APPENDIX 5/2

SPECIFICATION FOR SERVICE DUCT REQUIREMENTS

THE CAMPUS, WELWYN GARDEN CITY

Control Sheet

Project Title:	The Campus, Welwyn Garden City
Document Title:	Appendix 5/2 Traffic Signs: Traffic Signals – The Campus Nr Bridge Rd, Welwyn Garden City
Revision:	First Issue

1.0 Location

1.1 The location for all new service ducts are shown on drawing number /003/1250/001 Traffic Signal Detailed Design.

2.0 Duct Requirements

2.1 Traffic signal ducts shall conform to BS EN 50086-2-4 and be MDPE 100 mm diameter, orange coloured and have 'Traffic Signals' embossed along its length. All ducts are to have smooth internal bore. Ducts from under kerbs/carriageway to nearest chamber shall be 50mm diameter and orange in colour.

2.2 Service ducts shall be arranged and laid in accordance with Hertfordshire County Council Standard Detail Drawing Number RING/1250/001.

2.3 The minimum cover below finished level shall be as follows:

- 100 mm diameter ducts across carriageway 750 mm
- 100 mm diameter ducts within footway/verges 450 mm

2.4 Ducts under carriageways shall extend at least 500 mm beyond the edge of the paved surface

2.5 Ducts shall extend into access chambers by 25 mm +/- 2 mm

2.6 Where joints are required between duct sections the edges shall be chamfered and any burrs removed.

2.7 The Contractor shall ensure that all draw cords remain within the ducts, chambers and all other access points following the installation of cable to facilitate future maintenance or modification requirements.

2.8 Where ducting is to run through the concrete foundation of a pole retention socket, the size of the concrete foundation will need to be increased. The socket manufacturer shall be contacted to advise on the required adjustment.

2.9 The duct locations shall be checked against the Contract drawings. Any differences shall be recorded on the "As-Built "drawings.

3.0 Chamber Requirements

3.1 Chambers shall be NAL Stakka box plastic twin walled type, installed as per manufacturer's specifications.

3.2 Chambers shall be 450 x 450mm or 600 x 600mm in size as stated on drawing /003/1250/001 Traffic Signal Detailed Design

3.3 All duct chambers shall be cleared of construction debris and detritus prior to the installation of any signal cable or other equipment. Any redundant cable should be removed from all duct and chambers prior to new cable installation

3.4 All new covers to inspection chamber/draw pits in footway shall be composite Grade B 125 to BS EN124:1994 with minimum skidding resistance (SCRIM Value) of 40 and incorporate the words 'Traffic Signals'.

3.5 All new covers and frames to inspection chambers / draw pits in the verge are to have the frame securely fitted to the chamber using fixings as supplied by NAL. The legend ‘Traffic Signals’ is to be applied to each cover. A 100mm concrete surround shall be supplied around the chamber frame and cover to reduce overgrowth covering the chamber.

The Campus, Welwyn Garden City
Bridge Rd Nr The Campus, Welwyn Garden City

APPENDIX 12/5 (INC. APPENDIX 12/70)

SPECIFICATION FOR THE INSTALLATION OF TRAFFIC SIGNALS THE CAMPUS, WELWYN GARDEN CITY

The Campus, Welwyn Garden City
Bridge Rd Nr The Campus, Welwyn Garden City

CONTROL SHEET

PROJECT TITLE: **THE CAMPUS, WELWYN GARDEN CITY**

DOCUMENT TITLE: **APPENDIX 12/5 TRAFFIC SIGNS: TRAFFIC SIGNALS THE CAMPUS NR BRIDGE ROAD, WELWYN GARDEN CITY**

RINGWAY REF:	REVISION	DATE	AUTHOR	CHECKED	AUTHORISED
352	-	18/05/22	T.BEDDING	H KHAN	C J GLADWYN

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1. TRAFFIC SIGNALS GENERAL REQUIREMENTS.

A new dual stream PUFFIN crossing shall be installed. This shall incorporate ELV LED signal heads, PUFFIN Demand and Display units, narrow field of view PUFFIN demand and Display unit, PUFFIN push button units, MVD's and on crossing detection, straight poles, NAL Retention Sockets. The controller shall be an ELV controller, as shall all signals equipment. A new feeder pillar with rotary isolator to Hertfordshire County Council specification shall be provided.

The pedestrian traffic signal controller shall be capable of operating in Pre-timed max mode.

The site is to communicate with the Hertfordshire County Council Dynniq RMS systems via a compatible 4G OMU. A 5 port 4G router shall be provided for wireless communication. All street furniture shall be black in colour.

A new feeder pillar and earth mat shall be required. The provision of a DNO electrical supply shall be ordered by the Client / Principal Contractor.

The Contractor shall then supply 3 core and Earth 6mm² SWA link cable to the Controller.

The Controller shall not be installed on site until there is operable electricity company power installed within the Traffic Signal Services Pillar. The controller shall be connected to the electricity supply and left powered unless isolation is required for safety reasons.

The site shall not be taken into maintenance by Hertfordshire County Council until all defects including remote monitoring are resolved unless otherwise agreed with a HCC traffic signal engineer representative.

Specialist traffic signal sub-contractors considered suitable must hold an ISO 9001 Certificate or similar approved accreditation.

1.1. Ducting and access chambers shall be installed in accordance with Appendix 5/2.

1.2. This specification is to be read in conjunction with standard detail drawings RING/1250/001 to RING/1250/011 (excluding RING/1250/004 & RING/1250/007).

Table 12/5 – Applicable Standards	
British Standards BS7671. (IET Wiring Regulations) 18TH Edition	
HSE Avoiding Danger from Underground Services.	
Institution of Electrical Engineers; Safety Related systems.	
IEC61508 Functional Safety of Electrical, Electronic and Programmable Electronic system.	
The Traffic Signs Regulations and General Directions 2016 inc. Chapter 6	
Manual of Contract Documents for Highway *Works* (MCHW)	
LTN 01/98	The Installation of Traffic Signals and Associated Equipment.
TA,TD,TM,TS 101 (DMRB)	Traffic Signalling Systems
TOPAS 0600D	Self Certification Procedures for Statutory Approval of Traffic Control Equipment.
TOPAS 2130B	Environmental Tests for Road Traffic Control Equipment
TOPAS 2500B	Specification for Traffic Signal Controller.
TOPAS 2505B	Above Ground Vehicle Detector Systems for Use at Permanent Traffic Signal Installations.

