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# Haverhill Relief Road Toucan (East of Roundabout), Suffolk

January 2018

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# Document History

## Haverhill Relief Road Toucan (East of Roundabout), Suffolk

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## 1. Introduction

- 1.1. This specification details the work required to supply, install and commission the traffic signal related works which form part of the Haverhill Relief Road scheme and ensure that all the equipment is fully operational. Unless stated otherwise the work undertaken shall comply fully with the latest standards as detailed in the DfT Highways Works Specification. Where differences arise between the content of this Appendix and any referenced specifications/documents, the contents of this appendix shall be followed.
- 1.2. The work required as part of this contract is the installation of all the signal equipment at the new proposed Toucan crossing. All signal equipment to be Extra Low Voltage (ELV) and the Toucan is to operate under MOVA control.
- 1.3. This document shall be read by all key parties who are involved with the Installation, testing and commissioning of the traffic signal equipment.
- 1.4. The Toucan crossing is located within the jurisdiction of Suffolk County Council and is managed and maintained by Dynniq.
- 1.5. The reference to 'Overseeing Organisation' in this specification is the Highway Authority, Suffolk County Council, who has responsibility for the Toucan crossing.
- 1.6. The reference to 'Traffic Signal Engineer' in this specification is the nominated Traffic Signal Engineer of the Highway Authority or their appointed representative.

## 2. Contractor Responsibilities

### Principal Contractor

- 2.1. The appointed Principal Contractor shall be responsible for the overall installation of the scheme, the programming and co-ordination of all installation activities, including the arrangement of traffic management. Should any changes to the design or specification be required or desired during construction, the Principal Contractor shall liaise with the Principal Designer to ensure the proposed changes are suitable.
- 2.2. A copy of the proposed civil works and signal installation programme shall be presented to the Overseeing Organisation and their Traffic Signal Engineer (or representative) at a pre-construction meeting. The installation programme shall include the duration of all areas of works, including Factory Acceptance Test (FAT), Site Acceptance Test (SAT) and Commissioning.
- 2.3. The Principal Contractor shall be responsible for all safe working methods whilst on site. The Principal Contractor shall adhere to all relevant regulations, including Chapter 8 of the current Traffic Signs Manual, The Electricity at Work Regulations 1989, HSG47 "Avoiding Danger from Underground Services" as well as any site-specific rules or instructions.
- 2.4. The Principal Contractor shall co-ordinate with the Traffic Signal Contractor to arrange all necessary traffic management in accordance with the requirements of chapter 8 of "The Traffic Signs Manual - Road Works & Temporary Situations" (2009) Parts 1 & 2, to carry out all necessary works under this contract.

### Traffic Signal Contractor

- 2.5. The Traffic Signal Contractor shall be the appointed organisation responsible for the provision, installation and commissioning of the traffic signal installation and all associated works as defined in section 2.
- 2.6. The signal equipment layout that is shown on the signal design drawings in Appendix A shall be installed in accordance with TA 84/06 'Code of Practice for Traffic Control & Information Systems For All Purpose Roads', LTN1/98 'The Installation of Traffic Signals & Associated Equipment', the signal design drawing and this specification.
- 2.7. The Traffic Signal Contractor shall ensure that all staff involved in the installation have been fully made aware of all relevant specifications and have the information and equipment necessary to comply fully with all the requirements. The Traffic Signal Contractor must ensure that all staff involved in the installation attend the site induction.

- 2.8. The Traffic Signal Contractor shall, upon the request of the Principal Contractor, electrically isolate any of the existing traffic signal equipment to be removed. They shall identify and clearly mark all isolated equipment to the Principal Contractor and shall warn of any equipment not isolated.
- 2.9. The Traffic Signal Contractor supervisor shall be present on site, at all times whilst any signal installation works are being carried out.
- 2.10. The Traffic Signal Contractor shall be approved to BS EN 9002 certification against QAS 3433/287 or QSS 015. A copy of the approval certificate is to be submitted with the returned tender document.

## Health & Safety

- 2.11. All work on site is to comply with current Health and Safety requirements and standards. Contractors must also comply with the respective Health and Safety Regulations as well as duties placed on them under CDM regulations and NRSWA. This includes Contractors not starting works until they have received all the documentation from the client and designers relating to significant risks associated with the works.

## Procurement

- 2.12. All equipment supplied shall fully comply with the Traffic Signs, Regulations and General Directions (TSRGD 2016) and British Standards Institution documents. Furthermore, the equipment shall comply with the relevant TOPAS 25\*\* Series Specification(s) and be registered as such with TOPAS at the time of submission of Tender and throughout the contract period, until the equipment has been accepted by the Client following a successful SAT.

- 2.13. Equipment provided, which is not:

- a registered product with TOPAS, listed on the TOPAS website and with a valid certificate of registration, or
- a product specifically detailed by the Designer

shall not be accepted as suitable or fit for purpose. Evidence of TOPAS registration shall be provided with the tender submission and also at FAT and SAT if requested by any party.

- 2.14. Where specific equipment is detailed, only that equipment is to be supplied. Any use of equivalent equipment will need to be authorised in writing by the client.
- 2.15. Any specific item not detailed in the schedules, which the Tenderer considers necessary must be detailed in the tender submission.





### 3. Traffic Signal Controller Requirements

#### General

- 3.1. Traffic signal Controllers shall conform to the latest issue of TOPAS 2500A Specification for Traffic Signal Controller.
- 3.2. All traffic signal controllers shall be an ELV controller unless otherwise specified.
- 3.3. Keys are to be provided with each controller to ensure all parts of the controller can be accessed.
- 3.4. The Traffic Signal Contractor shall provide a maintenance logbook for each controller at the SAT. The logbook should ideally take the form of an A5 book with each page divided into three columns, to be pro-formed with date, time on/off site, reason for visit, action taken and signature.

