#### Broadoaks Development, West Byfleet,

#### MOVA upgrade of J401, Old Woking Road / Parvis Road / Pyrford Road / Camphill Road.

#### Appendix 12/5

https://www.gov.uk/guidance/traffic-systems-and-signing-plans-registry-how-to-access-documents

# SPECIFICATION FOR THE SUPPLY, INSTALLATION, COMMISSIONING AND MAINTENANCE OF TRAFFIC SIGNAL AND ASSOCIATED CONTROL EQUIPMENT

## April 2020

## Issue History

**Document Acceptance**

|  |  |  |  |
| --- | --- | --- | --- |
| **Action** | **Name** | **Signed** | **Date** |
| Author | Andrew Lunn | AJL | 1 – 4 - 2020 |
| Checked By | Andrew Lunn | AJL | 2 – 4 - 2020 |
| Reviewed By | Tim Parker | THP | 2 – 4 - 2020 |
| Approved By | Tim Parker | THP | 2 – 4 - 2020 |

**Document History and Status**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Revision** | **Date** | **Author** | **Approved By** | **Description** |
| Draft |  |  |  |  |
| A | 3 – 4 - 2020 | Andrew Lunn | Tim Parker | For Issue |
| B |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

# Disclaimer

# “This document sets the standards and requirements for the supply, installation, commissioning and maintenance of traffic signal equipment within Surrey. It is the intention that this document should be used as an aid to meeting the required standards set by Surrey County Council, Best Practice and National Standards. Surrey County Council accepts no responsibility or liability for the consequences of this document being used for a purpose other than the purposes for which it was commissioned. Any person using or relying on the document for such other purposes agrees, and will by such use or reliance be taken to confirm this agreement, to indemnify Surrey County Council for all loss or damage resulting there from. Surrey County Council accepts no responsibility or liability for this document to any party other than the person to whom it was commissioned.

# Every attempt was made to ensure that the information in this document was correct at the time of publication. Any errors should be reported as soon as possible so that corrections can be issued. Comments and suggestions for future editions are welcomed.”

## **1 General** **Requirements**

* 1. For the purposes of this Specification, the Signal Company referred to in the requirements below is the Signal Company carrying out works on behalf of the Highway Authority and developer. The Highway Authority shall be Surrey County Council.
	2. The Signal Company shall ensure that all staff involved in installation are fully aware of the specifications and are supplied with all the information and equipment necessary to comply fully with all requirements.
	3. Only skilled or instructed personnel with relevant technical knowledge and experience, who are also familiar with the safety procedures required when dealing with modern electrical or electronic equipment, are to be allowed to use and/or work on the equipment.
	4. **SCOPE** - The works involves adding MOVA control to the existing (new in 2018) ST950 ELV controller – EN0023 (by Phil Arnold), SCC site number J401. Existing controller to be re-configured to utilise the MOVA loops (and new feeder cables etc) installed as part of these works, the existing VA detection to be abandoned – see drawing ‘J401-FOR WSP, P01’ for details.
	5. The existing ST950 ELV is to be reconfigured for integral MOVA (MOVA7) including licences and any other items (hardware / software, cable forms etc) necessary to bring MOVA into full operation.
	6. A UTMC OTU is required for remote monitoring and UTC control when required. The Signal Company to supply, install, configure and bring into operation, including commissioning and setting up on the SCC instation.
	7. The Signals Company – or main contractor, whichever is best placed to do so – is to arrange for the existing PSTN line (number 01932 353 614) to be upgraded to a suitable ADSL circuit to allow connection to SCC’s instation. The contractor must make arrangements for the ongoing costs to be covered by SCC Traffic Signals – as is the case for the current PSTN.
	8. The Signal Company to supply, install and configure all necessary equipment (router etc acceptable to SCC Traffic Signals) to bring into operation the ADSL UTMC OTU, including any configurations necessary on site and on the SCC instation.
	9. The Signal Company shall provide, install and commission the upgraded traffic signals. The Signal Company shall be supplied with copies of all relevant specifications and traffic signal drawings necessary to complete the works.
	10. The Signal Company should undertake a condition survey of the site prior to commencing works, to identify any defects. Any defects should be brought to the attention of the SCC Traffic Signals department, so they can be rectified (if deemed necessary) before these works commence.
	11. The Highway Authority reserves the right to amend the requirements defined in this document in accordance with any new legislation, amendment to current working practices or modifications in performance specifications, at any time, relevant to the installation under consideration.

## 2 Standards

* 1. The Specifications, Standards and Advice Notes with which the installation shall comply are listed below and, for detection, in paragraph 8.1. The Contractor / Promoter and the Signal Company shall make themselves aware of the requirements of the Department of Transport Standards and Advice Notes, TOPAS 2016, and any other relevant documents, which are current at the time of the equipment being commissioned. Reference should be made to the Highways Agency *Design Manual for Roads and Bridges* and *Traffic Signs Manual*, which incorporates the following documents:

(i) *TD 07/07 Type Approval of Traffic Control Equipment*

(ii) *TA 12/07 Traffic Signals on High-Speed Roads*

(iii) *TA 16/07 General Principles of Control by Traffic Signals*

### (v) TA 82/99 The Installation of Traffic Signals and Associated Equipment

(vi) *TA 84/06 Code of Practice for Traffic Control and Information Systems for All- Purpose Roads*

(vii) *TD 35/06 All Purpose Trunk Roads MOVA System of Traffic Control at Signals*

(viii) *TA 15/07 Pedestrian Facilities at Traffic Signal Installations*

(ix) *TD 24/97 All-Purpose Trunk Roads Inspection and Maintenance of Traffic Signals and Associated Equipment*

(x) TSRGD *Traffic Signs Regulations and General Directions 2016*

### or subsequent legislation which supersedes these documents.

The installation or modification of electrical components is to comply with *BS 7671:2008 + Amendment 3: 2015 Requirements for Electrical Installations, IET wiring regulations, Seventeenth edition*. The requirements of the current Electricity at Work Regulations and all subsequent issues will be complied with.

* 1. The exclusion of a definitive list does not remove the contractor’s requirement to adhere to the relevant standards, specifications, laws, codes of practice and European directives relating to the work requirements of this document.
	2. Self-Certification shall be in accordance with *TRG 0600 Self-Certification Procedures for Statutory Approval of Traffic Control Equipment*. 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 Highway Authority may seek to obtain references for any equipment, which is proposed to be used.
	3. Responsibility for safe working methods whilst on Site shall lie with the Contractor. Compliance with the requirements of *The New Roads and Street Works Act 1991*, *TA 82/99 The Installation of Traffic Signals and Associated Equipment* and to the requirements of the current issue of the Electricity at Work Regulations and all subsequent issues shall be complied with.
	4. Installation works shall conform to The Construction (Design and Management) Regulations 2015 (CDM 2015) where applicable, and *TA 84/06 Code of Practice for Traffic Control and Information Systems for All-Purpose Roads* (incorporating Correction dated February 2007) and all subsequent issues.
	5. All traffic signal equipment shall be supplied in new, unused condition, complete with all ancillary parts necessary to allow commissioning of the equipment, unless otherwise agreed with the Highway Authority.

## 3 Traffic Signal Street Furniture

* 1. The Signal Company shall arrange for the supply, transport to site, storing, on-site handling, installation, testing of the traffic signal equipment associated with the Works and undertake commissioning (Site Acceptance Test) in conjunction with the Highway Authority.
	2. Earth bonding shall be provided for all signal poles in accordance with the latest Edition of the IEE Regulations for Electrical Installations.
	3. Storage of equipment shall be the responsibility of the Signal Company (including controller) until required on site. No on-site storage facilities will be provided, unless specified by the Highway Authority.