TOPAS 2506A	Specification for Above Ground On-Crossing Pedestrian Detection Systems.
TOPAS 2511A	Performance specification for nearside signal and demand units
TOPAS 2508C	Performance specification for tactile equipment for use at pedestrian crossings
TOPAS 2522A	Remote Monitoring and Control of traffic signal equipment via a telecommunication network
TOPAS 2523B	Traffic Control equipment interfacing specification
MCH 1969 A	Traffic Control System Design for all Purpose Roads.
MCH 1827D	Traffic controller *works* specification and controller forms.
BS:EN 12767	Passive Safety of Support Structures For Road Equipment.
MCS 0206	List of Drawings, Specifications and Instructions.

1.3. All materials and equipment shall comply with the relevant TOPAS specifications and with the latest Department of Transport TA, TR, MCE, MCH and MCK specifications, requirements and recommendations for Traffic Signal control equipment including, but not limited to those listed in Table 12/5 above.

1.4. The Contractor is to liaise directly with the Overseeing Organisation and statutory undertakers, prior to, at the commencement and during the signals associated works regarding detailed requirements.

1.5. All equipment, including cable, shall be supplied in a new and unused condition except insofar as it has been tested during the course of manufacture. Only equipment of the most recent type approved model currently in production shall be used.

1.6. Where an approved list for a particular type of equipment is incorporated in the Work/Job Order for the individual scheme, only equipment on that list shall be supplied, subject to the requirements of the general specification. Alternative equipment may be submitted for inclusion in the approved lists and alternative quotations may be provided assuming use of that equipment.

1.7. Traffic signal controllers shall comply with TOPAS 2500 issue B “Specification for Traffic Signal Controller” including all released amendments. All controllers shall comply with appropriate sections of this general specification as required by the technical specification for the individual scheme.

1.8. Street furniture shall comply with all relevant TOPAS specifications, Regulatory signs on traffic signal heads shall comply with BS 873: Part 5: 1983 “Specifications for internally illuminated signs and external lighting luminaries”.

1.9. Above ground detection equipment shall comply with the latest edition of TOPAS 2505 issue B “Specification Above Ground Vehicle Detector Systems for use at Permanent Traffic Signal Installations” and additionally any other requirements of this specification.

1.10. Tactile equipment mounted in pedestrian push button boxes shall comply with TOPAS 2508 issue C “Performance Specification for Tactile Equipment for use at Pedestrian Crossings”.

1.11. One printed copy of the user handbook or guide shall be supplied to the Overseeing Organisation for each type of controller and item of ancillary equipment. The documentation shall include a full list of operator commands and their functions and details of the functions of all switches accessible to the Overseeing Organisation. The Contractor shall supply the above documentation at the time of the Factory Acceptance Test (F.A.T.).

1.12. All equipment supplied shall be type approved for its purpose, including any modifications required by this specification.

1.13. All necessary blank forms/certificates and/or schedules referred to in this document are contained in Appendix A.

1.14. The Contractor is to notify the Overseeing Organisation of any problems that would affect installation of traffic signal equipment prior to the works.

1.15. The Contractor shall include for the supply and delivery of all equipment within this section, together with the testing of the installation and leaving it in working order to the satisfaction of the Overseeing Organisation. He shall also include for any materials and work which may not be expressly specified but which are implied and necessary for the satisfactory completion of the installation.

1.16. No equipment or street furniture is to be located within the working width of any existing or proposed road restraint system (safety barriers).

2. EQUIPMENT SPECIFICATION REQUIREMENTS.

2.1 The Contractor shall confirm in writing that the equipment has Department of Transport Type Approval for use on Public Roads or alternatively that the Department of Transport has granted provisional approval to Stage 3 where Type Approval is pending.

2.2 The traffic signal installation company shall be approved to BS EN ISO 9002 (Ref.1) certification against QAS 3433/287 (Ref.1) or QSS 015 (Ref.8). A copy of the respective approval certificate shall be submitted with the returned tender document.

2.3 The Contractor shall make provision in his tender for providing such facilities as may be required by the Electricity Supply Company to carry out such inspections and tests as they may require.

2.4 The regional electricity supply cables shall be provided and installed by the local Electricity Company who shall be responsible for bringing the service into the feeder pillar.

3. TRAFFIC SIGNAL CONTROLLER ELECTRICITY SUPPLY.

3.1 A new DNO supply shall be fed into the new feeder pillar. This shall be arranged by the Client / Principal Contractor.

3.2 The electricity supply to a traffic signal controller unit shall be fed from an independent feeder pillar/cabinet housing the Electricity Company's Cut out. The Feeder Pillar shall be installed adjacent to the controller. The feeder pillar shall have an independent double pole lockable isolator installed in conjunction with the Electricity Company's Drip proof cut-out both being attached to a 10mm thick non hygroscopic wooden Back Board.

3.3 The Contractor shall be responsible for the installation of the connecting cable between the feeder pillar and the Traffic Signal Controller Unit. Including the connection of tails in the Electricity Company's cut-out. The interconnecting cable shall be 3 cores PVC insulated SWA with a minimum conductor size of 6mm.

3.4 The Contractor shall be responsible for arranging/purchase of new or re-routing of existing controller electricity supplies to the new controller/cabinet locations with the Electricity Company. The supply shall be a minimum of 32 Amps 240Volts 50HZ, 24Hr single phase with a source impedance of <0.35 Ohms.

3.5 The Contractor is to notify the Electricity Board of the service requirements and the installation of the controller supply cabinet pillar. The Contractor is to arrange the necessary service *works* onsite.

3.6 The controller electrical connection is to be as per drawing RING/1200/005 and 1250/009.

4. TRAFFIC SIGNAL CONTROLLER INSTALLATION.

4.1 Unless specified by the Overseeing Organisation, all Traffic Signal Controllers and termination cabinets supplied under this contract are to be of the large case type, and shall be capable of accommodating a standard 465mm rack for the installation of transmission equipment.

4.2 All controller and termination cabinets shall be finished as per Overseeing Organisation specification. Space shall be made available within the cabinets for the Outstation Monitoring Units.

4.3 The locations of the controllers and termination cabinets shall be confirmed on site with the Overseeing Organisation prior to installation.

