



South Wokingham Distributor Road - Spine Road and Western Gateway Phase 1

Specification Appendix 12/5

WMHP-TG-SRWG1-SP-HI-1205

(Revision P04, Date 19/01/24)



Balfour Beatty

South Wokingham Distributor Road -Spine Road and Western Gateway Phase 1

Specification Appendix 12/5

Wokingham Borough Council

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Issuing Office:	Tony Gee and Partners LLP, Hardy House, 140 High Street Esher, Surrey, KT10 9QJ
Tel:	+44 1372 461600
Email:	esher@tonygee.com

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1. Permanent Traffic Signals

1.1. General

- 1.1.1. The specification works package refers to the installation of six new permanent signal-controlled crossings within Wokingham Borough Council (WBC) district:

- Toucan Crossing Finchampstead Road South
- Toucan Crossing SWDR by Tesco
- Toucan Crossing SWDR by Tesco
- Croudace Link junction
- Easthampstead Road Junction
- Heathlands Road junction

- 1.1.2. This traffic signals specification shall be read in conjunction with the following traffic signals design drawings:

Finchampstead Road South

- WMHP-TG-SRWG1-DR-HI-1231 – Signal Layout
- WMHP-TG- SRWG1-DR-HI-1232 – Signal Ducting

SWDR by Tesco

- WMHP-TG- SRWG1-DR-HI-1233 – Signal Layout
- WMHP-TG- SRWG1-DR-HI-1234 – Signal Ducting

SWDR by FP25

- WMHP-TG- SRWG1-DR-HI-1235 –Signal Layout
- WMHP-TG- SRWG1-DR-HI-1236 – Signal Ducting

Croudace Link junction

- WMHP-TG- SRWG1-DR-HI-1240 – Signal Layout
- WMHP-TG- SRWG1-DR-HI-1241 – MOVA Detection
- WMHP-TG- SRWG1-DR-HI-1242 – Ducting Layout

Easthampstead Road Junction

- WMHP-TG- SRWG1-DR-HI-1237 – Traffic Signal Layout
- WMHP-TG- SRWG1-DR-HI-1238 – MOVA Detection
- WMHP-TG- SRWG1-DR-HI-1239 – Ducting Layout

Heathlands Road Junction

- WMHP-TG- SRWG1-DR-HI-1243 – Traffic Signal Layout
- WMHP-TG- SRWG1-DR-HI-1244 – MOVA Detection

- WMHP-TG- SRWG1-DR-HI-1245 – Ducting Layout

- 1.1.3. All traffic signals installation works shall be in accordance with TD 101 revision 0 for Traffic Signalling Systems including former traffic signals guidance which may be more appropriate (i.e. TA 84/06 “Code of Practice for Traffic Control & Information Systems for All Purpose Roads”), the traffic signals design drawing and this specification.
- 1.1.4. All traffic signals works shall be fully approved to the current Traffic Open Products and Specifications (TOPAS) 2500A, Technical Directives, Advice Notes, Wokingham Borough Council (WBC) specifications and guidelines and Chapter 6 of the Traffic Signs Manual (TSM).
- 1.1.5. The traffic signals equipment shall comply with all relevant specifications in law or in common practice or covered in codes of practice. In all cases the current issue shall apply including any subsequent amendments.
- 1.1.6. The traffic signals equipment and works shall comply and be manufactured, supplied, brought into service by relevant contractor(s) in accordance with the set procedures of the relevant technical directives and advice notes. In all cases the current edition, issue or version will apply including any subsequent amendments.
- 1.1.7. The traffic signals contractor shall ensure that all traffic signals equipment is available for installation on site within 12 weeks of an order being placed.
- 1.1.8. The installation of traffic signals ducts, sockets, ducting chambers, mains feeder pillar and controller root bases will be undertaken by the main civils contractor. Responsibility for checking the vertical alignment of signal posts also rest with the civils contractor who shall also ensure that retention sockets are correctly aligned before the third-party traffic signals installer attends the site to fit traffic signals equipment.
- 1.1.9. The WBC Traffic Signals Engineer is to be called to site to verify the exact locations of the poles, chambers and controller before any excavation takes place. The main civil contractor is to allow 24 hours’ notice for this inspection.
- 1.1.10. The traffic signals contractor will be responsible for carrying out all necessary electrical tests in accordance with BS7671 including earth loop impedance (ELI) and insulation testing, and in this respect, certificates should be completed and given to the engineer prior to commissioning.
- 1.1.11. The Contractor must also make provision for providing such facilities as may be required by the Electrical Authority to carry out such inspection and tests as they may require.
- 1.1.12. The installation works shall be carried out with minimum disruption to pedestrians and vehicular traffic. Measures should be taken to ensure the safety of the contractor’s staff and the public during the works. Adequate working space, warning signs, means of access and lighting must be provided.