#### Installation

- 3.5. The controller can only be installed once a permanent mains power supply is available. The Principal contractor shall install all necessary ducting. This includes the 50mm duct between the controller and the Electricity feeder pillar as well as the 50mm duct for a telemetry connection.
- 3.6. The Traffic Signal Contractor shall provide the Principal Contractor with clear instructions as to how to install each controller cabinet. These include the recommended method of installation and the final level of adjacent footway. The sections of the controller cabinet below ground should be treated accordingly.
- 3.7. The traffic signal controller shall be fitted with a Detector Fault Monitor (DFM) lamp. When illuminated, the lamp shall be visible externally with all cabinet doors closed.
- 3.8. The controller cabinet shall be installed to enable the DFM lamp to be visible from the adjacent carriageway. The orientation of the controller is to be installed as per the design drawing or as instructed by the Overseeing Organisation's Traffic Signal Engineer prior to installation.
- 3.9. Each controller cabinet shall be base sealed to prevent ingress of moisture or gas once all cables have been terminated. The base seal should comprise of backfilled compacted dry sand, followed by an approved sealing compound. This sealing compound shall be mixed as specified by the manufacturer, comprising a layer of 6mm epoxy resin laid on top of the compacted dry sand.

- 3.10. The area around the controller cabinet shall be paved in accordance with the design drawings, in either flexible carriageway material or concrete flags and shall link accordingly to the maintenance bay or footway.
- 3.11. Each controller cabinet shall be grey in colour and shall include space for the addition of an OMCU/MOVA unit even if such unit can be fitted integrally. Refer to later clauses of this document and Bill of Quantities for unit type/s to be installed. Space shall also be made available for a communication interface.
- 3.12. Each controller cabinet shall be fitted with a suitable stay, to secure the door in windy conditions. The cabinet shall be provided with a door pocket to enable storage of design drawings and the maintenance logbook. A self-adhesive folder/wallet on the back of the cabinet door will not be accepted.
- 3.13. The controller cabinet shall be labeled with the site reference number provided by the Traffic Signal Engineer and should be visible from the adjacent carriageway.
- 3.14. The Traffic Signal Contractor shall arrange for training to be given for any new software or modifications to the controller, which has not been previously used.

### Set up and configuration

- 3.15. The timing information for the Toucan crossing can be found on the ITS1827D Forms in Appendix B.

### Monitoring Functions

- 3.16. Both Red Lamp and Lamp monitoring facilities shall be provided with this installation. The Traffic Signal Contractor shall be responsible for the installation and operation of lamp monitoring facilities, which shall be provided either by means of an integral or non-integral method. Likewise the Traffic Signal Contractor shall be responsible for the installation and operation of red lamp monitoring facilities which shall be installed in accordance with the requirements of TOPAS 2500A.
- 3.17. The DFM lamp is to be lit for any failure of detector input (vehicle/pedestrian) for which fault monitoring has been specified. No fault indication shall be generated when inhibited by an operator command. A permanently active condition shall be inserted for each detector when in fail state, unless otherwise specified. This permanent demand shall be removed when the fault is rectified.

## Microprocessor Optimised Vehicle Actuation (MOVA)

- 3.18. All MOVA facilities provided by hardware other than the controller shall comply with the requirements of the latest issue of MCH 1542 'Guidelines for the implementation of MOVA using 'Add On' Equipment. MOVA may alternatively be provided by 'integral' means. If provided integrally within the controller, the Traffic Signal Contractor shall demonstrate that MOVA is fully functional and provides the same level of functionality as is available on equivalent 'add-on' MOVA equipment.
- 3.19. The Traffic Signals Contractor shall install the MOVA unit (or enable the facility) in the controller. The latest version of MOVA is to be compatible with the signal equipment and the associated RMS remote monitoring system.
- 3.20. The Traffic Signal Contractor shall setup all necessary licenses and configuration as may be necessary to enable MOVA (other than providing a dataset). This shall include the mapping of detectors, control and reply bits, if necessary.
- 3.21. Where the unit is also configured for Remote Monitoring the OMCU specification (Section 5 of this document) shall also apply.
- 3.22. The MOVA equipment supplied shall be provided with a means of communication via both a front panel terminal port (via Windows notebook PC) and by the in-station equipment (via communication connection). The communication with equipment should be achieved using the latest TRL MOVA Comms programmes, or through a standard web browser on a laptop PC.
- 3.23. The Traffic Signal Contractor shall supply, install and commission all of the necessary interface facilities, hardware and software to provide MOVA control as detailed in this specification and design drawings.

## 4. Electrical Requirements

### General

- 4.1. The Principal Contractor shall be responsible for procuring the power supply, including the placing of the order and liaising with the DNO prior to the start of the works, supplying and installing the supply pillar. As part of the liaison the Principal Contractor is to determine the type of power supply (unmetered/metered) required and respond to queries raised by the DNO with regards to ELEXON codes. Liaison is also required with the Traffic Signals Contractor to determine controller power requirements. As part of this process the Principal Contractor should also contact the Overseeing Organisation's Traffic Signal Engineer to determine whether existing power supply arrangements are already in place and if they can be used for the new installation. The Principal Contractor is to further liaise with the Traffic Signals Contractor to confirm timescales of the power connection to the traffic signal controller and/or termination cabinet.
- 4.2. All electrical work shall be undertaken in accordance with the latest edition of BS 7671 (IEE wiring regulations), including all amendments.
- 4.3. A 6mm<sup>2</sup> core armoured cable shall be used to link the power supply secondary isolator fuse to the signal controller/termination cabinet. The pillar casing, door and controller link cable earth conductor shall be bonded together and to a main earth terminal with a 10mm<sup>2</sup> earth cable.
- 4.4. All cables (excluding loop detector cables) shall be coloured orange and marked with 'Traffic Signals'. Refer to documents AMD 14197 and AMD 15650 which superseded BS6346.
- 4.5. The Traffic Signal Contractor shall calculate the cable requirements for the traffic signal equipment and shall provide the Traffic Signal Engineer with a Cable Schematic drawing, detailing proposed cable runs, types and lengths. This is to be provided not less than one month prior to the installation date.
- 4.6. All Cables are to comply with the requirements of BS 7671 and all other relevant specifications and standards.
- 4.7. The ends of all spare cores for each cable shall be capped using self-amalgamating tape. All spare cores are to be earthed at the controller.
- 4.8. The Traffic Signal Contractor shall ensure that all cables lengths have sufficient slack to enable future pole relocation of up to 2m should it be required in the future.

