be cut along the crown of the road wherever this is possible but should be least 300mm from any longitudinal asphalt joints. This slot should be installed so as to not obliterate any road markings in whole or part.
- 4.13.10 Loop tails and feeder cable shall be joined in footway boxes and identified at both feeder cores and loop tails.
- 4.13.11 For vehicle actuation operation each loop shall be separated from adjacent loops by a minimum of 300mm unless agreed otherwise with the Overseeing Organisation. Loops operating the MOVA system shall be offset from lane lines and kerbs by distances specifically provided for each installation. Generally, loops shall be set out 0.4m from the kerb and 0.8m from adjacent lane lines. A minimum distance of 3.0m shall be maintained between these loops and any adjacent bus priority, SCOOT or queue loops.

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- 4.13.12 Debris and silt shall be cleared from the base of the slot and the slot blown dry with compressed air prior to cable laying. The Contractor shall ensure that the cable lies evenly in the bottom of the slot and shall secure the cable in such a position if necessary. Sharp implements shall not be used to seat the cable in the slot.
- 4.13.13 Loop tails shall be twisted and separately taken back to the joint box so as to enable any single loop to be disconnected from the feeder cable. Joints shall be made using jointing kits complying with latest version BS EN60529 (IP68 CAT1). All cable joints shall be made using screw terminal open pot reusable connectors. The joint shall be made in accordance with the manufacturer's instructions.
- 4.13.14 The Contractor shall ensure that all slots are clean and dry immediately prior to backfilling and that all silt and debris has been removed from the slot.
- 4.13.15 Slots shall be backfilled with a low viscosity epoxy resin, approved by the Overseeing, to give a minimum of 10mm cover above the uppermost cable. The resin shall be poured at a viscosity of between 50 and 100 poise. The remaining volume of loop slot shall be backfilled with blown grade hot oxidised R85/40 or R85/25 bitumen to the level of the road surface. Where alternative backfill products can be sourced to comply with risk reduction and COSHH regulations the Contractor shall provide suitable alternatives.
- 4.13.16 For modification works slots through kerb edges shall be formed at natural kerb joints where possible and be backfilled with a layer of resin, followed by hot pour bitumen in several layers to fill the slot flush with the adjacent kerb. Any recess in the kerb remaining shall be grouted with sand / cement mortar.
- 4.13.17 Where partial excavation of the footway is required to access stub duct ends, the exposed loop tails shall be covered with resin and then bitumen in several layers as necessary after sealing the end of the stub duct and prior to reinstatement of the footway with cold setting asphalt and sealing with hot pour bitumen.
- 4.13.18 At new installations or more major refurbishment works, the loop tails shall be laid into a loop carriageway box type NAL D400 or approved equivalent. The carriageway loop box shall be connected to an adjacent loop chamber in the footway / verge by way of a 100mm dia or 50mm dia smooth bore orange under-kerb duct. There shall be a maximum number of three loop tail pairs cut into any carriageway loop box with only one pair on each side of the box. After loop installation has been completed, the end of the duct in the loop carriageway box shall have a small amount of expanding foam inserted to prevent detritus from blocking the duct. Where slots in the carriageway loop box are not used then blanking plates shall be placed over the inside faces as supplied by the manufacturer.
- 4.13.19 Should loop re-cutting be necessary, the loop carriageway box shall be re-opened, the expanding foam broken out and the reinstatement operation repeated without any disturbance to the carriageway or footway finishes.
- 4.13.20 Loop tail cable slots shall be backfilled with low viscosity epoxy material around the cable. The upper 20mm of the slot shall be filled with hot oxidised bitumen R85/40.

5.0 COMMENCEMENT OF WORKS AND SITE DECOMMISSIONING

5.1 Commencement of Works

- 5.1.1 Works shall only commence following approvals granted by the Network and Traffic Management Environment Directorate NRASWA Street Works Coordinator, with all works being subject to appropriate notices and approvals granted under this system.

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- 5.1.2 Works shall only commence following submission and approval by the Overseeing Organisation of the Contractors works programme. The works programme shall be submitted using either MS Project or Excel and shall identify all works activities and key milestones in the procurement, lead-in, site installation and testing/ commissioning processes.
- 5.1.3 Works shall only commence following submission and approval of the Contractors developed Health and Safety Plan information which shall include site specific information.
- 5.1.4 Failure to comply with the above requirements will place the Contractor at risk for future tendered schemes.

5.2 Site Decommissioning

- 5.2.1 Decommissioning of existing sites prior to removal or refurbishment shall be specified in site specific works instructions and drawings. Signals shall only be switched off with the prior permission of the Overseeing Organisation and with site specific Traffic Management in place, and certification of power isolation and disconnections.
- 5.2.2 Site specific Traffic Management shall either be provided by the Principal Contractor or the Contractor. Where Traffic Management is to be supplied under this contract the Contractor shall employ suitable qualified staff or Contractors to undertake these works. Site specific works information shall highlight requirements.