- 1.1.13. The Contractor must install a NAL controller base or similar approved by WBC Traffic Signals Engineer.
- 1.1.14. The Contractor must install NAL pole retention socket (RS115X750DF) units which shall be manufactured from ductile iron to BS 2789 (GGG50-Din 1693) Grade 500/7 with a lockable lid and enables easy bottom entry of cabling through a duck-foot bend arrangement.
- 1.1.15. The contractors shall ensure that all construction works and activities on the existing highway network conform to the New Roads and Street Works Act 1991, Traffic Signs Manual Chapter 8 and all the relevant health and safety regulations and acts.

2. Traffic Signals Equipment and Street Furniture

2.1. General

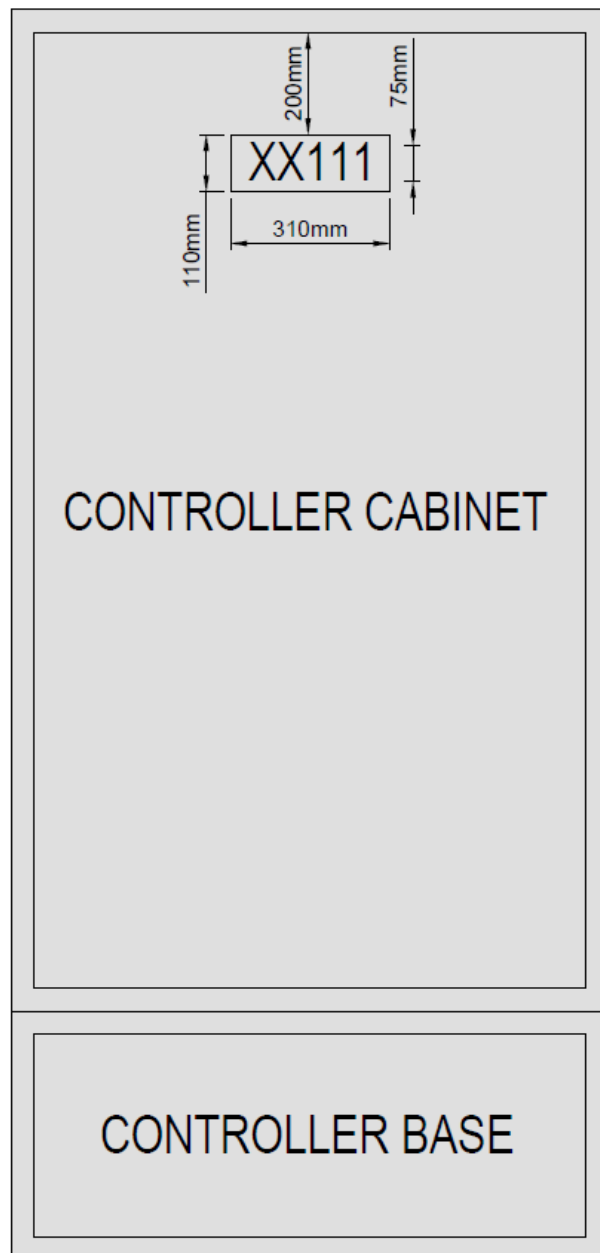
- 2.1.1. All traffic signals street furniture shall comply with TR 2206A "Specification for Road Traffic Signals". Regulatory signs on traffic signal heads shall comply with BS 873: Part 5:1983 "Specifications for Internally Illuminated Signs and External Lighting Luminaries".
- 2.1.2. All items of street furniture shall be treated with an appropriate protective finish that shall be intact at the time of delivery. Where major damage is sustained after delivery, advice should be sought from the Engineer before undertaking further work involving the damaged item. If during installation, the finish sustains minor damage or unprotected metal surfaces are exposed, for example while drilling holes in poles for pedestrian demand units, an appropriate repair shall be undertaken or protective coating applied to reduce the risk of corrosion.
- 2.1.3. All telemetry shall be compliant with 'UTMC-TS004.0064bis:2017 UTMC Objects Registry: Traffic Signal Interface'. The traffic signals controller and outstation I/F shall be UG405 compatible for communication via ethernet.

2.2. Traffic Signal Controller and Controller Cabinet

- 2.2.1. An ELV Traffic Signal Controller, as indicated on traffic signals design drawing, is to be installed that includes a large form controller case, black in colour, which is to be mounted on a NAL controller base or similar approved by WBC Traffic Signals Engineer. All traffic signal control street hardware specified shall be provided to the latest specification.
- 2.2.2. Hard standing around traffic signal controller and poles (in verges) to be constructed of 150TK C25/30 concrete with a lightly tamped finish over 150TK granular sub-base to clause 891AR, 892AR or 893AR. Hard standing to have 1:40 fall away from signal equipment. Surrounds to have a minimum extension of 1.2m from all outer edges of traffic signal furniture.
- 2.2.3. A 50mm duct shall be installed directly into pre-formed void under the controller and shall be connected into adjacent electricity supply pillar (ESP). The ESP is

typically located alongside the controller approximately 100mm away and shall have a second black duct laid in the direction of the electricity service provider's first available power source as specified by that provider.