## Traffic Signal Cable Installation

- 4.9. ELV shall have yellow 'pull tight' labels and (where used) LV cables shall have red 'pull tight' labels securely fixed to each end. Additional cable labels are required at the end of each cable. Each cable label shall have a unique cable reference in indelible ink.
- 4.10. All ELV cable runs between the controller and signal pole or adjacent controller shall include for a minimum of 25% spare cores throughout its length.
- 4.11. Each and every pole shall have its own cable, with the exception of adjacent linked 2m poles. If that is not possible then cables installed are to be arranged such that should one signal pole be knocked down, it does not extinguish all of the signals on any one phase.
- 4.12. The signal cabling within the controller cabinet shall be terminated at the termination points recommended by the manufacturer. ELV cores shall be terminated on separate terminal blocks to any LV cores.
- 4.13. Cable Schedules shall be completed for the controller showing the cable identities and their termination locations. A separate schedule is required for Low Voltage and Extra Low voltage at sites where both types of cables are used. Cable Core Schedule shall be completed for each cable detailing the function of each core within the cable. The completed schedules shall be passed to the Overseeing Organisation's Traffic Signal Engineer for signature prior to site acceptance.

## Mains Power Supply

- 4.14. The electricity supply to the traffic signal controller is to comply with the requirements of all relevant TOPAS 25\*\* Series specifications for the equipment being installed, including the classes specified from BS EN7987:2001. A 60-80A lockable double pole isolator with a single pole fuse is to be fitted in the mini pillar together with a secondary isolation fuse (double pole MCE 040DN or similar) incorporating a 20-32A. The connection between the mini pillar and the controller is via a 6mm<sup>2</sup> double insulated cable installed in 50mm black ducting.
- 4.15. The Traffic Signal Contractor shall be responsible for ensuring fuse discrimination. During the SAT the Traffic Signal Contractor will be required to demonstrate fuse discrimination as well as compliance with BS 7671 and the requirements of the electrical regulations to the Overseeing Organisation's Traffic Signal Engineer.
- 4.16. The Traffic Signal Contractor shall be responsible with the Principal Contractor with regards to the procurement and connection timescales of the electricity supply to the controller of this 230 volt supply.

- 4.17. The Electricity supply pillar shall be of Stainless Steel construction (Haldo or equivalent). This pillar will need to be supplied sufficiently wide enough for a meter to be installed if the electricity supply has to be metered. Within the pillar a wooden panel shall be fixed to enable the electricity supply to mount and connect the cut out (180mm (H) x 100mm (W) x 95mm (D)). Where a meter is required within a supply pillar a larger or additional wooden panel will be required. A suitable lockable double pole fused isolation switch shall be fitted within the mini pillar. All earth bonding within the pillar shall be terminated at a main earth terminal.
- 4.18. Refer to Appendix 5/2 'Traffic Signals Service Duct Specification' for details of the ducting to be installed by the Principal Contractor between the Electricity Supply pillar and the controller.
- 4.19. The Traffic Signal Contractor shall supply and install the cable connecting the supply to the controller. The final connection and installation of the electricity supply company's cartridge fuse is to be only undertaken by the electricity company's authorised staff.
- 4.20. A 6mm<sup>2</sup> core armoured cable shall be used to link the power supply secondary isolator fuse to the signal controller/termination cabinet. The pillar casing, door and controller link cable earth conductor shall be bonded together and to a main earth terminal with a 10mm<sup>2</sup> earth cable.
- 4.21. Should the feeder pillar have multiple isolators, a clear label shall be installed to identify the supply to each controller and termination cabinet.
- 4.22. For regulatory signs a separate fuse or circuit breaker shall be provided.

### **OMCU/ OTU Power Supply**

- 4.23. A 5A fused supply shall be provided within the controller for powering the OMCU/OTU unit, irrespective of whether it is specified that a separate unit is to be fitted.

### **Maintenance Power Supply**

- 4.24. Within the Traffic Signal controller a switched dual 13A socket for maintenance purposes shall also be provided in addition to other power requirements. This socket must be protected by an RCD.

### **Photo Electric Control Unit Power Supply**

- 4.25. A separate fuse or circuit breaker shall be provided for the power supply to the photo electric control unit.

4.26. Signal lamp dimming to 27V (ELV) shall be provided. A software command shall be provided to override dimming settings.

## 5. Outstation Monitoring and Control Unit (OMCU)

### General

- 5.1. The OMCU shall conform to TOPAS 2522A Remote Monitoring and Control of Traffic Control Equipment via a Telecommunications Network
- 5.2. All equipment shall be compatible with the Overseeing Organisation's equipment and shall have the latest issue of firmware installed. It shall be, either complete with current sensing transformers, detector input leads and the appropriate link cable for add-on installation or installed as semi-integral. In either case the TRN-RS232 connecting cable shall provide full handset communications via the OMU to the controller both locally (on site) or from the RMS Instation. Both controller and MOVA interrogation shall be possible.
- 5.3. The Traffic Signal Contractor shall install the OMCU and all necessary connections/torriods within the traffic signal controller. The Traffic Signal Contractor will also configure each OMCU to the Traffic Signal Engineer's requirements in readiness for commissioning, including Instation configuration and working graphic mimic.
- 5.4. Each site specific OMCU shall be supplied fitted and tested as part of the controller installation tests for new installations. The RMS configuration file including live update diagrams shall be supplied and loaded prior to works completion ready for testing.
- 5.5. The OMCU shall be provided with a Communication Module (i.e. PSTN/GSM) as detailed in Appendix C Bill of Quantities
- 5.6. The OMCU shall be capable of monitoring the operation of the control equipment and reporting to the Instation any faults that are detected.
- 5.7. The OMCU shall be able to detect and report to the Instation the following fault conditions:
  - Any controller fault log entry
  - CF (Controller Fault) bit output from controller
  - DF (Detector Fault) bit output from controller
  - LF1 (Lamp Fault) bit output from controller
  - RF (Red Lamp Fault) bit output from controller
  - RR (Remote Reconnect) bit output from controller
  - LE (Lamps Extinguished) bit output from controller
  - Loss of power supply to controller and/or OMCU
- 5.8. The OMCU shall have the capability to report or log other miscellaneous inputs as may be required.