6.0 COMMISSIONING AND SITE ACCEPTANCE

6.1 General

- 6.1.1 Commissioning of traffic signal installations shall only be undertaken when all works, including surfacing, reinstatements, signing, pedestrian guard railing and road marking activities are complete. The traffic signals installation shall be totally complete and pre-tested by the Contractor prior to attendance by the Overseeing Organisation.
- 6.1.2 The Contractor shall demonstrate to the Overseeing Organisation satisfactory operation of the installation at site acceptance test in accordance with the test schedule contained in this specification or other agreed schedule. On completion of the tests the site acceptance certificate shall be completed by the Contractor and the Overseeing Organisation. A certificate shall be awarded provided the site is deemed to be operating satisfactorily. Any incomplete works or failed tests of a minor nature shall be noted on the interim certificate. A full completion certificate shall only be awarded to the Contractor after expiration of the maintenance period. The maintenance period shall only commence when ALL works are fully complete and tested. The maintenance period shall typically be 28 days fault free but may be defined as a longer period in works specifications.
- 6.1.3 The Overseeing Organisation shall be given a minimum of 10 working days advance-notice for the site acceptance testing by the Contractor. The Contractor shall allow one clear working day to undertake testing of the installation ensuring all resources are retained for the duration of the testing procedure.
- 6.1.3 Green conflict and red lamp monitoring tests shall be performed on all signal installations.

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6.2 Insulation Resistance Tests

- 6.2.1 The insulation resistance of each cable and their individual cores shall be tested using impedance test voltages of 500 volts' dc. for a period of one minute. The test shall be carried out as follows with the specific tolerances noted.
 - 6.2.1.1 Before each cable is glanded to its earth point, an insulation resistance test shall be carried out between the earth and armouring, earth and each cable core and each cable core to armouring.
 - 6.2.1.2 All tests results shall record an impedance greater than 20 Megaohms, with the actual reading recorded by the Contractor.

6.3 Loop / Feeder Tests

- 6.3.1 With the feeder cables jointed to their inductive loops, the total series resistance of each loop/feeder circuit shall be tested. The total series resistance shall be less than 5 ohms, with actual results recorded by the Contractor.
- 6.3.2 Where armoured feeder cable is installed with the feeder cables jointed to their inductive loops, the armouring of the feeder cable shall be connected to its earth point and the impedance of the feeder cores to earth shall be tested. The impedance of the feeder cores to earth shall be greater than 20 Megaohms. Non-armoured feeder cable shall normally be installed.

6.4 Earth Fault Loop Impedance Tests

- 6.4.1 Earth continuity and bonding shall be demonstrated through earth fault loop impedance testing of the controller, supply pillar and each low voltage signal pole on site.

7.0 **DEFECTS CORRECTION PERIOD MAINTENANCE AND WARRANTY.**

7.1 Maintenance

- 7.1.2 The Contractor shall provide maintenance and fault attendance for the installation in addition to the Defects Liability or Warranty period commencing from the acceptance of the traffic signal installation. The Maintenance Period may be 12 months or 28 days as stipulated by the Overseeing Organisation in the works specification. When the Maintenance Period is identified as being 28 days, this shall be a 28-day fault free period, the period re-starting after replacement or repair of defective components having been completed and reported in writing to the Network and Traffic Management Environment Directorate. This does not relieve the Contractor of his obligations under the Defects Liability Clause.
 - 7.1.3 Maintenance standards shall accord with the latest issued of TM 101 Traffic signalling systems.
 - 7.1.4 All goods and materials used by the Contractor in carrying out his obligations under the Contract shall be in accordance with the technical specification appropriate to the equipment and in accordance with current approved standards.
 - 7.1.5 The Contractor shall execute the works from a designated maintenance facility adequate for receiving fault reports and shall maintain the equipment supplied under the contract throughout the Defects Liability Period or other agreed duration. The Contractor shall

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provide all the necessary labour and equipment including spares to provide the maintenance service set out below.

- 7.1.6 An attended service to receive and record faults notified in respect of the equipment supplied and installed, covering 24 hours a day, 7 days a week (inclusive of Public Holidays). The contractor shall be responsible for locating the cause of all faults (including software and system faults where applicable) and identifying these to the Overseeing Organisation or GCC.
- 7.1.7 Notification of arrival on site and departure shall be made verbally by telephone. Written confirmation of clearance shall be made within 24 hours by email or via fault management systems where applicable.
- 7.1.8 Maintenance standards shall be the same as those in force under the GCC maintenance contract at the time of commissioning.

Fault Classification

- a) Urgent Fault - The following events shall be classified as Urgent Faults during the hours 05:00 to 21.00 each day.
- All Signals Unlit
 - Signals failing to change
 - Defective signals likely to cause abnormal traffic conditions or danger.
 - Equipment damaged and in a dangerous condition.
 - Tactile devices not working.
 - Red lamp failures
- b) Non-Urgent Fault
- All other faults not covered by the above

7.2 Warranty

- 7.2.1 A twelve-month warranty shall be provided, from the date of site acceptance of the equipment. Under warranty, the Contractor shall replace or repair all parts found to be defective by reason of faulty design, materials or workmanship. The repaired, or replacement parts shall be delivered and installed free of charge to the site location by the Contractor.
- 7.2.2 During the first twelve months of service excluding the initial 28-day fault free period the controller shall not exceed more than four firmware or hardware related faults resulting in junction control failure. Should the controller fail to perform to this service requirement, the Contractor shall replace it with another new controller of proven reliability meeting the same hardware and software specification of the original. A further twelve-month warranty shall then be given on the replacement controller.
- 7.2.3 LED aspects shall be supplied with a 5-year warrantee.

