



**TRANSPORT
SCOTLAND**

An Agency of  The Scottish Government

M8 M73 M74 MOTORWAY IMPROVEMENTS

DBFO AGREEMENT

Schedule 2 - New Works Requirements

Part 3: Specific Requirements

Traffic Scotland Equipment

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SCHEDULE 2 - NEW WORKS REQUIREMENTS

PART 3: SPECIFIC REQUIREMENTS - TRAFFIC SCOTLAND EQUIPMENT

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1 General Requirements

1.1 Introduction

- 1.1.1 Intelligent Transport Systems (“ITS”) are technology systems / facilities that assist road network operators in providing an efficient, reliable and safe transport network. This is achieved by deploying temporary controlling and information responses at a strategic or local level to complement the fixed route signing. These responses therefore manage normal, planned or unplanned conditions on the road network but can also be used to influence traveller’s behaviour and deliver policy objectives. This is achieved for the trunk road network in Scotland through the Transport Scotland’s Traffic Scotland Service (“TSS”). The TSS is described in APPENDIX F.
- 1.1.2 Transport Scotland intends to enhance the TSS on the M8, M73 and M74 motorways by deploying additional Traffic Scotland Equipment (“TSE”). The provision of ITS on the network shall be on the following sections of motorway:
- (a) Between M8 J8 (Baillieston) and the current M8 J6 (Newhouse) in both directions
 - (b) Between M8 J10 and M8 J8 (Baillieston) Eastbound
 - (c) Between M73 J2 (Baillieston) and M73 J1 (Maryville) in both directions
 - (d) Between M74 J6 and M74 J3
- 1.1.3 In addition, Transport Scotland is upgrading the existing TSE to Internet Protocol (IP) communications and modifying the Traffic Scotland Instation/software through separate contracts, including “IP Roll-Out”.
- 1.1.4 Transport Scotland has established a number of transport planning objectives for the project, some of which are to be addressed through the use of ITS. These are listed in APPENDIX F. Strategies shall be developed through this Contract to deliver these objectives together with the standard operational management responses. This will deliver optimum capacity within a safe, efficient and reliable environment and provide local and strategic information to road and public transport users during normal, planned and unplanned conditions.
- 1.1.5 The operational management response strategies for the network defined in section 1.1.2 will be developed by Transport Scotland. These operational response strategies will be deployed by Transport Scotland initially onto the Transport Scotland’s Instation test system and finally onto Transport Scotland’s operational Instation. The TSE is required to determine and display the information required to support the operations management response strategies. Operational management response strategies are required for a range of operational regimes. Scheme operational regimes include:
- (a) normal operation;
 - (b) incident control;
 - (c) journey time reliability; and
 - (d) capacity management;
- 1.1.6 The Company shall design, provide, install and commission the ITS facilities with the TSS without compromising Transport Scotland’s ability to deliver the TSS.
- 1.1.7 Transport Scotland will provide the technology components and software systems for the ITS facilities, known as Active Equipment as detailed in Appendix A. The Company shall be required to provide the infrastructure necessary to support the Active Equipment. This infrastructure is known as the Passive Network.
- 1.1.8 The ITS systems / facilities to be provided by the Company shall include:
- (a) Lane Signalling (“LS”) to provide control of each lane by displaying dynamic road sign aspects above each lane on an overhead gantry;

- (b) Mandatory Speed Signalling (“**MSS**”) to manage the network by regulating the speed of traffic, achieved by displaying variable mandatory speed limits above each lane on an overhead gantry;
 - (c) Variable Message Signs (“**VMS**”) to display strategic and tactical text messages and / or multicoloured pictograms to drivers;
 - (d) Vehicle Detection for Incident Management (“**VDIM**”), using real-time vehicle detection of traffic parameters to identify incidents / events occurring on the network, and to provide abnormal event alerts to the control centre so that TSS can implement strategies to mitigate the effects and manage safety;
 - (e) Closed Circuit Television (“**CCTV**”) monitoring to provide full coverage of the corridor and for visual monitoring by TSS operators and other parties that the CCTV images are shared with;
 - (f) Access control and management – used to regulate and manage traffic entering the main carriageway to prevent flow breakdown. It is also used to close a motorway entry point when the motorway downstream of the entry point is closed. This is achieved through Motorway Access Control (“**MAC**”);
 - (g) Traffic monitoring and measurement system to gather traffic data used by the TRBO;
 - (h) Journey Time (“**JT**”) information to implement control strategies and statistical purposes;
 - (i) Emergency Roadside Telephone (“**ERT**”) system – to provide roadside assistance through direct connection of roadside telephones along the sections of the corridor where it is safe to do so;
 - (j) MSS compliance system in support of variable mandatory speed limits and facilities so as not to preclude the installation of future compliance measures on the hard shoulders throughout the extent of the New Works;
 - (k) Communication network to provide the backbone for all ITS implementations whether it is for local connections between roadside equipment and cabinets or long distance connections between a control centre and the roadside. The communications network shall be installed in a duct system and shall be based on a fibre cable backbone with local copper multi-pair cables; and
 - (l) Electrical power network.
- 1.1.9 To establish data, video and voice networks to the Traffic Scotland Control Centre (“**TSCC**”) the Company shall connect ITS facilities and TSE to Transport Scotland’s communications network at the roadside cabinets and the core IP switch transmission stations both within and outwith the Land Made Available (“**LMA**”). The establishment of these networks and connection of the ITS facilities shall be achieved through the Company’s design of the communications system incorporating Transport Scotland Issued Equipment (“**TSIE**”). The Company shall liaise with Transport Scotland regarding access to the existing TSS cabinets, transmission stations and TSCC as required to complete the New Works.
- 1.1.10 Additional requirements relating to ITS are included in Schedule 2: Part 2, which in summary covers general requirements and also specific requirements for Structures (Gantries), vehicle restraint systems, road lighting, maintenance access, hard landscape, and ancillary items;
- 1.1.11 The Company shall consult and comply with the requirements of Glasgow City Council, North Lanarkshire Council and South Lanarkshire Council, regarding the provision of local VMS and associated infrastructure.

1.2 Scope of ITS Works

- 1.2.1 The Company shall design, develop, provide, execute, implement, test, commission and hand over the ITS facilities and TSE to Transport Scotland for transfer to the live TSS network. The Company shall assist Transport Scotland in the integration, detailed in Section 10.9, of new TSE with both the existing TSS and existing TSE, which shall be undertaken to allow continued and uninterrupted delivery of the TSS.
- 1.2.2 The Company shall undertake the same obligations relating to TSE for all ITS equipment that belongs to, or is under the control of Glasgow City Council, North Lanarkshire Council and South Lanarkshire Council,
- 1.2.3 Due to the location of these New Works and their interaction with the critical East-West link for the TSS which is located on the M8 between J8 (Baillieston) and the current M8 J6 (Newhouse), as well as at the Transmission Station located within the Baillieston interchange, the Company shall pay particular attention to the requirements of 3.3 and 3.4 to ensure continuity of service for the TSS for the duration of the New Works.

1.3 Traffic Scotland Service

- 1.3.1 The Traffic Scotland Manager is responsible to Transport Scotland for the operation, development and maintenance of the TSS.
- 1.3.2 The TSS, in part, relies on the provision of a system comprising of Instation servers and associated Traffic Scotland ("TfS") system software, control room workstations, private and public communication services, roadside equipment, a web site and various organisations to operate, maintain, and develop the same as described in APPENDIX F.
- 1.3.3 Prior to the TSS similar functionality was provided through the National Driver Information and Control System ("NADICS"). A number of existing documents, specifications and drawings may refer to NADICS. The terms NADICS and TSS are equivalent in all documentation.