- 5.9. The OMCU shall be supplied and installed with standby batteries to enable 'last gasp' dialing facilities to enable it to report a mains power failure whilst mains power is not present.
- 5.10. The OMCU shall be supplied with facilities to enable interrogation of the traffic signal control equipment remotely by the Instation operator and on site by an Engineer.
- 5.11. The Traffic Signal Contractor shall supply and install a suitable 'micro switch' for both the controller door and manual panel/police flap to enable the 'door open' message to be generated by the OMCU to the Instation, whenever one of the controller entry points is opened.
- 5.12. The Traffic Signal Contractor shall provide and install any additional Instation hardware/software to ensure full compatibility with the OMCU.
- 5.13. The full functionality of the OMCU is to be demonstrated and checked during the SAT including the checking of the following, via an Instation operator: lamp loads, lamp faults, detector faults, controller faults, dimming, MOVA operation and any other items deemed appropriate. This process should be completed no later than one week after the initial SAT, should it not be possible to complete during the SAT.

## Installation

- 5.14. The OMCU unit shall be mounted within the traffic signal controller cabinet. The Traffic Signal Contractor is to provide all necessary mounting equipment and racking. Likewise the Traffic Signal Contractor is to supply and install all necessary cabling/interface leads between the traffic signal controller and the OMCU.
- 5.15. Cable forms for OMCU installations are to be of a standard length and not to be cut down to fit the dimensions of the traffic signal controller during installation. All excess and spare cables are to be coiled and suitably tied back.

## GSM Communications

- 5.16. The Overseeing Organisation shall be responsible for the provision of a data only GSM SIM card that is compatible with the Suffolk County Council Remote Monitoring Instation and OMCU. The Overseeing Organisation is responsible for requesting the data SIM card and the Traffic Signal Contractor is responsible for the installation of the SIM card and setting it up within the OMCU.
- 5.17. The Traffic Signal Contractor shall be responsible for the supply and installation of the GSM enabled OMCU. All equipment provided by the Traffic Signal Contractor shall be compatible with the Remote Monitoring System currently operated by Overseeing Organisation.

- 5.18. The Principal contractor shall be responsible for arranging and overseeing that the connection and set up of the site has been carried out on the appropriate RMS Instation modem prior to site commissioning.

## 6. Signal Equipment Requirements

### General

- 6.1. All traffic signal street furniture is to comply with the requirements of all relevant TOPAS 25\*\* Series specifications for the equipment being installed.

### Installation

- 6.2. All items of street furniture are to be treated with an appropriate colour coating which is to be intact at the time of delivery. Should any item sustain minor damage or have unprotected metal surfaces exposed during the course of installation an appropriate repair shall be undertaken to reduce the risk of corrosion. Such repairs are to be highlighted to the Overseeing Organisation's Traffic Signal Engineer.
- 6.3. The location of the signal equipment shall be marked on site prior to works commencing during a site meeting between the Overseeing Organisation's Traffic Signal Engineer and a representative from the Traffic Signal Contactor.
- 6.4. The Traffic Signal Contractor will be responsible for the transportation of all signal equipment to/from site during the course of the site installation as well as the on-site handling of the signal equipment during the course of installation works. The safekeeping of all equipment until site acceptance by the Overseeing Organisation's Traffic Signal Engineer will also be the responsibility of the Traffic Signal Contractor.
- 6.5. All pillars (mini/haldo type), including any pole access doors, shall be sealed to prevent water ingress.
- 6.6. The Traffic Signal Contractor shall be responsible for the supply and affixing of self-adhesive pole numbers.
- 6.7. The supplied numbers shall be to the following specification:-
- Title Size: 75 mm x 75mm
  - Character Height: 50mm
  - Colour: Black character on white background
  - Material: Non reflective, self-adhesive
- 6.8. The pole numbers shall be affixed just below the bottom signal head bracket and be located on the pole so it can be seen from the controller.

## Traffic Signal Poles

- 6.9. Steel poles are to be supplied galvanised and have a grey coloured plastic coating. Steel poles are to be galvanised in accordance with BS729: 1971 'Specification for Hot Dip Galvanised Coatings on Iron and Steel Articles'. The Overseeing Organisation' Traffic Signal Engineer reserves the right to check than un-galvanised poles have not been used.
- 6.10. All signal poles are not to be supplied with pre-drilled holes for pedestrian demand units. Holes shall be drilled on site as required in accordance the design and the Traffic Signal Engineer instructions. The colour of the pole caps is to match the signal poles.
- 6.11. All signal poles shall be mounted in NAL pole retention sockets (or similar if agreed by Overseeing Organisation). The Pole retention socket and its foundation is to be designed and installed as per the manufacturer's guidelines. The top of the socket is to be level with the finished level of the footway. The Traffic Signal Contractor is to supply the appropriate length signal pole and cable entry system.
- 6.12. As part of the pole installation process the Principal Contractor is to obtain a stump pole. This stump pole is to be used to obtain correct vertical alignment of the socket. During the course of installation the Principal Contractor is to liaise with the Overseeing Organisation for guidance should problems be encountered with installation of the retention sockets/poles.