- 2.2.4. A 4G STRATOS / MOVA (where applicable) unit is to be supplied, installed and configured to the Reading Borough Council (RBC) cloud-based system.
- 2.2.5. A dual LAN output router, similar to the LR77v2 Libratum SLMDR router, provided by Mobius Networks Ltd., shall be supplied, installed and commissioned by the traffic signals contractor.
- 2.2.6. The antenna is to be affixed to the outside of the controller case and to be black in colour. The latest specification antenna, similar to the Puck-5 (black in colour), shall be included in the router assembly as mentioned above. A Mobius Networks Ltd. 4G SIM card for the router will be free-issued by WBC.
- 2.2.7. Traffic signal controllers shall comply with TOPAS 2500A "Specification for Traffic Signal Controller" and all its appendices or latest approved specification. The fundamental design purpose and preferred phase operation is highlighted within associated traffic signals design drawing.
- 2.2.8. Controller main access door(s) shall be fitted with door stays and straps, to secure the door(s) at greater than 100 degrees to the closed position. Hinged swing frames or similar arrangements providing additional internal access shall be fitted with robust systems to hold them at their maximum opening.
- 2.2.9. A 13A maintenance socket shall be provided as minimum on all controllers. All ancillary equipment shall be wired to its own Miniature Circuit Breaker (MCB) on the power distribution rail and shall not be connected into maintenance sockets.
- 2.2.10. Controller cabinet shall be labelled with the allocated site reference number (SRN) on a legible weather-proof label (Black letters with X-height of 75mm on White background). Indicative schematic diagram for the reference of traffic signals contractor has been provided below.
- 2.2.11. The controller cabinets shall be fitted with type S18 main door lock and compression box of similar approved by WBC. Two sets of keys for each controller lock type and instruction manuals for equipment purchases shall be provided unless otherwise directed by the WBC Traffic Signals Engineer.
- 2.2.12. Controller cabinet door(s) shall be closed and secured whenever unattended. Unattended is defined as not in the immediate vicinity of the controller or any live exposed conductor. It will be acceptable to be a distance away making it impossible to take avoiding action should anyone attempt to interfere with any live equipment. If for whatever reason this is not possible, the contractor shall position suitably signed temporary safety barriers around the controller or any live conductor. Failure to adhere to instructions may incur penalties against the authority responsible.



2.3. Traffic Signal Poles

- 2.3.1. All new poles to be installed shall be as per pole types, specifications and setting out details provided within the traffic signals design drawing. All poles shall be with mid-access, slot-less traffic signal poles, fitted with a standard matching colour vented pole cap.
- 2.3.2. All poles should fit in standard NAL sockets (RS115X750DF) as indicated on traffic signals design drawing. The poles shall include termination units, similar to the NAL pole termination unit, which is to be confirmed with WBC Traffic Signals Engineer prior to pricing.

- 2.3.3. All signal poles shall be labelled clockwise using two black on white weatherproof adhesive labels, 50mm x-height, fitted on each pole as follows:
- 150mm below the lowest head bracket facing on-coming traffic; and
 - 150mm below the lowest head bracket facing the controller location.
- 2.3.4. The poles supplied shall be without pre-drilled holes for pedestrian demand units (PDUs). Such holes shall be drilled on site so that demand units are angled to enable pedestrians at the kerb to see both the 'WAIT' indicator and approaching traffic. The angle of all pedestrian demand and nearside units shall be set-out by the Engineer prior to installation. Where during the installation, the finish sustains minor damage or unprotected metal surfaces are exposed, for example while drilling holes in poles for the PDUs, an appropriate repair shall be undertaken or protective coating applied to reduce the risk of corrosion. All protective sleeves provided to protect poles during transportation to site should remain in place until commencement of the Site Acceptance Test.
- 2.3.5. The traffic signals contractor shall ensure all traffic signal poles have pole numbers affixed prior to the SAT.

2.4. Vehicle Signal Heads

- 2.4.1. Unless specified otherwise, each signal head assembly on a single approach shaft comprises fully compatible equipment and shall comply to BS EN 12368:2000 "Traffic Control Equipment – Signal Heads". LED ELV Red, Amber, Full Green 3 aspect traffic signal head (primary or secondary) assembly shall be supplied and installed unless otherwise indicated by the WBC Traffic Signals Engineer.
- 2.4.2. Where signal head assemblies are to be side mounted on the pole negating the need for extension brackets, there shall be a horizontal clearance of not less than 450mm from vertically above the kerb edge to the nearest part of the assembly. Where the road has a steep camber or on high speed approaches, the clearance may be increased as instructed by the WBC Traffic Signals Engineer, to avoid any likelihood of damage to signal heads by approaching vehicles.
- 2.4.3. Signal heads installed on a footway shall be mounted at 2.1m height to maintain reasonable vertical clearance for pedestrians and 2.3m above cycleways to maintain reasonable vertical clearance for cyclists. For installation on grass verges and traffic islands, the mounting height for signal head shall be as directed by the WBC Traffic Signals Engineer.
- 2.4.4. Where the 85th percentile approach speed is 35 mph or less, signal heads shall be directed at point approximately 1.5 metres above the half of the carriageway involved at 50 metres from the stop line.
- 2.4.5. Where the 85th percentile approach speed is greater than 35 mph, signal heads shall be directed at a point approximately 1.5 metres above the half of the carriageway involved at 200 metres from the stop line. If the visibility distance at a site is less than 200 metres then the signal shall be aimed at the maximum visibility distance.

