West Sussex County Council
Highways and Transport

Traffic Signal Installation Standards

July 2017

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Requirements for Installation of Permanent Traffic Signal Equipment in West Sussex

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1. Introduction

1.1 The aim of this document is to provide a guide to enable promoters of schemes to prepare signal installations which address the specific requirements of West Sussex County Council.

1.2 Although this document is not in the form of an "APPENDIX 12/5: TRAFFIC SIGNS: TRAFFIC SIGNALS AND ASSOCIATED EQUIPMENT" scheme promoters should ensure that items covered within this document are replicated within any Appendix 12/5 that they produce for work on Traffic signals in West Sussex.

1.3 Traffic signals for both vehicle and pedestrians control, in West Sussex are required to meet a number of standards in both function and installation. As a result this guide should be read with reference to West Sussex County Councils standard detail drawings. The most relevant of which are contained within the appendix of this document.

1.4 The National Code of Practice TA 84/06 (formally MCH 1869A) shall apply throughout the design and installation cycle. In addition, the "Guide to Good Practice" shall be used as a reference (when published by EITAC).

1.5 All designs and installations shall be subject to Safety Audit in accordance with the latest WSCC Safety Audit Policy. This shall include the completed Signal Controller Specification (TR2500 forms). The completed and Audited specification shall be signed and dated by the Engineer who carries out the Audit. The Original of all Audits shall be retained in the WSCC Traffic Signal section site file.

1.6 In addition, where appropriate, modelling data from Linsig version 2 or higher shall be submitted in electronic format (.lsg files), to demonstrate the proposed signal arrangements can operate satisfactorily. This must include sufficient information to allow the design to be audited, and any assumptions used in the design, for example a pedestrian phase appearing once every other cycle, shall be fully documented and justified.

1.7 The installation of traffic signal equipment shall only be undertaken by a Contractor certificated to BS EN ISO 9000:2000 or equivalent, and in line with the current edition of the IEE wiring Regulations for electrical installations.

1.8 The Works contained in this appendix shall refer to the installation of traffic signals, Pelican crossings, Puffin crossings, Toucan crossings, Equestrian Crossings and cycle facilities.

1.9 Installers shall at all times conform to Health and Safety at Work Acts, the Electricity at Work Regulations, the Construction Design & Maintenance Regulations and all other relevant legislation. Installers shall also ensure that installation procedures conform with all relevant DfT advice notes and directives, especially signing and guarding shall conform to Chapter 8 of the Traffic Signs Manual.

1.10 All systems should be designed to minimise energy consumption and utilise ELV controllers and associated equipment. Where this is not possible written approval from WSCC Traffic Signals must be obtained.

1.11 Any deficiencies found in the design or in the operation of the equipment shall remain the responsibility of the promoter of the scheme for a period of 1 year from the date of the take-over of the site following a successful site commissioning or for a year following the date that the associated development is opened and the initial impact of the fill traffic and pedestrian flows are realised, whichever is the later. It is therefore the responsibility of the promoter to ensure that all data regardless of source is correct, and that the consequence of any imposed conditions are well documented and acknowledged.
2. **Standards, specifications and regulations**

2.1 All works shall be undertaken in accordance with the following:

(a) EN 12368:2006

(b) IEE Regulations for Electrical Installations (current edition) BS 7671 : 2015

(c) Current Department of the Environment, Transport and the Regions (DfT) Specifications relating to traffic signals and associated equipment


(e) Current DfT Standards relating to traffic signals and associated equipment

(f) Current DfT Advice Notes relating to traffic signals and associated equipment

(g) The Traffic Signs Regulations and General Directions 2 or later

(h) The Zebra, Pelican and Puffin Pedestrian Crossings Regulations and General Directions 1997

(i) DfT Local Transport Note 1/98 The Installation of Traffic Signals and Associated Equipment

(j) DfT Specification TR2500

(k) The Traffic Signs Manual

(l) The Health and Safety at Work Act, 1974

(m) Electricity at Work Regulations 1989

(n) Code of Practice for Traffic Control and Information Systems TA 84/06

(o) MCH 1815 A System Certification

(p) New Roads and Street Works Act (NRSWA) 1991

(q) Construction (Design Management) Regulations 2015

(r) Highways Act 1980

(s) Road Traffic Regulations Act 1984
3. **Equipment**

3.1 **General**

3.1.1 The Works shall be monitored using the Urban Traffic Control system or Remote Monitoring system as specified by WSCC. The monitoring equipment shall be supplied and installed by the WSCC traffic signal term maintenance provider and the costs for this shall be covered by the scheme contractor, unless prior written agreement is obtained from West Sussex Traffic Signals Section. All other equipment shall be supplied by the Contractor.

3.1.2 The Contractor is to store, deliver to the Site at a time specified, install, test and commission the equipment associated with the Works unless otherwise agreed by West Sussex Traffic Signals Section.

3.1.3 All street furniture must comply with the appropriate TOPAS specification number and in accordance with the latest standards. If it is proposed to use street furniture without approval, the supplier shall state the level of approval and what, if any conditions or limitations have been imposed on use or operation. Except with the prior written permission of WSCC traffic signals engineer the street furniture shall be supplied by the WSCC traffic signal term maintenance contractor.

3.1.4 Signals installed on roads with a speed limit of 50mph plus shall use passively safe low access poles with a quick disconnect system.

3.1.5 Any equipment not to WSCC Traffic Signals Engineers approval identified up to the signing and acceptance of final Site Acceptance Certificates shall be replaced by the Contractor at their own expense.

3.1.6 With the exception of LED aspects all equipment, materials and workmanship shall be covered by a 12 month warranty by the Contractor which shall take effect from the date of the Site Acceptance Certificate. During this time the Contractor shall be responsible for rectifying any failure of equipment, materials or workmanship, with the exception of lamp failures. At the Engineer's discretion, the Contractor shall at his own expense attend the site within 48 hours of notification and rectify the fault or replace / repair the faulty equipment and return it within 1 week.

3.1.7 All LED aspects shall be covered by a 6 year warranty by the contractor which shall take effect from the date of the Site Acceptance Certificate. During this time the Contractor shall be responsible for rectifying any failure. At the WSCC Traffic Signals Engineer's discretion, the Contractor shall at his own expense attend the site within 48 hours of notification and rectify the fault or replace / repair the faulty equipment and return it within 1 week.

3.1.8 All street furniture shall be set out at the positions shown on the drawings which shall be approved in advance by WSCC Traffic Signals Engineer and in accordance with the Engineer's siting instructions. An Engineer from West Sussex Traffic Signals section shall confirm the position of all traffic signal street furniture and detection on site matches the drawing before the equipment is installed. Where engineering difficulties necessitate alternative positions the Contractor shall inform the WSCC Traffic Signals Engineer and gain their consent prior to installing the furniture and provide amended drawings to show all new positions.

3.1.9 Unless otherwise specified, the installation of ducts, drawpits, controller base, pole retention sockets and the feeder pillar will be undertaken by the main civil engineering Contractor for the Works.

3.1.10 Signal dimming, will be required and is to operate from a Photocell. The photocell shall be located as shown on the drawing or in a position furthest away from overhead lighting units.
3.2 Controller and Controller Functions

3.2.1 Except with the prior written permission of WSCC traffic signals engineer the controller shall be supplied by the WSCC Traffic Signal term maintenance contractor.

3.2.2 If the controller type supplied is new to WSCC then a full set of documentation and facilities offered for the training of Engineers from WSCC and their Maintenance Contractors shall be supplied free of charge.

3.2.3 If the controller type supplied has less than 5 units in WSCC then a full set of spares will be supplied.

3.2.4 The operation of traffic signal installations shall be in accordance with TR2500 - General Specification Form

3.2.5 The Controller shall be fitted as a minimum with a 20 amp double pole switch fuse.

3.2.6 The controller shall be constructed on a foundation all in accordance with the manufacturers/suppliers recommendations. Excepting where the 'root' is an integral part of the controller cabinet, the controller base shall be levelled by the Civils contractor and stable prior to installation of the controller cabinet.

3.2.7 The controller base shall be sealed immediately after installation is completed and accepted. The installer shall accept responsibility for damage caused by failure to seal the equipment properly.

3.2.8 The Contractor shall provide up to 2 EPROM reconfigurations at the Engineer's request within 12 months of the issuing of the final Site Acceptance Certificate. The reconfigurations shall not result from a non-compliance at the Factory Release Test nor subsequently from the equipment failure

3.2.9 Controllers are to be installed so that the DFM lamp may be readily seen from the carriageway and such that all normal maintenance and checking can be readily carried out without encroachment on the carriageway by equipment or personnel and with minimum obstruction to pedestrians.

3.2.10 Controllers mounted on a root based plinth shall be sealed at base level and controllers mounted on a post shall be sealed just below the post access door. Following the termination of all signal cables the Contractor shall backfill the controller void with dry compacted sand. This shall be sealed by a 6mm thick epoxy resin to form a water and airtight seal.

3.2.11 Where a controller cabinet base seal has been broken for removal or installation of cables the fine dry sand backfill shall be reinstated and an epoxy resin base seal repair shall be made.

3.2.12 The Contractor shall ensure that a separate 50mm diameter duct for a telemetry connection has been provided before sealing the base. The duct shall link between the main controller pit and shall terminate above the final base seal level within the controller. The duct entry shall be sealed to prevent the ingress of moisture but the seal shall be removable to allow telemetry equipment to be installed subsequently.

3.2.13 The controller to be supplied shall meet the appropriate TOPAS specification, TR2500 and all relevant appendices for traffic signal junctions, Pelican crossings, Puffin crossings, Toucan crossings and cycle facilities.

3.2.14 The controller shall include a Master Time Clock System (MTCS) to permit the use of alternative maximum timings, fixed time plans, etc.

3.2.15 The controller shall have a back up power supply for all detector commands, timing details and MTCS.
3.2.16 Manual push buttons shall be labelled to indicate the stage number/letter using the facility panels standard lettering.

3.2.17 Where practical a scheme drawing shall be laminated and attached to the inside door of the controller.

3.2.18 Where practical the MOVA link diagram shall be laminated and attached to the inside door of the controller.

3.2.19 A staging diagram should be provided on the inside of the manual panel door, with clearly labelled stages and phases, by means of silk-screening or adhesive label.

3.2.20 The controller shall include a 3U equipment rack(s) with sufficient void space to accommodate an Outstation Monitoring Unit, Outstation Transmission Unit and/or a camera surveillance unit as specified in the WSCC specification. The minimum void space within the 3U equipment rack shall be 300mm wide by 300mm deep for each module stated above. The Contractor should satisfy himself that the controller contains adequate void space within the rack to accommodate the stated modules prior to tendering. Subsequent failure to meet this requirement shall result in the Contractor replacing the controller cabinet, and internal hardware, as necessary, and undertaking all remedial works at his own expense.

3.2.21 Two 13 amp 3 pin electricity sockets to BS 1363 shall be provided inside the controller cabinet, protected by a residual current device of maximum rating 30mA residual current. The sockets shall be marked for maintenance use only and be connected via a dual lockable isolator switch to the controller mains.

3.2.22 Provision shall be available within the controller to supply two devices via a separately fused auxiliary supply.

3.2.23 On sites where bus priority is to be installed (ACIS) a separate power supply controlled via a dedicated RCD is required.

3.2.24 Sufficient terminals and termination points are required at the controller to accommodate all Neutral and Earth connections.