## Traffic Signal Heads

- 6.13. All signal heads and aspects shall be designed in accordance with BS EN 12368.
- 6.14. All signal heads shall be ELV central light source LED type unless otherwise specified. The size, appearance and optical performance of all signal heads is to comply with the requirements of the Traffic Signs, Regulations and General Directions (TSRGD) 2016, BS 7987 (HD 638) and all relevant TOPAS 25\*\* Series specifications for the equipment being installed.
- 6.15. All vehicle signals shall be fitted with primary, secondary or tunnel hoods as shown on the signal design drawing. The Traffic Signal Contractor shall be responsible for ensuring all signal equipment (including backings boards, visors and tunnel hoods) is installed achieving a minimum of 0.45m lateral clearance between the kerb edge and the equipment.
- 6.16. All vehicle signal heads shall be installed on poles, with the bottom of the signal head/bracket assembly mounted between 2.1 and 2.55 metres above ground level. Each nearside signal head and its associated offside signal head should be mounted on the same horizontal plane.

- 6.17. Signal head mounting brackets are to be protected with an appropriate plastic coating or catalytic paint. Brackets should be sufficiently long enough to provide at least 125 degree rotational adjustment movement on each traffic signal head where several are mounted on one pole.
- 6.18. If a signal head is shown on the design drawing as being bracket mounted, a bracket is to be installed to allow for the signal head to be offset from the pole as specified.
- 6.19. Traffic signal heads shall be supplied and installed with backing boards that have been factory treated with BS EN 12899-1: 2001 Class 1 retro-reflective white borders.
- 6.20. Signal heads shall be installed so that any flexible tubing (Copex type), above ground detectors plugs and sockets and associated cabling is not loose or susceptible to damage by vandals or adverse weather.
- 6.21. Flexible tubing is to be installed to protect the external wiring between each signal head and pole. This tubing shall be fixed securely to the back of the signal head using a nylon or plastic gland. The length of this tubing should be sufficiently long enough to ensure that it remains within the pole to accommodate the signal head being flexed in all weathers.
- 6.22. No transformer or power supplies (for tactile devices, pedestrian detectors or audible/tactile equipment) shall be fitted in any traffic signal head.
- 6.23. All erected signal heads that have not been commissioned are to be covered at the end of each day of installation. The Traffic Signal Contractor is to provide durable waterproof orange coloured covers for this purpose. During the installation period the Traffic Signal Contractor will be responsible for the maintenance of the covers and their fitting.
- 6.24. Signal lamp dimming to 27.5V (ELV) shall be provided. A Photo Electric Control Unit (PECU) (PE cell) shall be mounted on top of the signal head with the least effect from artificial light sources. Ideally this should be on the signal head closest to the controller and in a location that makes it easy to be serviced. Failure of the solar switch shall cause the signals to assume the 'bright' condition. Refer to the signal design drawing for details of which pole the PECU is to be installed.

### **Pedestrian Demand Units**

- 6.25. All pedestrian push button units are to be ELV with a maximum voltage rating of 48V, fitted with appropriate wait indicator lamps, unless otherwise specified. The demand panel is to be manufactured from Makrolon or a similar material.
- 6.26. Nearside demand and nearside display units can either be separate items or combined.

- 6.27. Nearside pedestrian demand units are to comply with TOPAS 2511A 'Performance Specification for Nearside Signal and Demand Units'. All Cycle/Pedestrian aspects shall be LED design and fitted with 3M masks or other equivalent means of limiting phantom effects.
- 6.28. The demand unit shall be fitted with any of the following as specified on the drawing and/or Bill of Quantities: an audible device, a tactile device and a LED indicator for the demand being accepted.
- 6.29. The demand unit shall be mounted between *1.0 and 1.1* metres above the pavement to the centre of the push button.
- 6.30. A gap of approximately 150mm is to be provided between the top of the demand unit and the bottom of the display unit.
- 6.31. Nearside pedestrian demand and display units are to be installed on the signal pole as agreed with the Traffic Signal Engineer on site.
- 6.32. Audible devices shall comply with TOPAS 2509 'Performance Specification for Audible Equipment for use at Pedestrian Crossings'. Refer to Signal Design Drawing, Appendix A for specific information.
- 6.33. Tactile devices shall comply with TOPAS 2508 'Performance Specification for Tactile Equipment for use at a Pedestrian Crossing' and have its own separate power supply. The Traffic Signals Contractor is to contact and confirm with the Overseeing Organisation's Traffic Signal engineer as to the type of tactile indicator unit to be supplied and installed.
- 6.34. The Traffic Signals Contractor is to ensure that all the pedestrian push button and display units are suitably covered until commissioning, indicating the equipment is not in use.
- 6.35. Refer to Appendix A Detailed Design and Appendix C Bill of Quantities for exact pedestrian equipment requirements.

## 7. Detection Requirements

### Above Ground Detection (AGD)

- 7.1. Above ground pedestrian detection is to comply with the latest issue of TOPAS 2506A “Performance Specification for Above Ground On-Crossing Pedestrian Detection Systems” for use with Nearside Signals and Demand Units.
- 7.2. The supporting bracket for above ground detectors shall normally be mounted on top of a signal aspect bracket. The supporting bracket shall allow for the vertical and horizontal adjustment of the above ground detectors. When set in final position the detector should be able to be locked in that position.
- 7.3. The mounting method of the detector should ensure that other signal equipment, such as a backing board, does not obscure the field of detection. The above ground detector is to be secured by means of an anti-theft fixing.
- 7.4. Cables for the above ground detectors are to be neatly secured to the top signal bracket using tie-wraps.
- 7.5. Plug and socket cable connections are to be supplied for termination purposes. They are to be fitted to the stop of the signal head assembly, enabling easy removal of the detector units
- 7.6. Refer to Appendix A Detailed Design Drawing for exact above ground detector requirements.

### Inductive Vehicle Loop Detection

- 7.7. Inductive loop detection is to comply with TOPAS 2512 ‘Performance Specification for Below Ground Vehicle Detection Equipment’.
- 7.8. Vehicle detector loops are to be installed only after the road markings and any High Friction Surfacing has been laid, unless specific authorisation has been granted by the Traffic Signal Engineer.
- 7.9. The inductive loop cable is to comply with TR2029 ‘NMCS inductive Loop Detector Cable’
- 7.10. The feeder cable for the inductive loops is to comply with TR2031 ‘NMCS feeder cable for inductive loop detectors’. The colour of the outer sheath of the feeder cable is to be orange and not grey as specified in TR2031 clause 5.10.1
- 7.11. The Traffic Signal Contractor is to carry out tests and record the insulation and series resistance of the components of each loop detector installation. The results of the tests are to be completed prior to the SAT and handed over signed to the Traffic Signal Engineer.