## 4 Method of Control

* 1. The method of control will be amended to MOVA, with VA fall back and UTC when forced from the SCC instation.

## 5 Traffic Signal Controller

* 1. The Signal Company shall supply the Highway Authority with an electronic copy of the facilities manual / engineer’s handbook for the controller supplied and for any item of ancillary equipment, if required. The documentation shall include a full list of operator commands.
	2. Controller base and cable ducts to be re-sealed following installation of the new loops, to safeguard against the ingress of moisture, gas, rodents and other pests, especially where cables enter the controller. The sealant shall be an approved sealing compound a minimum of 6mm thick laid on top of back filled kiln-dried fine sand. A guaranteed gas tight seal is not required but a complete seal shall be provided at the time of commissioning.
	3. Failure of detection equipment for which fault monitoring has been specified shall cause the DFM indicator to be displayed. A detector inhibited by an operator command, shall not generate a failure indication. A permanently active condition shall be effectively inserted for each detector with a failure indication unless otherwise specified in the controller specification forms. This effective permanent demand shall be removed when the detector fault is removed.
	4. Where specified, all ancillary equipment must be provided with a fused auxiliary mains supply with a separate point of isolation.
	5. The revised controller configuration, logbook and site drawings shall be stored in a suitable document rack within the controller.
	6. All new equipment is to be identified with a suitable label also showing the date of installation. For example, OMU, CPU, PSU, etc.
	7. Where the installation is promoted by an external organisation an electronic copy (of a type specified by the Highway Authority) of the as‑built drawing shall be supplied to the Highway Authority prior to commissioning the installation.

## 6 Signal Head Specification N/A

## 7 Electrical Supply N/A

## 8 Cable Specification

* 1. All cables, including loop feeder cables but excluding loop detector cables, shall be armoured.
	2. All cables shall be laid in 100mm diameter smooth bore polyethylene ducts, indicated on the Traffic Signal Drawing, unless otherwise specified. Each cable shall be provided with an extra length of adequate slack. 2.0m shall be coiled in the access chamber located at the base of each traffic signal pole and 1.0m shall be laid in the access chamber located at the traffic signal controller.
	3. Feeder cable shall be supplied as 1.5mm2 plain annealed circular copper conductors with 0.7mm radial polyethylene insulation with four cores (2 pairs) and an orange coloured outer covering.
	4. All feeder cable shall be armoured, one-pair or Two-pair feeder cable shall be installed unless otherwise agreed with the Highway Authority with a separate cable allocated to each and every loop.
	5. 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) and 7.2mm (maximum).
	6. The traffic signal ducting system shall not be shared with any other utilities and/or under-ground plant.
	7. Access chambers should be of a twin-wall self supporting construction which have been developed for use in both footway and carriageway installations and shall conform to the requirements of the Standard Detail Drawings, unless otherwise specified.
	8. 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 system.
	9. On completion of cable installation a draw cord (typically blue in colour) shall be left in each duct, running through the full length of the duct.
	10. A “**Cable Schedule – Low Voltage**” and a “**Cable Schedule – Extra-Low Voltage**” shall be completed, showing the unique identity of each cable, and the location of its terminations. A “**Cable Schedule – Core Allocation**” shall be completed for each cable showing the function of each core within the cable. The schedules shall also demonstrate compliance with the requirements of the Detector Installation Specification for loop feeder cables. The schedules shall be passed to the Highway Authority prior to site acceptance. One copy of the schedules shall be retained within the Controller.
	11. All cables in permanent traffic signal installations shall be identified by an approved system,(see Annex A). Signal and other cables are to be labelled with permanent markings within all inspection chambers.
	12. Joints on loop feeder cables are not accepted other than in exceptional circumstances. The Highway Authority must approve cable joints before being carried out. Joints shall only be made within access chambers where they are readily accessible. All joints shall be made using an approved joint kit (crimp, heat-shrink, bottle joint or chemical type). The manufacturer’s instructions supplied with the joint kit shall be issued to all installation and supervisory staff and these instructions shall be carried out. The joint shall be waterproof.
	13. Pulling of cables shall be the responsibility of the Signal Company. Cables shall not be bent to a radius of less than 12 times their diameter or less than the minimum bending radius recommended by their manufacturer, whichever is the greater.
	14. Cables shall be terminated in the controller at the appropriate terminal block and in the correct terminal position.

## 9 Detection Specification

* 1. Specifications and advice notes with which the installation of detection shall comply are the most recent version of the documents listed below:

(i) *TR 2512A Performance Specification for Below Ground Vehicle Detection Equipment*

(ii) *MCE 0100* *Inductive Loop Vehicle Detecting Equipment*

(iii) *MCE 0108C Siting of Inductive Loops for Vehicle Detecting Equipment at Permanent Road Traffic Signal Installations*

(iv) *MCH 1540F Specification for the Installation of Detector Loops on Motorways and All-Purpose Trunk Roads*

(v) *MCH 1542* *Installation Guide for MOVA*

(vi) *TR 2029D NMCS Inductive Loop Detector Cable.*

(vii) *TR 2031E NMCS Feeder Cable for Inductive Loop Detection*

(viii) *TR 2505A Performance Specification for Above Ground Vehicle Detector Systems for Use at Permanent Traffic Signal Installations*

* 1. Each detector card shall be clearly labelled in the controller. Detector cards shall indicate clearly which loops they refer to; the references used shall comply with those shown on the Traffic Signal Drawing or Site Layout Drawing.
	2. Prior to the installation of detectors, reference should be made to the Traffic Signal Drawing for the proposed arrangement and location of loops, with the final location of detector loops, and actual slot cutting dimensions, to be agreed with the Highway Authority.
	3. As the final number of loops remains similar to the existing number of VA loops it is not expected new detector cards will be required, however the signal company must make a decision on this and include any extra cards within the works cost.
	4. Slot cutting shall only take place between the hours agreed with the Highway Authority or as per the main highways contract if applicable, unless written approval is obtained from the Highway Authority prior to the works being commenced.
	5. The minimum dimensions for slot cutting in asphalt road surfaces shall be 10mm wide by sufficient depth (typically 80mm) to allow 65mm cover of cables, for the actual loop perimeter and for the “Cut Back” for single, double or triple loop tails. On concrete road surfaces, the depths specified may be reduced by 30mm by prior permission of the Highway Authority.
	6. When slot cutting on or adjacent to bridges guidance should be sought from the Highway Authority to ensure the depth of slots is reduced sufficiently to avoid damage to any waterproof membrane on the bridge deck.
	7. Where the loop cable turns in the slot at an angle less than 110°, the apex of the corner shall be crosscut.
	8. For detectors that are paired the joint should be placed in series, not in parallel, to ensure that the DFM is flagged when a detector becomes faulty.
	9. Unless otherwise agreed with the Highway Authority, slots shall not be cut within 1.1m of any ferrous objects, expansion joints and/or poor surfacing. Failure to observe this can cause spurious demands, weaken the road surface and may cause subsequent surface failure.
	10. All slots shall be made dry and free of debris before the loop cable is laid, and all efforts shall be made to keep slots clean and dry before back fill is complete.
	11. Unless otherwise specified, loops will normally consist of three turns of the loop perimeter.
	12. Loop tails shall be twisted together and separately taken back to the chamber so as to enable any single loop to be disconnected from the feeder cable if required at a later date.
	13. Loop tails shall normally be taken under the kerbing / channelling, unless otherwise specified, into ducting leading to a chamber situated in the footway / verge where the loop tails and detector armoured feeder cables shall be jointed. In the event of “Beany Block” kerbing being employed loop tails shall be taken to the footway / verge chamber by a purpose built cable duct block. The Signal Company shall include for excavation (the minimum necessary) at the channel to access this duct and for reinstatement with bitumen (as used for sealing slots).
	14. Approximately 500mm of surplus loop tail and 500mm of feeder cable shall be left at the joint position. Loop tails shall be jointed to the feeder cable within the connection chambers in the footway / verge.
	15. The back fill for the loop cable shall be a two-part process, comprising of a layer of a suitable compound, such as epoxy resin, to encapsulate the cables followed by hot pour bitumen to BS EN 13304 heated to 180°C and having a viscosity not greater than 80 Poise. The hot pour compound shall totally fill the slot and any shrinkage as a result of curing is to be topped up, especially on crosscut corners. The layer of encapsulate shall be of a depth to provide 5mm cover for all loop cables in the slot. Where more than one pair of loop tails share a common “Cut Back” slot, a layer of encapsulate shall be poured over each pair to avoid entrapment of air amongst the loop cables. The manufacturers’ recommendations shall be followed explicitly regarding the handling, mixing and use of suitable compounds. The compound must be allowed to set before the application of hot pour bitumen. In addition, all COSHH 2002 guidelines should be followed.
	16. All feeder cable shall be armoured, and shall contain two pairs of cores unless otherwise agreed with the Highway Authority.
	17. Labelling of detector feeder cable shall be in accordance with an approved system as to their function and destination.
	18. Detector feeder cables shall be terminated at the controller in an appropriate fixed terminal block and “soft wired” using light-gauge multi-strand twisted-pair cable to the correct labelled detector input. Detector outputs shall be wired to all necessary equipment, i.e., Traffic Signal Controller, MOVA, etc.
	19. The “**Cable Schedule - Slot Cutting Measurement**” shall be completed prior to site acceptance, when the Signal Company will sign it, and hand it to the Highway Authority.
	20. The Signal Company shall provide, where feasible, a water bowser for cooling saw blades during slot cutting operations. The Signal Company shall do all they can to keep the outwash from the slot cutting operation to a minimum.