2.5. Pole Retention Socket (PRS)

- 2.5.1. The PRS shall be installed in the footway/cycleway, verge or traffic island to support the signal pole and to ease the subsequent cabling of the installation. The specification details for PRS is tabulated within the relevant traffic signals design drawing.
- 2.5.2. The retention unit shall be manufactured from ductile iron to BS 2789 (GGG50-Din 1693) Grade 500/7 with a lockable lid and enables easy bottom entry of cabling through a duck-foot bend arrangement. The duck-foot bend is rotational through 360 degrees to allow cable access from any direction. The signal pole shall be secured in position by captive stainless-steel retention setscrews. Only PRS agreed by the WBC Traffic Signals Engineer shall be used.
- 2.5.3. The PRS shall provide for burying all types of signal pole to a depth of 0.6m, or unless as instructed by the manufacture's requirements. Any change to the standard burying depth shall be agreed with the WBC Traffic Signals Engineer and supported with a modified foundation design. The PRS foundation shall be concrete with characteristic cube strength of not less than 25 N/mm², laid to the underside of the surface course.
- 2.5.4. The maximum distance between a PRS and nearest ducting chamber shall be 20m.
- 2.5.5. The PRS cover shall be retained within the lockable lid for future use.

2.6. Vehicle and Pedestrian Detection

- 2.6.1. Any above ground vehicle detection equipment shall conform to TOPAS 2505B "Performance Specification for Vehicle Detection Equipment".
- 2.6.2. Any on-crossing pedestrian detection equipment shall conform to TOPAS 2506A "Performance Specification for Above Ground On-Crossing Pedestrian Detection Systems".
- 2.6.3. Any kerbside pedestrian detection equipment shall conform to TOPAS 2507A "Performance Specification for Kerbside Pedestrian Detection Systems for Use with Nearside Signals and Demand Units".
- 2.6.4. Each above ground detector unit shall be attached to a high-level bracket connected to a signal pole, so the detector shall have a clear view past brackets, signal heads and backing boards of the required detection zone.

2.7. Luminescence Control Via a Photoelectric Cell

- 2.7.1. The location of the 'plug in' type photoelectric cell shall be shown on the traffic signals design drawing.
- 2.7.2. The photoelectric shall be rated at 55 Lux.

- 2.7.3. Photocells shall be sited in accordance with the manufacturer's recommendations. Care should be taken to ensure that the photocell is not overshadowed, causing the lamps to be permanently dimmed, or installed near street lighting, causing the lamps to operate on full brightness during the hours of darkness.

2.8. Audible Equipment and Tactile Indicators

- 2.8.1. Audible indicators shall be installed as specified on the contract drawings and shall comply with TOPAS 2509A "Performance Specification for Audible Equipment for use at Pedestrian Crossings". The audible equipment must be switched off at night between 2200 hours and 0600 hours or as specified in the TOPAS 2500 forms.
- 2.8.2. Tactile indicators shall be installed as specified on the contract drawings and shall comply with TOPAS 2508A "Performance Specification for Tactile Equipment for use at Pedestrian Crossings".

2.9. CCTV

- 2.9.1. A CCTV camera with radio communications shall be installed by others on a lighting column at each of the three traffic signal junctions. A fused supply in the lighting column base and a commando socket 6.5m above ground level shall be arranged by others.
- 2.9.2. There is no connection between CCTV and the signals equipment.

3. Cabling, Ducting and Chamber Arrangements

3.1. Cabling Requirements

- 3.1.1. All signal cables shall comply with current issue of BS 6346:1987 "Specification for PVC-Insulated Cables for Electricity Supply", with the following specification PVC/SWA and have their outer-sheath coloured orange. Additionally, they shall be embossed with the legend "TRAFFIC SIGNALS" in 4mm high characters generally in accordance with Clause 11.2 of the specification.
- 3.1.2. The cabling for the installation shall be designed and include an assessment of the applied loading. The design shall be authorised by the competent Signals Engineer prior to implementation on site.
- 3.1.3. The colours of cores within multi-core cables and the function of each core colour at junction and mid-block crossing controllers shall conform to the guidance provided in TR 2206A Appendix D.
- 3.1.4. All Signal Heads (ELV), pedestrian demand units and Above Ground Detectors shall only be supplied with ELV supply and cabling. Where required, transformers for demand unit lamps and tactile equipment shall be housed within the controller. ELV cables between the pole top cap and push-button box may have the armouring removed to ease installation.