3.2.25 Two complete sets of keys to all parts of the apparatus, including 'T' bars, as required, shall be provided at the time of commissioning.

3.2.26 The controller access door(s) shall be fitted with a door stay.

3.2.27 A suitable fixed facility to store controller documentation & drawings shall be provided within the cabinet, where this is not a welded plate on the inside of the door approval should be sought for it from WSCC.

3.2.28 The Controller cabinet shall have front and rear opening doors or a swing frame in order to provide access to the rear of the equipment.

3.2.29 The controller shall include a location at which to securely fix a telemetry termination unit.

3.3 Signal Heads General

3.3.1 The lowest part of any signal head assembly including brackets shall have a minimum clearance above the finished ground level of 2.1 metres.

3.3.2 All entry points into signal heads for cables shall have a secure and permanent watertight seal.
3.3.3 Backing boards shall be securely attached to all vehicular signal heads. The composite head including any additional signs shall be bordered on the front by a high intensity white retroreflective tape between 45mm and 55mm wide.

3.3.4 There shall be a minimum clearance of 450mm between the edge of the signal head and the edge of the carriageway. Where the minimum clearance cannot be achieved the Contractor shall notify WSCC Traffic Signals immediately.

3.3.5 Puffin/Toucan/Equestrian crossings, unless otherwise shown on the design, all vehicle signal head cowls shall be Primary, to maximise the angle of view of the optics.

3.3.6 The Contractor shall align all signal heads in accordance with the Contract drawing and as required by WSCC Traffic Signals Engineer at the site commissioning.

3.3.7 All vehicular signal aspects shall include cowls. The primary signal shall include cut away cowls and the secondary heads shall include full length cowls. In addition where specified the Contractor shall supply and install louvred cowls.

3.3.8 Adjustable horizontally louvred cowls designed to reduce the driver's visibility to the aspect shall only be used on the amber and green aspects of the primary or secondary signals. The angle of the slats shall be capable of being adjusted on site by the Contractor to the Engineer's requirements. The cowl shall be a minimum of 300mm long and include a minimum of 5 slats.

3.3.9 Fixed vertically louvred cowls designed to reduce the driver's visibility to the opposing secondary aspect shall be used on all the aspects of the secondary signals. The cowl shall be a minimum of 500mm long and include a minimum of 3 slats.

3.3.10 Where signal heads include additional filter or right turn arrow signals or box signs the configurations shall be as specified in the signal head schedule on the Contract drawing.

3.3.11 All signal aspects shall be monitored Central Light Source (CLS)-type extra low voltage (ELV) LED's with a minimum 6 year warranty, unless otherwise agreed and written approval obtained from WSCC Traffic Signals Engineer. (ELV = 50 Volts maximum)

3.3.12 The Contractor shall be responsible for installing LED vehicular signal heads on overhead mast arms and tall signal poles (exceeding 4 metres length) including the hiring of lifting equipment and traffic management.

3.3.13 Where two signal heads (twin) are positioned adjacent to each other on the same signal pole the Contractor shall ensure the structural stability of signal pole and provide a base plate where necessary.

3.4 Pedestrian Far Side Signal Heads

3.4.1 The lowest part of any pedestrian signal head assembly including brackets shall have a minimum clearance of 2.1 metres above the finished ground level.

3.4.2 All entry points into pedestrian signal heads for cables shall have a secure and watertight seal.

3.4.3 All pedestrian far sided signals shall be fitted with hoods and where required louvres to restrict see through at crossings.

3.4.4 All far sided signal heads shall be monitored CLS-type ELV LED's with a minimum 6 year warranty, unless otherwise agreed and written approval obtained from WSCC Traffic Signals Engineer.
3.5 Pedestrian Near Side Signal Heads

3.5.1 Near side pedestrian aspects and combined units shall meet the appropriate TOPAS specification and shall comply with the Zebra, Pelican and Puffin Pedestrian Crossings Regulations and General Directions 1997 Schedule 3 Part I.

3.5.2 To reduce the risk of ‘see through’, narrow field of view display units to be installed as standard on dual crossings and signalised junctions. Deviation from this standard will need justification and written agreement from WSCC Traffic Signal Engineer.

3.6 Pedestrian Demand Units

3.6.1 Push button units shall include both an audible and tactile devices unless specified elsewhere in the Contract or if an audible device can not be fitted for safety reasons then just a tactile device need be supplied. The facility shall exist to inhibit the audible signal between 22:00 and 07:00 each day or at any other times as required by the Engineer.

3.6.2 Pedestrian push button units shall be positioned in accordance with the orientation shown on the Contract drawing.

3.6.3 All entry points into pedestrian demand units for cables shall have a secure and watertight seal.

3.6.4 Push-button units shall not contain cables carrying mains or any other low voltage.

3.6.5 The centre of all pedestrian push button units shall be positioned between 1.0 and 1.1 metres above the finished ground level. The push button units shall be securely fixed to the signal pole so that no movement occurs.

3.6.6 Where tactile devices are to be installed in pedestrian push-button units as specified on the drawing they shall be of a type approved by the Engineer.

3.7 Signal Heads For Cyclists

3.7.1 The lowest part of any cycle signal head assembly including brackets shall have a minimum clearance of 2.4 metres above the finished ground level.

3.7.2 All entry points into cycle signal heads for cables shall have a secure and watertight seal.

3.7.3 All cycle signals shall be fitted with primary or secondary cowls and shall be fitted with anti-phantom screens and hoods.

3.8 Additional Signs

3.8.1 Internally illuminated 'box' signs shall be provided as specified on the drawing. The configuration shall be as specified on the drawing signal head schedule.

3.8.2 The lowest part of the signal head assembly including any additional signs and brackets shall have a minimum clearance of 2.1 metres above the finished ground level.

3.8.3 Regulatory signs on signal heads shall comply with BS 873: Part 5: 1983 "Specification for Internally Illuminated Signs and External Lighting Luminaires".

3.8.4 Regulatory signs on signal heads shall be individually fused within the head.

3.8.5 Green arrows and regulatory signs which are side mounted on signal heads shall be secured, after alignment, with stay bars.
3.8.6 There shall be a minimum lateral clearance of 500mm between the outer edge of all additional signs including backing board and the edge of the carriageway.

3.8.7 Backing boards shall be securely attached to all additional signs to form a composite signal head.

3.9 **Traffic Signal Poles**

3.9.1 All traffic signal poles shall be installed using the NAL pole retention system or a similar system that has WSCC approval that allows the pole to be removed following a knockdown. The pole retention system is to have at least two bolts to securely fix the pole in place, to reduce the risk of rotation. See Standard drawing in Annex D for installation.

3.9.2 All traffic signal poles that are not installed in a retention socket shall have a slot to provide cable entry access and shall be installed in a pole box.

3.9.3 All poles are to be set to ensure that the centre of the ambers are between 2.4 and 4.0 metres above finished ground level.

3.9.4 All traffic signal poles shall be galvanised prior to the application of a grey plastic coating unless otherwise specified by WSCC for specific locations. Poles shall not be supplied with pre drilled holes for push buttons. Holes shall be drilled on site as required and shall be treated with a suitable zinc rich paint or other suitable rust inhibiting paint as agreed by the Engineer.

3.9.5 Stub poles shall be of a one piece, welded top, construction and shall be galvanised prior to the application of a grey plastic coating.

3.9.6 Signal head extension brackets ('D' type) shall be galvanised prior to the application of a black final coating. Brackets shall only be used where specified (in position and length) on the relevant site drawings, or following approval of the WSCC traffic signals engineer.

3.9.7 Signal head mounting brackets ('L' type) shall be galvanised prior to the application of a black final coating. All brackets shall be long enough to provide sufficient rotational movement to allow correct alignment of heads, with a minimum movement of 120 degrees.

3.9.8 Responsibility for checking the vertical alignment of signal posts rests with the Contractor who shall also ensure that there is adequate stability before fitting signal heads. The Contractor shall notify the Engineer immediately if any signal poles fail to satisfy the aforementioned requirements.

3.9.9 Where necessary to achieve the correct location for the pedestrian push buttons and achieve not less than 500mm clearance to the side of the signal head/heads, formed swan neck signal poles shall be used, welded cranked type will not be accepted. Consideration to matching other poles for cosmetic reasons shall be made.

3.9.10 Location of poles in relationship to the tactile paving can be found on standard drawing in Annex D

3.9.11 All traffic signal poles must be of spigot low access design. An example of this can be supplied on request

3.10 **Vehicle Detection**

3.10.1 Unless otherwise specified all detector packs shall be housed within the controller cabinet.
3.10.2 Detection shall be supplied as 2 or 4 channel detection cards. System D, MOVA, UTC or speed loops are not to be mixed on the same detector card.

3.10.3 All new loop detector cards shall be of automatic self-tuning multi-channel microprocessor type and shall be fully type-approved and in accordance with the latest issue of MCE 01/08.

3.10.4 System D and Stopline detector loops are shown schematically on the relevant site drawings and shall be cut to the standard configuration shown on the attached drawing: "Standard Detail for the Configuration of Loop Detectors". The location of detector loops shall conform with the latest issue of MCE 108B "Siting of Inductive Loops for Vehicle Detecting Equipments at Permanent Road Traffic Signal Installations", incorporating all released amendments.

3.10.5 Special facility loops e.g. SCOOT, MOVA, Call/Cancel, presence or red light camera loops or where specific conditions require, shall be sited under the instruction of the WSCC traffic signals engineer. Where this is necessary, the position and size of loops shall be set out on site by the Engineer with the Contractor in attendance prior to slot cutting work commencing.

3.10.6 Where the use of Microwave Vehicle Detectors and infra-red detectors are specified these shall be Type Approved and shall comply with TR2505 "Above ground vehicle detector systems for use at permanent traffic signal installations". The use of the above ground detection shall be in accordance with the manufacturer's instructions. The alignment of all pedestrian above ground detection shall be set up as required by the Engineer at the site commissioning.

3.10.7 Subject to the prior approval of WSCC the use of suitable wireless linking equipment may be considered where there would be practical difficulties with the installation or maintenance of hard wired links or loops.

3.10.8 Subject to the prior approval of WSCC the use of a suitable camera detection system may be considered where there would be a cost benefit or there are practical difficulties with the installation or maintenance of the loops.

3.11 Pedestrian Detection

3.11.1 Kerbside and On Crossing detection of pedestrians are now standard on all WSCC sites. The type of detection shall be agreed with WSCC and supplied as per the relevant site drawing.

3.11.2 Requirements for test and configuration equipment for programmable devices shall again be agreed with WSCC and the appropriate number of test units supplied. Any relevant training shall be part of the training requirements.

4. Loop Detection Installation

4.1 All detector channels shall be labelled to indicate the detector name. The label shall be waterproof and marked adjacent to the detector channel.

4.2 Loop feeder cables shall be kept clear of main switch and maintenance sockets within the cabinet.

4.3 The standard dimension for the width of the loop slots shall be 10.0mm (+1mm/-0mm). The formula for the overall depth of the slots shall be 50+7n mm (+10mm/-0mm), where 'n' is the number of layers of cable in the slot. In general the depth shall allow for 50mm of cover above the uppermost cable in the slot.
4.4 Where a surface comprises black top overlaying concrete, the installer shall ensure that all loops are laid within one material, subject to a minimum cover which may be discussed with WSCC traffic signals engineer.

4.5 Slot cuts between adjacent 'System D' loops (where required) shall be made along the centre line of single carriageways or the offside of dual carriageways (not along the gutter edge).