## 10 Outstation Monitoring & Control Unit / Urban Traffic Control / MOVA Unit

* 1. Where specified, the remote monitoring and control equipment shall be fully Type Approved and comply with the latest issue of the *TOPAS 2522A Remote Monitoring and Control of Traffic Control Equipment via a Telecommunications Network*. Self-Certification shall be in accordance with *TOPAS 0600B Self Certification Procedures for Registration Process of Traffic Control Equipment*.
	2. The minimum capability of the remote monitoring system shall be to detect the failure of those items shown below although most systems will be capable of monitoring other failures as well.

Any OTU installed should be able to report the following to the UTC instation:

Controller supply fail etc. Power restored
- Lamps on / off
- All out due to fault. Fault resolved, site restored
- Lamp failures. Lamps replaced
- Detector failures (PD and ND)

- Mode change
- Controller stuck

* 1. Where specified, the Outstation Transmission Units (OTU) / UG405 including associated MOVA / SCOOT detection and router shall be installed in the controller cabinet. The configuration of each Unit site address shall be carried out by the Signal Company to the Highway Authority’s requirements advised at the time of commission. The Signal Company shall supply Usernames and Passwords to the Highway Authority.
	2. The ADSL router shall have its own fused auxiliary power supply, suitably rated and marked accordingly. The ADSL router shall be installed in an appropriate position in the controller racking.
	3. The Signal Company shall enable Microprocessor Optimised Vehicle Actuation (MOVA) in the controller as defined in the scheme specific details, or as per manufacturer’s guidelines.
	4. The Signal Company shall install the most current version of MOVA, unless otherwise specified.
	5. Integral MOVA may be utilised at the discretion of the Highway Authority.
	6. The Signal Company shall supply the MOVA Licence Number and MOVA Licence Facility Code where appropriate to the Highway Authority.
	7. The OMCU / OTU / MOVA unit shall have its own fused auxiliary power supply, suitably rated and marked accordingly.
	8. A mounting shall be provided within the cabinet for the installation of the router. The mounting shall allow for a full width horizontally mounted equipment rack and shall include bolts and captive nuts.
	9. All unused reply bits on the OTU interface shall be strapped out. Unused cores of OTU cables shall be coiled and tied off to allow for future use, and not cropped.
	10. The Signal Company shall provide a suitable telecom termination point for the connection of the ADSL circuit in the controller. The provision of the telecom circuit will be the responsibility of others.
	11. The telecom circuit provided for new installations must ensure continued viability of service.
	12. The Signal Company shall be responsible for connecting the OMCU / OTU to the telecom circuit.

## 11 Commissioning and Testing

* 1. **A Factory Acceptance Test (FAT) of the revised junction controller (IC4) shall be carried out at the Surrey County Councils Traffic Signal depot.** The Signal Company’s configurator must be available via the phone to discuss any issues found with the revised configuration and to make any amendments necessary. The Highway Authority / WSP to give at least five working days notice of the proposed controller configuration being tested. A copy of the controller configuration document and IC4 file shall be forwarded to the Highway Authority before the FAT can take place. Such commissioning shall demonstrate compliance with the *MCH 1827B Traffic signal controller work specification and configuration forms*. Suitable signal lamp mimics and a means of simulating all inputs and outputs, lamp failures and conflicts shall be required. A “**Certificate of Factory Acceptance Test Results**” shall be completed and digitally signed by representatives from the Highway Authority and the Contractor on completion of the test. The accepted controller configuration shall be provided as an electronic file, in a format to be agreed with the Highway Authority, but which as a minimum shall allow for all configuration devices and project documentation to be replicated, and facilitate the generation of subsequent versions of the controller configuration. Following successful completion the Signal Company shall deliver the controller to Site for installation.
	2. Site testing and commissioning, after installation of the equipment, shall be required to demonstrate full compliance with the specification.
	3. Commissioning tests are as follows;
* Inspection of site layout and equipment location, to check compliance with the requirements of the specification and drawings.
* Electrical tests to demonstrate compliance with electrical requirements. The form ‘Traffic Signal Cable Test Certificate’ **must** have been completed, witnessed and agreed by suitably qualified Traffic Signal Engineer.
* A successful Site Acceptance Test (SAT) to demonstrate satisfactory and safe signal operation and control, including correct cabling of signal heads and operation of Lamp Monitoring.
* Successful testing of Remote Monitoring, including the reporting of faults to the SCC UTC instation.
	1. The Traffic Signal Engineer and design engineer shall be given at least 5 working days’ notice of the above for each site. Commissioning’s are not carried out on Fridays or weekends, or during the peak traffic hours.
	2. The SAT’s are to be carried out in the presence of / by representatives of the Traffic Signal Engineer, the design engineer and SCC signals engineer.
	3. The Contractor shall carry out comprehensive pre-commissioning checks to ensure compliance with the specification, **and confirm this has been done in writing** (email to the design engineer is adequate andrew.lunn@wsp.com) prior to requesting a representative of the Traffic Signal Engineer to attend SAT and Commissioning’s.
	4. The following documents are to be supplied by the Signal Company and retained in the controller at commissioning:

(i) A copy of the controller specification

 (ii) A copy of the “as laid” cable and signal schedule

 (iii) Electrical test certificates.

* 1. The Signal Company shall submit to the Highway Authority, prior to site acceptance, completed test certificates of all loops and feeders in accordance with the format shown in **Annex B** or an equivalent approved format. The Signal Company shall notify the Highway Authority 5 days prior to tests being undertaken so that the Highway Authority or their representative may be present.
	2. The Signal Company shall measure the series resistance and the insulation resistance of each loop circuit in accordance with Loop Testing of *MCH 1540F* or its subsequent issue. The following tests shall be carried out:

(i) Series resistance of loop. The resistance shall not exceed 2.0 ohms.