1.4 Provision of the ITS Works

- 1.4.1 The Company shall prepare a "Strategy of ITS New Works for Traffic Scotland Equipment Document" in accordance with APPENDIX E of this Part 3 for submission to Transport Scotland in accordance with the Consult and Comply Procedure. The Company shall provide the ITS New Works in accordance with these New Works Requirements and implement them in accordance with APPENDIX E of this Part 3.
- 1.4.2 The Company shall provide a communication network that is fully compatible with Transport Scotland's existing communication network to accommodate TSE provided under this Contract. The Company shall consult and comply with the requirements of Transport Scotland regarding the communications network design.
- 1.4.3 The Contract Drawings listed in Schedule 2: Part 4 comprise both specific requirements and standard details of non site specific installations of standard equipment and site layouts. The Company shall use both the specific requirements and these standard details to prepare site specific layouts to meet the New Works Requirements and Specification. Where these standard details cannot be achieved the Company shall consult with and comply with the requirements of Transport Scotland
- 1.4.4 The Company shall test and commission all New Works for TSE in accordance with the Specification and Section 10.
- 1.4.5 Transport Scotland shall provide as TSIE only the Active Equipment and Passive Network components as detailed in APPENDIX A of this Part 3 required to complete the New Works. Unless otherwise specified, the Company shall provide all other TSE necessary to complete the New Works.

1.4.6 The Company shall ensure that the TSE is operational both on the Site and from the TSCC, by undertaking acceptance testing in accordance with the Section 10.

1.4.7 Not used.

1.5 Extent of New Works

1.5.1 The extent of the ITS works are within the Land Made Available as detailed in Schedule 2: Part 2 and Schedule 2: Part 4 Appendix 1/7.

1.6 Deleted section

1.7 Electrical Supply

1.7.1 The Company shall procure power supplies to all new TSE sites. The Company shall upgrade existing supplies as required. The Company shall provide the power supply distribution network to all TSE sites.

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2 Consultation and Third Parties

2.1 General

- 2.1.1 Transport Scotland has a number of TSS equipment and service providers as described in APPENDIX F of this Part 3. The Company shall consult and comply with the requirements of Transport Scotland regarding liaison with TSS equipment and service providers. In addition, the Company shall consult and comply with Transport Scotland with regard to the interface between the TSS equipment provided by Transport Scotland and the Passive Network, provided by the Company, in respect of weight, size, fixing arrangements and the like.
- 2.1.2 Transport Scotland works closely with other parties involved in operating the network in Scotland. The parties that work closely with Transport Scotland to provide a coordinated response to the management of incidents and deliver route guidance are Glasgow City Council, North Lanarkshire Council and South Lanarkshire Council, the Police and Trunk Road Operating Companies.
- 2.1.3 The Company shall confirm the ownership of all ITS as described in Section 3, before commencing any work involving TSE on Site. The Company shall consult and comply with the requirements of Glasgow City Council, North Lanarkshire Council and South Lanarkshire Council, and any third parties in regard to their ITS equipment.

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3 Traffic Scotland Equipment

3.1 General

- 3.1.1 To accommodate the Transport Scotland provided TSE, Transport Scotland will be responsible for managing the modifications to the instation and the configuration changes to the instation at the TSCC. In addition, Transport Scotland shall develop the data interface and make the changes to the IP wide area network outwith the Site as required, to provide communications with the TSE.
- 3.1.2 If the Company wishes, as part of his design, to utilise the existing Passive Network within the Site he shall undertake site investigations in accordance with Clauses 1518, 1524 and 1533 of the Specification and additionally as necessary to confirm the condition and suitability of the existing Passive Network, prior to them being incorporated in the New Works.
- 3.1.3 Transport Scotland will manage the modifications as required to the instation at the TSCC, to operate the TSE and, modify or develop applications as necessary to accommodate the Transport Scotland provided TSE. To allow Transport Scotland to make the necessary modifications to existing TSE equipment the Company shall provide to Transport Scotland the following information, including but not limited to:
- (a) Ordnance Survey grid reference coordinates and details of changes in lane configuration and lane relationships along the length of the road;
 - (b) Ordnance Survey grid reference coordinates and details of changes in the default speed limit of traffic along the length of the road,
 - (c) Ordnance Survey grid reference coordinates and dimensions, where applicable, of maintenance access gates, maintenance access slips and maintenance hard standings;
 - (d) Ordnance Survey grid reference coordinates and road alignment details to allow the new road to be overlaid on the Traffic Scotland operational instation geographical mapping;
 - (e) Ordnance Survey grid reference coordinates of all TSE equipment and its cross sectional position; and
 - (f) a table of all TSE with chainage and equipment reference names. The format of the TSE chainage and reference names will be provided post contract award by Transport Scotland.
- 3.1.4 To allow Transport Scotland to order TSIE and prepare all modifications and configurations described in Section 3.1.3, the Company shall notify Transport Scotland of the TSIE requirements and instation and TSE modifications and configuration in accordance with the following lead-in time requirements:
- (a) design and development of the Instation - six months;
 - (b) configuration of Instation/software system to accommodate TSE that requires to be relocated - three months;
 - (c) setting TSE out of service to allow removal – 14 days;
 - (d) delivery of TSIE – twelve months written notice and confirmation 1 month prior to actual delivery requirement;
 - (e) The Company shall provide Transport Scotland with four months written notice and confirmation 14 days prior to any Data Service works being undertaken by the Company;
 - (f) Service diversion documents – six months prior to any diversion taking place;
 - (g) notification to Transport Scotland of any New Works affecting the existing TSE and Traffic Scotland Service – six months;
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- (h) Transport Scotland's attendance to witness work – 21 days;
 - (i) notice to uplift TSIE from the Nominated TSIE Store – seven days; and
 - (j) configuration of an item of TSIE for the IP communications network – three months from notification regarding configuration requirements.
- 3.1.5 The Company shall not undertake any testing in accordance with Section 10 on the Traffic Scotland operational installation until the necessary modifications and configuration input have been undertaken and released by Transport Scotland. This release will not occur until a date not less than four months prior to the additional TSE being required as part of the TSS.
- 3.1.6 Transport Scotland will plan, undertake and release the configuration works input to match the Construction Programme. The Company shall be responsible for any additional modification, configuration and data input effort by Transport Scotland as a result of changes to the Construction Programme.
- 3.1.7 The Company shall give not less than three months written notice of the proposed date of each TSE installation. This notice shall be reconfirmed at two months and at 21 days prior to installation and again at the time of installation.
- 3.1.8 The Company shall at any time allow access by Transport Scotlands TSOIS contractor to undertake a maintainability audit of the TSE implementation. The Company shall take cognisance of the output of such a maintainability audit and make reasonable adjustments to their implementation so as to facilitate Transport Scotlands handover of the scheme into maintenance and operation.
- 3.2 Transport Scotland Issued Equipment (TSIE)**
- 3.2.1 Transport Scotland procures various items of TSE through term and call-off contracts with different manufacturers and suppliers. Transport Scotland will issue to the Company TSE as detailed in APPENDIX A of this Part 3 required to complete the New Works, for installation, testing and commissioning by the Company. This TSE is referred to as TSIE.
- 3.2.2 APPENDIX A of this Part 3 identifies those large items of TSIE that shall be dispatched direct to the "**Company's Traffic Scotland Equipment Assembly Point**" from Transport Scotland's supplier. All other TSIE shall be uplifted and transported by the Company from Transport Scotland's Nominated TSIE Store to Site or the Company's TSE Assembly Point.
- 3.2.3 Transport Scotland's Nominated TSIE Store is located within 150 kilometres of the Site.
- 3.2.4 Where the Company disassembles TSIE to ease transportation to Site the Company shall be responsible for reassembly and testing to ensure that the equipment is operational and has not been damaged during disassembly, transportation, reassembly or installation. Any damage incurred shall be treated in the same way as Company's damage to TSE and shall be rectified at the Company's expense.
- 3.2.5 The Company shall develop and maintain with relevant assistance from Transport Scotland an order and control process and associated records to manage the planning, ordering, dispatch and installation of TSIE such that the status of each and every item of TSIE can be readily determined by both the Company and Transport Scotland. The TSIE order and control process and associated records shall be in an electronic format and identify for each item of TSIE the following:
- (a) Transport Scotland's TSE equipment number of the TSIE;
 - (b) serial number of the TSIE;
 - (c) date ordered;