- 3.1.5. Signal cables of 8, 12, 16, or 20 core shall be used throughout, with a minimum of 4 (four) spare cores or 25% spare core capacity (whichever is greater) between poles and between poles and controller. Daisy chaining of cables is not permitted.
- 3.1.6. Separate cables shall be supplied for Extra Low Voltage (ELV) and Loop Detector Feeder cable runs. Each cable shall have a unique cable number. Both the number and the location of the other end of the cable shall be clearly written in indelible ink on a 'pull tight' tag securely fixed to each end of the cable. ELV cables shall have a yellow tag and loop detector feeder cables shall have a green tag.
- 3.1.7. Cable and wiring forming out shall be to a uniform and neat manner. All new installations shall use ELV as the street cabling system. Either as multi-core or a data-power combination system.
- 3.1.8. All cables leaving the controller/termination cabinet shall be fastened to the castellation bars within the controller/termination cabinet. These bars should be earthed to the main earth point.
- 3.1.9. All cables at pole cap top assemblies should be fastened to the Pole Cap Top (PCT) mechanically bonding the cables armouring to the assembly. A minimum size earth lead of 2.5mm flexible wire should be attached to the cables armouring and terminated on to the earth block of the PCT.
- 3.1.10. Cables shall not be bent to an internal radius of less than 12 times the overall external diameter of the cable or less than the radius recommended by the cable manufacturer, whichever is the greater.
- 3.1.11. The cores, including the spares, shall then be routed below and parallel to the distribution panel and then branched out from this form to their appropriate termination point. Cable cores that have been terminated shall be tied together in a neat manner.
- 3.1.12. Spare cores at the pole tops, controller and all other locations shall be terminated and bonded to earth. The spare cores shall be cut to a minimum length, grouped and tied together and labelled 'SPARE'.
- 3.1.13. All cables at the controller end should be labelled clearly to identify the function of each individual core. A cabling schematic shall also be produced. The same wiring colour should be used per function through the site.

3.2. Ducting

- 3.2.1. Ducts shall be made from high density polyethylene (HDPE), with a smooth internal and external face and have a wall thickness of no less than 4.75 mm. The ducts shall be coloured orange, impact resistant even at low temperatures, and inscribed with white lettering, 9mm high at 1m centres "TRAFFIC SIGNALS".
- 3.2.2. A ring duct system shall be deployed around junction signal installations where applicable, with each duct being a minimum 100 mm internal diameter unless

otherwise directed. The location and number of ducts shall be as shown within the traffic signals design drawing.

- 3.2.3. The ducts shall be in straight lines between chambers. No pre-formed bends shall be used, except for 50 mm diameter ducts used to connect duct boxes and loop boxes. All ducts shall be butt jointed by means of custom made polyethylene connector sockets or sleeves.
- 3.2.4. The ends of all ducts shall be incorporated into loop box, duct box, large duct box, signal pole retention system, and controller inspection chambers. The ends of all ducts shall be finished flushed with the inside of the chambers and should be a snug fit having used the appropriate sized cut-out. Where ducting enters a pre-formed chamber at an angle and the hole has had to be enlarged then the remainder of the cut-out not filled by the duct shall be pointed with Class (1) mortar.
- 3.2.5. Ducts running beneath footways and verges shall have a depth of cover not less than 400 mm from the surface of footway or verge, unless otherwise agreed with the WBC Traffic Signals Engineer.
- 3.2.6. Ducts running beneath carriageway shall have a depth of cover not less than 700 mm from the surface of carriageway, unless otherwise agreed with the WBC Traffic Signals Engineer.
- 3.2.7. Each duct shall be fitted with a pigmented and stranded polyethylene draw rope of minimum 5 kN breaking load and having design life not less than 20 years, the ends of which shall be made fast to eyebolts in the chamber wall. All draw ropes shall be completed over their entire length and not jointed or knotted with minimum internal diameter of 25 mm for the eyebolts.
- 3.2.8. The contractor shall ensure that the polyethylene draw ropes used to pull cables through the duct system remain intact throughout the duct network on completion of the cable installation.
- 3.2.9. The bedding of all ducts shall be on suitable compacted material ensuring the stability and strength of the backfill of the trench. For carriageway crossings, in-situ concrete with a grade of C8/10 may be used.
- 3.2.10. The trenches of all ducts laid in existing or proposed carriageways and footways shall be backfilled and compacted up to the formation level or underside of the reinstatement of existing paved surfaces with granular type 1 sub-base material. In existing carriageways, the trench may be backfilled up to the underside of the reinstatement with in-situ concrete with a grade of C8/10. Trenches of all ducts laid in verges shall be backfilled and compacted with suitable material up to the underside of the topsoil.
- 3.2.11. All reinstatements of existing carriageways and footways shall be carried out in accordance with the 'Specification for the Reinstatements of Opening in Highways – NRSWA' published by TSO.

3.3. Duct Box and Large Duct Box

- 3.3.1. The duct box shall be installed in the footway or verge to facilitate the jointing of loop tails to loop feeder cable, and to intersect the duct network at changes in direction.
- 3.3.2. On long duct runs a duct box shall be provided no more than 40 m apart.
- 3.3.3. The duct box shall be installed preferably adjacent to the kerb or alternatively at the back of the footway so as not to cause an obstruction to pedestrians/cyclists when open, unless otherwise agreed by the WBC Traffic Signals Engineer.
- 3.3.4. Where constructed in a verge the duct box shall have a 500 mm apron surrounding the cover as specified in the drawing.
- 3.3.5. Large duct box shall be used where,
 - A PRS duct connects directly to the chamber to provide storage for the spare coil of cable;
 - Where duct run(s) are required to cross the carriageway;
 - The number of ducts intersecting exceed the space available for a duct box; and
 - Where the depth of the ducts requires its use.
- 3.3.6. The large duct box shall be positioned not to cause an obstruction to pedestrians when open or unless otherwise agreed by the WBC Traffic Signals Engineer.