4.4 The cabinets are to be mounted on controller case root pedestals, installed as per standard detail drawing number RING/1250/003.

4.5 The part of the excavation within the controller case root shall be backfilled with compacted dry fine sand after the cables have been terminated.

4.6 Following completion of cabling, a layer of epoxy resin 6mm thick is to be laid on top of the sand to provide a seal with the controller case.

5. TRAFFIC SIGNAL CONTROLLERS.

5.1 Functional safety requirements are to conform to TOPAS 2500B including all appendices and TOPAS 2523B and be capable of offering UTC interface and UTC bits as described. Attention is drawn to I.E.T. Regulation number 471-12 and the requirement to ensure that the maximum earth disconnection time for low voltage circuits does not exceed 0.4 seconds.

5.2 Twin 13 amp switched maintenance sockets to BS 1363 shall be provided in all controllers and termination cabinets. The switched outlet sockets circuits are to include a residual current device (RCD) having a rated residual operating current not exceeding 30 mA. The RCD shall have a disconnection time not exceeding 0.4 seconds. The sockets are to be left spare and the connection of permanent site equipment such as an OTU or OMU shall not be allowed into the sockets.

5.3 All equipment shall be suppressed against interference with, or from, mobile phone, radio and television signals as stipulated by the Highway Agency.

5.4 The Contractor shall provide a Factory Acceptance Test (FAT) of the actual controllers to the Overseeing Organisation, by the Signal Company's Engineer at the local depot/factory prior to the installation on site. The FAT shall include the provision of all lamp and detection simulation. The Factory test shall also test all the controller PCB cards, Transformers and any other associated equipment to be used in the controller cabinet.

5.5 The Contractor shall not give less than 7 days notice to the Overseeing Organisation of the intention to carry out any of the (FAT) testing above.

5.6 In order that the Overseeing Organisation may witness the works tests carried out on the Traffic Signal Controller Unit prior to delivery to site, the Contractor is to give the Overseeing Organisation at least fourteen days advance notice that such tests are to be performed. Such tests are to be performed at the Contractor's expense.

5.7 The signal company shall allow for up to 3 requests for re-blowing of any PROM(s) with additional/amended information supplied to the Signal Company following commissioning of the installation. The time between installation and re-blowing could be up to twelve months. The PROM is to be collected from & fitted back on site within a maximum of 2 days from the requested amendments being received from the Overseeing Organisation.

Arrangements shall be in place for maintaining traffic signal control during the re-blowing period.

5.8 Manual Panel facilities are to include the following: -

- Dimming override switch.
- VA / FIXED TIME / MANUAL control switches.
- DFM lamp/LED test switch.
- Signals ON / OFF switch.
- All Red switch.
- VA / MANUAL / FIXED TIME / UTC / HURRY CALL /PRIORITY MODE and MOVA LED Indicators.
- The DFM lamp shall be visible from outside the controller cabinet.

6. CONTROLLER CONFIGURATION & DATA SET-UP.

6.1 The controller shall be configured and operable as a 2 stream pedestrian controller with Pre-timed max, VA and Fixed Time modes. The appropriate timings are detailed on the traffic signal drawings.

7. TRAFFIC SIGNAL POLES.

7.1 Standard steel traffic signal poles supplied shall be Galvanised and Coated with a plastic or equivalent material designed and manufactured and shall be fit for the purpose. A manufacturer guarantee of 20-Year life on all poles shall be required.

7.2 The Traffic Signal poles to be installed are at locations shown in the Work/Job Order. Final positions are to be agreed on site with the Overseeing Organisation.

7.3 All traffic signal poles are to be installed in NAL RS115 DF Retention Socket with Duckfoot Bend. The contractor shall ensure that:

- The retention socket shall be installed as per the manufacturer's guidance.
- If the planting depth of the retention socket is to be shortened, this shall be carried out in accordance with the manufacturer's guidelines.
- The RS 115 DF Retention Socket with duck foot swivel bend shall be inserted in the centre of the excavation with the locking chamber of the cast iron body positioned furthest from the tactile paving (usually 180º).
- The drainage tube shall extend to outside the concrete foundation.
- A stump pole is obtained prior to installation of retention socket, this is used to obtain correct vertical alignment of the socket.
- Foundation is constructed as stated by the manufacturer.
- No poles containing cable slots to be cut, if there is a need for a shorter pole, poles not containing a cable slot shall be used.
- If a pole is cut, galvanising spray shall be used at the point of the cut.
- Concrete of grade ST4 or better shall be used for filling the excavation.
- The soakaway shall be drained into the subbase.
- Pole wedges shall be used if poles are installed at 500mm from tactile paving. Block paviours do not need to be cut to 25mm; they can be directly bedded into the concrete foundation.

7.4 All traffic signal poles are to be numbered in accordance with the Overseeing Organisation's requirements.

7.5 Standard steel signal poles are to be installed as per Standard Detail Drawings numbers RING/1250/002.

8. TRAFFIC SIGNAL HEADS.

8.1 All traffic signals heads shall comply with the requirements of BS EN 12368 (Traffic Control Equipment – Signal Heads).

8.2 Unless agreed by the Overseeing Organisation, signal heads shall be high intensity LED, type approved, compatible with ELV controllers and capable of full lamp monitoring via the integral lamp monitoring facilities of the controller.

8.3 Heads shall be Class IV: IP55 in accordance with EN60529

8.4 The Head shall have a Class A temperature range +60ºC to -15ºC

8.5 All cable entry points into signal heads shall have a secure & permanent watertight seal.

8.6 Retro-reflective backing boards shall be supplied by the Contractor and fitted to all Traffic signal heads. They shall be fitted using the correct number and type of fixings as specified by the manufacturer.

8.7 Appropriate Hoods as indicated on the scheme drawings shall be provided by the Signal Company on all signal heads, pedestrian signal heads shall also be fitted with anti-phantom screens. Primary hoods shall be used on secondary heads at Pelican, Puffin, Toucan crossings and where closely associated secondary signals are used.

8.8 The centres of the amber lenses are to be located not less than 2.65 m, and not more than 3.10 m, above carriageway level. The lower most part of the signal head at toucan crossings shall be not less than 2.4m.