4.6 Detector loops are to be connected via individual pairs of feeder cables or where agreed with WSCC twin pairs.

4.7 No feeder cable shall be jointed unless it is to connect a detector loop.

4.8 All joints shall be made using a reusable joints system conforming to IP68 Cat 1 (BS EN60529) and in accordance with the manufacturer’s instructions and recommendations.

4.9 Detector feeder cables shall be jointed to the detector loop within the specially provided connection chamber in the footway/verge. No additional joints between the detector loop and detector unit shall be permitted unless agreed with the Engineer prior to commencement of works. Individual cores shall be jointed by means of insulated crimp connectors using a ratchet type of crimping tool and staggered to avoid the possibility of any short circuits. The joint shall be waterproof and able to withstand a vigorous "pull-test" of approximately 3kg.

4.10 Loop tails shall be cut directly back to the under kerb ducting and cabled into the connection chamber. See standard drawing in Annex D for under kerb installation. Slots through kerb edges are not acceptable and loops and loop tails so cut shall be re-cut and the kerbs replaced at no cost to WSCC.

4.11 Where partial excavation of the footway is required to access stub-duct ends, then the exposed loop tails shall be covered with resin and then bitumen in several layers as necessary, after sealing the end of the stub duct and prior to re-instatement of the footway with cold setting asphalt and sealing with hot pour bitumen.

4.12 Working Practice when Cutting Slots and Laying Loop Cable

(a) Slots shall be cut at least one metre from any ferrous objects or areas of poor surfacing unless otherwise approved by the Engineer.

(b) Slots shall be properly dried and cleared of all debris before laying loop or detector feeder cable and the slots shall be kept clean and dry before the backfill is complete.

(c) The depth of the slot shall be checked with a depth gauge along the whole length of the slot.

(d) All cable shall be dry before laying in slots.

(e) Sharp implements shall not be used to seat cable in slots.

(f) Where the corners of the slot are at an angle of less than 100 degrees then this angle shall be rounded with the use of a cold chisel or the corners of the loop shall be crosscut.

(g) After backfilling, which shall be hot pour bitumen, excessive spillages of bitumen shall be removed from the road surface and loose asphalt shall be swept clear of the road surface and disposed of off site.

(h) The type of bitumen used shall not embrittle at temperatures above 5 degrees Celsius. The temperature of the ‘kettle’ shall be in accordance with the suppliers instructions.

(i) Loop cable shall conform with Departmental Specification TR2031.
(j) The Contractor shall be responsible for erecting, maintaining and dismantling all Chapter 8 Traffic signing including traffic control required to complete the slot cutting. The method of traffic control is to be stated by the Engineer and may include the use of temporary traffic signals at the Contractor's own expense.

(k) Loop cable shall be taken through a length of orange colour plastic ducting marked Traffic Signals with a minimum diameter of 50mm leading to a chamber situated in the footway/verge where the loop tails and detector feeder cables shall be jointed. The Contractor shall include for excavation (the minimum necessary) at the channel to access this duct and for reinstatement with bitumen (as used for sealing slots). The holes shall then be backfilled with hot rolled asphalt or cement. The depth of cover for the duct end at back of footway shall be 60mm. If practical constraints prevent this any alternative arrangement must be agreed with WSCC. (See standard drawing in Annex D for under kerb installation details)

(l) All slot cutting shall be carried out only once appropriate Chapter 8 signing and traffic control has been put in place.

(m) Where the bitumen backfill is below the road surface, the Contractor shall be responsible for topping up the bitumen backfill to achieve a level finish with the road surface. The Contractor shall be responsible for additional backfilling of the slots should the level of backfill fall below the road surface within 28 days of the issue of the Taking-Over Certificate.

(n) Where the contract drawing indicates the application of new special surfacing on the carriageway, the contractor shall complete all slot cutting and backfilling of cables in these areas prior to the application of the special surfacing.

5. Cabling

5.1 Pedestrian push button units and all other extra low voltage equipment on all LV installations are to be wired on a separate core cable(s) to the vehicle signal cables.

5.2 Cables shall be terminated in the controller at the appropriate terminal block and in the correct terminal position.

5.3 Detector feeder cables shall be terminated in an appropriate terminal block and "soft wired" to the correct labelled detector unit, using light gauge stranded wire, twisted in pairs.

5.4 With stranded conductors or with conductors having a diameter less that 2.5mm sq, a crimped pin or protective leaf shall be used in the terminal.

5.5 All labels shall be permanent and marked in ink.

5.6 Cable sheath and cable core identification is to be undertaken on all signal cables within the controller as per ANNEX C.

5.7 Cable sheath identification only is to be undertaken on all signal cables, at the pole tops as per ANNEX C.

5.8 All loop feeders shall be labelled with the detector name or conductor function at both ends as near as is possible to the appropriate terminal or connection.

5.9 All loop conductor wire pairs shall be connected together with zip ties or similar, and labelled as close to the point they enter the drawpit as possible.
5.10 All cables shall be armoured in multibanded steel and covered in an outer sheath of orange coloured PVC.

5.11 All cables including loop feeder cables shall comply with or exceed the WSCC specification shown in Appendix A and comply with the requirements of B.S.505 as amended by TR0102.

5.12 Detector signals shall not be brought back on the same cable carrying the supply to signal heads or push buttons.

5.13 The core provision shall provide not less than the greater of 25% or 4 spare cores overall to each pole.

5.14 Each signal pole shall be cabled directly to the controller. The looping of any cables between signal poles will not be accepted. ONLY in exceptional circumstances, as directed by the Engineer, will alternative means of cabling be acceptable.

5.15 Unused cores at the controller shall be left for future expansion but isolated to ensure no earth loops can be created.

5.16 Unused cores between poles shall be connected to Earth at one pole top.

5.17 Unused cores between the pole and the controller shall be connected to Earth at the pole top.

5.18 Signal cables shall not pass through ducts or boxes used for any other service and no other services may utilise the traffic signals ducts or boxes.

5.19 Duct shall be in accordance with NJUG Standards, Orange 100 mm diameter with ‘traffic signals’ stamped at regular intervals.

5.20 A mixture of extra low voltage (ELV) and low voltage (LV) circuits in multicore cables is not acceptable in any circumstances.

5.21 Cables carrying 230v lamp power shall occupy separate ducts from cables carrying extra low voltage (push button/audible, detection etc) although they will use the same chambers. This will not apply to the individual duct directly feeding each pole.

5.22 One duct shall be left empty on all road crossings.

5.23 Draw strings will be provided in all duct runs and to the pole tops by the main civil engineering contractor. The Contractor shall be responsible for ensuring that a drawstring is retained in each duct run and pole following the installation of the cables.

5.24 Pulling of cables will be the responsibility of the Contractor. All cabling shall be installed as shown on the relevant site drawing.

5.25 Cables shall not be bent to a radius of less than 12 times their diameter or less than a radius recommended by the manufacturer, whichever is the greater.

5.26 Low voltage and extra low voltage cables shall not be terminated in the same position in the pole tops.

5.27 Where possible all cable runs shall include 1 metre of slack cable in each drawpit, along the full length of the run.

6. Electricity Supply

6.1 The mains input shall be to a Haldo or equivalent pillar positioned close to the controller, in a location where the chance of impact by vehicles leaving the carriageway is minimised. The Mains Electricity supply shall incorporate a protective earth. The supply will be 230 V 50Hz. (See standard drawing in Annex D for installation details)
6.2 The feeder pillar shall be a minimum size to ensure that the electrical apparatus can be installed. A typical size approximately 560 mm high, by 250 mm wide by 160 mm thick above the ground, with an installation depth of approximately 250 mm.

6.3 Connection to the DNO supply must only be made by the DNO’s authorised staff with a fuse rating between 16 and 40 amp (specific rating is determined by the DNO).

6.4 The traffic signals equipment must be protected by a lockable double pole safety isolator switch rated at 32 amp cut-out with a 25 amp fuse for a Traffic Signal junction, and 16 amp fuse for Pedestrian Crossings in accordance with BS 88 Part 2. (TOFCO DP1 or equivalent).

6.5 Traffic signals installation should not normally commence until the feeder pillar has been installed and connected.

7. **Testing of Installed Cables and Marking of Cable Drawing**

7.1 The Contractor shall supply to WSCC at the site commissioning the relevant electrical test certificates. The Contractor’s failure to supply the test certificate will cause the switching on of the signals to be delayed until the certificate is produced. The Contractor shall be liable for all expenses involved with re-attending the subsequent site commissioning.

7.2 The electrical test certificates shall be in accordance with the format shown in Annex A.

7.3 The Contractor shall notify WSCC prior to tests being undertaken so that the Engineer or his representative may be present to verify the tests.

7.4 The following tests shall be carried out:

7.4.1 Series resistance of loop and feeder. The resistance shall not exceed 5 ohms.

7.4.2 Impedance to earth of the armouring of every feeder cable and connecting cable before the armouring is bonded to earth. The reading shall not be less than 10 megohms.

7.4.3 Impedance to earth of cable armouring after the armouring has been connected to earth. The reading shall not exceed 0.5 ohms.

7.4.4 Impedance to earth of loop and feeder conductors with both feeder conductors connected together, using at least 500 volts DC applied for at least one minute. The cable shall be disconnected at both ends during the taking of this reading.

7.4.5 Impedance to earth of connecting cable conductors with all conductors connected together, using at least 500 volts DC applied for at least one minute. The reading shall not be less than 10 megohms. The cable shall be disconnected at both ends during the taking of this reading.

7.5 Any loop or feeder or connectable cable which fails any of the tests shall be replaced by the Contractor before the site is commissioned.

7.6 The Contractor shall reset the detector card power supply where necessary and shall observe and monitor the LED for the correct operation of each loop connected to the detector card. Any defects or malfunction shall be reported immediately to the WSCC. This work shall be carried out for all detectors which have been affected by the Works.

7.7 Measurement of linear meterage may be carried out with a measuring wheel that has been calibrated within the previous 12 months. WSCC shall have the right to check any measurement and request that any electrical test be repeated at the contractors expense during commissioning.
8. Testing and Commissioning

8.1 The contractor shall translate the TR2500 specification into a controller configuration and give WSCC at least 10 days notice of a simulated Configuration Acceptance Testing (CAT). The contractor will allow for WSCC attendance at those tests by the Engineer’s representative or they will be conducted by a WSCC approved consultant. (For approved supplier list contact Traffic.signals@westsussex.gov.uk) The test will verify operation of the signals and will be conducted on an emulator to allow various scenarios to be tested.

8.2 On completion of the simulation test the Configuration Acceptance Test shall be documented on the WSCC forms shown in Annex C.

8.3 The Contractor shall give WSCC at least ten working days notice of the controller(s) being ready for Factory Acceptance Testing (FAT) and shall allow for attendance at those tests by the Engineer’s representative. The location of the acceptance test is to be at the contractors premises.

8.4 The installer shall supply the WSCC traffic signals engineer with a copy of the controller specification prior to or at the above tests.

8.5 Suitable signal lamp mimics and means of simulating inputs shall be required and the test shall demonstrate compliance with the operational specification, including necessary green conflict monitoring. Any non-compliances identified by the Engineer shall be rectified by the Contractor at his own expense.

8.6 The Factory Acceptance Test shall be documented on the WSCC forms shown in Annex C.

8.7 The Contractor shall supply suitable opaque signal head covers. The Contractor shall use these to completely cover all signal head assemblies including pedestrian heads and push-buttons that are not controlling traffic during installation. The covers shall only be removed by the Contractor when commissioning the signals.