(ii) Resistance to earth of the loop conductor. The reading shall not be less than 10 Mohms.

1. Series resistance of loop and feeder. The resistance shall not exceed 5.0 ohms.
2. Resistance to earth of loop and feeder conductors with both feeder conductors connected together. The reading shall not be less than 10 Mohms.

A completed “**Certificate of Inductive Loop Detector Test Results**” shall be given to the Highway Authority prior to site acceptance.

* 1. A “**Certificate of Site Acceptance Test Results**” shall be completed and signed by representatives from the Highway Authority and the Signal Company on completion of the test.
	2. During the S.A.T, the Contractor is to carry enough spare equipment to ensure that any hardware/equipment failure does not delay switch-on or commissioning.

## Site Inspection

12.1 The contractor shall be deemed to have inspected the site prior to tendering for the works to assess any site-specific requirements and also log any outstanding faults.

* 1. Any faults should be made aware to SCC’s traffic signal maintenance department.

## Maintenance and Warranty

13.1 A 12-month warranty shall be provided, from the date of site acceptance of all the equipment supplied as part of this upgrade. Under warranty, the Signal Company shall replace or repair all parts found to be defective by reason of faulty design, materials and/or workmanship. The repaired or replacement parts shall be delivered and installed free of charge at the site location by the Signal Company.

* 1. The Maintenance Period is defined as “the 12-month period following the issue of the Final Site Acceptance Test Certificate and snagging when the installation has completed 30 fault free days leading up to the end of the 12 month period”.
	2. If the installation has not run fault free for 30 days then the Maintenance Period will be extended until the installation does run fault free for 30 days.

## Post Commissioning Configuration Amendments

14.1 Following acceptance of the traffic signal installations, the Highway Authority may request alterations to the controller EPROM or Flash Memory to incorporate minor changes and/or post commission data changes. The EPROM or Flash Data shall be supplied with all supporting documentation updated as necessary.

* 1. The Signal Company shall allow for the provision and installation of a revised EPROM configuration within the 12-month warranty period at the time of the site-specific works tender (Free of Charge).

# ANNEX A

## A1 Cable Identification Method

All cable and cable cores in permanent traffic signal installations shall be identified by the same method and code as detailed below or an equivalent approved system as to their function and destination.

A1.1 All cables entering any equipment housing shall be identified by a self-adhesive, or pull-tight self-keeping tag designed specifically for use in identification of cables. The tag shall be fixed around the inner sheath immediately above the Steel Wire Armouring (SWA) termination gland.

A1.2 The tag shall be marked, using a waterproof, permanent black marker pen, in the following manner:

(a) Low Voltage Signal Cables

The tag shall be red and shall be marked with the numbers of all the poles in the run.

(b) Extra Low Voltage Cables (Pedestrian Push Buttons, etc)

The tag shall be yellow and shall be marked with all the poles in the run but in addition the letters ELV shall be added.

(c) Extra Low Voltage Cables (Linking Cables)

The tag shall be yellow and shall be marked with the site reference number of the linked equipment and in addition the letters ELV shall be added.

1. Loop Feeder Cables

The tags shall be green, located at both ends of the feeder cable and marked with the loop identities as detailed in the Signal Design drawing.

Examples:

 a) b) c) d)

 P6 – 7 P3 – 9 P123 AX

 ELV ELV BX

Note: The pole numbers referred to above shall be those shown on the Site Layout Drawing.

# ANNEX B

## B1 Test result and acceptance certificates

The following certificates shall be utilised to record the results of tests carried out on equipment installations, and to document the acceptance of Traffic Signal Installations by the Overseeing Organisation.

|  |  |
| --- | --- |
| **Document No.** | **Title** |
| B1.1 | CERTIFICATE OF FACTORY ACCEPTANCE TEST RESULTS |
| B1.2 | CABLE SCHEDULE – SLOT CUTTING MEASUREMENT |
| B1.3 | CABLE SCHEDULE – LOW VOLTAGE (LV) |
| B1.4 | CABLE SCHEDULE – EXTRA-LOW VOLTAGE (ELV) |
| B1.5 | CABLE SCHEDULE – CORE ALLOCATION |
| B1.6 | CERTIFICATE OF INDUCTIVE LOOP DETECTOR TEST RESULTS |
| B1.7 | CERTIFICATE OF SIGNAL INSTALLATION ELECTRICAL TEST RESULTS |
| B1.8 | CERTIFICATE OF GREEN CONFLICT TEST RESULTS (may be part of SAT) |
| B1.9 | CERTIFICATE OF SITE ACCEPTANCE TEST RESULTS |