8.9 Primary Signal Heads are to be aligned to a point approx 1.5m above the centre of the approach, at a distance in accordance with Stopping Sight Distance (SSD) of the approach unless otherwise agreed by the Overseeing Organisation.

8.10 Secondary heads shall be aligned to a point 1.5m above the approach stop-line, unless instructed otherwise by the Overseeing Organisation.

8.11 Heads shall be securely clamped to prevent movement post alignment.

8.12 Any traffic signal head located on a traffic signal pole that is adjacent to an active carriageway shall have a minimum clearance of 450mm from kerb face to the edge of the associated sighting screen. Traffic signal head mounting brackets shall be supplied as required to achieve this minimum requirement.

8.13 The signals shall not be visible to motorists or pedestrians during installation and pre commissioning tests. All new signal heads shall be covered with a purpose made; opaque, orange tarpaulin/canvas cover (with no advertising on) and securely attached to the signal head. Push buttons including tactile devices shall also be covered. The coverings shall be fitted as soon as the new signal heads are positioned and shall not be removed until the Overseeing Organisation commissions the signals.

8.14 A Photo Electric Control Unit (PECU), plug-in type rated 55 lux on/100 lux off, with a 10-year guarantee shall be mounted on the signal head furthest away from any artificial light source.

8.15 Failure of the solar switch shall cause the signals to automatically assume the 'bright' condition. A Dimmer override switch is to be provided in the Police Flap.

8.16 Solar cell for dimming is to be of the type that shall ensure the correct dimming operation of the controller under street lighting conditions at the site location.

8.17 All regulatory (box) signs mounted within or on signal heads shall be illuminated using ELV LED energy saving lamps.

9. OUTSTATION MONITORING (CONTROL) UNIT.

9.1 Where remote monitoring is required, the Contractor shall supply and install a compatible 5port 4G router for the use with the OMCU unit.

9.2 OMCU's are to be compatible with the Overseeing Organisation's Dynniq in-station R.M.S.

9.3 Each OMCU is to be capable of being monitored and configured via the in-station, RS 232 to 485 Communications links, laptop computer, PDA and controller handset connected directly to the controller or OMCU port or termination cabinet port..

9.4 The Contractor shall liaise direct with the Overseeing Organisation, regarding the provision of the SIM and be responsible for ensuring that the SIM cards are setup and working prior to the SAT/OMCU testing.

9.5 Cabinet mounted aerials are to be used unless a signal strength test indicates that a separate aerial is required. When required any separate aerial shall be located on a signal pole which is to be positioned to ensure adequate signal strength that enables both outgoing and incoming calls to the OMCU. Signal strength tests are to be carried out by the Contractor prior to installation. Approval shall be sought from the Overseeing Organisation prior to installation of any pole mounted aerial.

9.6 Each OMCU shall be mounted within the traffic signal controller cabinet.

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

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

9.9 The OMCU shall also be supplied with facilities to enable interrogation of the traffic signal control equipment remotely by the in-station operator. This shall enable the operator at the in-station terminal (via the OMCU) to communicate with the control equipment to carry out 'manual' checking and amendment of RAM data if required.

9.10 Cable forms for OMCU installations are to be of a standard length and are 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 tied to an appropriate part of the controller chassis in such a way it shall not impede any subsequent maintenance *works* to the controller or the OMCU.

9.11 The OMCU shall be able to monitor variable all red periods and report violations as faults.

10. ABOVE GROUND PEDESTRIAN DETECTORS.

10.1 Any above ground pedestrian detectors that may be required as part of a signal installation, shall be capable of operating from a nominal supply of 24 Volts a.c. or d.c.

10.2 The type of above ground pedestrian detector unit, may be one of the following:

- Above ground Microwave On-Crossing Detector.
- Above ground Digital Vision Kerbside Detectors that shall incorporate an adjustable pick up zone.

10.3 Above Ground Pedestrian Detectors shall be the most recent statutory type approved model fit for the purpose, produced by the supplier.

10.4 Plug and socket cable connections shall be supplied for termination purposes. These connectors shall be fitted to the signal head assembly to enable the detector units to be easily removed for maintenance purposes.

10.5 All above ground detection units shall have clear viewing zones and brackets shall be installed accordingly to ensure detection beams are not hindered by any backing board or other equipment arrangements

11. PEDESTRIAN FACILITIES.

11.1 Pedestrian Signals shall be ‘Near-sided’.

11.2 Near-sided indicator and pushbutton demand units shall be of the combined type as specified and shall comply with the requirements of TOPAS 2511A (Performance Specification for Nearside Signal and Demand Units)

11.3 Where audible units are installed, it shall be possible to mute the audible signal using the controller’s internal master time clock.

11.4 The push button case and front panel is to be manufactured from Die cast Aluminium.

11.5 All push-button units are to be installed with the underside of the push-button unit 1000mm above footway level, unless otherwise specified.

11.6 When separate indicator and demand units are installed, there shall be a minimum of 100mm between the top of the demand unit to the hinge of the nearside indicator unit.

11.7 Where separate or high-level repeater nearside indicators/display units are specified they shall be narrow field of view. The installation height of repeat indicator units is to be agreed on site with the Overseeing Organisation.

12. CABLING.

12.1 All cables are to be provided with a minimum of 25% spare dedicated cores between each pole position and the controller. Each Pole is to be individually fed from the Controller. Series cabling of poles is NOT permitted. All cable sheaths shall be coloured Orange unless otherwise agreed by the Overseeing Organisation and marked “Traffic Signals”.

12.2 Each cable shall be clearly labelled in waterproof lettering at the Pole cap termination, in access chambers, termination cabinets and the controller giving a unique cable identifier for ease of maintenance. Labelling to be in accordance with appendix 12/70

12.3 Each Detector cable shall be clearly labelled in waterproof lettering at the controller base.

12.4 The connections in the pole cap assembly for 4m poles SHALL not contain more than two cores per connector. To take into account the extra terminations that may be required when a Puffin / Toucan facility is installed then as appropriate an extended pole cap assembly shall be employed. It shall be noted that additional termination blocks strapped to the standard arrangements of a standard pole cap would not be allowed.

12.5 All wire-armoured cables, which are to be installed into the traffic signal controller cabinet, shall be terminated using the compression gland technique and bonding shall satisfy the requirements of BS7671.