8.8 The SCN of the site shall be displayed on the controller cabinet in characters approximately 50 mm high. (i.e. 3621) The method of application shall be approved by WSCC.

8.9 All signal poles shall be numbered as specified on the design drawing or starting with the pole closest to the controller and proceeding in a clockwise direction around the facility.

8.10 On completion of the installation the site shall be left clean and tidy and all rubbish shall be removed.

8.11 After installation of the equipment, site testing shall be carried out by the Contractor prior to the commissioning in order to demonstrate compliance with the specification. The Contractor shall test the operation of all lamps, detectors and push buttons. Only after the tests have proved satisfactory shall WSCC or their representative be asked to attend the installation in order that it may be commissioned. The Contractor shall supply all equipment necessary for testing purposes.

8.12 The Contractor shall give at least one week advance notice to WSCC traffic signal section’s traffic signal engineer to attend the commissioning tests. WSCC reserve the right to invite their maintenance contractor to attend the site commissioning.

8.13 The Site Acceptance Test shall be documented on the WSCC forms shown in Annex C.

8.14 Any non-compliances identified by WSCC shall be resolved at the commissioning by the Contractor. If after taking all reasonable action the Contractor is unable to rectify the outstanding non-compliances and at the commissioning the Engineer considers that the non-compliances are such that the signal equipment cannot be switched on the Contractor shall re-attend the site to resolve the non-compliances immediately the following day and each day thereafter until the item is rectified. Where the non-compliances are not deemed by the
Engineer to affect the switching on of the signal equipment and the Contractor has taken all reasonable measures at the commissioning, the outstanding non-compliance items must be resolved within 5 working days. All labour, plant and materials required to resolve the non-compliant items shall be undertaken at the Contractor's own expense.

8.15 Following a successful site commissioning the installation will be handed over to the Engineer's maintenance contractor. For a period of 12 months following adoption of signals works the WSCC maintenance provider shall be responsible for maintaining the site, in the event of a fault with any of the equipment, other than lamps, shall inform the Contractor of the faulty equipment and return for said equipment for repair or replacement, or shall instruct the Contractor to attend the site and to rectify the fault.

8.16 In addition to any faults that occur following site acceptance the maintenance responsibilities and liability for any traffic signal equipment shall not be accepted by the Engineer until final Site Acceptance Certificates have been signed and accepted by WSCC. If during this period a fault develops, WSCC's maintenance provider shall attend the site, to rectify the fault at the Contractor's expense.

9. Documentation

9.1 The following documents are to be supplied by the Contractor and retained in the controller at commissioning:
   (i) A Log Book
   (ii) A copy of the controller specification.
   (iii) RAM data sheet

9.2 The Contractor shall supply to WSCC at the site commissioning the relevant electrical test certificates. The Contractor's failure to supply these test certificates will cause the switching on of the signals to be delayed until the certificate is produced. The Contractor shall be liable for all expenses involved with re-attending the subsequent site commissioning.

9.3 Within 30 days of the commissioning the contractor is to supply three "as built" cable and signal drawings. One shall be retained within the controller, the remaining two shall be sent to WSCC. The Contractor is in addition to supply the "as built" drawing in Autocad format.

9.4 Within 7 days of the commissioning the contractor is to supply an electronic PDF version of the EPROM specification and the relevant data files.

10 Connection to Urban Traffic Control (UTC) SCOOT

10.1 Where UTC facility and/or connection is specified the Contractor should ensure that the following requirements are met.

10.2 The controller is to be modified as necessary for UTMC including a UTMC interface with a 3U rack including sufficient void space and back wiring to an approved unit which provides the UG405 communication protocol.

10.3 The modification wiring is to include all sockets for connection to the UG405 communication unit.

10.4 The bit pattern shall be as specified in the UTC database sheet(s) of the General Specification forms.

10.5 The manual panel is to be fitted with a 'computer on' LED operated by the presence of force bits from the UTC computer and with a remote reconnect switch. The manual panel LED shall be labelled 'UTC on'.

10.6 The Contractor is to provide self tuning multi-channel detector units for all SCOOT loops which are to be mounted and wired in the UTMC detector rack.
10.7 It is the Main Contractor’s responsibility to arrange for a telemetry line to be fitted in the controller cabinet and to liaise with WSCC signal engineer to determine the exact telephone requirements.

10.8 It’s the main contractor’s responsibility to arrange for an approved supplier to input all UTC/SCOOT data into the WSCC in-station, in an agreed format.

10.9 The Contractor shall be responsible for commissioning the SCOOT detection control and reply bits. The Contractor shall be responsible for supplying all necessary equipment for testing purposes.

10.10 The Contractor is responsible for validating the SCOOT region and supplying a report verifying validation and identifying any observations.

10.11 Any unused data transmission bits shall be strapped out.

10.12 A UTC/SCOOT drawing and any data configuration will be recorded on an appropriate sheet will be left in the controller and within 7 days of commissioning a electronic

11 Connection to Remote Monitoring (RMS)

11.1 Unless specified otherwise by the Engineer in writing the installation will be connected to West Sussex County Council's Remote Monitoring System supplied by Telent. The following requirements are to be met.

11.2 The preferred option is the installation of an integral OMU, therefore reducing wiring and ensuring direct communication with the controller. If this is not feasible a standard 3U rack is to be provided for an Outstation Monitoring Unit (OMU) to be fitted in the controller cabinet containing a 300mm wide by 300mm deep void space.

11.3 It is the Main Contractor’s responsibility to arrange for an agreed communication connection to be installed and connected. This could be in the form of an ADSL line, GSM modem (sim card to be supplied by WSCC Traffic signals) or a telemetry line connected to the Public Switched Telephone Network to be fitted in the controller cabinet.

11.4 The OMU must report any identified fault back to the Instation.

11.5 The OMU must be linked to enable full interrogation of the controller via handset commands.

11.6 A separately fused supply shall be provided solely for use of the OTU/OMCU.

11.7 The OMU equipment shall be of a type approved by WSCC Traffic Signals Engineer to ensure compatibility with the Instation operating system.

11.8 The OMU shall be connected with phase indications in order, followed by phase wait lamps in order. The detectors shall be connected in the order in which they appear in the controller input.

12 Connection to Microprocessor Optimised Vehicle activation (MOVA)

12.1 Unless specified otherwise by WSCC Traffic Signals in writing the installation will be connected to MOVA and the following requirements are to be met.

12.2 An integral MOVA system shall be installed thus eliminating the need for separate detector wiring and ensuring direct communication with the controller. If this is not feasible written permission must be obtained from WSCC Traffic Signals and a standard 3U rack is to be provided for a MOVA/Outstation Monitoring Unit to be fitted in the controller cabinet containing a 300mm wide by 300mm deep void space.
12.3 A UTC interface is provided inside the controller for MOVA control. The Contractor shall test the output of all UTC bits at the Site commissioning.

12.4 All controller detector inputs shall be capable of being remotely monitored. All control and reply bits shall be capable of being wired to the MOVA unit.

12.5 The manual panel shall include a 'computer on' LED which shall indicate when the controller is operating under MOVA control. The LED shall be labelled 'MOVA on-line'.

12.6 The MOVA equipment shall be of a type approved by the Engineer to ensure compatibility with the WSCC Site interrogation software and Instation operating system.

12.7 The latest version of the MOVA software shall be supplied, including all relevant licences to operate MOVA.

12.8 WSCC currently operate Telent integral MOVA and Siemens MOVA via Gemini Units.

Appendix A Cable Specification

A) Loop Cable

2.5mm² 30/0.25 tinned annealed copper conductor, insulated with 0.8 mm radial thickness of EPR and sheathed with 1.4 mm radial thickness of PCP. Overall diameter 6.8 mm (minimum), 7.2mm (maximum)

B) Feeder Cable

2.5mm² 1/1.38 plain annealed circular copper conductor, steel wire armoured, 0.7 mm radial polyethylene insulation, 2 or 4 cores with cores laid up with 5 turns per metre

C) Power Cable (low voltage or extra low voltage)

1.5mm², 8, 12 or 16 core steel wire armoured, with orange PVC sheathing and colour coded cores according to requirements, noting the need for spare cores:

- Black
- Red
- Blue
- Brown
- Red/Brown
- Red/Grey
- Red/Blue
- Purple
- Green
- White
- Orange
- Yellow
- Red/Yellow
- Red/White
- Red/Black
- Grey

8 core

12 core

16 core
# ANNEX A

## TEST CERTIFICATE FOR CABLES AND EQUIPMENT

<table>
<thead>
<tr>
<th>Customer</th>
<th>Site No</th>
<th>Site Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Controller Type</td>
<td>Controller S/No</td>
<td>Engineer</td>
</tr>
<tr>
<td>Config Number</td>
<td>Firmware Number</td>
<td></td>
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### Controller / Site Checks

<table>
<thead>
<tr>
<th>Fail</th>
<th>Pass</th>
<th>Fail</th>
<th>Pass</th>
<th>Fail</th>
<th>Pass</th>
<th>Fail</th>
<th>Pass</th>
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<tbody>
<tr>
<td>Power Supplies</td>
<td>Seals</td>
<td>Controller Case</td>
<td>Reg Signs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuses</td>
<td>Base seal</td>
<td>Pole</td>
<td>Hâle</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dimming</td>
<td>Earthing</td>
<td>Pole Tops</td>
<td>Road Markings</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relays</td>
<td>Locks</td>
<td>Lanterns</td>
<td>Above Ground Det</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Detectors</td>
<td>Hinges</td>
<td>Brackets</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DFM</td>
<td>UTC</td>
<td>P/B Units</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terminal Blocks</td>
<td>OUT</td>
<td>Tactiles</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Operation</td>
<td>LMU</td>
<td>Audio</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drawings</td>
<td>OMU</td>
<td>Detector Housings</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Schedule</td>
<td>RCCB</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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</tbody>
</table>

### Loop Tests

<table>
<thead>
<tr>
<th>Loop</th>
<th>RE</th>
<th>RS</th>
<th>Frequency</th>
<th>Setting</th>
<th>Loop</th>
<th>RE</th>
<th>RS</th>
<th>Frequency</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>AX</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Comments

Further Action Required: Y  N
ANNEX B
SPECIFICATION FOR 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 CABLE IDENTIFICATION

1.1 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.

1.2 The tag shall be marked, using an approved waterproof, indelible, black marker pen, in the following manner:-

(a) Low Voltage Signal Cables

The tag shall be red and shall be clearly marked with the number of the pole, serviced by the cable.

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

The tag shall be yellow and shall be clearly marked with the pole number serviced by the cable, 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 added.

Examples:-

<table>
<thead>
<tr>
<th>(a)</th>
<th>(b)</th>
<th>(c)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P 6</td>
<td>P 3 ELV</td>
<td>3636 ELV</td>
</tr>
</tbody>
</table>

Note: The pole numbers referred to above are as shown on the contract drawing.

(d) Loop Feeder Cables

The identification of these cables is as follows:-
One side of the yellow tag shall be marked with the detector and arm designation - the other side shall be marked with the Street or Road name.

Example:-

<table>
<thead>
<tr>
<th>Side 1</th>
<th>Side 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>AXYZ1</td>
<td>HIGH ST</td>
</tr>
<tr>
<td>ARM 1</td>
<td>W/BND</td>
</tr>
</tbody>
</table>

2 CABLE CORE IDENTIFICATION

2.1 All individual cable cores in cables used in a traffic signal installation shall be identified using coloured PVC grip type markers with black lettering. The markers shall be positioned on the core adjacent to the termination point in such a way that they can be read easily.