- (d) earliest date for delivery based on the lead in time detailed in Section 3.1.4;
 - (e) date uplifted by the Company;
 - (f) Nominated TSIE Store equipment release note reference number;
 - (g) date delivered to the Company by the supplier, the supplier's name and goods delivered reference number, for TSIE dispatched direct from Transport Scotland's supplier;
 - (h) date the TSIE was installed on Site;
 - (i) Site Acceptance Test ("**SAT**") dates for each TSIE and successful Pre-commissioning SAT certificate reference number; and
 - (j) successful Commissioning SAT certificate reference number.
- 3.2.6 The TSIE process order and control form and associated records shall be version controlled and backed up by the Company.
- 3.2.7 Where activity is taking place that requires the TSIE order and control form to be modified the Company shall issue the modified order and control form to Transport Scotland on a weekly basis or as instructed by Transport Scotland.
- 3.2.8 The Company shall ensure that the request for delivery of TSIE matches the Construction Programme. The Company shall comply with the following constraints:
- (a) TSIE supplied directly to the Company shall be subject to a minimum delivery order so that efficient use of the supplier's transport is made. The minimum delivery order shall be 75 percent of the capacity of Transport Scotland's TSIE delivery vehicle. The Company shall be responsible for the additional transport costs associated with inefficient supplier transport use;
 - (b) the Nominated TSIE Store operates between 08:30 hours and 16:30 hours Monday to Friday excluding statutory holidays. The Company shall provide written notice, in compliance with the lead in times detailed in Section 3.1.4, of the Company's intention to uplift TSIE. The written notice shall include a list of TSIE to be uplifted;
 - (c) TSIE equipment waiting to be installed within a cabinet shall be stored by the Company in an environment that is equivalent to that of its final location; and
 - (d) the Company shall advise Transport Scotland of the location and description of the store that the Company shall use, at least 28 days prior to the TSIE being uplifted by the Company from the Nominated TSIE Store. The Company shall also store the equipment supplied directly to the Company in a safe, secure and heated environment to avoid potential damage prior to installation by the Company.
- 3.2.9 The Company shall appoint a Traffic Scotland Coordinating Representative ("TSCR") whose duties shall be:
- (a) to liaise with Transport Scotland on all matters relating to TSIE;
 - (b) to ensure continuity of the Traffic Scotland service for the duration of the New Works; and
 - (c) to coordinate with Transport Scotland on all matters relating to the Traffic Scotland service, specifically in relation to down-time of the service whether planned or unplanned.
- 3.2.10 Transport Scotland shall not accept any request from the Company for the release of TSIE unless it is included with a delivery programme that has been agreed with Transport Scotland.
- 3.2.11 Written notification shall be provided to Transport Scotland, in compliance with the lead-in times detailed in Section 3.1.4 by the Company's TSCR, of the planned requirement to
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release TSIE from the Nominated TSIE Store. The request for TSIE shall be on a just-in-time basis and take cognisance of minimum order requirements to avoid inefficiency of transportation. The Company shall take account of the lead-in time for the delivery of TSIE within the Construction Programme.

- 3.2.12 Faulty or non-operational TSIE, identified during testing in accordance with Section 10, shall be replaced or repaired within 14 days of notification to Transport Scotland. Subject to the nature of the fault Transport Scotland may arrange repair of the equipment at the Company's TSE Assembly Point, and the Company shall facilitate access for Transport Scotland's contractor to undertake repairs to rectify such faulty or non-operational TSIE. Faulty or non-operational TSIE not being repaired at the Company's TSE Assembly Point shall be returned to Transport Scotland's Nominated TSIE Stores or shall be uplifted by the provider of the TSIE. Replacement / repaired TSIE shall be subject to testing in accordance with Section 10.

3.3 Existing Traffic Scotland Equipment

- 3.3.1 The Company shall ensure that all the existing TSE affected by the New Works remains operational at all times until such time that the existing TSE requires to be removed to facilitate the Permanent New Works. The Company shall take whatever measures are required to protect, divert, reroute or relocate TSE as detailed in Section 3.4 to maintain its operational status unless Transport Scotland has previously agreed in writing that the TSE downtime can occur. The Company shall, at the request of Transport Scotland, provide TSS compliant equipment to provide equivalent functionality of the existing TSE while the downtime occurs.
- 3.3.2 The Company shall undertake investigations as necessary to confirm the condition of the existing Active Equipment and Passive Network within the Site or connected to the Site that is required to complete the New Works. The Company shall ascertain as part of these investigations the location and quantity of all existing TSE and associated communications and power networks installed within the Site. The Company shall use all information gained from these investigations in the design of the New Works.
- 3.3.3 With regard to damage to the existing TSE by the Company, the Company shall take cognisance of and provide all assistance necessary to allow Transport Scotland's providers to fulfil their obligations in relation to Transport Scotland's immediate step-in rights to make repairs to TSE and any costs so incurred by Transport Scotland shall be chargeable to the Company. Any interruption or delay caused to the Company as a result of the application of Transport Scotland's step-in rights to make repairs shall lie solely with the Company. The Company shall provide such assistance and resources to Transport Scotland to facilitate repairs being undertaken.
- 3.3.4 Transport Scotland shall not apply these step-in rights if the Company provides immediate evidence that repairs to damaged TSE shall be undertaken by the Company within the following timescales:
- (a) to attend at the point of damage within one hour;
 - (b) commence to make repair within thirty minutes of attending the point of damage; and
 - (c) to make a cable serviceable within six hours of attending the point of damage.
- 3.3.5 The Company shall record their attendance and repair times for each and every occurrence of cable damage and shall submit to Transport Scotland such time records within twenty four hours of the damage occurring. If the repair to TSE is of a temporary nature the permanent repair shall become an obligation on the Company. At the time of a temporary repair the Company shall consult and comply with the requirements of Transport Scotland regarding the allowable time to effect a permanent repair. If there are no constraints the permanent repair shall be undertaken within twenty eight days.

- 3.3.6 The Company shall maintain a written record, including marked up drawings which detail all damage to TSE. Such records shall include where, when and what was damaged and detail the temporary and/or permanent repairs which were undertaken. In addition to maintaining such records in accordance with the Specification, the Company shall submit records to Transport Scotland within 24 hours of completing the permanent repair.
- 3.3.7 The Company shall confirm in writing to Transport Scotland in accordance with the Review Procedure those elements of the existing TSE which are affected by the New Works. The Company shall provide a schedule of the location details and type of existing TSE and the complete course of action that shall be undertaken by the Company to protect, divert, reroute, relocate, provide equivalent functionality equipment, to decommission, reuse, relocate, uplift to store or to dispose of the TSE. The schedule shall be accompanied by a programme and method statements detailing how the Company shall ensure that the TSS shall remain operational during the New Works and how the TSE shall be dealt with. The schedule, programme and method statement shall be submitted to Transport Scotland to provide at least three months advance notification to Transport Scotland of any New Works affecting the existing TSE and TSS. Any infrastructure associated with existing TSE that is being decommissioned by the Company shall be removed to minimum of 300mm below ground level.
- 3.3.8 TSE identified for uplift to Transport Scotland's Nominated TSIE Store shall be arranged and carried out by the Company.
- 3.3.9 Cabling made redundant by the New Works and moved from its original position in the ground shall be removed from Site and disposed of by the Company. Other cabling made redundant and not disturbed can remain in situ provided it does not form a hazard to maintainers, operators or Users. All existing cables made redundant and that remain in situ shall be recorded on as-built drawings and labelled using cable markers in accordance with Clause 1507 (Schedule 2: Part 4) of the Specification.
- 3.3.10 The TSE designated for disposal shall be disposed of in accordance with the EC Waste of Electrical and Electronic Equipment (WEEE) Regulations and the Company's Environmental Management Plan.
- 3.3.11 The Company shall advise Transport Scotland of all existing TSE to be made redundant as a result of the New Works. The Company shall consult and comply with the requirements of Transport Scotland in relation to those items of TSE to be removed from the Site and taken to the TSIE Nominated Store.
- 3.4 Diversion, Re-routing or Relocation of Existing Traffic Scotland Equipment**
- 3.4.1 The Design shall take cognisance of the importance of both existing and new TSE located within the scheme to the wider TSS, and ensure all TSE is operational for the duration of the works.
- 3.4.2 The Company shall divert, re-route or relocate existing TSE to prevent disruption to the TSS or damage to TSE to comply with the requirements of this Part 3 and Clauses 1521 and 1528 of Schedule 2: Part 4.
- 3.4.3 The Company shall ensure that the connectivity with the existing TSE and associated communications and power networks outwith the Site are not affected by the New Works and remain operational at all times.
- 3.4.4 Any temporary Passive Network shall include, but shall not be limited to, an armoured multi-pair copper communications cable to BT specification CW1128/1198 with 0.9mm conductors, and armoured optical fibre cable to WOEM 4421 and armoured power cables in accordance with Clause 1506 of Appendix 0/5, where required.