12.6 Adjacent metalwork not forming part of the installation shall NOT be bonded to any part of the Traffic Signal installation.

13. TESTING AND COMMISSIONING OF THE COMPLETED TRAFFIC SIGNAL INSTALLATION.

13.1 The Contractor shall be responsible for the testing, inspection and commissioning of the completed installation (Clause 1424), and for certifying that all such *works* comply with the current edition of BS 7671 by issuing a Completion Certificate and a copy of the associated test results.

13.2 The completed installation shall be designed and tested electrically in accordance with the I.E.T. Wiring Regulations (BS 7671). The Electrical tests shall be completed and submitted to the Overseeing Organisation at least 1 day prior to commissioning of the signals and shall include: -

- Earth continuity test.
- Earth loop impedance test
- Insulation resistance test of all cores.
- Continuity of all cores to mass of cores
- Polarity check
- Residual Current Device test

13.3 A Completion Certificate shall be issued to the Overseeing Organisation at the time of signals commissioning or Site Acceptance Test (SAT). A copy of the certificates is contained in Appendix A. Commissioning shall not be completed until this certificate has been satisfactorily completed and accepted by the Overseeing Organisation.

13.4 The Contractor shall not give less than 7 days notice to the Overseeing Organisation of the intention to carry out any of the Electrical tests specified. The Overseeing Organisation and his representative shall be entitled to witness such tests. As many tests as in the opinion of the Overseeing Organisation are possible shall be arranged together.

13.5 In the event of any Electrical test indicating failure to comply, that test and those proceeding shall be repeated, in the correct sequence, after the fault has been rectified.

13.6 Until the site is commissioned and accepted by the Overseeing Organisation, the traffic signals are to remain switched off except for the purpose of electrical testing. Should the signals require to be switched on prior to commissioning, then Traffic Signal Inoperative boards are to be used in accordance to the Traffic Signs Regulations & General Directions 2002 Diagram No. 7019 at the responsibility of the Contractor.

13.7 The signals shall not be visible to motorists or pedestrians during installation and pre commissioning tests. All new signal heads shall be covered with a purpose made; opaque, orange tarpaulin/canvas cover (with no advertising on) and securely attached to the signal head. Push buttons including tactile devices shall also be covered. The coverings shall be fitted as soon as the new signal heads are positioned and **shall not** be removed until the Overseeing Organisation commissions the signals.

13.8 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.

14. OMCU COMMISSIONING.

14.1 Commissioning of the OMCU is to be carried out in the presence of the Overseeing Organisation. Interrogation of the OMCU shall be demonstrated by the Contractor to the Overseeing Organisations satisfaction by means of a suitable interrogation device.

14.2 The Contractor is to provide the Overseeing Organisation with an In-station configuration and live graphic diagrams, on disk or via e-mail at least one week prior to the SAT

14.3 The Contractor shall also complete and forward a copy of the completed “OMCU Installation Details Certificate” form to the Overseeing Organisation at least one week prior to the SAT

14.4 The Contractor shall test the OMCU in the presence of the Overseeing Organisation to demonstrate that the monitoring requirements of section 12 of this Appendix have been met, and that OMU current indication corresponds with the number of lamps being monitored per phase and detector input locations, etc.

14.5 The Contractor shall also override the dimming sensor in order to force the control equipment to change to the dim state. The OMCU shall be tested to confirm that the dim state has been recognised and that no lamp faults (as a result of the dim state) are reported by the OMCU to the in-station.

14.6 The Contractor shall remove one signal lamp per phase in turn at each signal installation being commissioned. Confirmation from the in-station operator shall be sought by the Overseeing Organisation that the lamp failure has been identified by the OMCU for the correct aspect and phase.

14.7 The Overseeing Organisation reserves the right to instruct the Contractor to carry out any other tests that they may consider necessary to prove the correct operation of the monitoring equipment.

15. WARRANTY AND MAINTENANCE.

15.1 The Contractor shall provide for warranty periods during which any defective equipment supplied shall be repaired or replaced. These warranty periods shall consist of 36 months for below ground vehicle detection and associated equipment (TOPAS 2505B), 5 years for LED signal heads Regulatory Signs and Push-Buttons and 12 months for the remainder of equipment. All returned parts shall be repaired / replaced and returned to the Overseeing Organisation free of any charge within 2 weeks from receipt of the faulty components.

15.2 The warranty periods listed above shall not commence until all works (including all Defects and Incomplete Works) have been completed, and a period of 28 fault free days has elapsed.

15.3 All outstanding defects and incomplete *works* (snags) are to be rectified within two weeks of switch on. In the event that outstanding works and defects are not completed within the timeframe, the Overseeing Organisation reserves the right to employ the services of another signal company to complete outstanding work and invoice the Contractor. Failure to resolve outstanding snags, to the Overseeing Organisations satisfaction, within the allocated timeframe may also result in the signal company being omitted from future tenders.

16. DOCUMENTATION.

16.1 Traffic Signal Design Drawing and controller log book is to be provided in a waterproof wallet fixed inside the controller cabinet.

16.2 A hard copy of the instruction and maintenance manual for the controller shall be provided.

16.3 Instruction Manuals shall contain all information necessary to enable the equipment to be operated under normal working conditions and include brief details of simple checking procedures.

16.4 A DVD, contained within a protective case, with electronic versions of the above files and diagrams and manuals shall also be provided and handed to the Overseeing Organisation at the SAT.

APPENDIX A – INSTALLATION DOCUMENTS

Title
Slot Cutting Measurement Certificate
Cable Schedule - Extra Low Voltage (ELV)
Cable Schedule - Low Voltage (LV)
Equipment Power Consumption Certificate
OMCU Installation Details Certificate
Traffic Signal Installation Completion Certificate

SLOT-CUTTING MEASUREMENT CERTIFICATE

Junction Location .....

Site Reference No ..... Sheet ..... of ..... Date of Measurement .....

Loop Identity	Slot-cutting (metres)		Under Kerbs (No.)	Notes
	Flexible Pavement	Rigid Pavement		
Totals				

Signed .....for and on behalf of ..... (Contractor)

Signed ..... for and on behalf of the Overseeing Organisation

CABLE SCHEDULE - EXTRA LOW VOLTAGE (ELV)

Junction Location .....

Site Reference No ..... Date ..... Sheet..... of .....