## B1.1 - CERTIFICATE OF FACTORY ACCEPTANCE TEST

|  |
| --- |
| Site Location: |
| **Site Ref. No:** | **Job Reference No:** |
| **Reason for Test (New site, Refurbishment, Modification, etc):** |
| **Controller Type:** | **EPROM No. & Issue:** |
| **Controller Serial No:** | **Date:** |
| **Check the following points**; ***✓*** passes, ***🗶*** non-conformance, ***N/A*** for not applicable and ***FUR*** for follow-up required. In the event of a non-conformance make a note in the comments section. |
|  |
| **Start Up / General** |
| 1) Verify all timer values in configuration printout correlate with original specification |  |
| 2) Clear RAM, switch on without PROM, and then turn off |  |
| 3) Set all detector and UTC inputs to Off, select Normal on Manual Panel, Insert PROM, switch on and verify start-up sequence |  |
| 4) Verify Starting Inter-green value (L/A not included): Seconds |  |
| 5) Verify Checksum value (insert value here): |  |
| 6) Check fall-back mode:  |  |
| 7) Set time and date |  |
| 8) Reset and clear fault log |  |
| 9) Check Signals On / Off switch. |  |
| Controller Configuration |
| 10) Check that artificial demands have been inserted, and controller serves all phases |  |
| 11) Verify all timer values in PROM correlate with original specification. Ensure timer values can be altered by handset command |  |
| (i) Verify Phase Minimum Green Periods(ii) Verify Phase Maximum Green Periods(iii) Verify Phase Extensions / Pedestrian Leaving Periods(iv) Verify Phase Intergreen Times & Handset Intergreen Limits(v) Verify Phase Delays(vi) Verify Detector Extensions(vii) Verify Detector Call / Cancel(viii) Verify Time Switch Parameters / Timetable(ix) Verify operation of Extend All Red (if applicable)(x) Verify operation of Cableless Linking (if applicable)(xi) Verify operation of SDE / SA (if applicable) |  |
| **Manual Mode** |
| 12) Select manual mode, observe mode indicator |  |
| 13) Select All-Red stage, ensure detector demands are inhibited |  |
| 14) Select each stage demand button, and verify the phases / stages relationship is correct. Operation of green arrows is correct? |  |
| 15) Verify all permitted movements |  |
| 16) Verify prohibited stage movements give correct indication |  |
| 17) Check phase delays |  |
| 18) Select All-Red stage, and ensure artificial demands are inserted when another mode is selected |  |
| 19) Verify operation of all remaining switches |  |
| **Fixed-time Mode** |
| 20) Select Fixed-time mode, observe mode indicator |  |
| 21) Verify stage sequence and operation of demand dependant stages in Fixed-time |  |
| 22) Check phase / stage timings; if running to current VA maxima, verify timetable events |  |
| 23) Ensure artificial demands are inserted when another mode is selected |  |
| **Vehicle Actuated mode** |
| 24) Verify detector allocation and function (demand / extend, latched / unlatched, call / cancel and pedestrian facilities) is correct  |  |
| 25) Verify permitted / alternative stage movements, and stage change logic is correct |  |
| 26) Check revertive stage with lack of demands |  |
| 27) Check Max reversion occurs, if extension is present when Max timer expires |  |
| 28) Verify timetable events |  |
| 29) Verify operation with permanent demands applied for all phases |  |
| Urban Traffic Control / MOVA |
| 30) Verify mode changes when force bit is applied |  |
| 31) Verify mode change when a TO bit is sent |  |
| 32) Verify mode changes when a force and TO bit is sent |  |
| 33) Verify permitted movements can be achieved: indicate any prohibited moves |  |
| 34) Verify when leaving UTC / MOVA mode that demands are inserted for all phases |  |
| 35) Check all prohibited moves or “vias” are prohibited in MOVA (can only be done by inspecting MOVA data) |  |
| 36) Verify Stage confirm bits all present and correct? |  |
| 37) Verify Phase confirm bits all present and correct? |  |
| 38) Check stage Force bits all present and correct? |  |
| 39) Verify a “Controller Ready Bit” (CRB) presence |  |
| 40) Verify CRB operation? |  |
| 41) Check TO actuation changes mode |  |
| 42) Verify stage change logic correct |  |
| 43) Verify G1 / G2 returned when lamps off? |  |
| 44) Verify detector inputs are correct and operate |  |
| 45) Check detectors have correct functions? (latch, call / cancel, etc) |  |
| 46) Check detectors demand / extend the relevant stage |  |
| 47) Check revert stage if no demands present |  |
| 48) Check operation with pd’s all round |  |
| 49) Verify outputs to MOVA are correct |  |
| 50) Verify operation of real time clock synchronisation control / reply bits |  |
| Hurry Call Mode |
| 51) Verify operation of detectors |  |
| 52) Verify target stage is selected when the Hurry Call is active |  |
| 53) Verify operation of delay, hold and prevent timers for each Hurry Call |  |
| Pedestrian facilities |
| 54) Verify operation of pedestrian demand units,  |  |
| 55) Verify pedestrian Blackout / All-Red periods |  |
| 56) Verify operation of pedestrian facilities in relationship with Safety Red Lamp Monitoring |  |
| 57) Verify operation of Pedestrian or Local links, in relationship with any specified stage operation, time of day event, input or delay, hold or prevent timers, etc. |  |
| Cableless Link Facility |  |
| 58) Verify timetable events select all plans |  |
| 59) CLF influences / bit patterns |  |
| 60) Verify operation of each plan influence, including demand dependant stage / phase moves, operate at correct entry point, and are not masked by previous influences |  |
| Part-time Operation |  |
| 61) Verify signals turn On / Off by timetable events, Queue loop input or auxiliary switch. Observe start-up stage shut down stage |  |
| 62) Verify Minimum On / Off timers operate |  |
| 63) Check operation of Safety Red Lamp monitoring |  |
| Monitoring |  |
| 64) Check Green-to-Green conflicts with suitable test box, for all real phases that conflict. Verify controller shut-down and fault log entries |  |
| 65) Lamp monitoring, verify operation of maintenance lamp monitoring |  |
| Miscellaneous Tests |
| 66) Use this section to detail tests required for additional facilities: |  |
| **Comments:** |
| **Make a note of the serial numbers of the cabinet, rack and principal modules:** |
| **Electronic “Master” Configuration file number: supplied (Y/N)** |  |
| **Hardcopy of Controller printout number: supplied (Y/N)** |  |
| **PASS or FAIL Test** |  |
| **Latest date for corrective action** |  |
| **Supplementary FAT required? (Y/N)** |  |
| **Surrey County Council Representative:** | **Contractor Company & Representative:** |
| **Signed:** | **Signed:** |
| **Date:** | **Date:** |

## B1.2 - CABLE SCHEDULE – SLOT CUTTING MEASUREMENT

|  |  |  |
| --- | --- | --- |
| Customer: | **Sheet** | **Of** |
|  |  |
| **Site:** | **Date:** |
| **Loop designation (Ax, Bsl etc)** | **Slot cut length (m)** | **Loop designation (Ax, Bsl etc)****Loop** | **Slot cut length (m)** |
| **Loop** | **Cut-back** | **Loop** | **Cut-back** |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| **Contractors Representative:** |
| **Signed:** |
| **Date:** |

## B1.3 - CABLE SCHEDULE – LOW VOLTAGE (LV)

|  |  |  |
| --- | --- | --- |
| Customer: | **Sheet** | **Of** |
|  |  |
| **Site:** | **Date:** |
| **Cable No.** | **No. of cores** | **From** | **To** |
| L |  |  |  |
| L |  |  |  |
| L |  |  |  |
| L |  |  |  |
| L |  |  |  |
| L |  |  |  |
| L |  |  |  |
| L |  |  |  |
| L |  |  |  |
| L |  |  |  |
| L |  |  |  |
| L |  |  |  |
| L |  |  |  |
| L |  |  |  |
| L |  |  |  |
| L |  |  |  |
| L |  |  |  |
| L |  |  |  |
| L |  |  |  |
| L |  |  |  |
| L |  |  |  |
| L |  |  |  |
| L |  |  |  |
| L |  |  |  |
| L |  |  |  |
| L |  |  |  |
| L |  |  |  |
| L |  |  |  |
| L |  |  |  |
| L |  |  |  |
| **Contractors Representative:** |
| **Signed:** |
| **Date:** |

## B1.4 - CABLE SCHEDULE – EXTRA-LOW VOLTAGE (ELV)

|  |  |  |
| --- | --- | --- |
| Customer: | **Sheet** | **Of** |
|  |  |
| **Site:** | **Date:** |
| **Cable No.** | **No. of cores** | **From** | **To** |
| E |  |  |  |
| E |  |  |  |
| E |  |  |  |
| E |  |  |  |
| E |  |  |  |
| E |  |  |  |
| E |  |  |  |
| E |  |  |  |
| E |  |  |  |
| E |  |  |  |
| E |  |  |  |
| E |  |  |  |
| E |  |  |  |
| E |  |  |  |
| E |  |  |  |
| E |  |  |  |
| E |  |  |  |
| E |  |  |  |
| E |  |  |  |
| E |  |  |  |
| E |  |  |  |
| E |  |  |  |
| E |  |  |  |
| E |  |  |  |
| E |  |  |  |
| E |  |  |  |
| E |  |  |  |
| E |  |  |  |
| E |  |  |  |
| E |  |  |  |
| **Contractors Representative:** |
| **Signed:** |
| **Date:** |

## B1.5 - CABLE SCHEDULE – CORE ALLOCATION

|  |  |  |
| --- | --- | --- |
| Customer: | **Sheet** | **Of** |
|  |  |
| **Site:** | **Date:** |
| **Cable core colour** | **Cable No.** | **Cable core colour** | **Cable No.** |
| **Phase** | **Function** | **Phase** | **Function** |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| **Contractors Representative:** |
| **Signed:** |
| **Date:** |

## B1.6 - CERTIFICATE OF INDUCTIVE LOOP DETECTOR TEST RESULTS

|  |  |  |
| --- | --- | --- |
| Customer: | **Sheet** | **Of** |
|  |  |
| **Site:** | **Date:** |
| Loop Designation | Series Resistance of LoopMax R = 2Ω | Resistance to Earth of LoopMin R = 10MΩ | Series Resistance of Loop and Feeder CableMax R = 5Ω | Resistance to Earth of Loop and FeederMin R = 10MΩ | Notes |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| **Contractors Representative:** |
| **Signed:** |
| **Date:** |