4. Tactile Paving, Dropped Kerbs and Crossing Studs for Controlled Crossing

- 4.1.1. Tactile paving and dropped kerbs for all pedestrian crossings shall conform to “Guidance on the Use of Tactile Paving Surfaces” published by DfT, and as set out within WBC standard detail specifications highlighted within the traffic signals design drawing.
- 4.1.2. The tactile paving for controlled crossings shall be laid using precast concrete paviours, preferably in 400 mm x 400 mm modules with 36 domes, they shall be coloured red and have a minimum skid resistance of 45 PSV. Any deviation from this requirement shall be authorised by the WBC Traffic Signals Engineer.
- 4.1.3. The setting out and alignment of the tactile paving and dropped kerbs shall be for the whole crossing and not for a single side at a time. The tactile paving shall be aligned using a temporary string line or similar pulled taught across the carriageway and marked out on the front and back of the footway on both sides of the carriageway. On a standard minimum crossing width of 2.4 m the line is best placed at the middle of the crossing allowing both stems of tactile paving to be aligned.
- 4.1.4. Dropped kerbs at controlled pedestrian crossings are to have an upstand of not more than 6 mm between the bullnose kerb and the carriageway level, or otherwise specified within WBC specifications. Footways, cycleways and grass verge areas shall

preferably have 1:40 gradient towards the carriageway, with 1:12 gradient being the maximum.

- 4.1.5. 100 mm wide channel blocks shall be provided at all controlled crossings unless agreed with the Engineer that there is a significant longitudinal fall to prevent ponding at the crossing point. Channel blocks are to extend as minimum to the raised end of the taper kerb either side of the crossing and may extend further in areas where the longitudinal fall is slack and extra channel blocks may remove ponding near the dropped crossing point.
- 4.1.6. Studs shall be provided as 100 mm square or circular diameter surface hot applied white thermoplastic, or 100 mm diameter 6 mm deep cored filled with white thermoplastic. Surface mounted metal or plastic raised studs and metal pinned studs are not acceptable. Setting out details for the crossing studs is given within the traffic signals design drawing.
- 4.1.7. Zig zag carriageway markings shall conform to the latest version of "Traffic Signs Regulations and General Directions". Setting out details for the crossing studs is given within the traffic signals design drawing.

5. Miscellaneous Requirements

5.1. Mains Electricity Supply

- 5.1.1. All fuses, isolators and circuit breakers for mains power supplies shall be clearly labelled and readily accessible to a WBC Traffic Signals Engineer. All controllers shall be capable of a maximum load of 40A extra low and 30A low voltage.
- 5.1.2. DNO supply to be agreed and arranged by the contractor.
- 5.1.3. The DNO supply shall be terminated in an Electric Supply Pillar (ESP) placed on site adjacent to the controller cabinet at the time of construction. The exact location shall be agreed by the WBC Traffic Signals Engineer.
- 5.1.4. The ESP shall be of sufficient size to provide space for the mounting of an electricity provider's 60A cut-out unit and meter and double pole isolator switch which can be locked when isolated. It shall have preservative treated wooden backboard at least 220 mm wide and the unit shall be no larger than required to provide the facilities listed above. The ESP shall be constructed of 3 mm galvanised steel to BSEN ISO 1461, painted black in colour. It shall have a suitable vandal and weather proof hinged door and locking system acceptable to the WBC Traffic Signals Engineer.
- 5.1.5. The contractor's signal installer shall be suitably qualified and certified by the local electricity distribution company for making connection to the mains supply from the cut-out provided within the termination box to the controller. The connection cable between the consumer side cut-out and controller shall conform to the current issue of BS7671 and shall be double insulated with a minimum conductor CSA as required by the system load. The contractor is to ensure that the electricity distribution

company has installed the correctly rated BS88 HRC (High Rupturing Capacity) cartridge fuse into the ESP when connecting the power supply.

- 5.1.6. The contractor shall supply and install a 3-core armoured cable connecting the cut out in the feeder pillar to the isolator switch provided in the controller cabinet. The cores of the cable shall be at least 4 mm² copper. The outer sheathing of the cable shall be coloured black to distinguish it from cables carrying current switched within the controller.
- 5.1.7. The cable and fuse ratings are to be calculated by the Contractor for each installation. Certification and documentation to BS7671 shall be supplied to the WBC Traffic Signals Engineer.
- 5.1.8. The traffic signals contractor shall affix an electricity warning label with the letters 'TRAFFIC SIGNALS'. The ESP installation shall be in accordance with BS7671.

5.2. Telecommunications Services

- 5.2.1. The traffic signals contractor shall supply and confirm a 4G modem compatible with the sim card range connectivity requirements as specified by the network's service provider. All the equipment setting up works must be included within the supplier price or quotations. Refer to Section 2.2 above for more details on installation of 4G STRATOS aerial modem.
- 5.2.2. The sim card will be free issued by WBC.
- 5.2.3. All configuration data, subnet, IP address and passwords must be handed over as part of the site information at final commissioning, for the purpose record keeping.