Cable No.	No. of Cores	From	To
E1			
E2			
E3			
E4			
E5			
E6			
E7			
E8			
E9			
E10			
E11			
E12			
E13			
E14			
E15			
E16			
E17			
E18			
E19			
E20			

Signed .....for and on behalf of ..... (Contractor)

Signed ..... for and on behalf of the Overseeing Organisation.

CABLE SCHEDULE - LOW VOLTAGE (LV)

Junction Location .....

Site Reference No ..... Date ..... Sheet..... of .....

Cable No.	No. of Cores	From	To
L1			
L2			
L3			
L4			
L5			
L6			
L7			
L8			
L9			
L10			
L11			
L12			
L13			
L14			
L15			
L16			
L17			
L18			
L19			
L20			

Signed ..... for and on behalf of ..... (Contractor)

Signed ..... for and on behalf of the Overseeing Organisation .

EQUIPMENT POWER CONSUMPTION CERTIFICATE

Power Supply Requirements of Equipment to be Supplied.

a) Average power consumption of controller, detection and lamps (inc. wait lamps & internally illuminated Regulatory box sign lamps) .....Watts

b) Peak Current .....Amps

c) Electricity Supply Company Cut-out fuse rating ..... Amps

OMCU INSTALLATION DETAILS CERTIFICATE

S.C.N./SITE Location:……
Site telephone no:……
Commissioned by……...(Signal Engineer)

Phase	Description	Type
1a		
2b		
3c		
4d		
5e		
6f		
7g		
8h		

Det	Description
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	

Det	Description
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	
27	
28	
29	
30	
31	
32	

Date: Comments:

TRAFFIC SIGNAL INSTALLATION COMPLETION CERTIFICATE

Customer

DETAILS OF THE INSTALLATION

Site Address:	
Maintenance Site No:	Customers Drawing No:
New Installation.	Extent of installation covered by this certificate
Modification to Installation.	

Type of Earthling

TN-C-S TN-S TT

Characteristics of the Supply at the origin of the installation:

Nominal Voltage ..... Volts Frequency ..... Hz

	Specified	Measured
Maximum prospective fault current (KA)		
Earth fault loop impedance or origin, Ze Ω		

Mains supply protection device at origin: Type: BS ……. Rating ……. A

Master switch fuse or circuit breaker: Type: BS ……. Rating ……. A

Residual Current Device protecting:

Whole installation ……. mA N/A

Maintenance socket only ……. mA

INSTALLATION TEST RESULTS

Test Equipment Used	Serial Number:	Calibration Date:
MultiMate: -		
Insulation Tester: -		
Earth Loop Impedance Tester: -		
RCD Tester: -		
Inductance Tester: -		
Other: -		
	RCD Test	Time
Insulation Test of Complete Installation	30 mA	
	150 mA	
500V : - ……	300 mA	

Traffic Signal Cable Test Certificate

Site: .....

Cable (From-To) .....

Cable type (LV/ELV).....

Tested	Witnessed
By:	By: .....
of:	of: .....
Signature: ..... Date:	Signature: ..... Date: .....

Circuit Protective device	Type :	Standard :	Rating :	A
Sheath Insulation Test (min. 1 MΩ @ 500 V)	MΩ			
Supply Voltage	At Feeder Pillar : V	At Signal Head : V		
Earth Loop Impedance (Ω) (max 20 Ω)	At Feeder Pillar:	Phase-Neutral : Ω	Phase-Earth : Ω	
	At Signal Head:	Phase-Neutral : Ω	Phase-Earth : Ω	

Core	Colour / Description	Insulation Resistance MΩ (min 6 MΩ @ 500 V)	Continuity Ω
Armour			
1	Brown		
2	Yellow		
3	Green		
4	Red		
5	White		
6	Blue		
7	Orange		
8	Black		
9	Red / White		
10	Red / Blue		
11	Grey		
12	Violet		
13	Red / Brown		
14	Red / Yellow		
15	Red / Black		
16	Red / Grey		
17	Red / Purple		
18	Red / Orange		
19	Red / Green		
20	Blue / White		

Inductive Loop Test Certificate

Site:.....

Weather ..... Temperature : ……..... ºC (min 2 ºC)

Tested By:..... of : ..... Signature : ...…..... Date : .....

Witnessed By : .....of : ..... Signature : ....…….. Date : .....

	Loops						Feeder Cables			Loops and feeder cables				
	Loop before backfilling			Loop after backfilling				Loop Feeder before jointing		After jointing				
Loop Reference	Insulation Resistance MΩ (min. 10 MΩ @ 500 V)	Conductor Continuity Ω	Inductance μh	Insulation Resistance MΩ (min. 10 MΩ @ 500 V)	Conductor Continuity Ω	Inductance μh	Length m	Insulation Resistance MΩ	Conductor Continuity Ω	Insulation Resistance MΩ	Conductor Continuity Ω	Measured Inductance μh	Theoretical Inductance μh (L=0.82.P.N(N+1))	Theoretical Continuity Ω (Max. 13.7 Ω/Km @ 20°C [±20%])

APPENDIX B – TR2500 CONTROLLER WORKS SPECIFICATION.

Note: N/A – Hertfordshire County Council Standard Dual Stream PUFFIN Crossing Controller

APPENDIX C – TRAFFIC SIGNAL DESIGN DRAWING.