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8 DOCUMENTATION AND TRAINING

8.1 General

- 8.1.1 All control equipment supplied together with related hardware shall be offered with one complete set of User Manuals detailing procedures for the installation, operation and maintenance of the equipment.
- 8.1.2 Duplicate bound copies of the configuration specifications shall be handed over at the time of site acceptance together with final 'installed' record sheets. Any RAM data changes introduced at the time of commissioning shall be noted at this time and included in a RAM data record sheet to be appended to the manufacturer's configuration specification.
- 8.1.3 A logbook shall be supplied and annotated with the controller maintenance reference number, any MOVA licensing information such as LIN, LIF etc and IP addressing. The book shall be pro-formed with date, time on / off site, reason for visit, actions taken and signature columns.
- 8.1.4 The site acceptance certificate shall be signed and handed over to the Overseeing Organisation complete with one full set of keys to access all parts of the control equipment, at the time of site acceptance.
- 8.1.5 All relevant test certificates compliant with the site acceptance testing shall be submitted to the Overseeing Organisation within 72 hours of the tests being carried out. An As-Built CAD drawing shall be supplied based on the Overseeing Organisation's design drawing detailing relevant site changes and accurately locating equipment and detection details. The drawing shall be issued to the Overseeing Organisation in electronic format within 14 working days of acceptance.
- 8.1.6 The Contractor shall retain sufficient records to provide replacement EPROMs or Configuration files in the event of EPROMs becoming damaged or requiring modification. A PDF file and an electronic version of the Controller Configuration shall be issued to the Overseeing Organisation within 14 working days of acceptance.
- 8.1.6 Equipment training shall be supplied to the Overseeing Organisation if requested during factory / site acceptance testing for any section of equipment relating to the traffic signal control system.

9.0 POST COMMISSIONING ALTERATIONS

9.1 Controller Configuration Data Changes

- 9.1.1 Following acceptance of the signals, the Overseeing Organisation may order alterations to the controller EPROM or Configuration file to incorporate minor changes and or post commission RAM data changes. The EPROM or Configuration file shall be supplied with all supporting documentation updated as necessary.
- 9.1.2 Revisions shall be allowed for under Provisional Item rates provided at the time of site-specific works tender.
- 9.1.3 Should the intersection exhibit faulty / undesirable operation which in the opinion of the Overseeing Organisation cannot be left without immediate attention, the Contractor shall accelerate attendance and support and make all efforts to provide an immediate temporary fix to the problems by utilising download or site EPROM revision facilities.

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10.0 PROVISION OF ELECTRICAL AND COMMUNICATION SERVICES

10.1 Permanent Services, Electrical Supply

10.1.1 The Overseeing Organisation or Principal Contractor shall arrange for a 230 Volt 50Hz AC power supply, terminated in a feeder pillar or other suitable enclosure and fused at between 60 and 80 Amps.

10.1.2 Should the Contractor be required to supply the feeder pillar this work shall be nominated in site specific works information.

10.2.3 Should the Contractor be required to supply and fit a mains meter; this work shall be nominated in site specific works information.

10.1.3 The fuse rating shall provide suitable discrimination between all safety isolators, cut-outs and controller.

10.1.3 Feeder Pillars shall be fabricated from 3mm (min.) thick hot galvanised mild steel with either galvanised or black paint finish. The pillar shall have a flush fitting hinged door with tri-head or similar screw locks. The earth terminals on body and door shall connected with 10mm² earth strap. The internal backing board shall be of 9mm thick external-grade plywood suitable for housing a 100amp cut out, meter (as instructed), isolator and main earth block.

10.1.4 The Contractor shall supply and install a suitable fused isolator with appropriate rating and current characteristics, confirming to the latest issue of BS EN60947 Parts 1-7 "Specification for Low-Voltage Switchgear and Control Gear". The isolator shall be mounted on the feeder pillar's mounting board and shall incorporate a double pole switch 230 Volt 50 Hz ac. The unit shall be fitted with integral 'locking off' facilities within an IP54 (min.) rated housing. The unit shall incorporate fully shrouded or enclosed clamp type cable connectors and shall be capable of accepting 16mm² meter tails.

10.1.5 An installation certificate shall be provided by the Contractor certifying his work to be in accordance with BS7671: Requirements for Electrical Installations; IEE Wiring Regulations latest Edition.

10.1.6 The Contractor shall supply and install a steel wire armoured 6mm² (or other appropriately rated) live, neutral and earth cable between the feeder pillar and the controller cabinet.

10.1.7 The Contractor shall provide and install an additional supplementary 10mm² earth bonding conductor between the feeder pillar and the traffic signal controller.