6. Completion and Commissioning

- 6.1.1. The Contractor's and Engineer's normal factory acceptance test (FAT) shall be conducted either at the manufacturers' or suppliers' factory, works or depot. The Contractor shall provide all necessary test equipment in a suitable environment set aside for the purpose. The Contractor shall provide a competent person for any technical discussion resulting from or associated with the tests and to sign the Engineers FAT document containing any agreed actions to complete the test. Additional tests may be required at the discretion of the WBC Traffic Signals Engineer.
- 6.1.2. The Engineer will expect to carry out a FAT on simulation software. The controller hardware or equipment being supplied is not required for the FAT. The supplier of the controller will have had to supply a hardware conformance certificate.
- 6.1.3. All equipment installed on site shall be commissioned in the presence of the WBC Traffic Signals Engineer.
- 6.1.4. On completion of the installation of the Traffic Control System the Contractor shall give the Engineer a minimum two working days' notice to attend for the site

acceptance and commissioning. Any commissioning request should give as much advanced warning as possible.

- 6.1.5. The telemetry services installed within the traffic signal controller shall only be used to prove the operation of the systems installed. They shall not be used by any representative of the Contractor or any Sub-contractor for general communication.
- 6.1.6. The WBC Traffic Signals Engineer will provide a completion/take over certificate for the Contractor to sign. A copy will be made available to the Contractor.
- 6.1.7. A shelter shall be provided on site by the Contractor to protect the sensitive electronic equipment from the effects of inclement weather when testing or commissioning. If this is unavailable, then the Engineer reserves the right to postpone the commissioning at the cost of the Contractor including maintaining Traffic Management on site until the weather has improved.
- 6.1.8. Maintenance will not be required for the new equipment, which shall be subject to twelve months' warranty. If during the life of the equipment the DfT issues an instruction to the manufacturer that modifications, or engineering changes, are necessary on grounds of safety, then the manufacturer shall arrange for those safety modifications to be carried out. These safety engineering works shall be at manufacturer's cost and to be a programme agreed by DfT and to be approved by the WBC Traffic Signals Engineer. Design changes where they enhance manufacturer's product shall be offered to the WBC Traffic Signals Engineer, at an agreed price.
- 6.1.9. The Contractor shall provide at, or preferably prior to commissioning, hard copy details of the setup data for equipment which uses erasable storage devices, for example: mid-block Puffin controller.
- 6.1.10. The Contractor shall provide at, or preferably prior to the commissioning the relevant cable and isolator test certificates appropriate to the requirements of BS7671, (the latest I.E.E regulations), which has been signed by a competent engineer or person so competent and qualified to carry out such tests.
- 6.1.11. The Contractor shall provide at the commissioning an installation test certificate for the inductive loop detectors if any provision has been made in the relevant proposed scheme drawing.
- 6.1.12. The Contractor shall provide at the commissioning a log book, the style of which has been previously agreed by the WBC Traffic Signals Engineer.
- 6.1.13. The Contractor will confirm full testing of the hardware conflict monitor in the supplied controller by providing a green conflict test certificate signed and dated by the Contractor. This shall be provided where the Engineer has not performed a green conflict test on the supplied controller hardware.
- 6.1.14. Failure to supply the information and certificates identified in this section will terminate the site acceptance test at that time and continuation of the test will recommence when all the certificates are available

7. Record of Documentation

- 7.1.1. The following traffic signals documentation shall be made available as a record for each junction/mid-block crossing site, if applicable:
- As built layout drawing(s);
 - TOPAS 2500 Forms;
 - Inventory and Asset Log;
 - Factory Acceptance Test (FAT) certificate;
 - Site Acceptance Test (SAT) certificate;
 - Traffic signals equipment schedule;
 - BS7671 electrical testing certificates;
 - Electrical power consumption calculation for traffic signals equipment including Elexon UMSUG codes for each current-drawing equipment;
 - Final snagging list;
 - Record of special maintenance requirements (if any);
 - Traffic signals controller and equipment identification sheet;
 - OTU setup sheet;
 - UTC/STRATOS configuration; and
 - Photos (After).

8. Traffic Signals Equipment Item Schedule – Crossings

Description		Item Quantity		
Site		Finchampstead Road South (Toucan)	SWDR by Tesco (Toucan)	SWDR by FP25 (Toucan)