## B1.7 - CERTIFICATE OF SIGNAL INSTALLATION ELECTRICAL TEST RESULTS

|  |  |  |
| --- | --- | --- |
| Customer: | **Sheet** | **Of** |
|  |  |
| **Site:** | **Date:** |
| Test Equipment Used | Model & Serial Number | Calibration Date |
| Multimeter:Installation Tester:Earth Loop Impedance Tester:RCD Tester:Inductance Tester:Other: |  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
| Insulation Test of Complete Junction500V: …………………….. | RCD Test | Time |
| 30mA |  |
| 150mA |  |
| 300mA |  |
| Cable Test Results |
| Cable RunFrom To | Max. Allowable Earth Loop Impedance | Loop Resistance Core to Core | Loop Resistance Core to CPC | CPC Resistance | Earth Loop Impedance |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| **Contractors Representative:** |
| **Signed:** |
| **Date:** |

##

## B1.8 - CERTIFICATE OF GREEN CONFLICT TEST

|  |
| --- |
| Customer: |
| **Site:** | **Date:** |
| **Controller Type:** | **Number of “Real” Phases:** |
|  | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z | AA | AB | AC | AD | AE | AF |
| A |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| B |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| C |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| D |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| E |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| F |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| G |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| H |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| I |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| J |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| K |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| L |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| M |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| N |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| O |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| P |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Q |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| R |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| S |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| U |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| V |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| W |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| X |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Y |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Z |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| AA |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| AB |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| AC |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| AD |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| AE |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| AF |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Test conflicts “to” and “from” all real phases that conflict, ***✓*** passes, *🗶* failures and ***N*** non-conflicts. |
| **Contractors Representative:** |
| **Signed:** |
| **Date:** |

## B1.9 - CERTIFICATE OF SITE ACCEPTANCE TEST

|  |
| --- |
| Site Location: |
| **Site Ref. No:** | **Job Reference No:** |
| **Reason for Test (New site, Refurbishment, Modification, etc):** |
| **Controller Type:** | **EPROM No. & Issue:** |
| **Controller Serial No:** | **Date:** |
| **Equipment Installation by:** |
| **Check the following points**; ***✓*** passes, ***🗶*** non-conformance, ***N/A*** for not applicable and ***FUR*** for follow-up required. In the event of a non-conformance make a note in the comments section. |
|  |
| Site Layout & Street FurnitureCheck the following in accordance with the traffic signal drawing |
| 1) Poles are in correct position, vertical, stable and with correct numbering |  |
| 2) The road markings including stop lines are in the correct position |  |
| 3) The pedestrian crossing road studs are in the correct position |  |
| 4) The tactile paving has been installed to the correct layout |  |
| 5) Permanent / temporary advanced warning signs have been erected  |  |
| 6) The alignment of the signal aspects are correct and include backing boards with high intensity retro-reflective tape borders  |  |
| 7) Each traffic lane shall have clear forward visibility to both primary and secondary signal associated with its particular movement |  |
| 8) Box signs are illuminated (i.e., regulatory signs) |  |
| 9) The height and orientation of pedestrian demand units and repeaters |  |
| 10) Above-ground detector position and alignment. Check pedestrian detection for field of detection |  |
| 11) Inductive loops have been cut in the correct positions and have been sealed. Check SD/SA loop spacing are configured in software (if applicable) |  |
| 12) Lamp dimming solar cell positioned and secured correctly |  |
| 13) Ensure cabling in access chambers is tidy (to include 2m of slack) |  |
| 14) Flash test, verify all lamps are operational, if successful turn signals On |  |
| Controller ItemsCheck the following |
| 15) Provision of intersection ID on controller enclosure door  |  |
| 16) All battery back-ups are activated |  |
| 17) Door stay is fitted and functional |  |
| 18) Controller enclosure and door (when open) does not obstruct pedestrian movement |  |
| 19) Controller enclosure is fitted with a document rack on the door |  |
| 20) Internal wiring is arranged neatly and secure. Cables should not obstruct maintenance work on the controller or any other equipment fitted within the controller enclosure  |  |
| 21) Cable identification carried out correctly |  |
| 22) Detector cards are correctly labelled |  |
| 23) The base of the controller has been sealed; including spare and utility ducts |  |
| 24) The electrical service feeder pillar is installed correctly (inc. electricity providers cut-out and the secondary isolation fuse)  |  |
| 25) The communication pillar is installed correctly (inc. duct from pillar to controller enclosure) |  |
| 26) Maintenance socket is working correctly |  |
| 27) Handset port is functioning correctly |  |
| 28) The operation of all auxiliary switches on manual panel |  |
| Controller ConfigurationCheck the following |
| 29) Green conflict test |  |
| 30) Time of day, day of week, week of year / date and the operation of daylight saving is correct |  |
| 31) Verify Checksum value (Insert value here): |  |
| 32) Verify PROM number correlates with documentation and The Certificate of FAT if FAT not completed or Checksum values do not match, verify all timer values in PROM correlate with original controller works specification *(If yes, skip to Manual Mode Operation section)* |  |
| (i) Verify Phase Minimum Green Periods |  |
| (ii) Verify Phase Maximum Green Periods |  |
| (iii) Verify Phase Extensions / Pedestrian Leaving Periods |  |
| (iv) Verify Phase Intergreen Times & Handset Intergreen Limits |  |
| (v) Verify Phase Delays |  |
| (vi) Verify Detector Extensions |  |
| (vii) Verify Detector Call / Cancel |  |
| (viii) Verify Time Switch Parameters / Timetable |  |
| (ix) Verify Extend All Red (if applicable) |  |
| (x) Verify operation of Cableless Linking (if applicable) |  |
| (xi) Verify operation of SDE / SA (if applicable) |  |
| Manual Mode |
| 33) Select manual mode, observe mode indicator |  |
| 34) Select All-Red stage, ensure detector demands are inhibited |  |
| 35) Select each stage demand button, and verify the phases / stages relationship is correct. Operation of green arrows is correct? |  |
| 36) Verify all permitted movements |  |
| 37) Verify prohibited stage movements give correct indication |  |
| 38) Check phase delays (if applicable) |  |
| 39) Verify operation of all auxiliary switches on manual panel |  |
| **Fixed-time Mode** |
| 40) Select Fixed-time mode, observe mode indicator |  |
| 41) Verify stage sequence and operation of demand dependant stages in Fixed-time |  |
| 42) Check phase / stage timings; if running to current VA maxima, verify timetable events |  |
| **Vehicle Actuated Mode** |
| 43) Verify vehicle detector allocation and function (demand / extend, latched / unlatched, call / cancel, pushbuttons) is correct  |  |
| 44) Verify permitted / alternative stage movements, and stage change logic is correct |  |
| 45) Check revertive stage with lack of demands |  |
| 46) Check Max reversion occurs, if extension is present when Max timer expires |  |
| 47) Verify timetable events |  |
| 48) Verify Stage Prohibited, Alternate and Ignored moves (if applicable)The types of restrictions available are:PROHIBITED MOVEALTERNATIVE MOVEIGNORED MOVEThe above movement restrictions can apply in one or more modes, as specified on the configuration sheets |  |