10.1.8 An Earth Rod system compliant with the 18th Edition IEE wiring Regulations shall be fitted as required.

10.2 Permanent Services, Monitoring and Communications

10.2.1 Unless otherwise specified communication for RMS solutions and UTC shall be wireless with suitable cabinet or aerial mounted antenna. Data enabled SIM cards shall normally be supplied by GCC but may be directed to be ordered by the Principal Contractor.

10.2.2 Copper or Fibre Optic Telecommunications supplies shall be ordered by GCC but may be directed to be ordered by the Principal Contractor.

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10.2.3 The Contractor shall be required to make final connections between line termination units and supplied modems or routers and prove acceptable performance of the communication circuitry.

11.0 TRAFFIC MANAGEMENT REQUIREMENTS

11.1 Traffic Management associated with junction installation and refurbishment works shall generally be supplied and maintained by the Principal Contractor. Traffic Management may be ordered from the Contractor with site specific works information. These works shall be undertaken using suitably qualified staff or approved specialist contractors.

11.2 Traffic management for slot cutting operations shall normally be provided by the Contractor and shall comply with the recommendations of Traffic Signs Manual Chapter 8 as appropriate to the statutory speed limit applicable to the Site. The Contractor shall submit details of his proposals to the Overseeing Organisation for approval prior to commencing works.

12.0 SITE WORKING HOURS

12.1 Operations affecting traffic flow are to be undertaken outside of peak traffic hours (Peak hours being Mon to Fri 07:00 to 09:15 and 15:15 to 18:00). Where slot-cutting is carried out outside normal working hours the work shall include Contractor's supervising staff time in attendance during such operations.

13.0 MINOR CIVIL ENGINEERING REQUIREMENTS FOR TRAFFIC SIGNALS

13.1 Civil engineering works shall normally be supplied by the Principal Contractor. In the event that minor civil engineering works such as duct, drawpit, signal pole and signal controller root installations are required of the Contractor a separate works specification and works information pack shall be issued. Should no other information be supplied, the following standards shall be used.

13.2 The number and position of ducts shall be detailed on scheme specific design drawings.

13.3 All chambers shall be "Style Y" twin wall construction STAKKA-box type or equivalent, with a 12mm LDPE integrated base, with a pre-drilled 50mm diameter soak away hole in the centre of the chamber, as supplied by NAL Ltd or equivalent.

13.4 All chambers shall have covers and frames fitted. These shall conform to EN124 standard and be Class B125 (12.5 tonnes) Warwick composite covers with extra deep galvanised steel raising frames, unless C250 or D400 (40 tonnes) type covers and frames are specified on the scheme drawings.

13.5 All frames shall be secured to the chamber by means of bolts. All covers shall be clearly embossed with the words "Traffic Signals". Chambers shall have a 150mm backfill around the chamber using ST2 concrete, unless manufacturers details stipulate otherwise. In unmade verges, all covers, and frames shall have a ST4 concrete surround formed from wood shuttering to extend 300mm from each side and 150mm deep.

13.6 Access chamber types are detailed in GCC standard details.

13.7 Retention Sockets are detailed in GCC Standard Details.

13.8 Ducts shall be H.D.P.E / M.D.P.E, high impact resistant smooth inner bore, a minimum 5mm wall thickness and orange in colour, with an internal diameter of 100mm and clearly

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marked "TRAFFIC SIGNALS" in white lettering at ONE metre intervals. Orange smooth bore ducts of 50mm dia may be used from the electric supply housings to the controller.

- 13.9 No preformed bends shall be permitted along the duct runs, except with the prior written permission of GCC.
- 13.10 Corrugated ducting will NOT be permitted on site without the prior written approval of GCC.
- 13.11 All 100mm ducting shall be proven, by the Contractor passing a 90mm mandrel through the whole length of the completed ducting.
- 13.12 All ducts shall be fitted with nylon drawstrings between access chambers and shall be flushed clear, using compressed air, prior to installation of traffic signal cables.
- 13.13 Ducts shown on the drawings for the use of traffic signal cables shall not be used to carry any other type of service. ELV and LV traffic signal cables must be separately ducted.
- 13.14 The minimum cover for ducts laid in the carriageway shall be 750mm.
- 13.15 Where ducting in the carriageway has less than 750 mm cover, reinstatement proposals shall be agreed with GCC before works are undertaken. Alternatively, NAL multi-duct systems may be proposed for approval.
- 13.16 The minimum cover for ducts laid in the footway/verge shall be 450mm.
- 13.17 The location of all new ducts and drawpits shall be accurately shown on contractor supplied As-Built drawings.
- 13.18 The Contractor shall take particular care when working in the vicinity of existing statutory undertakers (SU) ducting and apparatus. Protection shall be provided, and disturbance minimised. SU representatives shall be given adequate prior notice should any excavation, moving or backfilling of their service ducts or other apparatus be necessary. The Contractor shall comply with the Special Requirements of the SU companies.
- 13.19 Where new ducts are installed into existing drawpits, the ducts are to be cut flush with the drawpit walls or have maximum protrusion of 50mm. Ducts must not be installed through the base of drawpits as this leaves them susceptible to blockage through muck and debris falling into the chamber over time.
- 13.20 Trial excavations under the supervision of the Overseeing Authority shall be undertaken in areas where Statutory Undertakers apparatus are identified as being in close proximity or where existing duct runs are to be captured within new drawpits.
- 13.21 Site clearance drawings shall identify the removal of traffic signal equipment and pole retention systems / drawpits. Redundant signal equipment shall be taken to the GCC stores for maintenance stock or to tip off site.
- 13.22 The Contractor shall conform to environmental regulations and requirements for all civil engineering or site clearance activities.