2.2 Three types of identification marker shall be used:-

(a) Numbered markers indicating poles numbers. These will be colour coded in accordance with the international resistor colour code. The number shall indicate the pole fed by that cable ie the next pole to which the cable runs.

(b) Legend markers indicating the function of the core as shown below.

(c) Lettered markers indicating the phase of the core.
2.3 The colours, numbers, function, letters and arrangement of the markers shall be as follows:-

2.3.1 (a) **Low Voltage Signal Cables** - This arrangement shall be used for all cables in the controller and for all cables leaving a signal pole.

<table>
<thead>
<tr>
<th>First Marker</th>
<th>Second Marker</th>
<th>Third Marker</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Pole)</td>
<td>(Function)</td>
<td>(Phase)</td>
</tr>
<tr>
<td>Colour:-</td>
<td>Colour Coded</td>
<td>Red</td>
</tr>
<tr>
<td>1 Brown</td>
<td>RED</td>
<td>AMBER</td>
</tr>
<tr>
<td>2 Red</td>
<td>R/MAN</td>
<td>G/MAN</td>
</tr>
<tr>
<td>3 Orange</td>
<td>I.G/A</td>
<td>F.G/A</td>
</tr>
<tr>
<td>4 Yellow</td>
<td>P/EL</td>
<td>PE/N</td>
</tr>
<tr>
<td>5 Green</td>
<td>SIG/N</td>
<td>SIGN/N</td>
</tr>
<tr>
<td>6 Blue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Violet</td>
<td>Note:-</td>
<td>Functions not covered</td>
</tr>
<tr>
<td>8 Slate (Grey)</td>
<td>written onto blank markers with an approved pen.</td>
<td>H etc</td>
</tr>
<tr>
<td>9 White</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Brown and Black</td>
<td>(Two Markers)</td>
<td></td>
</tr>
</tbody>
</table>

2.3.1. (b) **Low Voltage Signal Cables** - This arrangement shall be used for all cables arriving at a signal pole or equipment housing.

Only two markers shall be used ie the Second and Third marker as in 2.3.1 (a) above.

2.3.2 (a) **Extra Low Voltage Cables** - This arrangement shall be used for all cables in the controller and for all cables leaving a signal pole.

<table>
<thead>
<tr>
<th>First Marker</th>
<th>Second Marker</th>
<th>Third Marker</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Pole)</td>
<td>(Function)</td>
<td>(Phase)</td>
</tr>
<tr>
<td>Colour:-</td>
<td>Colour Coded</td>
<td>Yellow</td>
</tr>
<tr>
<td>1 Brown</td>
<td>PUSH/B</td>
<td>BLEEP</td>
</tr>
<tr>
<td>2 Red</td>
<td>COMM</td>
<td>INHIB</td>
</tr>
<tr>
<td>3 Orange</td>
<td>T/O</td>
<td>PB/COM</td>
</tr>
<tr>
<td>4 Yellow</td>
<td>DET+</td>
<td>DET-</td>
</tr>
<tr>
<td>5 Green</td>
<td>MVD</td>
<td>IRD</td>
</tr>
</tbody>
</table>
6 Blue
7 Violet Note:- Functions not covered by the above to be G
8 Slate (Grey) written onto blank markers with an H
9 White approved pen. etc
10 Brown and Black (Two Markers)

2.3.2 (b) Extra Low Voltage Cables - This arrangement shall be used for all cables arriving at a signal pole or equipment housing.

Only two markers shall be used ie the Second and Third marker as in 2.3.2 (a) above.

Examples of above:-

<table>
<thead>
<tr>
<th>Controller</th>
<th>Pole 12</th>
</tr>
</thead>
</table>
| 0--- | 1 2 - RED - A --- | ---- | ---- | RED - A ---0-->

Marker Colour
Brown Red Red White

Post 12 (cont'd)

<table>
<thead>
<tr>
<th>Post 6</th>
</tr>
</thead>
</table>
| ---- -- | 6 - RED - A -- | ---- | ---- | RED - A ---0-->

Marker Colour
Blue Red White
Red White
ANNEX C - TEST CERTIFICATES

1) Configuration Acceptance Test for a Telent Controller:

CONFIGURATION ACCEPTANCE
TEST SCHEDULE
FOR TELENT TR2500 CONTROLLER

<table>
<thead>
<tr>
<th>CUSTOMER :</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SITE NAME :</td>
<td></td>
</tr>
<tr>
<td>SITE REFERENCE :</td>
<td></td>
</tr>
<tr>
<td>CONTROLLER TYPE :</td>
<td>TELENT MTC / SENTINEL/Optima</td>
</tr>
<tr>
<td>CONFIG REFERENCE :</td>
<td></td>
</tr>
<tr>
<td>CONFIG ISSUE :</td>
<td></td>
</tr>
</tbody>
</table>
# CONFIGURATION ACCEPTANCE TEST RESULTS

<table>
<thead>
<tr>
<th>DATE OF TEST</th>
<th>PASSED / FAILED (delete as appropriate)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEST METHOD:</td>
<td>EMULATOR</td>
</tr>
<tr>
<td>COMMENTS</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LATEST DATE FOR CORRECTIVE ACTION</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SUPPLEMENTARY FAT REQUIRED YES / NO (delete as appropriate)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TRAFFIC SIGNAL ENGINEER</th>
<th>Name:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Signature:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SIGNAL COMPANY ENGINEER OR CONSULTANT</th>
<th>Name:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Signature:</td>
</tr>
</tbody>
</table>
CONFIGURATION ACCEPTANCE TESTS

General:

Check Configuration Serial Number & Issue with the Specification (RSN)  
Check that the controller starts up in correct stage and that the correct indications are given  
Check the starting inter-green time (IGS)  
Check that the controller serves all specified phases after start-up  
Check phase appearance and termination types  
Use the handset commands to check the following basic parameters are as specified:-

- Minimum Green times (MIN)  
- Maximum Green times (MAX)  
- Pedestrian Blackout times (PBT or PSQ)  
- Pedestrian Window times (PWN)  
- Intergreen times (IGN)  
- Phase Delay times (DPG)  
- Timetable Entries and Event Parameters (TTI & TEL)  
- BST Changeover Weeks (BST)  
- Handset Limit Values – try setting some times outside limit values  
- Pedestrian Sequence times (PSQ)  

Mode Priority:

Check that the mode priority operates as specified (MOD)  

Manual Mode:

Check manual disable via handset, if specified (MND)  
Select each configured manual button & check stage/phase relationship is correct  
Check any optional appearance phases under manual mode are as specified  
Check permitted stage to stage movements  
Check that non-permitted movements give the correct indication  
Check that leaving manual mode inserts demands for all specified phases  
Check operation of all other buttons/switches on the manual panel
CONFIGURATION ACCEPTANCE TESTS – continued

Detection:

Check DFM times are as specified (DFA & DFI)  
Check Call/Cancel times are as specified (DCL & DCN)  
Check for correct active states on each detector input (DAC)  
Check for correct DFM force states on each detector input (DAC)  
Check Detector times are as specified (EXT)  
Check that all inputs perform the correct functions, e.g. latched/unlatched demands, green extensions, light wait indicators, etc (PHS)  
Check SD/SA loop spacing is as specified (controlled by SD/SA logic unit)  
Check SD/SA Extension times are as specified (controlled by SD/SA logic unit)  
Check SD/SA Extra Intergreen times are as specified (MIG & IGX)  
Check SD/SA operation

FT Mode:

Select fixed time mode and check for correct stage sequence  
Check fixed time stage durations, if specified (FIX)  
Check fixed time runs to current phase maximums (if specified)  
Check any demand dependant stages/phases  
Check that leaving fixed time mode inserts demand for all specified phases

VA Mode:

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

CLF Mode:

Check plan timings/influences are as specified (CLC, CLD, CLO & CLI)  
Check that all plans operate, especially demand dependant stages  
Check CLF permitted movements by writing a plan with a non-permitted move in it
CONFIGURATION ACCEPTANCE TESTS – continued

UTC Mode (or add-on MOVA):

Check mode changes when force bit is active, with TC bit if specified (MOD)
Check operation of non-demand dependant force bits
Check operation of demand dependant force bits with both street demands and D-bits and check that any stage demand reply bits are returned correctly
Check that the UTC stage change logic is correct
Check for correct operation with multiple force bits
Check stage to stage movement restrictions (i.e. permitted, prohibited, alternative)
Check DX bit runs specified stages/phases to maximum in VA mode
Check operation of any other miscellaneous control bits
Check that the correct G-bit replies are returned for each stage
Check that any phase confirm bits are correctly returned
Check reply bits for specific controller conditions (lamps off, DFM, manual, etc)
Check operation of any other miscellaneous reply bits
Check operation of serial MOVA detectors

Part Time Mode:

Check timetable change points by altering the clock (TOD)
Check that signals switch off in correct stage, once minimums have expired (MOD)
Check queue detector operation
Check minimum on/off operating timers (PTH & PTP)
Check operation of part-time inhibit switch

Hurry Call Mode:

Check Hurry Call Delay times are as specified (HCD)
Check Hurry Call Hold times are as specified (HCH)
Check Hurry Call Prevent times are as specified (HCP)
Check operation of request detectors
Check operation of cancel detectors
Check that correct stage is called in relation to the detector (MOD)

MOVA Mode (Integral only):

Check that all MOVA data is as specified (DS)
Check that all MOVA IN, X and Stopline detectors call the appropriate phases
Check that all push button inputs call the appropriate phases
Check that stage selection logic (SDCODE’s) operates as intended
CONFIGURATION ACCEPTANCE TESTS – continued

Vehicle Priority Mode:

| Check Priority unit basic requirements are as specified (PAI, PRA, PRF, PRR, DSR) | Pass/Fail |
| Check Priority Extension times are as specified (PRE) | Pass/Fail |
| Check Priority Maximum times are as specified (PRM) | Pass/Fail |
| Check Inhibit times are as specified (PRI) | Pass/Fail |
| Check Phase Compensation times are as specified (PRC) | Pass/Fail |
| For each priority unit check operation of priority demands/extensions, inhibit periods and compensation periods (MOD, PHS, PRS, PUO) | Pass/Fail |

All Red Extensions:

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

Intergreen Extensions:

| Check Maximum Intergreen times are as specified (MIG) | Pass/Fail |
| Check Intergreen Extensions are as specified (IGX) | Pass/Fail |
| Check operation of intergreen extensions | Pass/Fail |

Variable Maximum:

| Check Variable Maximum Additional Period times are as specified (VMP) | Pass/Fail |
| Check Variable Maximum Threshold Flow values are as specified (VMT) | Pass/Fail |
| Check operation of phases with variable maximum | Pass/Fail |

Pedestrian Linking:

| Check Pedestrian Link timings are as specified (SCT or LNK) | Pass/Fail |
| Check operation of pedestrian link | Pass/Fail |
| Check operation of override timer | Pass/Fail |

Red Lamp Monitoring:

| Check that 1 red lamp out extends appropriate intergreens by the specified duration | Pass/Fail |
| Check that 2 reds out inhibit conflicting ped phases or shutdown part-time streams | Pass/Fail |
| Check that red lamp failure actions cease when lamps are replaced, (if required) | Pass/Fail |
**CONFIGURATION ACCEPTANCE TESTS – continued**