- 7.12. Feeder cables shall not generally exceed 200 metres. This length can be increased to 300m in exceptional circumstances with the specific authorisation from the Traffic Signal Engineer.
- 7.13. Only Single pair feeder cable shall be used one for each detector. Should the Traffic Signal Contractor wish to use Twin pair feeder cable, a cable schedule, detailing all the cable runs and detector channels/packs is to be submitted to the Traffic Signals Engineer for specific authorisation. This process is required to eliminate cross talk between detector channels/packs.
- 7.14. No individual feeder cable is to be connected to more than one physical detector. Each loop is to be individually connected to separate channels of multi-channel detector units or as shown on the signal design drawing or as detailed on the ITS1827D forms.
- 7.15. Each feeder cable is to have a green 'pull tight' label securely fixed to each end. The identity of the loop is to be labeled, in indelible ink, in accordance with the signal design drawing.
- 7.16. All detector channels including spares are to be labeled with their respective loop identification.
- 7.17. The Traffic Signal Contractor is to adjust the detector sensitivity and frequency settings on the detector channels to achieve optimum performance for the detection system in operation and ensure cross-talk between adjacent channels is eliminated.
- 7.18. The Traffic Signal Contractor is to provide the equipment detailed on the Signal Design Drawing and Appendix C Bill of quantities, including all the appropriate cables between the poles and the controller.

### Slot Cutting

- 7.19. No slot cutting through kerbs is permitted. Under kerb ducting is to be installed to connect the loop detector with the chamber in the adjacent footway/verge. Refer to traffic signal design drawing and Appendix 5/2 for details of the ducting and chambers.
- 7.20. The minimum dimensions for slot cutting in porous or bitumen road surfaces shall be 8.0mm wide by 95mm in depth. This dimension is to be used for the actual loop perimeter and the cut back to the kerb/verge for single and double loop tails. The minimum dimension shall be increased to 110mm where three pairs of loop tails share a single cut back to the kerb/verge. The depths specified may be reduced by 30mm for concrete road surfaces.
- 7.21. The loop cable turns will be in accordance with MCH1540.



- 7.22. All slots are to be free of debris and dry before loop cable is installed. The slots are to be kept clean and dry before the back fill is complete.
- 7.23. All loop tails are to be taken back to the joint with the feeder cable separately.
- 7.24. Slot cutting is to be carried out only during the hours identified by the Overseeing Organisation NRSWA coordinator Traffic Signal Engineer. Traffic Signal Contractor to liaise with the Overseeing Organisation NRSWA coordinator and Traffic Signal Engineer to determine the nominated hours.

### Water Supply during Slot Cutting

- 7.25. A water supply is to be used for cooling saw blades during slot cutting. This water supply shall be provided either directly from a mains water feed or via a water bowser.
- 7.26. The Traffic Signal Contractor/Slot Cutting Sub-Contractor shall be responsible for gaining permission from the water supply company for the extraction of water required for slot cutting purposes.
- 7.27. A double non-return valve assembly on standpipe is to be used by the Slot Cutting operatives when connected to the water hydrant. This is required to minimise the possibility of damage to the mains or contamination of the water supply.
- 7.28. To supply high pressure water from the bowser to the slot cutting machine a water pump may be connected.
- 7.29. Slot cutting operations shall not be conducted when the ambient temperature is below 2°C. If in doubt the Engineer's representative should be consulted.

### Inductive Loop Back Fill

- 7.30. The back fill for the loop cable is to be a one part process using hot pour bitumen.
- 7.31. When more than one pair of loop tails share the cut back slot a layer of epoxy resin is to be poured on each pair of loop tails . This is required to avoid entrapment of air amongst the loop cables.
- 7.32. The manufacturer's recommendations are to be followed regarding handling, mixing and use of resins. A 5mm cover of resin pour is to be used in all cases to cover the upper cable in the slot. The resin must be allowed to set before the application of hot pour bitumen or cold setting asphalt as appropriate.

- 7.33. Loop slots shall backfilled with oxidised grade bitumen R85/40 to BS3690 Part 2. The bitumen shall totally fill the slot and remain slightly proud of the carriageway surface by 3mm. Any cooling shrinkage shall be topped up to restore the level. Any excessive over spill shall be removed by the Signals Contractor prior to full setting.
- 7.34. The oxidised grade bitumen R85/40 shall be heated to a pouring temperature of 185°C, and poured from an enclosed container which shall be preheated before use.

### **Inductive Loop Jointing kits**

- 7.35. Only re-useable joint are to be used. No chemical joints are permitted.
- 7.36. Approximately 0.5m of surplus loop cable and 0.5m of surplus feeder cable shall be left at the joint position in the roadside chamber.
- 7.37. All joint connections are to by means of a suitable terminal block arrangement within an enclosure to IP68 rating. A suitable bracket arrangement within each loop chamber is to be provided. This is to ensure that the enclosure is kept above the base of the chamber and any water likely to be at the base of the chamber.
- 7.38. The process of jointing is to be carried out in a dry environment. If the weather conditions are wet suitable protection is to be provided to ensure that the no moisture enters the joint during the jointing operation.

## 8. Service Duct Requirements

- 8.1. The ducting and access chambers are shown on the signal design drawing and are to be installed in accordance with Appendix 5/2 'Traffic Signals Service Duct Specification'.

## 9. Testing

### Testing and Putting Into Service

- 9.1. The Principal Contractor shall make arrangement and cover all necessary costs to ensure the safe and independent testing of traffic signal equipment as it is being put into service by the Traffic Signal Contractor.
- 9.2. Witnessing of the testing and undertaking validation works may be provided by the Traffic Signal Engineer, on written agreement with that Local Authority. Otherwise, the Principal Contractor shall provide a competent person(s), independent of the Traffic Signal Contractor, to undertake the following works. Where the following paragraphs refer to the Traffic Signal Engineer, this would apply to either the Traffic Signal Engineer of the Local Authority, or whoever else undertakes the works.