**DEVELOPER INFORMATION PACK
TRAFFIC SIGNAL, INTELLIGENT TRANSPORT SYSTEMS AND ASSOCIATED CONTROL
EQUIPMENT.**

14.0 STANDARD DRAWINGS

- 14.1 All works shall conform to the Overseeing Organisations Standard Construction drawings issued and updated under this contract. Any deviation shall be agreed with GCC prior to works being carried out.

**DEVELOPER INFORMATION PACK
TRAFFIC SIGNAL, INTELLIGENT TRANSPORT SYSTEMS AND ASSOCIATED CONTROL
EQUIPMENT.**

APPENDIX B

**FORMS OF COMPLETION AND INSPECTION
FACTORY ACCEPTANCE TEST CERTIFICATE**

I/We being the person(s) responsible (as indicated by my/our signatures below) for the Inspection and Test of the electrical equipment as indicated on page 1 of the Test Schedule CERTIFY that the said equipment is to the best of my/our knowledge in accordance with the Regulations for Electrical Installations published by the Institution of Electrical Engineers latest Edition and the attached Factory Acceptance Test Schedule as demonstrated on this day except for departures, if any, stated below.

The following tests have failed to comply with either the TOPAS 2500 forms as completed by the Designer or the Specification or DMRB Specifications.

List of departures/test failures.

The above tests shall be demonstrated at a subsequent FAT to be arranged within one week.

.....

.....

The above tests shall be demonstrated at SAT in addition to the SAT test schedule.

.....

.....

(Delete as appropriate).

This equipment may be delivered to site for installation and further testing as detailed above and in accordance with the SAT test schedule.

Designers signature

Purchasers signature

Signal Company Engineers Signature

**DEVELOPER INFORMATION PACK
TRAFFIC SIGNAL INSTALLATION**

**APPENDIX B1
FACTORY/SITE ACCEPTANCE
TEST SCHEDULE
FOR TR2500 CONTROLLER**

| | |
|-------------------|--|
| CUSTOMER: | |
| SITE NAME: | |
| SITE REFERENCE: | |
| CONTROLLER TYPE: | |
| CONFIG REFERENCE: | |
| CONFIG ISSUE: | |

**DEVELOPER INFORMATION PACK
TRAFFIC SIGNAL INSTALLATION**

FACTORY ACCEPTANCE TEST RESULTS

| | | |
|---|------------|---|
| DATE OF TEST: | | PASSED / FAILED (delete as appropriate) |
| <u>COMMENTS</u> | | |
| | | |
| LATEST DATE FOR CORRECTIVE ACTION: | | |
| SUPPLEMENTARY FAT REQUIRED - YES / NO (delete as appropriate) | | |
| TRAFFIC SIGNAL ENGINEER: | Name: | |
| | Signature: | |
| SIGNAL COMPANY ENGINEER: | Name: | |
| | Signature: | |

**DEVELOPER INFORMATION PACK
TRAFFIC SIGNAL INSTALLATION**

FACTORY ACCEPTANCE TESTS

(Alternative forms may be substituted for differing controller types).

General:

* Indicates commands that only apply to the ST800.

| | |
|---|----------------------|
| Check Configuration Identity Code Number & Issue with the Specification (CIC) | Pass/Fail |
| Note serial number of controller | <input type="text"/> |
| <input type="text"/> | |

Set all detectors to Off, all computer bits to Off, select Normal on the Manual Panel
Switch on mains supply, initialise RAM (PME, TKE, LRN, CNN), check time/date (STM, CKL, TOD, DAY, WEK) and switch signals on

| | |
|--|----------------------|
| Check controller starts up in correct stage and that the correct indications are given | <input type="text"/> |
| Check the starting inter-green time (IGS) | <input type="text"/> |
| Check demands have been inserted for all stages and the controller serves all phases | <input type="text"/> |

Use the Configuration printout/handset to check the following basic parameters are as specified:-

| | |
|---|----------------------|
| Minimum Green times (MIN) | <input type="text"/> |
| Green Extension times (EXT, IPX*) | <input type="text"/> |
| Maximum Green times (MAX, MBX, MCX, MDX, MEX*, MFX*, MGX*, MHX*) | <input type="text"/> |
| Pedestrian Blackout times (PBT) | <input type="text"/> |
| Pedestrian Window times (PWN) | <input type="text"/> |
| Pelican Sequence times (PAR*, PIT*, PBT, CMX*, CDY*, CRD* – 141C only) | <input type="text"/> |
| Puffin Sequence times (PAR*, PIT*, PBT, CMX*, CDY*, CRD* – 141C only) | <input type="text"/> |
| Pedestrian Sequence times (PAR*, PIT*, PBT, CMX*, CDY*, CRD* – 141C only) | <input type="text"/> |
| Toucan Sequence times (PAR*, PIT*, PBT, CMX*, CDY*, CRD* – 141C only) | <input type="text"/> |
| Intergreen times (IGN) | <input type="text"/> |
| Phase Delay times (DPG, DMV, DFZ) | <input type="text"/> |
| Timetable Entries and Event Parameters (TSW, TDY*) | <input type="text"/> |
| BST Changeover Weeks (BSA, BSR, CKA*, CKR*) | <input type="text"/> |
| Handset Limit Values | <input type="text"/> |