**Green Conflict Monitoring:**
Check all green/green conflict data is correct

**Special Conditioning:**
Check operation of any special conditioning not already covered (SCV & SCT)

**Miscellaneous:**
Perform any other miscellaneous tests that may be required (define below):
1.
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12.
2) Configuration Acceptance Test for a Telent Controller: -

**CONFIGURATION ACCEPTANCE**

**TEST SCHEDULE**

**FOR SIEMENS TR2500 CONTROLLER**

<table>
<thead>
<tr>
<th>CUSTOMER :</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>SITE NAME :</td>
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<tr>
<td>SITE REFERENCE :</td>
<td></td>
</tr>
<tr>
<td>CONTROLLER TYPE :</td>
<td>SIEMENS T400 / ST800 / ST900/ST950</td>
</tr>
<tr>
<td>CONFIG REFERENCE :</td>
<td></td>
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<tr>
<td>CONFIG ISSUE :</td>
<td></td>
</tr>
</tbody>
</table>
# CONFIGURATION ACCEPTANCE TEST RESULTS

<table>
<thead>
<tr>
<th>DATE OF TEST</th>
<th>PASSED / FAILED (delete as appropriate)</th>
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<tr>
<td>TEST METHOD</td>
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<td>COMMENTS</td>
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<tr>
<td>LATEST DATE FOR CORRECTIVE ACTION</td>
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<tr>
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</table>

<table>
<thead>
<tr>
<th>SIGNAL COMPANY ENGINEER OR CONSULTANT</th>
<th>Name:</th>
<th>Signature:</th>
</tr>
</thead>
</table>
CONFIGURATION ACCEPTANCE TESTS

General:

* Indicates commands that only apply to the ST800/ST900.

Check Configuration Identity Code Number & Issue with the Specification (CIC)  
Pass/Fail

Check controller starts up in correct stage and that the correct indications are given

Check the starting inter-green time (IGS)

Check that the controller serves all specified phases/stages after start-up

Check phase appearance and termination types

Use the handset commands to check the following basic parameters are as specified:

Minimum Green times (MIN)

Green Extension times (EXT, IPX*)

Maximum Green times (MAX, MBX, MCX, MDX, MEX*, MFX*, MGX*, MHX*)

Pedestrian Blackout times (PBT)

Pedestrian Window times (PWN)

Intergreen times (IGN)

Phase Delay times (DPG, DMV, DFZ, DMF*, DMT*)

Timetable Entries and Event Parameters (TSW, TDY*)

Handset Limit Values (MTV, ITV) – try setting some times outside limit values

Pedestrian Sequence times (PAR*, PIT*, PBT, CMX*, CDY*, CRD*)

Mode Priority:

Check that the mode priority operates as specified (MOD, STS*)

Manual Mode:

Check manual disable via handset, if specified (MND)

Select each configured manual button & check stage/phase relationship is correct

Check any optional appearance phases under manual mode are as specified

Check permitted stage to stage movements

Check that non-permitted movements give the correct indication

Check that leaving manual mode inserts demands for all specified phases/stages

Check operation of all other buttons/switches on the manual panel
## CONFIGURATION ACCEPTANCE TESTS – continued

### Detection:

<table>
<thead>
<tr>
<th>Pass/Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check DFM times are as specified (DFD, DGP*, DSA*, DSI*)</td>
</tr>
<tr>
<td>Check Call/Cancel times are as specified (DCL &amp; DCN)</td>
</tr>
<tr>
<td>Check for correct active states on each detector input (IPS*)</td>
</tr>
<tr>
<td>Check for correct DFM force states on each detector input (DFA)</td>
</tr>
<tr>
<td>Check Input Extension times are as specified (IPX*)</td>
</tr>
<tr>
<td>Check that all inputs perform the correct functions, e.g. latched/unlatched demands, green extensions, light wait indicators, etc (SPH)</td>
</tr>
<tr>
<td>Check SD/SA loop spacing is as specified</td>
</tr>
<tr>
<td>Check SD/SA Extension times are as specified</td>
</tr>
<tr>
<td>Check SD/SA Extra Intergreen times are as specified (SCT)</td>
</tr>
<tr>
<td>Check SD/SA operation</td>
</tr>
</tbody>
</table>

### FT Mode:

<table>
<thead>
<tr>
<th>Pass/Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select fixed time mode and check for correct stage sequence</td>
</tr>
<tr>
<td>Check fixed time stage durations, if specified (FIX, FTS*, LFT*)</td>
</tr>
<tr>
<td>Check fixed time runs to current phase maximums (if specified)</td>
</tr>
<tr>
<td>Check any demand dependant stages/phases</td>
</tr>
<tr>
<td>Check that leaving fixed time mode inserts demand for all specified phases/stages</td>
</tr>
</tbody>
</table>

### VA Mode:

<table>
<thead>
<tr>
<th>Pass/Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check the VA logic for each stage change is correct (i.e. stages are only demanded/extended by the appropriate phases)</td>
</tr>
<tr>
<td>Check that arterial reversion occurs to the correct stage/phase if no demands/extensions present (if specified)</td>
</tr>
<tr>
<td>Check that correct revertive phase demands occur if extension running when maximum green expires (SPH)</td>
</tr>
<tr>
<td>Check stage movement constraints (i.e. permitted, prohibited, alternative moves)</td>
</tr>
<tr>
<td>Check operation of signals with permanent demands on all detectors ensuring that all phases are satisfied</td>
</tr>
</tbody>
</table>

### CLF Mode:

<table>
<thead>
<tr>
<th>Pass/Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check plan timings/influences are as specified (PLT, PLI, IFA, IFB, IFC, IFD, CYC*, PLE*, PLX*, OFF*, IFN*, IFS*)</td>
</tr>
<tr>
<td>Check that all plans operate, especially demand dependant stages</td>
</tr>
<tr>
<td>Check CLF permitted movements by writing a plan with a non-permitted move in it</td>
</tr>
</tbody>
</table>
CONFIGURATION ACCEPTANCE TESTS – continued

UTC Mode (or add-on MOVA):

- Check mode changes when force bit is active, with TC bit if specified (MOD, STS*)
- Check operation of non-demand dependant force bits
- Check operation of demand dependant force bits with both street demands and D-bits and check that any stage demand reply bits are returned correctly
- Check that the UTC stage change logic is correct
- Check for correct operation with multiple force bits
- Check stage to stage movement restrictions (i.e. permitted, prohibited, alternative)
- Check DX bit runs specified stages/phases to maximum in VA mode
- Check operation of any other miscellaneous control bits
- Check that the correct G-bit replies are returned for each stage
- Check that any phase confirm bits are correctly returned
- Check reply bits for specific controller conditions (lamps off, DFM, manual, etc)
- Check operation of any other miscellaneous reply bits
- Check operation of serial MOVA detectors

Part Time Mode:

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

Hurry Call Mode:

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

Vehicle Priority Mode:

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

All Red Extensions:

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

Pedestrian Linking:

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

Red Lamp Monitoring:

Check that 1 red lamp out extends appropriate intergreens by the specified duration (SIE, RLT*)
Check that 2 reds out inhibit conflicting ped phases or shutdown part-time streams
Check that red lamp failure actions cease when lamps are replaced, (if required)

Green Conflict Monitoring:

Check all green/green conflict data is correct

Special Conditioning:

Check operation of any special conditioning not already covered

Miscellaneous:

Perform any other miscellaneous tests that may be required (define below):-
1. Pass/Fail
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9.
3) Factory Acceptance Test for a Telent Controller: -

FACTORY ACCEPTANCE
TEST SCHEDULE
FOR TELENTE TR2500 CONTROLLER

<table>
<thead>
<tr>
<th>CUSTOMER :</th>
<th></th>
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<tbody>
<tr>
<td>SITE NAME :</td>
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<tr>
<td>SITE REFERENCE :</td>
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<tr>
<td>CONTROLLER TYPE :</td>
<td>TELENTE MTC / SENTINEL/Optima</td>
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<tr>
<td>CONFIG REFERENCE :</td>
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<tr>
<td>CONFIG ISSUE :</td>
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</tbody>
</table>

*If a Configuration Acceptance Test has been conducted the items identified in Blue Italics are not required unless specified by the WSCC Engineer.*
### FACTORY ACCEPTANCE TEST RESULTS

<table>
<thead>
<tr>
<th>DATE OF TEST :</th>
<th>PASSED / FAILED (delete as appropriate)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEST METHOD:</td>
<td>CONTROLLER / TEST RIG</td>
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<tr>
<td></td>
<td></td>
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<tr>
<td>COMMENTS</td>
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<tr>
<td>LATEST DATE FOR CORRECTIVE ACTION :</td>
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</tr>
<tr>
<td>SUPPLEMENTARY FAT REQUIRED  YES / NO (delete as appropriate)</td>
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<tr>
<td>TRAFFIC SIGNAL ENGINEER :</td>
<td>Name:</td>
</tr>
<tr>
<td></td>
<td>Signature:</td>
</tr>
<tr>
<td>SIGNAL COMPANY ENGINEER OR CONSULTANT :</td>
<td>Name:</td>
</tr>
<tr>
<td></td>
<td>Signature:</td>
</tr>
</tbody>
</table>
FACTORY ACCEPTANCE TESTS

General:

Check Configuration Serial Number & Issue with the Specification (RSN)
Note serial number of controller

Set all detectors to Off, all computer bits to Off, select Normal on the Manual Panel
Switch on mains supply, initialise RAM (RCP), check time/date (TOD, CAL, DAY, WEK) and switch signals on
NB. Use PWD to obtain level 3 access if using TR2500 software

Check controller starts up in correct stage and that the correct indications are given
Check the starting inter-green time (IGS)
Check that the controller serves all specified phases after start-up
Check phase appearance and termination types

Use the handset to check the following basic parameters are as specified:

Minimum Green times (MIN)
Maximum Green times (MAX)
Pedestrian Blackout times (PBT or PSQ)
Pedestrian Window times (PWN)
Intergreen times (IGN)
Phase Delay times (DPG)
Timetable Entries and Event Parameters (TTI & TEL)
BST Changeover Weeks (BST)
Handset Limit Values – try setting some times outside limit values
Pedestrian Sequence times (PSQ)

Mode Priority:

Check that the mode priority operates as specified (MOD)

Manual Mode:

Check manual disable via handset, if specified (MND)
Select each configured manual button & check stage/phase relationship is correct
Check any optional appearance phases under manual mode are as specified
Check permitted stage to stage movements
Check that non-permitted movements give the correct indication
Check that leaving manual mode inserts demands for all specified phases
Check operation of all other buttons/switches on the manual panel
FACTORY ACCEPTANCE TESTS – continued

Detection:

- Check DFM times are as specified (DFA & DFI)
- Check Call/Cancel times are as specified (DCL & DCN)
- Check for correct active states on each detector input (DAC)
- Check for correct DFM force states on each detector input (DAC)
- Check Detector times are as specified (EXT)
- Check that all inputs perform the correct functions, e.g. latched/unlatched demands, green extensions, light wait indicators, etc (PHS)
- Check SD/SA loop spacing is as specified (controlled by SD/SA logic unit)
- Check SD/SA Extension times are as specified (controlled by SD/SA logic unit)
- Check SD/SA Extra Intergreen times are as specified (MIG & IGX)
- Check SD/SA operation
- Check Operation of Dimming

FT Mode:

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

VA Mode:

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

CLF Mode:

- Check plan timings/influences are as specified (CLC, CLD, CLO & CLI)
- Check that all plans operate, especially demand dependant stages
- Check CLF permitted movements by writing a plan with a non-permitted move in it
FACTORY ACCEPTANCE TESTS – continued

UTC Mode (or add-on MOVA):

- Reset all detectors to off and select Normal on the Manual Panel
- Check mode changes when force bit is active, with TC bit if specified (MOD)
- Check operation of non-demand dependant force bits
- Check operation of demand dependant force bits with both street demands and D-bits and check that any stage demand reply bits are returned correctly
  - Check that the UTC stage change logic is correct
- Check for correct operation with multiple force bits
  - Check stage to stage movement restrictions (i.e. permitted, prohibited, alternative)
- Check operation of any other miscellaneous control bits
- Check that the correct G-bit replies are returned for each stage
- Check that any phase confirm bits are correctly returned
- Check reply bits for specific controller conditions (lamps off, DFM, manual, etc)
- Check operation of any other miscellaneous reply bits

Part Time Mode:

- Check timetable change points by altering the clock (TOD)
- Check that signals switch off in correct stage, once minimums have expired (MOD)
- Check queue detector operation
  - Check minimum on/off operating timers (PTH & PTP)
- Check operation of part-time inhibit switch

Hurry Call Mode:

- Check Hurry Call Delay times are as specified (HCD)
- Check Hurry Call Hold times are as specified (HCH)
- Check Hurry Call Prevent times are as specified (HCP)
- Check operation of request detectors
- Check operation of cancel detectors
- Check that correct stage is called in relation to the detector (MOD)

MOVA Mode (Integral only):

- Check that all MOVA data is as specified (DS)
- Check that all MOVA IN, X and Stopline detectors call the appropriate phases
- Check that all push button inputs call the appropriate phases
- Check that stage selection logic (SDCODE’s) operates as intended
FACTORY ACCEPTANCE TESTS – continued

Vehicle Priority Mode:

Check Priority unit basic requirements are as specified (PAI, PRA, PRF, PRR, DSR)  
Check Priority Extension times are as specified (PRE)  
Check Priority Maximum times are as specified (PRM)  
Check Inhibit times are as specified (PRI)  
Check Phase Compensation times are as specified (PRC)  
For each priority unit check operation of priority demands/extensions, inhibit periods and compensation periods (MOD, PHS, PRS, PUO)

All Red Extensions:

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

Intergreen Extensions:

Check Maximum Intergreen times are as specified (MIG)  
Check Intergreen Extensions are as specified (IGX)  
Check operation of intergreen extensions

Variable Maximum:

Check Variable Maximum Additional Period times are as specified (VMP)  
Check Variable Maximum Threshold Flow values are as specified (VMT)  
Check operation of phases with variable maximum

Pedestrian Linking:

Check Pedestrian Link timings are as specified (SCT or LNK)  
Check operation of pedestrian link  
Check operation of override timer

Red Lamp Monitoring:

Check that 1 red lamp out extends appropriate intergreens by the specified duration  
Check that 2 reds out inhibit conflicting ped phases or shutdown part-time streams  
Check that failure of all (or 2) monitored reds on a channel of a stand-alone pedestrian stream causes shutdown  
Check that red lamp failure actions cease when lamps are replaced, (if required)
FACTORY ACCEPTANCE TESTS – continued

Green Conflict Monitoring:
- Check all green/green conflicts using a test box (or the Simulator)
- Check fault log for correct conflict data (FLF & HFL)

Special Conditioning:
- Check operation of any special conditioning not already covered (SCV & SCT)

Miscellaneous:
- Perform any other miscellaneous tests that may be required (define below):
  1. 
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  3. 
  4. 
  5. 
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  7. 
  8. 
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  11. 
  12.
4) Factory Acceptance Test for a Siemens Controller: -

FACTORY ACCEPTANCE
TEST SCHEDULE
FOR SIEMENS TR2500 CONTROLLER

<table>
<thead>
<tr>
<th>CUSTOMER</th>
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<tr>
<td>SITE REFERENCE</td>
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<tr>
<td>CONTROLLER TYPE</td>
<td><strong>SIEMENS T400 / ST800 / ST900/ST950</strong></td>
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<tr>
<td>CONFIG REFERENCE</td>
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<tr>
<td>CONFIG ISSUE</td>
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*If a Configuration Acceptance Test has been conducted the items identified in Blue Italics are not required unless specified by the WSCC Engineer.*
# FACTORY ACCEPTANCE TEST RESULTS

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<tr>
<th>DATE OF TEST</th>
<th>PASSED / FAILED (delete as appropriate)</th>
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<tbody>
<tr>
<td>TEST METHOD</td>
<td>CONTROLLER / TEST RIG</td>
</tr>
<tr>
<td>COMMENTS</td>
<td></td>
</tr>
</tbody>
</table>

**LATEST DATE FOR CORRECTIVE ACTION:**

**SUPPLEMENTARY FAT REQUIRED**  YES / NO (delete as appropriate)

**TRAFFIC SIGNAL ENGINEER:**
- Name:
- Signature:

**SIGNAL COMPANY ENGINEER OR CONSULTANT:**
- Name:
- Signature:
## FACTORY ACCEPTANCE TESTS

### General:

* Indicates commands that only apply to the ST800/ST900.

| Check Configuration Identity Code Number & Issue with the Specification (CIC) | Pass/Fail |
| Note serial number of controller                                      |           |

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

Check controller starts up in correct stage and that the correct indications are given

**Check the starting inter-green time (IGS)**

Check that the controller serves all specified phases/stages after start-up

**Check phase appearance and termination types**

Use the handset to check the following basic parameters are as specified:

- Minimum Green times (MIN)
- Green Extension times (EXT, IPX*)
- Maximum Green times (MAX, MBX, MCX, MDX, MEX*, MFX*, MGX*, MHX*)
- Pedestrian Blackout times (PBT)
- Pedestrian Window times (PWN)
- Intergreen times (IGN)
- Phase Delay times (DPG, DMV, DFZ, DMF*, DMT*)
- Timetable Entries and Event Parameters (TSW, TDY*)
- Handset Limit Values (MTV, ITV) – try setting some times outside limit values
- Pedestrian Sequence times (PAR*, PIT*, PBT, CMX*, CDY*, CRD*)

### Mode Priority:

**Check that the mode priority operates as specified (MOD, STS*)**

### Manual Mode:

Check manual disable via handset, if specified (MND)

Select each configured manual button & check stage/phase relationship is correct

Check any optional appearance phases under manual mode are as specified

Check permitted stage to stage movements

Check that non-permitted movements give the correct indication

Check that leaving manual mode inserts demands for all specified phases/stages

Check operation of all other buttons/switches on the manual panel
FACTORY ACCEPTANCE TESTS – continued

Detection:

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

FT Mode:

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

VA Mode:

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

CLF Mode:

- Check plan timings/influences are as specified (PLT, PLI, IFA, IFB, IFC, IFD, CYC*, PLE*, PLX*, OFF*, IFN*, IFS*)
- Check that all plans operate, especially demand dependant stages
- Check CLF permitted movements by writing a plan with a non-permitted move in it
FACTORY ACCEPTANCE TESTS – continued

UTC Mode (or add-on MOVA):

<table>
<thead>
<tr>
<th>Test Description</th>
<th>Pass/Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reset all detectors to off and select Normal on the Manual Panel</td>
<td></td>
</tr>
<tr>
<td>Check mode changes when force bit is active, with TC bit if specified (MOD, STS*)</td>
<td></td>
</tr>
<tr>
<td>Check operation of non-demand dependant force bits</td>
<td></td>
</tr>
<tr>
<td>Check operation of demand dependant force bits with both street demands and D-bits and check that any stage demand reply bits are returned correctly</td>
<td></td>
</tr>
<tr>
<td><em>Check that the UTC stage change logic is correct</em></td>
<td></td>
</tr>
<tr>
<td>Check for correct operation with multiple force bits</td>
<td></td>
</tr>
<tr>
<td><em>Check stage to stage movement restrictions (i.e. permitted, prohibited, alternative)</em></td>
<td></td>
</tr>
<tr>
<td>Check DX bit runs specified stages/phases to maximum in VA mode</td>
<td></td>
</tr>
<tr>
<td>Check operation of any other miscellaneous control bits</td>
<td></td>
</tr>
<tr>
<td>Check that the correct G-bit replies are returned for each stage</td>
<td></td>
</tr>
<tr>
<td>Check that any phase confirm bits are correctly returned</td>
<td></td>
</tr>
<tr>
<td>Check reply bits for specific controller conditions (lamps off, DFM, manual, etc)</td>
<td></td>
</tr>
<tr>
<td>Check operation of any other miscellaneous reply bits</td>
<td></td>
</tr>
<tr>
<td>Check operation of serial MOVA detectors</td>
<td></td>
</tr>
</tbody>
</table>

Part Time Mode:

<table>
<thead>
<tr>
<th>Test Description</th>
<th>Pass/Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Check timetable change points by altering the clock (STM, CKL, TOD)</em></td>
<td></td>
</tr>
<tr>
<td>Check that signals switch off in correct stage, once minimums have expired (MOD, STS*)</td>
<td></td>
</tr>
<tr>
<td>Check queue detector operation</td>
<td></td>
</tr>
<tr>
<td><em>Check minimum on/off operating timers if specified</em></td>
<td></td>
</tr>
<tr>
<td>Check operation of part-time inhibit switch</td>
<td></td>
</tr>
</tbody>
</table>

Hurry Call Mode:

<table>
<thead>
<tr>
<th>Test Description</th>
<th>Pass/Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Check Hurry Call Delay times are as specified (DHC)</em></td>
<td></td>
</tr>
<tr>
<td><em>Check Hurry Call Hold times are as specified (HHC)</em></td>
<td></td>
</tr>
<tr>
<td><em>Check Hurry Call Prevent times are as specified (PHC)</em></td>
<td></td>
</tr>
<tr>
<td>Check operation of request detectors</td>
<td></td>
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<tr>
<td>Check operation of cancel detectors</td>
<td></td>
</tr>
<tr>
<td><em>Check that correct stage is called in relation to the detector (MOD, STS</em>)*</td>
<td></td>
</tr>
</tbody>
</table>

Vehicle Priority Mode:

<table>
<thead>
<tr>
<th>Test Description</th>
<th>Pass/Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Check Priority unit basic requirements are as specified (PUT, PUP, PMT, PDE, PRE, PRI, PDR, PUI, PSE, PSA, PVG)</em></td>
<td></td>
</tr>
<tr>
<td><em>Check Priority Extension times are as specified (PVE)</em></td>
<td></td>
</tr>
<tr>
<td><em>Check Priority Maximum times are as specified (PVM)</em></td>
<td></td>
</tr>
<tr>
<td><em>Check Inhibit times are as specified (PVI)</em></td>
<td></td>
</tr>
<tr>
<td><em>Check Phase Compensation times are as specified (PCn)</em></td>
<td></td>
</tr>
<tr>
<td>For each priority unit check operation of priority demands/extensions, inhibit periods and compensation periods (PVU, PVP, PVS, PIA, PDS, PIU)*</td>
<td></td>
</tr>
</tbody>
</table>
FACTORY ACCEPTANCE TESTS – continued

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

Pedestrian Linking:

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

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

Green Conflict Monitoring:
Check all green/green conflicts using a test box (or CFZ* on IC4 Emulator)  
Check fault log for correct conflict data (FLF, FLD, FFS*, FDS*, LOG*)  