Supply and install ELV ST750 TOUCAN controller unit to the requirements of TOPAS 2500A (latest issue), including: - Large form controller case, black in colour, to be mounted on NAL controller base; - STRATOS unit with 4G aerial modem unit affixed to the outside of the controller case, black in colour. All configuration/setting up works to be included; - Time switch facility (to switch off audible devices) - All necessary termination blocks and I/O cards; - Twin 13 Amp Socket; - Mains Transformer; - Full Manual Panel and DFM light; and - Any other associated equipment to bring controller to full working order.	1 No.	1 No.	1 No.
Supply and Install NAL Controller Base for the traffic signal controller	1 No.	1 No.	1 No.
Supply and Install 4m standard (straight), slot-less galvanised traffic signal pole, black in colour. To be NAL compatible and provided with RS115 NAL retention sockets	4 No.	2 No.	2 No.
Supply and Install short pole, slot-less galvanised traffic signal pole, black in colour. To be NAL compatible and provided with RS115 NAL retention sockets	-	2 No.	2 No.
Supply and Install ELV LED Red, Amber, Full Green 3 aspect primary traffic signal head with standard hood assembly	7 No.	4 No.	4 No.
Supply and Install MVD	2 No.	2 No.	2 No.
Supply and Install on-crossing detector unit	2 No.	2 No.	2 No.
Supply and Install nearside combined TOUCAN indicator and push button unit including rotating tactile cones and audible unit	2 No.	2 No.	2 No.
Supply and Install push button unit including rotating tactile cones and audible unit	2 No.	2 No.	2 No.
Supply and Install Electricity Supply Pillar (ESP)	1 no.	1 no.	1 no.
Supply and Install 2-way isolation unit for the Electricity Supply Pillar (ESP)	1 No.	1 No.	1 No.
Supply and Install Photocell for dimming	1 No.	1 No.	1 No.

9. Traffic Signals Equipment Item Schedule – Junction Signals

Description	Item Quantity
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Site	Croudace Link	Easthampstead Road	Heathlands Road
Supply and install Siemens ST950 ELV traffic signal junction controller unit to the requirements of TOPAS 2500A (latest issue) Including – - Large form controller case, black in colour, to be mounted on NAL controller base; - All necessary loop detectors - STRATOS unit with 4G aerial modem unit affixed to the outside of the controller case, black in colour. All configuration/setting up works to be included; - All necessary termination blocks and I/O cards; - Twin 13 Amp Socket; - Mains Transformer; - Full Manual Panel and DFM light; and - Any other associated equipment to bring controller to full working order.	1 No.	1 No.	1 No.
Supply and Install NAL Controller Base for the traffic signal controller	1 No.	1 No.	1 No.
Supply and Install 4m standard (straight), slot-less galvanised traffic signal pole, black in colour. To be NAL compatible and provided with RS115 NAL retention sockets.	18 No.	16 No.	9 No.
Supply and Install short pole, slot-less galvanised traffic signal pole, black in colour. To be NAL compatible and provided with RS115 NAL retention sockets	6 No.	8 No.	1 No.
Supply and Install ELV LED Red, Amber, Full Green 3 aspect primary traffic signal head assembly	2 No.	2 No.	5 No.
Supply and Install ELV LED Red, Amber, Full Green 3 aspect secondary traffic signal head assembly	1 No.	1 No.	2 No.
Supply and Install ELV LED Red, Amber, Green Arrow (left) 3 aspect primary traffic signal head assembly	2 No.	1 No.	-
Supply and Install ELV LED Red, Amber, Green Arrow (left) 3 aspect secondary traffic signal head assembly	-	1 No.	-
Supply and Install ELV LED Red, Amber, Green Arrow (right) 3 aspect primary traffic signal head assembly	4 No.	3 No.	-

Supply and Install ELV LED Red, Amber, Green Arrow (right) 3 aspect secondary traffic signal head assembly	-	1 No.	-
Supply and Install ELV LED Red, Amber, Green Arrow (ahead) 3 aspect primary traffic signal head assembly	2 No.	2 No.	-
Supply and Install ELV LED Red, Amber, Full Green plus Green Arrow Right 3 aspect secondary traffic signal head assembly	-	-	2 No.
Supply and Install ELV NUT roundel	2 No.	2 No.	2 No.
Supply and Install ELV NLT roundel	-	2 No.	-
Supply and Install ELV EB roundel	-	2 No.	-
Supply and Install on-crossing detector unit	8 No.	10 No.	6 No.
Supply and Install kerbside detector unit	4 No.	4 No.	-
Supply and Install standard field of view nearside combined TOUCAN indicator and push button unit including rotating tactile cones	8 No.	6 No.	-
Supply and Install narrow field of view nearside combined TOUCAN indicator and push button unit including rotating tactile cones	4 No.	6 No.	-
Supply and Install standard field of view nearside combined pedestrian indicator and push button unit including rotating tactile cones	-	-	5 No.
Supply and Install narrow field of view nearside combined pedestrian indicator and push button unit including rotating tactile cones	-	-	1 No.
Supply and Install push button unit including rotating tactile cones	12 No.	12 No.	2 No.
Supply and install carriageway loop box	12 No.	13 No.	11 No.
Supply and install stopline loops	6 No.	5 No.	5 No.
Supply and install queue loops	-	2 No.	-
Supply and install MOVA diamond loop	12 No.	9 No.	6 No.
Supply and Install Electricity Supply Pillar (ESP)	1 No.	1 No.	1 No.
Supply and Install 2-way isolation unit for the Electricity Supply Pillar (ESP)	1 No.	1 No.	1 No.
Supply and Install Photocell for dimming	1 No.	1 No.	1 No.