Mode Priority:

| | |
|--|----------------------|
| Check that the mode priority operates as specified (MOD, STS*) | <input type="text"/> |
|--|----------------------|

Manual Mode:

| | |
|--|----------------------|
| Check manual disable via handset, if specified (MND) | <input type="text"/> |
| Select each configured manual button & check stage/phase relationship is correct | <input type="text"/> |
| Check filter green arrow appearance under manual mode is as specified | <input type="text"/> |
| Check permitted stage to stage movements | <input type="text"/> |
| Check that non-permitted movements give the correct indication | <input type="text"/> |
| Check that leaving manual mode inserts demands for all phases | <input type="text"/> |
| Check operation of all other buttons/switches/indicators on the manual panel | <input type="text"/> |

**DEVELOPER INFORMATION PACK
TRAFFIC SIGNAL INSTALLATION**

FACTORY ACCEPTANCE TESTS – continued

Detector and Push Button Functions:

- Check DFM times are as specified (DFD, DGP*, DSA*, DSI*, PBG*)
- Check Call/Cancel times are as specified (DCL & DCN)
- Check for correct active states on each detector input (IPS*)
- Check for correct DFM force states on each detector input (DFA)
- Check Push Button Demand Extension times are as specified (IPX* - 141C only)
- Check Kerbside Demand Extension times are as specified (IPX* – 141C only)
- Check Registered Demand Extension times are as specified (PDX* – 141C only)
- Check that all inputs perform the correct functions, e.g. latched/unlatched demands, green extensions, light wait indicators, etc (SPH)
- Check SD/SA loop spacing is as specified
- Check SD/SA Extension times are as specified
- Check SD/SA Extra Intergreen times are as specified (SCT)
- Check SD/SA operation

| Pass/Fail |
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Fixed Time Mode:

- Select fixed time mode and check for correct stage sequence
- Check fixed time stage durations, if specified (FIX, FTS*, LFT*)
- Check fixed time runs to current phase maximums (if specified)
- Check any demand dependant stages/phases
- If fixed time runs to current phase maximums, check timetable changes (STM, CKL)
- Check that leaving fixed time mode inserts demand for all phases

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Vehicle Actuated Mode:

- Check the VA logic for each stage change is correct (i.e. stages are only demanded/ extended by the appropriate phases)
- Check that arterial reversion occurs to the correct stage/phase if no demands/extensions present (if specified)
- Check that correct revertive phase demands occur if extension running when maximum green expires (SPH)
- Check stage movement constraints (i.e. permitted, prohibited, alternative moves)
- Check timetable change points for switched maxes by altering the clock (STM, CKL)
- Check operation of signals with permanent demands on all detectors ensuring that all phases are satisfied

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Cableless Linking Facility Mode:

- Check plan timings/influences are as specified (PLT, PLI, IFA, IFB, IFC, IFD, CYC*, PLE*, PLX*, OFF*, IFN*)
- Check timetable change points for CLF plans by altering the clock (STM, CKL, CCP)
- Check that all plans operate, especially demand dependant stages
- Check CLF permitted movements by writing a plan with a non-permitted move in it

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**DEVELOPER INFORMATION PACK
TRAFFIC SIGNAL INSTALLATION**

FACTORY ACCEPTANCE TESTS – continued

UTC Mode (or add-on MOVA):

| | Pass/Fail |
|--|-----------|
| Reset all detectors to off and select Normal on the Manual Panel | |
| Check mode changes when a force bit is activated, with TC bit if specified (MOD, STS*) | |
| Check operation of non-demand dependant force bits | |
| Check operation of demand dependant force bits with both street demands and D-bits and check that any stage demand reply bits are returned correctly | |
| Check that the UTC stage change logic is correct | |
| Check for correct operation with multiple force bits | |
| Check stage to stage movement restrictions (i.e. permitted, prohibited, alternative moves) | |
| Check DX bit runs specified stages/phases to maximum in VA mode | |
| Check that no phase minimums can be violated by forcing stages | |
| Check that stages can be forced past the VA maximum green times | |
| Check operation of any other miscellaneous control bits | |
| Check that the correct G-bit replies are returned for each stage | |
| Check that any phase confirm bits are correctly returned | |
| Check reply bits returned for specific controller conditions (lamps off, DFM, manual, etc) | |
| Check operation of any other miscellaneous reply bits | |

Part Time Mode:

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|--|--|
| Check timetable change points by altering the clock (STM, CKL) | |
| Check that signals switch off in correct stage, once minimums have expired (MOD, STS*) | |
| Check queue detector operation | |
| Check minimum on/off operating timers if specified | |
| Check operation of part-time inhibit switch | |

Hurry Call Mode:

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|--|--|
| Check Hurry Call Delay times are as specified (DHC) | |
| Check Hurry Call Hold times are as specified (HHC) | |
| Check Hurry Call Prevent times are as specified (PHC) | |
| Check operation of request detectors | |
| Check operation of cancel detectors | |
| Check that correct stage is called in relation to the detector (MOD, STS*) | |

**DEVELOPER INFORMATION PACK
TRAFFIC SIGNAL INSTALLATION**

FACTORY ACCEPTANCE TESTS – continued

Vehicle Priority Mode:

Check Priority unit basic requirements are as specified (PUT, PUP, PMT, PDE, PRE, PRI, PDR, PUI, PSE, PSA, PVG)
 Check Priority Extension times are as specified (PVE)
 Check Priority Maximum times are as specified (PVM)
 Check Inhibit times are as specified (PVI)
 Check Phase Compensation times are as specified (PCn)
 For each priority unit check operation of priority demands/extensions, inhibit periods and compensation periods (PVU, PVP, PVS, PIA, PDS, PIU)

| Pass/Fail |
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All Red Extensions:

Check All Red Extension times are as specified (REX)
 Check All Red Maximum times are as specified (RMX)
 Check that appropriate detectors extend appropriate stage moves
 Check all red extensions are operative or auto-extend to max in the appropriate modes

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Pedestrian Linking:

Check Pedestrian Link timings are as specified (PIR, CDT*)
 Check operation of pedestrian link
 Check operation of override timer

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Red Lamp Monitoring:

Check that 1 red lamp out extends appropriate intergreens by the specified duration (SIE, RLT*)
 Check that 2 reds out inhibit conflicting pedestrian phases or shutdown part-time stream
 Check that failure of all (or 2) monitored reds on a channel of a stand-alone pedestrian stream causes shutdown (141C only)
 Check that red lamp failure actions cease when lamps are replaced

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Green Conflict Monitoring:

Check all green/green conflicts using a test box
 Check fault log for correct conflict data (FLF, FLD, FFS*, FDS*, LOG*)

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Special Conditioning:

Check operation of any special conditioning not covered by any of the preceding tests

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**DEVELOPER INFORMATION PACK
TRAFFIC SIGNAL INSTALLATION**

FACTORY ACCEPTANCE TESTS – continued

Miscellaneous:

Perform any other miscellaneous tests that may be required (define below):-

Pass/Fail

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|-----|--|
| 1. | |
| 2. | |
| 3. | |
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| 10. | |
| 11. | |
| 12. | |

**DEVELOPER INFORMATION PACK
TRAFFIC SIGNAL INSTALLATION**

SITE ACCEPTANCE TESTS

General:

- Perform visual inspection for neat wiring, base seal, ancillary equipment fitted, etc
- Check for correct dimming voltage connection
- Check operation of solar cell by covering
- Check that time and date are correct (STM, CKL, TOD, DAY, WEK)
- Check that BST Changeover Weeks are correct (BSA, BSR, CKA*, CKR*)
- Check that controller has a logbook

| Pass/Fail |
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Detector and Push Button Functions:

- Check all loop detector packs for the correct settings
- Check that all loops are connected to the correct controller input (IOP, DET*)
- Check that all above ground detectors are connected to the correct controller input
- Check that all push button units are connected to the correct controller input
- Check that all wait indicators are functioning correctly along with any tactiles/audibles
- Check for correct operation of push buttons with kerbside detection
- Check SD/SA for correct operation with Sound-mark Test set
- Check for correct operation of any Hurry Call inputs

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UTC Mode (or add-on MOVA):

- Check that all control bits are connected to the correct controller input (IOP)
- Check that all reply bits are connected to the correct controller output (IOP)

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MOVA:

- Validate MOVA data set(s)

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NB: refer to MCH 1542 for the full MOVA commissioning procedure

Remote Monitoring:

- Check that OMU can be dialled from instation
- Check that correct controller status/fault information is returned to the instation

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Red Lamp Monitoring:

- Check that 1 red lamp out extends appropriate intergreens by the specified duration
- Check that 2 reds out inhibit conflicting pedestrian phases or shutdown part-time stream
- Check that failure of all (or 2) monitored reds on a channel of a stand-alone pedestrian stream causes shutdown (141C only)
- Check that red lamp failure actions cease when lamps are replaced

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**DEVELOPER INFORMATION PACK
TRAFFIC SIGNAL INSTALLATION**

SITE ACCEPTANCE TESTS - continued

General Lamp Monitoring:

Check that general lamp failures are detected and reported correctly

Pass/Fail

Linking:

Check that any linking signals operate correctly

Miscellaneous:

Perform any other miscellaneous tests that may be required (define below):-

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APPENDIX B3

ELECTRICAL INSTALLATION CERTIFICATES

- a) The Contractor shall supply and complete to the satisfaction of the Overseeing Organization electrical test certificates in accordance with the latest edition of the Electricity at work Act and the IEE Wiring Regulations.