### Factory Acceptance Test (FAT)

- 9.3. A FAT is not usually required for Pelican/Puffin and Toucan controllers, however for MOVA crossings, a FAT will be required.
- 9.4. The Traffic Signal Contractor shall provide, if requested by the Traffic Signal Engineer one printed copy of the user handbook or guide. The documentation is to include a full list of operator commands and their functions as well as details of the functions of all switches accessible to the Traffic Signal Engineer. This documentation is to be handed to the Traffic Signal Engineer at the FAT.
- 9.5. The Traffic Signal Contractor shall make all necessary arrangements for the Traffic Signal Engineer to attend the FAT at the local depot of the Traffic Signal Contractor. At least two weeks' notice is to be provided of the proposed FAT date. A copy of the configured specification in .PDF and Emulation Format is to be provided to the Traffic Signal Engineer at this time.
- 9.6. The Traffic Signal Contractor shall ensure that the control equipment on test during the FAT is the equipment to be installed on site as part of this contract. The Traffic Signal Contractor is to demonstrate compliance with the TOPAS 2500/ ITS1827D work specification and configuration forms and signal design drawings. As part of the test suitable lamp mimics, adequate means of simulating detector inputs and an interface to simulate UTC/MOVA shall be provided.
- 9.7. The FAT is to be undertaken by the Traffic Signal Engineer with the Traffic Signal Contractor's engineer present. Upon completion of a successful FAT a certificate is to be issued and signed by all parties as evidence of test compliance.

- 9.8. Following a successful FAT the Traffic Signal Engineer reserves the right to uniquely mark parts of the control equipment.
- 9.9. Repeat tests are to be arranged within one week of the initial test failure. The Traffic Signal Contractor will meet all costs incurred by the Traffic Signal Engineer in attending the retest.

### Signal Installation Electrical Test

- 9.10. The Traffic Signal Contractor is to carry out Earth Leakage Impedance tests using appropriate test equipment, at each pole, controller cabinet and termination cabinet. These tests are to comply with BS 7671 'Requirements for electrical installation'.
- 9.11. A 'Signal Installation Electrical Test Certificate' is to be completed by the Traffic Signal Contractor and handed to the Traffic Signal Engineer at commissioning. The Traffic Signal Contractor is to notify the Traffic Signal Engineer in writing of any precautions that are required to safeguard the control equipment during the test process. A list of these precautions is to be left in the controller following commissioning.

### Site Acceptance Test (SAT)

- 9.12. Commissioning of any traffic signal installation shall only be undertaken when all works at the installation, including surfacing, pedestrian guard railing and road marking activities are complete.
- 9.13. If requested by the Traffic Signal Engineer the Traffic Signal Contractor is to provide one set of Traffic Signal Controller keys prior to or at the SAT.
- 9.14. The Traffic Signal Contractor is to provide a SAT engineer to demonstrate to the Traffic Signal Engineer that the signal installation has been installed in accordance with all specification requirements. This includes such tests as safety checks i.e. Red Lamp Monitoring.
- 9.15. The Traffic Signal Contractor is to have carried out all pre-switch tests before confirming and inviting the Traffic Signal Engineer to attend the SAT.
- 9.16. The SAT will also include the commissioning of the fitted OMCU/MOVA unit. The Traffic Signal Contractor is to provide the Traffic Signal Engineer with the OMCU/MOVA Installation Details Certificate either prior to or during the SAT or follow up OMCU/MOVA commissioning.
- 9.17. The SAT acceptance certificate/sheets are to be signed by both the Traffic Signal Contractor representative and the Traffic Signal Engineer. Detailed on this document will be a list of any outstanding items, which are to be addressed by the Principal Contractor within four weeks of switch on.

- 9.18. At commissioning the Traffic Signal Contractor is to complete and hand to the Traffic Signal Engineer the following documents: Inductive Loop Test Certificate, Cable Schematic, Signal Installation Electrical Test Certificate for all sites. For sites with OMCUs installed; OMCU installation Details Certificate. Without these documents the site will not be accepted by the Overseeing Organisation's Traffic Signal Engineer.
- 9.19. The Traffic Signal Contractor shall provide suitably competent and experienced personnel to set up the *MOVA* control facilities and to test and validate *MOVA* control operation in the presence of the Traffic Signal Engineer. The validation process shall include for a minimum of two peak periods, a morning and evening peak.
- 9.20. Validation shall include the optimisation of all relevant modes to ensure the traffic signals comply with the operational requirements of Suffolk County Council, including capacity, delay and safety considerations.
- 9.21. Following the successful commissioning, the Traffic Signal Contractor shall supply the Traffic Signals Engineer electronic details of the controller specific configuration data and shall retain sufficient records to provide replacements at reasonable cost, in the event of the EPROMS/configurations becoming damaged or requiring modification.

## 10. Equipment Handover and Warranty

### Handover

- 10.1. All outstanding items are to be rectified within four weeks of switch on. After four weeks has expired the Traffic Signal Engineer reserves the right to employ the services of another signal company to complete outstanding work not resolved. Failure to complete outstanding items to the Traffic Signal Engineer's satisfaction will result in the 12-month warranty period being awarded to another signal company. Costs incurred when resolving outstanding work after the allocated timeframe, including the 12-month warranty period, shall be invoiced to the original Traffic Signal Contractor.
- 10.2. The traffic signals will only be accepted into maintenance of the Overseeing Organisation once all items have been completed to the satisfaction of the Traffic Signal Engineer. Until such time the Principal Contractor will be responsible for the signal equipment including the maintenance.