|  |
| --- |
| Pedestrian facilities |
| 49) Verify operation of pedestrian demand units |  |
| 50) Verify operation of tactile indicators |  |
| 51) Verify operation of audible signals (unless specific site considerations warrant their exclusion) |  |
| 52) Is the audio facility configured to be inhibited during quiet hours? |  |
| TIMETABLE |  |
| **Time** (Insert time below, e.g., 07:00:00) | **Description** |
|  | Enable Audios |
|  | Disable Audios |
| 53) Verify operation of tactile indicators when audible signals inhibited during quiet hours |  |
| 54) Verify operation of kerb-side detector inputs |  |
| 55) Verify the operation of on-crossing detector inputs |  |
| 56) Verify pedestrian Blackout / All-Red periods |  |
| 57) Verify operation of pedestrian facilities in relationship with Safety Red Lamp Monitoring |  |
| 58) Verify operation of Pedestrian or Local links, in relationship with any specified stage operation, time of day event, input or delay, hold or prevent timers, etc. |  |
| Hurry Call Mode |
| 59) Verify operation of detectors |  |
| 60) Verify target stage is selected when the Hurry Call is active |  |
| 61) Verify operation of delay, hold and prevent timers for each Hurry Call |  |
| **Cableless Link Facility** |
| 62) Verify timetable events select all plans |  |
| 63) CLF influences / bit patterns |  |
| 64) Verify operation of each plan influence, including demand dependant stage / phase moves, operate at correct entry point, and are not masked by previous influences |  |
| **Part-time Operation** |
| 65) Part-Time mode: the Traffic Signals operate by time of day; minimum On / Off timers (if applicable) |  |
| 66) Verify queue loop input or auxiliary switch |  |
| 67) Check operation of Safety Red Lamp monitoring |  |
| Urban Traffic Control / MOVA |
| 68) Where specified, check OTU / UG405 unit supplied is as per works specification and installed correctly |  |
| 69) Verify functionality of OTU including signal lamp monitoring, detector monitoring, controller status checks, etc  |  |
| 70) Where specified, check functionality of MOVA unit |  |
| 71) Check that the controller returns a “Controller Ready Bit” (CRB) whenever it is not switched to a higher priority mode |  |
| 72) Check that the controller does not return a CRB whenever it is switched to a higher priority mode (e.g., manual). |  |
| 73) Check that the mode the controller returns to after a power failure generates the CRB, otherwise MOVA will not come back on control |  |
| 74) Verify Stage confirms: check that signal stages are confirmed correctly on the UTC reply bits (G1… Gn). Check that these signals are received correctly on the MOVA confirm channels 1 to n |  |
| 75) Verify Phase confirms: MOVA generally requires a confirmation signal for any phase which are green during an interstage period, either because they run through two consecutive stages, or because they have an early-start, or phase lag.Check that all phases defined by LPHASE data in the MOVA dataset are confirmed on the correct channels  |  |
| 76) Check correct stages are forced |  |
| 77) Check TO bit: should have been checked at FAT and should be checked again on site. MOVA is configured to send both a force and TO bit: check that a force alone is not sufficient to change mode, both a force and a TO must be sent to force the controller into UTC / MOVA mode and force a stage, and that all the stages can be forced |  |
| 78) Enable MOVA and check that MOVA takes control |  |
| 79) Check that MOVA stays on – serious faults will often be immediately obvious because MOVA will stick and then fail at the end of the first stage, or run stages which have no demands |  |
| 80) Verify detector inputs are correct and operate? |  |
| 81) Verify detectors have correct functions? (latch, call / cancel, etc) |  |
| 82) Verify detectors demand / extend the relevant stage |  |
| 83) Verify max reversion correct for each phase |  |
| 84) Check operation with pd’s all round |  |
| 85) Verify outputs to MOVA correct |  |
| 86) Verify G1 / G2 returned when lamps off? |  |
| 87) When MOVA is operational, check that Manual Panel Higher Priority mode LED is ON when MOVA is running |  |
| 88) Before leaving site, check that the DA and DF logs are starting to accumulate data and “clear” Error Log |  |
| 89) The MOVA facility requires the use of a licence code in order to be activated.Verify (MOVA) Licence Codes (if applicable)Licence Number (LIN) Licence Facility Code (LIF) |  |
| **Miscellaneous Tests** |
| 90) Priority / Emergency mode: the operation of detectors; the correct stage is called; time periods (if applicable) |  |
| 91) The operation of Local-Link / Pedestrian-Link facilities |  |
| 92) The DFM lamp operation |  |
| 93) Cover the solar cell and verify the operation of the dimming facility |  |
| 94) Check OMCU supplied is as per works specification and installed correctly |  |
| 95) Verify any fault detected is logged and reported to the instation identifying the type (i.e., signal lamp or detector, etc) and location (i.e., Phase A-RED or stage 2 demand, etc) |  |
| 96) Mimic a mains failure at the electrical service feeder pillar or mains switch and verify the fault is logged and reported to the instation. Once power is restored ensure the signal controller takes control. If MOVA is specified verify MOVA takes control and check that Manual Panel Higher Priority mode LED is ON when MOVA is running |  |
| Cable Testing |
| 96) The signal company shall measure the series resistance and the insulation resistance of each loop circuit in accordance with Loop Testing of *MCH 1540F* or its subsequent issue |  |
| 97) Earth Loop Impedance Tests shall be carried out in compliance with *BS 7671:2008 + Amendment 3:2015 Requirements for Electrical Installations, IET wiring regulations, Seventeenth edition* by the signal contractor |  |
| 97) Earth bonding shall be provided for all signal poles in accordance with the latest Edition of the IEE Regulations for Electrical Installations |  |

|  |
| --- |
| **Equipment** |
|  | *Type / Manufacturer* | *Qty* |
| Detector Packs |  |  |
| MVD |  |  |
| ONX |  |  |
| KSD |  |  |
| OMU |  |  |
| OTU |  |  |
| MOVA unit |  |  |
| Signal Head Manufacturer |  | Halogen |  | LED |  |
| **Documents supplied and complete: Cable (LV & ELV) and Core schedules; Loop, Electrical and Conflict Test Certificates**Electronic copies to be provided |  |
| **Site to scale drawing, controller configuration and site log book provided in controller** |  |
| **Set of keys and “T” bars provided if requested** |  |
| **Comments:** |
| **Engineer’s Acceptance** |
| **PASS or FAIL Test** |  |
| **Supplementary SAT required? (Y/N)** |  |
| **Corrective action required? (Y/N)** |  |
| **Corrective action required from Highway Authority:** | **Corrective action required from Contractor:** |
| **Latest date for corrective action** |  |
| **Surrey County Council Representative:** | **Contractor Company & Representative:** |
| **Signed:** | **Signed:** |
| **Date:** | **Date:** |

# ANNEX C

## C1 Standard Detail Drawings

The following drawings illustrate how facilities shall be installed. These should be read in conjunction with the Traffic Signal Drawing and Controller Specification, to ascertain the complete equipment or any special requirements. Please consult with the Highway Authority for exact equipment location and orientation details, and in case of doubt.

Detector Loop details shall conform to the requirements of the 7th Edition Specification for Highway Works, Volume 3 Highway Construction Details Section 1, G series drawings.

Further information for MOVA loop detector location and installation may be found in the TRL Application Guide 44 MOVA Traffic Control Manual, May 2011, Issue D and subsequent revisions.