Special Conditioning:
Check operation of any special conditioning not already covered
## FACTORY ACCEPTANCE TESTS – continued

**Miscellaneous:**

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

<table>
<thead>
<tr>
<th>No.</th>
<th>Test Description</th>
<th>Pass/Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
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<td>2.</td>
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<td>3.</td>
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<td>4.</td>
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<td>5.</td>
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<td>6.</td>
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<td>7.</td>
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<td>9.</td>
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<td>10.</td>
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<td>11.</td>
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<tr>
<td>12.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## 5) Site Acceptance Test: -

### SCHEME/LOCATION:

<table>
<thead>
<tr>
<th>Controller Make</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. GENERAL ARRANGEMENT</strong></td>
<td>Pass/Fail</td>
</tr>
<tr>
<td>1.1</td>
<td>Check that the poles have been installed in the correct positions and are upright.</td>
</tr>
<tr>
<td>1.2</td>
<td>Check lantern arrangements are correct and include backing boards and HI tape.</td>
</tr>
<tr>
<td>1.3</td>
<td>Check that the base of the controller has been sealed and that any spare ducts have also been sealed.</td>
</tr>
<tr>
<td>1.4</td>
<td>Check above ground detectors have been installed using nyloc nuts</td>
</tr>
<tr>
<td>1.5</td>
<td>Check that the white lining are in the correct positions. Stoplines</td>
</tr>
<tr>
<td></td>
<td>Studs</td>
</tr>
<tr>
<td></td>
<td>Zig Zags</td>
</tr>
<tr>
<td></td>
<td>Other</td>
</tr>
<tr>
<td>1.6</td>
<td>Perform visual inspection for neat wiring, ancillary equipment fitted, etc</td>
</tr>
<tr>
<td>1.7</td>
<td>Check that the paving has been installed to the correct layout Tactile</td>
</tr>
<tr>
<td></td>
<td>Corduroy</td>
</tr>
<tr>
<td>1.8</td>
<td>Check that permanent/temporary Advanced Warning Signs have been erected.</td>
</tr>
<tr>
<td>1.9</td>
<td>Check that a phone line has been installed if specified, and note the line number: ___________________</td>
</tr>
</tbody>
</table>

### 2. ELECTRICAL

| | |
| 2.1 | Check that correct fuse has been fitted in cut-out. Amp |
| 2.2 | Flash Test and if successful Switch the Signals ON. |
| 2.3 | Check that box signs are illuminated. |
| 2.4 | Check that all the lamps are operational. |
| 2.5 | Check the alignment of the signal heads. |
| 2.6 | Check dimming operation |
| 2.7 | Check that a conflict shuts down the controller |

### 3. TIMINGS

| | |
| 3.1 | Check that time and date are correct Telent = TOD, CAL, DAY, WEK Siemens = STM, CKL, TOD, DAY, WEK |
| 3.2 | Check British Summer Time settings Telent = BST Siemens = BSA, BSR, CKA*, CKR* |
## 4. CONFIGURATION

**If PROM has been signed off by a FAT or is the standard WSCC crossing config the following checks are not required:**

<table>
<thead>
<tr>
<th>4.1 Minimum Green Period, including Handset Limit Values</th>
<th><strong>TELENT</strong></th>
<th><strong>SIEMENS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>MIN</td>
<td>MIN</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4.2 Maximum Green Period, including Handset Limit Values</th>
<th><strong>TELENT</strong></th>
<th><strong>SIEMENS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>MAX</td>
<td>MAX, MBX, MCX, MDX, MEX*, MFX*, MGX*, MHX*</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4.3 Detector Extension Times</th>
<th><strong>TELENT</strong></th>
<th><strong>SIEMENS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>EXT</td>
<td>EXT, IPX*</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4.4 Intergreen Values, including Handset Limit Values</th>
<th><strong>TELENT</strong></th>
<th><strong>SIEMENS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>IGN</td>
<td>IGN</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4.5 Start Up Intergreen Period</th>
<th><strong>TELENT</strong></th>
<th><strong>SIEMENS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>IGS</td>
<td>IGS</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4.6 Detector Call/Cancel Values</th>
<th><strong>TELENT</strong></th>
<th><strong>SIEMENS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>DCL &amp; DCN</td>
<td>DCL &amp; DCN</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4.7 Phase Delays</th>
<th><strong>TELENT</strong></th>
<th><strong>SIEMENS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>DPG</td>
<td>DPG, DMV, DFZ, DMF*, DMT*</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4.8 Pedestrian Blackouts</th>
<th><strong>TELENT</strong></th>
<th><strong>SIEMENS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>PBT or PSQ</td>
<td>PBT</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4.9 Pedestrian Window times</th>
<th><strong>TELENT</strong></th>
<th><strong>SIEMENS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>PWN</td>
<td>PWN</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4.10 Timetable entries and events</th>
<th><strong>TELENT</strong></th>
<th><strong>SIEMENS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>TTI &amp; TEL</td>
<td>TSW, TDY*</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4.11 CLF data</th>
<th><strong>TELENT</strong></th>
<th><strong>SIEMENS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>CLC, CLD, CLO, CLI</td>
<td>PLT, PLI, IFA, IFB, IFC, IFD, CYC*, PLE*, PLX*, OFF*, IFN*, IFS*</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4.12 Pedestrian sequence times</th>
<th><strong>TELENT</strong></th>
<th><strong>SIEMENS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>PSQ</td>
<td>PAR*, PIT*, PBT, CMX*, CDY*, CRD*</td>
<td></td>
</tr>
</tbody>
</table>

## 5. DETECTION

<table>
<thead>
<tr>
<th>5.1 Check all loops have been cut in the correct positions and have been sealed.</th>
<th><strong>TELENT</strong></th>
<th><strong>SIEMENS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>SDE/SA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>System D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SCOOT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MOVA</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5.2 Check all loop detector packs for correct settings</th>
<th><strong>TELENT</strong></th>
<th><strong>SIEMENS</strong></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>5.3 Check that all loops are connected to the correct controller input</th>
<th><strong>TELENT</strong></th>
<th><strong>SIEMENS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Telent = DET or IPD</strong></td>
<td><strong>Siemens = IOP or DET</strong>*</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5.4 Check that all above ground detectors are connected to the correct controller input</th>
<th><strong>TELENT</strong></th>
<th><strong>SIEMENS</strong></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>5.5 Check that all push button units are connected to the correct controller input</th>
<th><strong>TELENT</strong></th>
<th><strong>SIEMENS</strong></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>5.6 Check SD/SA for correct operation with Soundmark Testset</th>
<th><strong>TELENT</strong></th>
<th><strong>SIEMENS</strong></th>
</tr>
</thead>
</table>

## 6. HURRY CALL

<table>
<thead>
<tr>
<th>6.1 Check the operation of detection or loops</th>
<th><strong>TELENT</strong></th>
<th><strong>SIEMENS</strong></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>6.2 Check that the correct stage is called in relation to the detector.</th>
<th><strong>TELENT</strong></th>
<th><strong>SIEMENS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Telent = MOD</strong></td>
<td><strong>Siemens = MOD or STS</strong>*</td>
<td></td>
</tr>
</tbody>
</table>
6.3 Check call delay period.
Telent = HCD Siemens = DHC
6.4 Check hold period.
Telent = HCH Siemens = HHC
6.5 Check prevent period.
Telent = HCP Siemens = PHC

7. OPERATION
7.1 Check VA operation, ensuring vehicle gaps terminate max timer.

7.2 Check alignment and operation of on-crossing detectors

7.3 Check operation of kerbside detectors:
(a) check alignment
(b) check demand lock-in
(c) check demand cancel

7.4 Check the operation of the crossing indications.
(a) Check that the wait indicator units are at the correct angle
(b) Check the wait indicator operates as specified
(c) Check the audible signal operates at the correct volume and by time of day.
(d) Check tactile devices operate.

7.5 Check operation of manual panel
(a) Auxiliary Switches
(b) Operation, particularly noting the operation of green arrows

7.6 Check the operation of CLF.

7.7 Check the operation of any Local Link/Ped Link Facility.

8. RED LAMP MOITIORING
8.1 Check that 1 red lamp out extends appropriate intergreens by the specified duration

8.2 Check the DFM lamp

8.3 Check that 2 reds out inhibit conflicting pedestrian phases or shutdown part-time streams

8.4 Check that failure of all (or 2) monitored reds on a channel of a stand-alone pedestrian stream causes shutdown

8.5 Check that red lamp failure actions cease when lamps are replaced, (if required)

8.6 Check that general lamp failures are detected and reported correctly

9. REMOTE MONITORING
9.1 Commission OMU using WSCC commissioning sheets
10. MOVA
10.1 Validate MOVA data set

11. UTC
11.1 Check the operation of any SCOOT loops.
11.2 Check that all control bits are connected to the correct controller inputs
   Telent = IPD  Siemens = IOP
11.3 Check that all reply bits are connected to the correct controller inputs
   Telent = OPD  Siemens = IOP

12. DOCUMENTATION
12.1 Check Controller Identification Number and Helpline sticker are in place
12.2 Check that the electrical tests have been carried out and the correct forms provided
12.3 Check the following documentation is in the controller
   (a) TR2500
   (b) Site drawing
   (c) Log book
   (d) RAM sheet
   (e) OTU set up sheets
   (f) SCOOT loop identification and layout sheet
   (g) UTC junction configuration
13. INVENTORY (enter quantity)

**Poles**
- Straight - 4m
- 6m
- Swan neck
- Nal Sockets

**Vehicle Heads** - (assumed LED unless specified)
- RAG
- Add. Green
- RAGA
- Box Signs

**Pedestrian Heads**
- Far Side Ped
- Far Side Tou

**Push Buttons**
- Puffin
- Toucan
- Pegasus
- Small Wait
- Addit Puffin (High Mounted)
- Addit Pegas (High Mounted)

**Pedestrian Equipment**
- Audibles
- Kerbside Dets
- Tactile Cones
- On Crossing

**Detection (check type)**
- MVDs
- VA
- SD
- SCOOT loops
- IRDs
- MOVA loops
- SA
- Detector Pack

**Remote Monitoring & Other**
- MSL
- CCTV
- PE Cell
- Bus Priority
- CCTV Make & Model
- Bus Priority Make & Model
COMMISSIONED BY: .............................................  Date: .............................................

COMMENTS:

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Latest Date for corrective action .................................................................

WSCC Traffic Signal Engineer

Name................................................................. Signature....................................................

Client Representative

Name................................................................. Signature....................................................
ANNEX D - STANDARD DRAWINGS

NOTES:-
1) All dimensions are in millimeters unless otherwise specified.
2) Surface around controller and feeder pillar to be made good to match existing.
3) All ducts to be installed with a suitable draw cord.
4) Only approved controller root shall be used.
Typical Section Through Traffic Signals
Access Chamber and Kerb Loop Connection

NOTES:-
1) All dimensions are in millimeters unless otherwise specified.
2) All ducts to be installed with a suitable draw cord.

Traffic Signals Pole Retention Socket Installation Detail

NOTES:-
1) All dimensions are in millimeters unless otherwise specified.
2) Surface around poles to be made good to match existing.
3) All ducts to be installed with a suitable draw cord.
4) Retention socket to be installed in accordance with manufacturers installation specification. Only approved retention sockets shall be used.

Traffic Signals Installation Standards Issue 4