- 3.4.5 The Company shall only interrupt the existing cabling network immediately prior to works commencing in any part of the Site.
- 3.4.6 The Company shall provide and maintain a temporary power supply network for the TSE that is affected by the New Works. The Company shall identify the power supply network associated with the existing TSE and determine the location of diverted, re-routed or relocated equipment, the duration of any Temporary Works and the requirements for continuous operation.
- 3.4.7 The Company shall ensure all Temporary Works for cabling are laid within ducting that is buried underground. The number, depth, routing and protection of the duct, and any Temporary Works for cabling shall be agreed with Transport Scotland prior to implementing.
- 3.4.8 The Company shall suitably mark with marker tape or other suitable means the temporary cabling works to prevent accidental damage during the New Works.
- 3.4.9 In the design of diversions and the like, the Company shall consider Transport Scotland's requirement to maintain the TSE at all times and shall provide all necessary infrastructure to enable safe maintenance of the TSE by organisations employed by Transport Scotland.
- 3.4.10 The Company shall ensure the diversion, re-routing or relocation of TSE is tested and commissioned and shall assist Transport Scotland as necessary to ensure the TSE is operational following such works. Temporary Works for TSE shall terminate within the existing TSE located at the extents of the Site or nearest connection point not affected by the New Works.
- 3.4.11 The Company shall ensure all diversion, re-routing or relocation of TSE is functionally tested prior to and after relocation of TSE in accordance with Section 10 and the Specification.
- 3.4.12 The Company shall ensure all non-operational TSE is covered over where practicable with purpose-made covers marked with 'not in use' or identified with appropriate signage to advise Users that the TSE is not in use. The Company shall remove such 'not in use' covers and signs when the TSE is available for use by Users.
- 3.4.13 The Company shall provide, in method statements submitted to Transport Scotland in accordance with the Consult and Comply Procedure, for Transport Scotland to witness the Company during any disconnections or reconnection of TSE from or onto the operational TSS. The Company shall provide notice of such disconnections and reconnections in compliance with Section 3.1.4.
- 3.4.14 At Transport Scotland's discretion the requirement for witnessing by Transport Scotland as described in Section 3.4.13, may be waived.

3.5 Connection of New and Existing Traffic Scotland Equipment

- 3.5.1 Each new item of TSE which connects to the existing TSE shall be subject to testing and commissioning in accordance with Section 10 and the Specification.
- 3.5.2 The Company shall complete the installation and testing of all TSE at the roadside a minimum period of 56 days prior to requesting the Acceptance Certificate. Within this 56 day period the first 42 days shall be for the Company Transport Scotland to undertake commissioning of TSE. The final 14 day period shall be for the sole use of Transport Scotland to undertake additional testing and fine tuning.

4 Active Equipment

4.1 General

4.1.1 Active Equipment is segregated into the following communications traffic types:

- (d) Voice (from office and roadside emergency telephones);
- (e) Video (from roadside CCTV cameras); and
- (f) Data (for example to/from Multi Purpose Controller ("**MPC**"), VMS, Lane Control Unit ("**LCU**"), JT cameras, CCTV controllers, networked computers, etc.)

4.1.2 The Active Equipment communications traffic shall be connected to the IP network at transmission stations, equipment rooms, Traffic Scotland 600(S) cabinets ("**600(S)**"), Combined Equipment Cabinets ("**CEC**") where environmental control is required, and at remote equipment sites (using Ethernet over the fibre optic cable network and Digital Subscriber Line ("**DSL**") technology over the copper cable network). Active Equipment communications traffic shall be capable of being recovered at transmission stations and at the TSCC.

4.1.3 The Active Equipment includes a communications system of switches/routers, connecting devices and transmission equipment.

4.1.4 The communications system shall comply with the following requirements:

- (a) A core / distribution network, consisting of Ethernet multi-layer switches connected to provide resilience through redundancy using the longitudinal fibre optic network;
- (b) A local access network for connecting roadside TSE to the core / distribution network, consisting of Ethernet switches connected to provide resilience through redundancy using the longitudinal and local fibre optic network;
- (c) Multi-layer switches located in transmission stations shall be connected to other transmission station multi-layer switches and to roadside cabinet switches and DSL equipment;
- (d) Roadside switches shall be connected to local DSL equipment, adjacent roadside switches or to an adjacent transmission station switch. No copper link from a roadside equipment cabinet to its corresponding upstream switch shall be greater than 7 kilometres in length;
- (e) Switches and DSL equipment shall be supplied with all necessary fibre optic interface equipment, and shall require patch leads with Fixed Connectors ("**FC**");
- (f) DSL equipment shall be supplied with all necessary copper interface equipment, and shall require patch leads with RJ45 connectors; and
- (g) Switches and DSL equipment shall require local copper Ethernet connection using Category 5e ("**CAT5e**") cables.

4.1.5 Prior to commencing the IP communications infrastructure design the Company shall request from Transport Scotland confirmation of the IP communication equipment that is available as TSIE and Transport Scotland will confirm that information within 21 days. The Company shall liaise with Transport Scotland and their nominated providers prior to the commencement of any design work to ensure that the IP communications infrastructure design philosophy will yield a design which will interface with the existing Traffic Scotland network.

4.1.6 The Company shall consult and comply with the requirements of Transport Scotland regarding the IP communications infrastructure design. The Company shall submit the IP communications infrastructure design to Transport Scotland in accordance with the Certification Procedure for it to be considered by Transport Scotland and by the relevant TSS provider. The Company shall incorporate IP communications infrastructure

- comments made by Transport Scotland into the IP communications infrastructure design.
- 4.1.7 In finalising the IP communications infrastructure design, the Company shall notify Transport Scotland of the TSIE to be provided and the configuration requirements that the Company is aware of for each item of TSIE for the IP communications infrastructure network. The timescale for notification shall be in accordance with Section 3.1.4.
- 4.1.8 Transport Scotland shall provide all pre-configured IP related Active Equipment required to provide the necessary communication path rules, prior to uplift by the Company from Transport Scotland's Nominated TSIE Store.
- 4.1.9 The Company shall assemble, install, connect, test and commission the Active Equipment complete with internal and, where appropriate, external communications cabling and terminations onto the Passive Network.
- 4.1.10 The Company shall take cognisance of the commissioning requirements for some items of TSE, and the necessity for involvement of Transport Scotlands providers at some stages of the commissioning process. The Company shall liaise with Transport Scotland to ascertain the exact requirements and integrate such involvement into their commissioning programme.
- 4.1.11 To prevent potential damage to environmentally sensitive components, Active Equipment shall not be installed on Site unless it can be connected to an electrical power supply (in accordance with Clause 1508 of the Specification) within eight hours of arrival at the location on Site where the Active Equipment is to be installed.
- 4.1.12 The Company shall undertake testing of Active Equipment in accordance with Section 10 and the Specification.

5 Passive Network (Roadside Infrastructure)

5.1 General

- 5.1.1 Passive Network components to be provided by the Company shall include, but shall not be limited to all infrastructure and supporting infrastructure associated with:
- (a) Gantry superstructures, substructures and infrastructure as detailed in Part 4 to mount and retain Active Equipment for operation, maintenance and alignment;
 - (b) Road restraint systems associated with TSE as detailed in Part 2: Section 1.4;
 - (c) CCTV substructures and infrastructure for CCTV cameras not mounted on a Gantry;
 - (d) Cabinets and foundations;
 - (e) Longitudinal, transverse and local copper and fibre optic communications cables, cable fittings and terminations;
 - (f) Longitudinal, transverse and local cable routing systems between cabinets and equipment including ducting, draw cords, draw chambers, platforms, cable tray and fixings;
 - (g) Vehicle detection inductive loops and associated feeder cable;
 - (h) Incoming power supply and all associated power distribution cabling and infrastructure;
 - (i) Mechanical interface components and brackets to enable the Active Equipment to be fixed, aligned and adjusted during its operational life to the Passive Network;
 - (j) Hard landscaping at, and safe access to, each equipment site or group of equipment sites as detailed in Part 2: section 1.4;

- (k) MS4VMS substructures and infrastructure for MS4VMS not mounted on a Gantry;
- (l) External Aspect Verification ("EAV") substructures and infrastructure for EAV cameras; and
- (m) MAC substructures and infrastructure for MAC.