APPENDIX C

CABLE IDENTIFICATION SYSTEM

- a) All cables in all drawpits shall be marked with a tag sleeve or pull tight marker system indicating the asset connected i.e.: Pole / Loop reference. Markers may be colour coded to represent the voltage carried or have the voltage carried marked. If pull tight tags are used indelible ink shall be used to reference the tag.
- b) All cable cores at each end of cable terminations shall be referenced and recorded.

**DEVELOPER INFORMATION PACK
TRAFFIC SIGNAL INSTALLATION**

APPENDIX D

**APPLICATION FOR CONSENT FOR ACTIVITIES
ON THE HIGHWAY ASSOCIATED WITH CIVIL ENGINEERING WORKS**

The Contractor shall apply in writing to GCC or their Agent, in advance of the minimum notice period stated, for consent to the following, all subject to road space availability and relevant legal and technical agreements being in place:

| | | Minimum Notice Period |
|----|--|-----------------------------|
| 1 | For any restriction of width or significant alteration to the existing carriageway or footway | 2 weeks |
| 2 | Temporary diversions of traffic onto existing highways outside the site boundary [Not involving statutory process] | 4 weeks |
| 3 | For any permanent closure as required by the Contract | TRO process |
| 4 | For shuttle working | 4 weeks |
| 5 | Temporary closure to traffic or any other restriction requiring statutory process (TTRO) | 12 weeks |
| 6 | For temporary traffic signal installations controlling shuttle working with no turning movements | 1 week |
| 7 | For temporary traffic signal installations with turning movements | 2 weeks |
| 8 | Alteration to or removal of existing permanent traffic signal installations | 12weeks |
| 9 | Introduction of permanent traffic signal installations | 12 weeks |
| 10 | For disconnection or connection of electrical supplies to lighting, signs, bollards and the like where this work is not included in the Contract | 4 weeks |
| 11 | For interference with access to private properties | 2 working days |

Applications shall state the proposed start date and anticipated duration and where applicable be accompanied by plans, profiles and details of construction.

Work that affects any public highway shall not commence until consent has been given by GCC and until the relevant temporary diversions and/or traffic safety measures are fully operational.

Notwithstanding any consent given by GCC, work which affects access to private properties (11 above) shall not be commenced until the Contractor has given 2 working days notice in writing to the occupier(s) of the property.

Application forms obtainable from GCC, shall be used for applications 5, 6 and 7 above.

**DEVELOPER INFORMATION PACK
TRAFFIC SIGNAL INSTALLATION**

APPENDIX E

STANDARD DRAWINGS

a) GCC Standard details accompanying this pack are:

- SD001 – Signal Pole Installation Details
- SD002 - NAL Controller Base Installation
- SD003 – Standard Controller Base Installation
- SD004 – Inductance Loop Reinstatement Details
- SD005 – Inductance Loop to Footway Box Connection Details
- SD006 – Typical Controller Layout Plan Detail
- SD007 – Composite Drawpit Type DP1 and DP2 Detail
- SD008 – Inductance loop setting out details
- SD009 – Tactile Paving and Signal Pole General Setting Out Detail

b) The Developer may use additional scheme standard details subject to technical approval.

**DEVELOPER INFORMATION PACK
TRAFFIC SIGNAL INSTALLATION**

APPENDIX F

COMMUTED SUMS

Commuted sums for the ongoing maintenance of installations shall be paid by the Developer to GCC covering a life expectancy period of 15 years. Commuted sum calculations shall be based on the ADEPT report Commuted Sums Levied for Traffic Signals September 2014. The life expectancy is based on the life expectancy of the controller as stipulated in TOPAS TR2500.

The following calculations shall be used:

1. Agreed signals installation estimate shall be used to form the basis of the Commuted Sum.
2. The cost of replacing the asset at end of 15-years life shall be included and be adjusted to take into account predicted cost of inflation, offset by accrued interest rates of the invested Commuted Sum by the Authority.
3. The estimated cost of ongoing maintenance and inspection of the asset over the 15-year period, including power and communications costs.

Example:

- Commuted sum period = 15 years
- Life of asset = 15 years
- Present day Asset Valuation = £50,000
- Annual maintenance and consumable = £2,500
- Discounted rate = 2%

| | |
|--|-----------------|
| Present day Asset Valuation | £ 50,000 |
| Annual maintenance cost | 2,500 |
| 1 | 2,500 |
| 2 | 2,451 |
| 3 | 2,403 |
| 4 | 2,356 |
| 5 | 2,310 |
| 6 | 2,264 |
| 7 | 2,220 |
| 8 | 2,176 |
| 9 | 2,134 |
| 10 | 2,092 |
| 11 | 2,051 |
| 12 | 2,011 |
| 13 | 1,971 |
| 14 | 1,933 |
| 15 | 1,895 |
| 15 years discounted @ 2% per annum | 32,766 |
| Estimated replacement cost (discounted present day valuation) | £ 49,020 |
| Commutated Sum | 81,785 |