Unless otherwise directed by the Highway Authority all road markings and sign details shall conform to the requirements of The Traffic Signs Regulations and General Directions 2011 and the Traffic Signs Manual Chapter 5 and any subsequent legislation which supersedes these documents.

|  |  |
| --- | --- |
| **Document No.** | **Title** |
| 1000/401 | Traffic Signal Poles |
| 1000/402 | Access Chambers |
| 1000/403 | Controller, Pole and Pillar foundations |
| 1000/404 | Ducts |
| G1, G2, G3 | Detector Loop – Slot Details |
| G5 | Detector Loop – Cross Cutting Corners of Loops |
| G27 | Detector Loop – Loop Profiles |
| G28 | Detector Loop – Turning, Queue and Speed Measuring configuration |
| G31 | Detector Loop – Typical UD, SCOOT and Count Loop configuration |
| G32 | Detector Loop – Typical MOVA diamond |

**ANNEX D**

## D1 Standards Reference Index

The following index cross-references standards and where they are used in this specification

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No | **Title** | **Date** | **Publisher** | **Reference Paragraph** |
| BS 8573:2012 | Electric cables. Thermosetting insulated, non-armoured cables with a voltage of 600/1000V, for fixed installations, having low emissions of smoke and corrosive gases when affected by fire | 2012 | British Standards | 8.2; 8.4 |
| BS 7671:2008+A3:2015 | Requirements for electrical installations. IET wiring regulations. Seventeenth edition | 2015 | British Standards | 2.1; 11.7 |
| BS EN 12368:2006 | Traffic control equipment. Signal heads | 2006 | British Standards | 6.1 |
| BS EN 12767:2007 | Passive safety of support structures for road equipment. Requirements, classification and test methods (incorporating corrigenda February 2008, October 2009 and November 2009) | 2008 | British Standards | 3.9 |
| BS EN ISO 1461:2009 | Specification for Hot Dip Galvanised Coatings on Iron and Steel Articles | 2009 | British Standards | 3.5; 7.3 |
| BS 50556:2011 | Road traffic signal systems | 2011 | British Standards | 2.6; 5.2; 8.4 |
| MCE 0108C | Siting of Inductive Loops for Vehicle Detecting Equipment At Permanent Road Traffic Signal Installations | 2002 | HA - Equipment specification | 9.1 |
| MCH 1540F | Specification for the Installation of Detector Loops on Motorways and All-Purpose Trunk Roads | 2006 | HA - Equipment specification | 9.1; 11.6 |
| MCH 1827B | Work Specification and Configuration Forms | 2005 | HA - Equipment specification | 11.1 |
| SI 2016 No. 362 | The Traffic Signs Regulations and General Directions 2016 | 2016 | The Stationary Office | 2.6 |
| TA 12/07 | Traffic Signals on High Speed Roads | 2007 | HA - DMRB | 2.1 |
| TA 15/07 | Pedestrian Facilities at Traffic Signal Installations | 2007 | HA - DMRB | 2.1 |
| TA 16/07 | General Principles of Control by Traffic Signals | 2007 | HA - DMRB | 2.1; 2.6 |
| TA 82/99 | The Installation of Traffic Signals and Associated Equipment | 1999 | HA - DMRB | 2.1; 2.8 |
| TA 84/06 | Code of Practice for Traffic Control and Information Systems for All-Purpose Roads | 2006 | HA - DMRB | 2.1; 2.9 |
| TD 07/07 | Statutory Approval of Traffic Control Equipment | 2007 | HA - DMRB | 2.1 |
| TD 24/97 | All-Purpose Trunk Roads Inspection and Maintenance of Traffic Signals and Associated Equipment | 1997 | HA - DMRB | 2.1 |
| TD 35/06 | All Purpose Trunk Roads MOVA System of Traffic Control at Signals | 2006 | HA - DMRB | 2.1 |
| TR 0102A | DTp Standard Traffic Signals | 1991 | HA - Equipment specification | 2.6; 5.5; 6.3 |
| TR 2029D | NMCS Inductive Loop Detector Cable | 2002 | HA - Equipment specification | 8.4; 9.1 |
| TR 2031E | NMCS Feeder Cable for Inductive Loop Detectors | 2008 | HA - Equipment specification | 8.4; 9.1 |
| TOPAS 2500A | Specification for Traffic Signal Controller | 2015 | TOPAS - Equipment specification | 2.3; 5.5 |
| TR 2505A | Performance Specification for Above Ground Vehicle Detector Systems for use at Permanent Traffic Signal Installations | 2005 | HA - Equipment specification | 9.1; 9.21 |
| TOPAS 2506A | Performance Specification for Above Ground On-Crossing Pedestrian Detection Systems | 2015 | TOPAS - Equipment specification | 9.1; 9.23 |
| TOPAS 2507A | Performance Specification for Kerbside Detection Systems for use with Nearside Signals and Demand Units | 2015 | TOPAS - Equipment specification | 9.1; 9.24 |
| TOPAS 2508A | Performance Specification For Tactile Equipment for use at Pedestrian Crossings | 2015 | TOPAS - Equipment specification | 2.7 |
| TOPAS 2509A | Performance Specification for Audible Equipment for use at Pedestrian Crossings | 2015 | TOPAS - Equipment specification | 2.7 |
| TR 2512A | Performance Specification for Below Ground Vehicle Detection Equipment | 2005 | HA - Equipment specification | 9.1; 9.28 |
| TOPAS 2513A | Performance Specification for Wig Wag Signal Control Equipment | 2015 | TOPAS - Equipment specification | 2.5 |
| TOPAS 2522A | Remote Monitoring and Control of Traffic Control Equipment via a Telecommunications Network | 2015 | TOPAS - Equipment specification | 10.1 |
| TOPAS 0600B | Self Certification Procedures for Registration Process of Traffic Control Equipment | 2016 | TOPAS - Equipment specification | 2.4; 10.1 |
|  | 7th Edition Specification for Highway Works, Volume 3 Highway Construction Details Section 1, G series drawings | 2005 | DfT | Annex C |
|  | The new roads and street works act | 1991 | Act of Parliament | 2.8 |
|  | Electricity at work regulations | 1989 | Statutory Instrument | 2.1; 2.8 |

# ANNEX E

# E1 Handover Checklist for Installation Site Records

**Site Name ……………………..………………………………………………………………………...**

**Site Reference Number …………………...…………………………………………………………**

# All of the following documents are to be supplied prior to the Hand-over inspection and prior to acceptance by the Highway Authority. All items shown with an asterix must be supplied prior to the Site Acceptance Test commencing.

|  |  |
| --- | --- |
|  | To be supplied |
| Signal equipment schedule \* |  |
| Controller configuration file (hardcopy) \* |  |
| Controller configuration file (electronic copy) \* |  |
| FAT documentation \* |  |
| Green conflict test certificate \* |  |
| Loop resistance schedule \* |  |
| Cable schedule – Low Voltage \* |  |
| Cable schedule – Extra-Low Voltage \* |  |
| Cable schedule – Slot Cutting measurement \* |  |
| Certificate of Signal Installation Electrical Test Results \* |  |
| Interim Site Acceptance Test certificate (if applicable) |  |
| Final Site Acceptance Test certificate |  |
| MOVA dataset (electronic copy) – if applicable |  |
| Fully updated As-Built drawing (hardcopy)  |  |
| Fully updated As-Built drawing (electronic copy) |  |
| Stage 1 Safety Audit |  |
| Stage 2 Safety Audit |  |
| Stage 3 Safety Audit |  |
| All exception responses to Safety Audits |  |

# ANNEX D

# D1 Site Handover Certificate

|  |
| --- |
| This Certificate signifies that in accordance with the attached checklist (Annex E) the installation has been verified as complying with the Works specification and all identified snagging has been rectified, therefore Practical Completion and Formal Acceptance has been agreed, subject to any alterations arising from the Stage 3 Safety Audit  |
| Site Name: | Site Reference Number: |
| Confirmed on behalf of the Traffic Management Team:Name:Position:Signature:Date: | Accepted on behalf of the Maintenance Team:Name:Position:Signature:Date: |