5.2 Cabinets and Cable Routing

5.2.1 Cabinets

- 5.2.1.1 Other than the specific cabinets provided as TSIE, as detailed in APPENDIX A of this Part 3 all other cabinet types required for the New Works shall be provided by the Company.
- 5.2.1.2 Cabinets and ancillary items required for the ITS works shall be provided in accordance with this Part 3 and Clause 1505, 1508 and 1512 of the Specification.
- 5.2.1.3 The Company shall provide and install all foundations including 610 plinth and skirts and other fixing arrangements for all cabinets and verge mounted TSE in accordance with the NDX1002-00 series of drawings as listed in Appendix 0/4 of the Specification.
- 5.2.1.4 Cabinet types to be issued as TSIE are:
 - (a) Electricity Supplier Termination Pillar ("TP") for the incoming local electricity supplier's cable head and outgoing circuits to TSE;
 - (b) Traffic Equipment Distribution Pillar ("TEDP") for local power supply termination at each TSE site requiring power, local switchgear and outgoing circuits for each item of TSE;
 - (c) Combined Electricity Supplier Termination and Traffic Equipment Distribution Pillar ("TP/TEDP") for termination of the incoming cable from the Electricity Supply Company and distribution to TSE in accordance with the NDX1011 series of drawings as listed in Appendix 0/4 of the Specification;
 - (d) CEC for housing Active Equipment requiring environmental protection, including but not limited to voice gateways and UPS equipment;
- 5.2.1.5 Cabinet types to be supplied by the Company are:
 - (a) 600(S) cabinet for housing Active Equipment;
 - (b) TB13 Cabinets for termination of copper cabling;
 - (c) Fibre optic cable termination pillar (FOTP), a Highways Agency Type 609 cabinet for termination of fibre optic cable.
- 5.2.1.6 The Company shall concentrate TSE at Gantry Sites and install the 600(S) or CEC as required, and the required type or types of power termination pillars in accordance with the typical Gantry Site layout as shown on drawing NDX1002-01 as listed in Appendix 0/4 of the Specification.
- 5.2.1.7 At all remote TSE sites (CCTV, VMS, MAC) the Company shall provide a consistent site layout of TSE and hard landscaped features in accordance with the NDX series drawings. Where a consistent layout cannot be provided, the Company shall consult and comply with the requirements of Transport Scotland.
- 5.2.1.8 Cabinets shall be placed such that doors open freely and there is sufficient space between and around cabinets for safe working. The Company shall design the site layout of the Passive Network to achieve a consistent approach throughout the Site in compliance with this Part 3, the Specification and Part 2.
- 5.2.1.9 To facilitate future upgrades to the TSS by Transport Scotland, all cabinets shall be sized to accommodate HSR.

- 5.2.1.10 Cabinets shall be located so that the maximum cable length to any TSE is 50m maximum except in the circumstances described in Section 5.5.5.6 (d) and (e).
- 5.2.2 **Cable Routing Systems**
- 5.2.2.1 Cable routing systems for TSE shall be installed in a cable management system as follows:
- (a) on Gantries; and
 - (b) at every other location in a duct management system as described in Section 5.2.3.
- 5.2.2.2 Cable routing systems shall comply with the following:
- (a) TSE power, copper and fibre optic cables shall be installed within a duct management system or cable management system to form the cable routing system;
 - (b) The cable routing system, detailed in (a) above, shall be physically separated from other power supply systems with a minimum separation of 500 millimetre throughout where the voltage of other power system is up to 415 volts and where the other power supply systems are greater than 415 volts, the minimum separation from the copper communications cables shall be a minimum of 2 metres. Where local conditions dictate, the longitudinal ducts may be placed closer for a maximum of 50 metres, but this shall be minimised as far as practical, and each occurrence shall only be allowed with the agreement of Transport Scotland.
 - (c) If routes are enclosed, whether utilised or not, they shall be provided with continuous draw cords secured between the chambers;
 - (d) Cable routing systems shall be installed so as to run parallel to the relevant adjacent road;
 - (e) Transverse cable routing shall be perpendicular to the relevant road; and
 - (f) Cable routing systems shall be continuous in both verges of the carriageway between the duct interface locations as agreed with Transport Scotland.
- 5.2.2.3 The Company shall ensure the continuity of the cable routing systems at their interface with Structures are not compromised during the construction of roads and Structures, for example Gantry foundations. The Company shall ensure:
- (a) Correct alignment of the cable routing systems within the Structure foundation;
 - (b) Installation of required draw cords within the cable routing systems within the Structure and its associated chambers;
 - (c) Provision of a smooth cable routing systems with an appropriate bending radius to avoid damage to cables within the Structure foundation;
 - (d) Continuity of cable routing systems through Structure components such as abutments, expansion joints and interfaces; and
 - (e) Provision of leak proof joints such that spoil (e.g. from resin, grouting, mortar, silt and the like) shall not migrate into the duct to create any blockage (permanent or otherwise) of the duct route.
- 5.2.2.4 Cable restraint and support systems shall be provided for above ground cable management systems in accordance with Clause 1507. Where cable management systems span mechanical or expansion joints the cable management system and cables shall be designed and installed to prevent additional strain to the cable restraint mechanism or damage to the integrity of the cable.
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5.2.3 Ducting and Chambers for Roads

- 5.2.3.1 The Company shall provide underground ducting and chambers for TSE cable networks in accordance with the New Works Requirements, series of NDX1063 series of drawings, as listed in Part 4: Appendix 0/4, and Clause 1530 of the Specification to provide an integrated duct network.
- 5.2.3.2 The Company shall provide, install and test ducts, duct network and duct chambers for TSE in accordance with Clauses 1507, 1530, 1531, 1532 and 1533 of Schedule 2: Part 4 and additionally the requirements of this Part 3.
- 5.2.3.3 Type A, B, C and D chambers are specified in Clause 1532 of the Specification.
- 5.2.3.4 The Company shall provide all necessary ducts, chambers and draw cords to complete the works which link TSE on all relevant roads and in accordance with the following minimum criteria;
- (a) Four, 100 millimetre internal diameter, longitudinal communication ducts within both verges throughout the site, and slip road verges, terminating at the tie-in locations detailed in Section 5.2.3.8;
 - (b) Four, 100 millimetre internal diameter, transverse communication ducts across Slip Roads;
 - (c) Two, 150 millimetre internal diameter power ducts to distribute power supply cables between the TSE and between TSE and the incoming power supply point;
 - (d) Two 100 millimetre, internal diameter, transverse communication ducts, and one 150 millimetre, internal diameter, transverse power supply ducts, shall be provided as required where ERT and other TSE network connections are required to cross the carriageway, forming a connected network of transverse ducts throughout the Site;
 - (e) Ducts shall not be installed where existing trees, shrubs and the like may have an impact on the future integrity of the ducting;
 - (f) Type A chambers in both verges at each transverse duct location, at each Gantry Site and each TSE site;
 - (g) Type C chambers at each 600(S) or CEC;
 - (h) Additional intermediate Type A chambers equidistant between each transverse duct in both verges at a maximum distance of 250 metres between transverse ducts;
 - (i) Additional Type A chambers at locations where any changes of direction, road crossings or level changes of the duct installation occur including entry to and egress from any Structures;
 - (j) Type D loop detector chambers at each vehicle detection equipment site where sub-surface loops are installed and jointed to loop feeder cables;
 - (k) Additional chambers and local 100 millimetre diameter ducts at each TSE site to interconnect all TSE chambers and ducts to provide a cable route between all TSE at each site;
 - (l) Chambers shall not be installed on the slope of embankments unless an appropriate level area of hard landscaping is provided for cable installation and future maintenance; and
 - (m) Two 100 millimetre internal diameter ducts and chambers shall be provided between each EAV cameras and their respective cabinet.