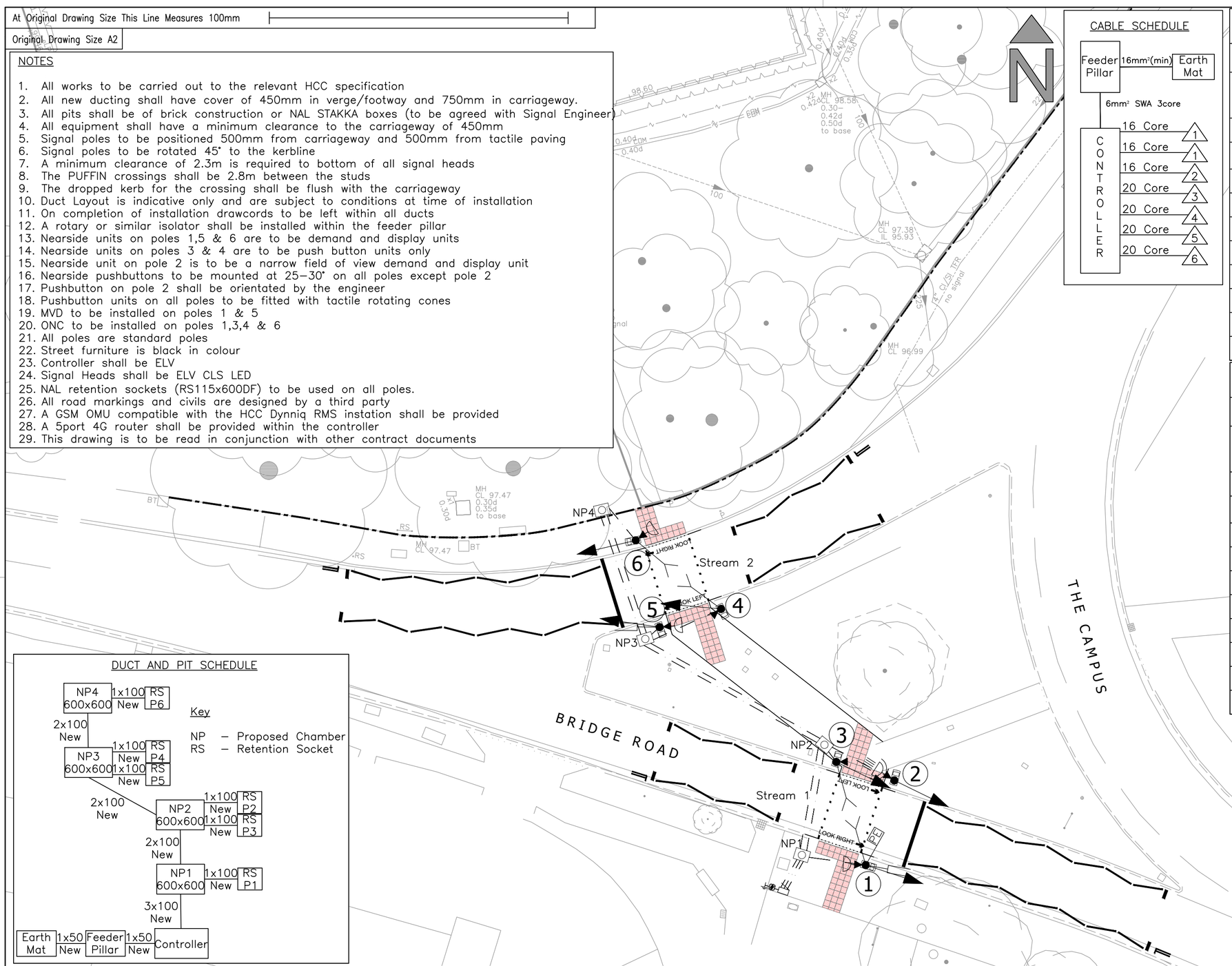
Note: /003/1250/001

At Original Drawing Size This Line Measures 100mm

Original Drawing Size A2

NOTES

1. All works to be carried out to the relevant HCC specification
2. All new ducting shall have cover of 450mm in verge/footway and 750mm in carriageway.
3. All pits shall be of brick construction or NAL STAKKA boxes (to be agreed with Signal Engineer)
4. All equipment shall have a minimum clearance to the carriageway of 450mm
5. Signal poles to be positioned 500mm from carriageway and 500mm from tactile paving
6. Signal poles to be rotated 45° to the kerbline
7. A minimum clearance of 2.3m is required to bottom of all signal heads
8. The PUFFIN crossings shall be 2.8m between the studs
9. The dropped kerb for the crossing shall be flush with the carriageway
10. Duct Layout is indicative only and are subject to conditions at time of installation
11. On completion of installation drawcords to be left within all ducts
12. A rotary or similar isolator shall be installed within the feeder pillar
13. Nearside units on poles 1,5 & 6 are to be demand and display units
14. Nearside units on poles 3 & 4 are to be push button units only
15. Nearside unit on pole 2 is to be a narrow field of view demand and display unit
16. Nearside pushbuttons to be mounted at 25–30° on all poles except pole 2
17. Pushbutton on pole 2 shall be orientated by the engineer
18. Pushbutton units on all poles to be fitted with tactile rotating cones
19. MVD to be installed on poles 1 & 5
20. ONC to be installed on poles 1,3,4 & 6
21. All poles are standard poles
22. Street furniture is black in colour
23. Controller shall be ELV
24. Signal Heads shall be ELV CLS LED
25. NAL retention sockets (RS115x600DF) to be used on all poles.
26. All road markings and civils are designed by a third party
27. A GSM OMU compatible with the HCC Dynniq RMS instation shall be provided
28. A 5port 4G router shall be provided within the controller
29. This drawing is to be read in conjunction with other contract documents



CABLE SCHEDULE

Feeder Pillar — 16mm²(min) — Earth Mat

6mm² SWA 3core

CONTROLLER

16 Core	1
16 Core	1
16 Core	2
20 Core	3
20 Core	4
20 Core	5
20 Core	6

DUCT AND PIT SCHEDULE

NP4 600x600 — 1x100 New — RS P6
2x100 New
NP3 600x600 — 1x100 New — RS P4; 1x100 New — RS P5
2x100 New
NP2 600x600 — 1x100 New — RS P2; 1x100 New — RS P3
2x100 New
NP1 600x600 — 1x100 New — RS P1
3x100 New
Earth Mat — 1x50 New — Feeder Pillar — 1x50 New — Controller

Key
NP – Proposed Chamber
RS – Retention Socket

STREAM 1 PUFFIN CROSSING OPERATIONAL CYCLE and TIMINGS

Period	SIGNALS SHOWN		Timings (seconds)
	To Pedestrians	To Vehicles	
1	Red	Green	PTM 20 FT 7 – 20 VA 7 – 20
2	Red	Amber	3
3	Red	Red	1 Gap 3 Force
4	Green	Red	5
5	Red	Red	3
6	Red	Red	5
7	Red	Red	0
8	Red	Red	0
9	Red	Red / Amber	2
Call Forward Timing – 18 Seconds		Pedestrian Comfort Factor – 3s	
MVD Ext. 0.5s		ONC Ext. 1.5s	