### Warranty

- 10.3. The tender price shall include for the provision of 12 months warranty of all equipment supplied under this contract. The 12-month warranty period will not commence until all works (including outstanding items list) have been completed and signed by Traffic Signal Engineer. The warranty is to include for all necessary materials, labour, transport required to carry out these works and traffic management.
- 10.4. During the time period of site acceptance and handover the Traffic Signal Contractor shall comply with the Overseeing Organisation's current maintenance response times, which shall be as follows:-
- Urgent faults attendance within 2 contract hours
  - Non-urgent faults attendance within 8 contract hours
  - Full repair for both categories within 4 contract hours.
  - Contract hours 08.00 - 18.00, Monday to Sunday including Bank Holidays.
- 10.5. An Urgent Fault is defined as:-
- All signals Unlit Signals failing to change
  - Defective signals that are likely to cause excessive queues or danger and have caused abnormal traffic conditions requiring urgent attention
  - Equipment damaged and in a dangerous condition
  - Red Lamp failures
- 10.6. All faults will be reported by telephone or email by the Traffic Signal Engineer.

- 10.7. The Traffic Signal Contractor is to provide contact details for both during and outside office hours, together with the postal address of the proposed maintenance facility from which the service is to be provided. Should the response times not be adhered to, the Traffic Signal Engineer reserves the right to obtain quotes from other signal companies. The associated costs incurred shall be invoiced to the original Traffic Signal Contractor.
- 10.8. The warranty includes all of the on-site equipment provided by the Traffic Signal Contractor. Excluded from the warranty is the telecommunication connection facilities and the incoming power supply into the pillar up to excluding the cartridge fuse.
- 10.9. Prior to leaving site, the Traffic Signal Contractor is to inform the Traffic Signal Engineer by telephone (during office hours) of the following details:
  - Time of arrival on site / time of leaving site
  - Fault on arrival on site
  - Works carried out
- 10.10. Upon return to the depot the Traffic Signal Contractor is to confirm by email, to both the Principal Contractor and Traffic Signal Engineer the details listed above.
- 10.11. Should six months have expired between commissioning and the formal site handover the Traffic Signal Contractor is to carry out Periodical Inspections (PI), in accordance with TD 24/97 "All-Purpose Trunk Roads Inspection and Maintenance of Traffic Signals and Associated Equipment". A PI will be required every six months until formal site handover.
- 10.12. Should 12 months have expired between commissioning and the formal site handover the Traffic Signal Contractor is to carry out the annual cleaning requirements detailed in TD 24/97.
- 10.13. The Traffic Signal Contractor is to invite the Overseeing Organisation's signal maintenance company to attend site at the SAT, to confirm that the installation is of a satisfactory standard. The Traffic Signal Contractor is to fund the site visit of the signal maintenance company of up to two persons. Any work required to ensure site is of a satisfactory standard shall be completed prior to hand over of the site.
- 10.14. Should there be conflicting views between the Traffic Signal Contractor and the signal maintenance company, the Traffic Signal Engineer's decision is final. The Traffic Signal Engineer reserves the right to employ the services of another signal company to complete outstanding work not completed at the time of takeover, after four weeks of the SAT. Any costs incurred to resolve such faults shall be invoiced to the original Traffic Signal Contractor.



- 10.15. A cost estimate is to be provided by the Traffic Signal Contractor for the supply of poles in barrels and associated works only if deemed necessary, to facilitate the installation of the new traffic signal installation. The Principal Contractor is to be responsible for the installation of any such system.

### **Timing Amendments - Revised Configurations**

- 10.16. The Traffic Signal Contractor shall include in the cost estimate for the provision and installation of up three revised configurations/EPROMs within the twelve months warranty period for each controller provided under this contract. This shall incorporate any timing or configuration amendments deemed necessary by the Traffic Signal Engineer.
- 10.17. For every revised configuration/EPROM the Traffic Signal Contractor shall provide an electronic copy of the configuration at least two weeks before FAT/SAT is scheduled to the Traffic Signal Engineer. Following successful commissioning of each revision, the Traffic Signal Contractor is to re-send the configuration electronically to the Traffic Signal Engineer.

# Appendix A: Traffic Signal Design Drawings

18007-101

## Appendix B: Controller Configuration Data

ITS1827D Forms/Timing Sheets

## Appendix C Bill Items

Item	Equipment	Location
1	Controller Cabinet	At Haverhill Relief Road as shown DWG 18007-101
2	Electrical Feeder Pillar	New feeder pillar to be provided

**Table E.1 – Cabinets and Enclosures**

Item	Enclosure	Description
3	Electrical Feeder Pillar	New single phase 32A supply
4	Controller Cabinet Item 1 (above)	GSM SIM card

**Table E.2 – Third Party Services**

Item No.	Description
5	All Civil Engineering works, including groundworks, excavations, reinstatements, paving etc.
6	Supply and erection of permanent signs, bollards and railings
7	Supply, erection and removal of temporary signs
8	Arrange supply of Electricity, Communications and Traffic Signals
9	Contract and Project Management, including liaison with Contractors and Overseeing Organisation
10	Traffic Management
11	Supply and Install ducting and chambers.
12	Supply and Install Electricity Supply Pillar
13	Install Controller Roots
14	Supply and Install NAL sockets and foundations.

**Table E.3 – Works and Equipment Supplied by Principal Contractor**

\*Note: Total amount items shown above are to be determined by contractor as they deem necessary.

Item No.	Description
18	Supply and Deliver signal controller stool/base.
19	Supply and Install Traffic Signal equipment as per detailed design, including controller(s), poles, heads, push button, detectors, etc
15	<i>Supply and Install site specific requirement xxxxxxxxxx</i>
16	Supply and Install Electrical Isolation Equipment into Electricity Supply Pillar and connection to controller
17	Supply and Install OMCU/MOVA facility and associated communication equipment
18	Facilitate Factory Acceptance Test (FAT)
19	Facilitate Site Acceptance Test (SAT)

**Table E.4 – Works and Equipment Supplied by Traffic Signal Contractor**

\*Note: Total amount items shown above are to be determined by contractor as they deem necessary.

Item No.	Description
20	Witness Factory Acceptance Test (FAT)
21	Witness Site Acceptance Test (SAT)
22	Undertake Validation

**Table E.5 – Works to be undertaken by Traffic Signal Engineer**