- 5.2.3.5 Two of the ducts provided under Section 5.2.3.4 (a), (b) and (e) shall be used by the Company whilst the other two ducts shall be kept available for use by Transport Scotland as a continuous and empty route throughout the Site in accordance with the Specification.
- 5.2.3.6 The Company shall provide marker tape for the cable routing systems in accordance with Clause 1511 of the Specification.
- 5.2.3.7 Where existing ducting is to be used the Company shall assess the suitability, availability and serviceability of such ducting to be included within the New Works. The Company shall undertake suitable testing to demonstrate to Transport Scotland that the duct is acceptable for reuse.
- 5.2.3.8 The Company shall consult and comply with Transport Scotland to ascertain suitable interface locations for the ducting and chambers with the existing network at the extents of the scheme.
- 5.2.3.9 The ducting and chambers shall provide an integrated network of routes that efficiently inter-connect Traffic Scotland equipment and required services, which shall accommodate for the future expansion by Traffic Scotland.
- 5.2.3.10 In exceptional circumstances where local constraints would prevent the installation of ducts within the verge, the Company may propose the use of either verge located cable troughs of equivalent volumetric capacity to the ducted network, in accordance with Clause 1507 of the Specification, or the installation of ducts beneath the carriageway with access chambers provided in the verge. This shall be approved by Transport Scotland in accordance with the Certification Procedure.
- 5.2.4 Transmission Station**
- 5.2.4.1 Transport Scotland has a Transmission Station building situated within the Baillieston interchange which shall be integrated into the Design. The Company shall allow Transport Scotland access to the Transmission Station during the New Works for the purpose of Transport Scotland checking, modifying and testing TSE.
- 5.2.4.2 The Transmission Station is a complete building with power, power termination, cable termination and communications equipment inclusive of core switch equipment and connection to the existing communications network.
- 5.2.5 Cable Network and Connections**
- 5.2.5.1 The cable network and connections shall form a communications system that collects, distributes and controls the movement of all data, voice and video between the TSCC and each item of TSE within and outwith the Site. The cable network and connections form part of the Passive Network while the switches and routing devices are part of the Active Network. The communications system radiates from transmission stations generally located at strategic junctions on the road network, between Nodes and locally from Gantry Sites.
- 5.2.5.2 The Company shall comply with the requirements in this Part 3 and Clauses 1506 and 1507 of the Specification with regard to the provision, use and installation of fibre optic, multi-pair communications and loop feeder cables within the New Works Site and communications circuits connected through the Site.
- 5.2.5.3 The Company shall comply with the requirements in this Part 3 and Clauses 1507, 1513 and 1514 of the Specification with regard to the termination, jointing and connection of multi-pair communications and loop feeder cables within and connected to the Site.

- 5.2.5.4 The Company shall comply with the requirements in this Part 3 and Clauses 1507, and 1515 of the Specification with regard to the termination, jointing and connection of fibre optic cables within the Site and communications circuits connected through the Site.
- 5.2.5.5 The Company shall comply with the requirements in this Part 3 and Clauses 1507, and 1516 of Schedule 2: Part 4 with regard to the termination, jointing and connection of power cables within the Site and communications circuits connected through the Site.
- 5.2.5.6 The cable types to be supplied, installed, tested and commissioned by the Company for use in cable routing systems in this Contract shall be:
- (a) armoured multi-pair copper communications cable to BT Specification CW1128/1198 with 0.9mm conductors;
 - (b) armoured 24 fibre single mode to Transport Wales Specification WOEM 4421;
 - (c) armoured feeder cable for inductive loop detectors to Highways Agency Technical Requirement Specification TR 2031;
 - (d) inductive loop detector cable to specification Highways Agency Technical Requirement Specification TR 2029;
 - (e) armoured power cable, three core XLPE/SWA/PVC to BS 5467; and
 - (f) all specialist TSE cable types as necessary to satisfy these New Works Requirements in relation to the installation of TSE.
- 5.2.5.7 Not Used
- 5.2.5.8 The Company shall consult and comply with the requirements of Transport Scotland to connect / disconnect cables, transmission paths or lasers at or across the extents of the Site.
- 5.2.5.9 Communications cables shall not be installed in longitudinal or transverse power ducts.
- 5.2.5.10 The Company shall terminate the copper and interconnect all fibre communication cables to the existing cable network where appropriate at the interface locations to be agreed with Transport Scotland.
- 5.2.5.11 The Company shall provide a dual cable network comprising of up to 48 cores of fibre cable and a thirty pair multi-pair cable providing an equivalent function as follows:
- (a) in the Westbound verge of the M8 section of the scheme to the East of the M8/M73 intersection;
 - (b) in the Eastbound verge of the M8 section of the scheme to the West of the M8/M73 intersection;
 - (c) In the Southbound verge of the M73 section of the scheme to the North of the M8/M73 intersection;
 - (d) in both verges of the M73 section of the scheme to the South of the M8/M73 intersection; and
 - (e) in both verges of the M74 section of the scheme.
- 5.2.5.12 At joint locations where the fibre optic cable does not require termination, the joint shall be a fusion splice type.
- 5.2.5.13 The Company shall provide 24 fibre optic spur cables between an FOTP and a remote location where a fibre connection is required.
- 5.2.5.14 The Company shall, as a minimum, install in each verge of the dual cable network as detailed in 5.2.5.11, one multi-pair cable, with a minimum of 30 pairs, through the duct network to form a longitudinal copper cable network to support local connection to TSE. The multi-pair cables shall be terminated at a maximum interval of 1000 metres in TB13s located in the verge coincident with other TSE.

- 5.2.5.15 The Company shall, as a minimum, install in each verge of the dual cable network as detailed in 5.2.5.11, fibre optic cables supplying 48 fibre cores, through the duct network to form a longitudinal optical fibre network to support local connection to TSE in each verge. The fibre optic cable shall be terminated at a maximum interval of 1500 metres in FOTPs located in the verge coincident with other TSE.
- 5.2.5.16 The Company shall provide multi-pair copper (and any other specialist required cables) cabling from the 600(S) to local distribution and connection points on a Gantry and from the 600(S) to ERTs. The Company shall provide multi-core optical fibre cabling from the FOTP to remote cabinet sites.
- 5.2.5.17 The Company shall provide multi-pair copper (and any other specialist required cables) cabling between the local distribution and connection points on all Gantries or remote cabinet sites to individual items of TSE.
- 5.2.5.18 All fibre optic and copper terminations shall be above ground and within termination cabinets. Underground joints shall not be permitted except within loop chambers for connection of loop cables to loop feeder.
- 5.2.5.19 The Company shall liaise with Transport Scotland to obtain up to date multi-pair copper and fibre optic cable allocations for both used and unused pairs and fibres. A minimum of eight fibres and a minimum of eight copper pairs shall remain unused and as a continuous path, from end to end. All spare fibres shall be spliced to form a continuous circuit between transmission stations.