STREAM 2 PUFFIN CROSSING OPERATIONAL CYCLE and TIMINGS

Period	SIGNALS SHOWN		Timings (seconds)
	To Pedestrians	To Vehicles	
1	Red	Green	PTM 20 FT 7 – 20 VA 7 – 20
2	Red	Amber	3
3	Red	Red	1 Gap 3 Force
4	Green	Red	5
5	Red	Red	3
6	Red	Red	5
7	Red	Red	0
8	Red	Red	0
9	Red	Red / Amber	2
Call Forward Timing – 18 Seconds		Pedestrian Comfort Factor – 3s	
MVD Ext. 0.5s		ONC Ext. 1.5s	

Key
- Proposed drawpit 600x600
- Proposed 50mm ø ducts marked "Traffic Signals"
- Proposed 100mm ø ducts marked "Traffic Signals"
- NAL RS115x600DF Retention Socket
- Standard pole
- 3 Aspect LED primary head
- Traffic signal controller
- PUFFIN demand and display unit
- NFOV PUFFIN demand and display unit
- Single LED pedestrian push button
- Microwave Vehicle Detector
- Pedestrian On–Crossing Detector
- Photo Electric Cell
- Feeder pillar
- Pedestrian crossing studs
- Proposed Pedestrian tactile paving
- Earth mat

Notes

Rev.	Detail	Date	D'rn	C'hd	App.

	CAD	Drawn
Initials	TB	TB
Date	18/05/22	18/05/22
	Checked	Approved
Initials		
Date	10/6/2022	10/6/2022
Scales	1:200	Sheet No 1 OF 1

Drg. No. 352/003/1250/001

Rev -

Project Title

THE CAMPUS, WELWYN GARDEN CITY

Drawing Title

TRAFFIC SIGNAL DETAILED DESIGN
BRIDGE RD NR THE CAMPUS, WGC

Mayer Brown Limited
Lion House, Oriental Road
Woking, Surrey,GU22 8AR
Tel:- 01483 750508
Web:- www.mayerbrown.co.uk

RINGWAY
Albion House, Springfield Road
Horsham, West Sussex, RH12 2RW
Tel:- 01403 215800
Web:- www.ringway.co.uk

APPENDIX D – EQUIPMENT SCHEDULE

Description	Quantity
ELV Dual Stream Pedestrian Controller (Black)	1
4G OMU with 5port 4G Router (compatible with HCC Dynniq instation)	1
Solar cell	1
4m straight Poles + pole cap (Black)	6
ELV RAG head incl bracketry (primary)	6
Nearside PUFFIN Indicator with combined push button and wait	3
Narrow field of view PUFFIN Indicator with combined push button and wait	1
PUFFIN push button unit only	2
On-crossing detectors	4
MVDs	2
Double pole isolation device	1
Commissioning	item
Additional Brackets as required	item
Testing	item
Liaison	item
1.0 / 1.5mm2 SWA traffic signal cable	item

All the above quantities are indicative and should be used in conjunction with the detailed site drawing, any anomalies in the quantities must be highlighted in the site specific quotation. All signal heads should have backing boards unless specified on the site drawing.

The above quantities are for traffic signal equipment only. No allowance has been made for any civils items (ie pole sockets, chambers, ducts etc)

APPENDIX 12/70 : CABLE AND CABLE CORE IDENTIFICATION

This Schedule is issued to ensure that all cable and cable cores in traffic signal installations are identified by the same method and code.

1 Traffic Signals Cable Identification

All cables entering any equipment housing shall be identified by a 'Pull-Tite' tag fixed around the inner sheath immediately above the Steel Wire Armouring (SWA) termination gland. The tag shall be marked, using an approved waterproof, indelible black marker pen, in the following manner:

(i) Low Voltage Signal Cables - The tag shall be red and shall be marked with the numbers of the post, serviced by the cable.
(ii) Extra Low Voltage Cables (Pedestrian Push Buttons, etc) - The tag shall be yellow and shall be clearly marked with the post number serviced by the cable, in addition the letters ELV shall be added.
(iii) 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.
(iv) Loop Feeder Cables – One side of the yellow tag shall be marked with the detector and arm designation. The other side of the tag shall give the location of the loop.

Examples:

(i)

P 6-7

(ii)

P 3-9
ELV

(iii)

12/99
P
ELV

(iv - Side 1)

AXYZ1
ARM1

(iv -Side 2)

HIGH
STREET
W/BND

2 Identification of Cable Cores

All individual cable cores in cables used in a traffic signal installation shall be identified using coloured PVC grip type markers as shown below. The markers shall be positioned on the core adjacent to the termination point in such a way that they can be read easily. The markers shall be of a type that can not be removed without the removal of the core from its terminal.

The three identification markers used shall be:

(i) First Marker – Numbered markers indicating posts numbers. These shall be colour coded in accordance with the international resistor colour code. The numbers shall indicate the post fed by that cable, i.e. the next post to which the cable runs.

(ii) Second Marker – Legend markers indicating the function of the core as shown below. These shall be colour coded as follows:

- LV Live conductor - Red with Black Text
- LV Neutral conductor - Black with white text
- LV Spare conductors - Brown with black text
- ELV All conductors - Yellow with Black text

(iii) Lettered markers indicating the phase of the core (White with black text)

17 Notes

- Where the address of the other end of a cable is the controller the first marker shall be omitted.
- Functions not covered by the above shall be written onto blank markers with an approved pen.

Example of standard pre-printed markers:

First marker

1	Brown	2	Red	3	Orange	4	Yellow	5	Green
6	Blue	7	Violet	8	Grey	9	White	0	Black

Second marker for LV cables

RED	Red	AMBER	Red	GREEN	Red
R/MAN	Red	G/MAN	Red	WAIT	Red
I.G/A	Red	F.G/A	Red	SIGN	Red
PE/L	Red	PE/N	Black	PE/SW	Red
SIG/N	Black	SIGN/N	Black	SPARE	Brown

Second marker for ELV cables

PUSH/B+	Yellow	BLEEP+	Yellow	TACT+	Yellow
PUSH/B-	Yellow	BLEEP-	Yellow	TACT-	Yellow
COMM	Yellow	INHIB	Yellow	LINK	Yellow
DET+	Yellow	SPARE	Yellow	T/O	Yellow
DET-	Yellow	MVD	Yellow	IRD	Yellow

Third marker

A	B	C	D	E	Etc. All White