5.3 Power Supply Network and Connections

- 5.3.1 The Company will provide an independent 230 volts single phase electrical supply from the Electricity Supply Company (Scottish Power Network Connections) to all new sites as detailed within the Design. The power supply provided will be located on the trunk road network boundary fence line, to be terminated in a TP that will not exceed a distance of 100 metres from the TP to the TSE Site. The Company shall specify and order the TP from Transport Scotland, and install it in the final location on the trunk road network boundary fence line in advance of the Electricity Supply Company installing the power cable.
- 5.3.2 The Company shall provide the power distribution network from the TP to the TSE site.
- 5.3.3 The Company shall monitor the Electricity Supply Company progress and work with and support them in the delivery of all required power supplies from the Commencement Date.
- 5.3.4 The Company shall where necessary, provide, purchase and upgrade existing power supplies required for the completion of the New Works. Any diversions of existing power supplies required shall be the responsibility of the Company.
- 5.3.5 Not Used.
- 5.3.6 With specific approval from Transport Scotland in accordance with the Certification Procedure and based on a justification report by the Company the longitudinal distribution of private power supply network may be increased to a maximum of 250 metres from the Electricity Supply Company's cable head to the furthest item of connected TSE.
- 5.3.7 Provision of power supplies and associated cabinetry shall be in accordance with NDS 9551 and NDS 9565.
- 5.3.8 Transport Scotland shall supply the power supply cabinets, complete with the associated internal fittings and switchgear, as detailed in APPENDIX A of this Part 3. The Company shall submit to Transport Scotland in accordance with the Certification Procedure the required ratings of the internal switchgear and protective devices necessary to ensure

- the New Works are compliant with BS 7671: Requirements for Electrical Installations. For each power supply the Company shall prepare circuit designs and calculations and complete an Order Package Configuration Sheet, in accordance with NDS 9565. This shall be submitted to Transport Scotland at least three months prior to the Company's request to release any TSIE in accordance with Section 3.2.8;
- 5.3.9 All TSE shall be earthed and bonded in accordance with Clause 1517 of the Specification.
- 5.3.10 The earth fault disconnection time of all circuits supplying TSE shall be a maximum of 0.4 seconds.
- 5.3.11 The Company shall ensure the incoming Electricity Supply Company's cable is terminated in a TP or TP/TEDP for isolation and distribution of outgoing circuits to TSE as specified in Clause 1508 of the Specification and the NDX 1011 series of drawings, as listed in Appendix 0/4 of the Specification. The TP shall be located so that the Electricity Supply Company staff can access the equipment safely without requiring access to the trunk road network or supervision from the trunk road maintenance organisation.
- 5.3.12 The Company shall provide the design, cabling, testing and completion certificates associated with the new, upgraded or amended power supply network and its distribution to the TSE in accordance with BS 7671: Requirements for Electrical Installations.
- 5.3.13 Power cables shall not be installed in the longitudinal or transverse communication ducts.
- 5.3.14 The Company may utilise the existing power supply network to TSE within and adjacent to the Site where compliance with BS 7671 and the Electricity at Work Regulation 1989 can be achieved. The Company shall upgrade the existing power supply network and associated supply / distribution cabinets as required to make such existing power supply networks equivalent to the standard detailed in this Section 5.
- 5.3.15 Not Used
- 5.3.16 The Company shall ensure that the power distribution network can accommodate the power consumption requirements for the TSIE as detailed in Table 3 and the requirements of Sections 5.3.18, 5.3.19 and gantry lighting specified in Schedule – Part 2. An additional allowance of twenty five per cent of the total supply to each TSE site shall be provided for future upgrades to the TSS.

Table 3 TSE Power Loading (Watts)

Equipment	Design Value (Watts)
CCTV Camera (Heater on and PTZ running)	460W
TMU	5W
MPC4	70W
JT Camera	30W
Ethernet Switch	40W
DSL Modem	20W
CEC 2	2100W
600(S) cabinet (with test socket allowance)	880W
Voice Gateway CISCO Type VG224	60W
LCU/MAC	350W
Roadside Controller ("RSC")	25W
MS4VMS Gantry Mounted (Full display with all Heaters/Fans On)	4000W
6x23 MS4VMS (Full display with all Heaters/Fans On)	6000W
UPS (for network equipment)	800W

- 5.3.17 The Company shall provide all necessary alteration and / or modification of existing electrical circuits to complete the New Works.
- 5.3.18 The Company shall provide two spare 6 amp circuits available at TEDP cabinets, CEC, and 600(S) cabinets.
- 5.3.19 The Company shall provide a single socket outlet for connection of portable apparatus to facilitate testing and maintenance within each CEC and 600(S) cabinet.
- 5.3.20 In the event that any new, upgraded or amended circuit fails an inspection or test, the Company shall carry out works necessary to achieve the requirements of BS 7671: Requirements for Electrical Installations. The Company shall operate under a 'Permit to Work' system when implementing any such changes to circuits.
- 5.3.21 The Company shall install the TSIE UPS equipment at all VG sites and all communications equipment cabinets supporting the VG.
- 5.3.22 The Company shall ensure provision of the power supply before installation of any Active Equipment in accordance with Clause 1508 of the Specification. The Company shall ensure this supply will continuously power the Active Equipment from the time of installation. The Company shall ensure that power supplies are made permanent before commencement of any site based testing or commissioning as described in Section 10, unless otherwise agreed in writing with Transport Scotland. The Company shall ensure that any temporary power supplies provided are suitable for use with sensitive electronic equipment and provide continuous operation of the Traffic Scotland Service at all times. The Company shall monitor and record the performance of the power supply, immediately rectifying any failures and shall record the Company's attendance and repair times for each and every occurrence of power failure, submitting to Transport Scotland such time records of power failure within twenty four hours of the failure occurring.
- 5.3.23 Not Used.

5.4 Hard Landscaping

- 5.4.1 The Company shall provide hard landscaping for TSE including vehicle pedestrian and maintenance access as detailed in Schedule 2: Part 2 and Clause 1539 of the Specification so that Transport Scotland does not require to employ traffic management to be able to gain access to maintain TSE.

5.5 Location and Installation of Traffic Scotland Equipment

5.5.1 Emergency Roadside Telephone Facilities

- 5.5.1.1 Transport Scotland shall supply the ERT equipment detailed in APPENDIX A of this Part 3 for installation by the Company.
- 5.5.1.2 The Company shall provide ERTs in accordance with the requirements of TA73 of the DMRB and with the following criteria:
- (a) at TSE Sites;
 - (b) at intervals of no more than 1.5 kilometres in the verges of the relevant roads and shall be located opposite each other;
 - (c) at locations to prevent a person from requiring to cross a Slip Road or carriageway of the relevant roads to reach the nearest ERT;

- (d) such that the location and orientation provides safe and clear access to the ERT and allows users to view it from at least 300 metres upstream and downstream of the site;
 - (e) ERTs shall not be installed on a road where there is either discontinuous or no hard shoulder. Where this occurs on one carriageway the normal requirement to install an ERT opposite shall not be required;
- 5.5.1.3 ERT sites shall be provided in accordance with Clause 1510 of the Specification and typical layout details and configuration details shown on the NDX1049-02 series of drawings, as listed in Appendix 0/4 of the Specification.
- 5.5.1.4 For each ERT location the Company shall:
- (a) provide the foundations for the ERT site;
 - (b) install the ERT supplied by Transport Scotland;
 - (c) in compliance with multi-pair copper allocation detail obtained from Transport Scotland configure each ERT and TSE site for two-wire operation;
 - (d) provide, install and terminate cabling at each ERT site; and
 - (e) test and commission the installation to prove the complete ERT installation in accordance with Section 10.
- 5.5.1.5 The Company shall install Voice Gateways ("VG") as required at the locations detailed within APPENDIX C of this Part 3.
- 5.5.1.6 Each VG shall be connected using CW1128/1198 multi-pair cable to a maximum of ten upstream and ten downstream ERTs at a maximum cable distance of 4 kilometres between the VG and the furthest ERT.
- 5.5.1.7 All ERTs and VGs shall be terminated by the Company through line protection units by means of a multi-core telecoms cable to CW1128/1198.
- 5.5.1.8 The Company shall establish a dedicated continuous cable link between each ERT and the Voice Gateway termination point within the CEC. The link between the ERT and the nearest TSE cabinet shall be via two pair cable and between TSE cabinets using the longitudinal multi-pair cables.
- 5.5.2 Closed Circuit Television Facilities**
- 5.5.2.1 Transport Scotland shall supply the CCTV equipment detailed in APPENDIX A of this Part 3 as TSIE for installation by the Company.
- 5.5.2.2 The Company shall install CCTV facilities and equipment in accordance with this Part 3 and Clause 1534 of the Specification to provide 100% coverage of the Trunk Roads to the TSCC from cameras mounted a maximum of 15m above carriageway level. The required level of coverage shall be achieved through the use of Pan, Tilt and Zoom ("PTZ") functionality.
- 5.5.2.3 CCTV facilities shall be installed:
- (a) at Gantry Sites; and
 - (b) at standalone (non-Gantry Site) locations.
- 5.5.2.4 All CCTV equipment shall be of **PTZ** configuration.
- 5.5.2.5 CCTV facilities shall be mounted on Gantries. The Company shall undertake a visibility survey of the CCTV coverage provided by the facilities and if the requirements of Section 5.5.2.2 are not achieved the Company shall provide additional CCTV cameras to achieve the requirements. All CCTV cameras shall be provided in accordance with the following:

- (a) Where Gantry mounted, CCTV cameras shall be at a minimum height of 10 metres above the carriageway;
 - (b) At standalone sites, CCTV cameras shall be mounted on the top of 15 metre masts; and
 - (c) spaced at intervals not exceeding 1000 metres.
- 5.5.2.6 The Company shall submit to Transport Scotland in accordance with the Certification Procedure evidence to confirm that the requirements of Section 5.5.2.2 can be achieved and also the extent of the coverage from each camera prior to undertaking any CCTV works.
- 5.5.2.7 The Company shall submit to Transport Scotland not less than three months from the date of requirement of CCTV equipment the length of prefabricated composite interconnecting cables required to allow connection between the CCTV and the TSE cabinet.
- 5.5.2.8 For each CCTV camera and PTZ unit mounted on a Gantry superstructure, the Company shall:
- (a) provide the camera mast on the Gantry such that the mast can be lowered and raised by an electrical means such that the maintenance operative is not required to transport more than a combined load of 5kg via the gantry access ladder.
 - (b) the mast shall additionally be designed to be located over the hard shoulder, unless agreed in writing with Transport Scotland, such that when lowered, maintenance can be undertaken without the requirement for traffic management and without any risk of any tools or parts falling from the Gantry;
 - (c) install CCTV cameras and PTZ units on each mast;
 - (d) install the prefabricated composite interconnecting cables between the CCTV camera housing on the Gantry and the base station unit within the TSE cabinet; and
 - (e) test and commission the installation to prove the complete CCTV installation in accordance with Section 10.
- 5.5.2.9 For CCTV cameras located at standalone sites, the Company shall:
- (a) provide the mast foundation, hard standing and TSE cabinets and associated interconnecting ducts;
 - (b) provide safe access and defined working area to allow attendance at the site by operatives;
 - (c) install the camera mast on the foundation;
 - (d) provide a 6A capable 110V electrical outlet within 10m of the base of the CCTV mast to facilitate the maintenance operatives electrical means of lowering and raising the CCTV camera;
 - (e) install the camera and PTZ unit on the top of the mast;
 - (f) provide the power, communications and fibre cables from the standalone CCTV site to the power distribution and longitudinal communications cables;
 - (g) install the prefabricated composite interconnecting cables between the CCTV camera housing on the mast and the base station unit within the TSE cabinet; and
 - (h) test and commission the installation to prove the complete CCTV installation in accordance with Section 10.

5.5.3 Not used

5.5.4 Data Service Vehicle Detection Facilities

- 5.5.4.1 Transport Scotland shall supply the Data Service equipment detailed in APPENDIX A of this Part 3, for installation by the Company.
- 5.5.4.2 The Company shall install the Data Service equipment at the locations detailed in APPENDIX C of this Part 3. At Gantry Sites the Company shall ensure that the loop cable from the TSE cabinet along the verge to the Type D chamber for the vehicle inductive loops is no greater than 200 metres.
- 5.5.4.3 The Company shall allow witnessing of works associated with the Data Service sites by Transport Scotland in accordance with the timescales set out in section 3.1.4 to comply with this requirement.
- 5.5.4.4 The Company shall note that the Traffic Monitoring Units (“**TMU**”) provided as TSIE have the capability to provide the functionality for Data Service and Vehicle Detection for Incident Management (“**VDIM**”) facilities. Where a Data Service TMU is required it shall be fitted within a TSE cabinet.
- 5.5.4.5 The Company shall note that the Weigh In Motion (“**WIM**”) units provided as TSIE have the capability to provide the functionality for Data Service WIM facilities only. Where a WIM unit is required it shall be fitted within a TSE cabinet.
- 5.5.4.6 The Company shall undertake the Data Service design element following completion of the VDIM facilities detailed in Section 5.5.5, such that the Company may take the opportunity to use a single set of vehicle detection loops to provide both the Data Service and VDIM requirements are satisfied.
- 5.5.4.7 The Company shall provide Data Service equipment in accordance with the requirements of this Part 3 and Clauses 1537, 1536, and 1549 of the Specification.
- 5.5.4.8 For each Data Service site the Company shall:
- (a) provide the vehicle inductive loops in accordance with MCH1540;
 - (b) install and terminate loop cables directly into the TSE cabinet;
 - (c) install the TMU and associated interconnection cables in the TSE cabinet; and
 - (d) test and commission the installation to prove the complete Data Service installation in accordance with Section 10.
- 5.5.4.9 The Company shall take cognisance of existing WIM installations prior to commencement of works. Due to the equipment used at these sites, the Company shall coordinate decommissioning, removal, re-instatement and commissioning of the equipment housed within the TSE cabinet with Transport Scotland.
- 5.5.4.10 The Company shall provide, or retain existing WIM sites at the locations detailed in APPENDIX C of this Part 3. The Company shall liaise with Transport Scotland prior to undertaking any works at WIM sites due to the specialist nature of the works required.
- 5.5.4.11 The Company shall consult and comply with Transport Scotland in relation to any works to be undertaken in relation to existing or new WIM installations.

5.5.5 Vehicle Detection for Incident Management Facilities

- 5.5.5.1 Transport Scotland shall supply the VDIM equipment detailed in APPENDIX A of this Part 3, for installation by the Company.
- 5.5.5.2 The Company shall install TMUs and VDIM equipment in accordance with the requirements of this Part 3 and Clause 1536 of the Specification.

- 5.5.5.3 The VDIM equipment is to be used to provide the Traffic Scotland system with volume, speed and occupancy data which is then used by the Traffic Scotland system to detect traffic parameters and variance to establish incidents occurring on the trunk road network.
- 5.5.5.4 The VDIM equipment comprises of loop detectors. These are used by the TMUs to detect vehicles and vehicle events, process the data, and transmit it to the TSCC via an MPC and the communications network. A single TMU can accommodate up to eight pairs of vehicle inductive loops (16 sensors inputs) or 4 sites – where a site is a group of adjacent lanes on the same piece of carriageway. For example, an on-slip plus one direction of main carriageway would be classed as 2 sites.
- 5.5.5.5 At VDIM locations the Company shall provide inductive loops.
- 5.5.5.6 The Company shall locate and install VDIM in accordance with the following criteria:
- (a) main carriageway detection sites shall be located at centres ranging from 400 metres to 500 metres and wherever possible they shall be at the same longitudinal location in both carriageways;
 - (b) Slip Road detection sites shall be provided at the same location as the mainline detection sites or connected to the same TMU;
 - (c) the optimum location for the detection sites and TMUs to minimise the quantity of TMUs required to meet the requirements of incident detection, screen line detection and Data Service detection;
 - (d) at nominally 200 metres upstream and downstream of each Gantry Site;
 - (e) the maximum feeder cable length from the Type D loop chamber to the CEC shall not exceed 200 metres;
 - (f) the configuration of inductive loops shall be a primary and secondary loop for each running lane and hard shoulder on both carriageways and Slip Roads to form a contiguous network of sub-surface detection;
- 5.5.5.7 The vehicle detection sites and configuration and detection units shall be capable of supporting a collection of individual vehicle flows, vehicle lengths, classification of vehicle speeds and lane occupancy parameters and shall be installed so as to achieve an accuracy of no less than 97 per cent, flow, count and speed accuracy when measured at the MPC.
- 5.5.5.8 Not Used
- 5.5.5.9 Once installed, the Company shall undertake interface testing, commissioning and equipment adjustment to comply with the agreed testing and performance requirements. The Company shall consult and comply with Transport Scotland with regard to the testing, integration and performance requirements.
- 5.5.5.10 Typical layout details for a VDIM site are shown on drawing NDX1007-01 as listed in Appendix 0/4 of the Specification.
- 5.5.5.11 For each VDIM site, the Company shall:
- (a) provide the loop chamber, Type D, in the verge prior to installing vehicle inductive loops and loop feeder cables;
 - (b) provide the vehicle inductive loops in accordance with MCH1540;
 - (c) provide the loop feeder cables;
 - (d) join the inductive loops onto the loop feeder cables in a Type D chamber;
 - (e) terminate the loop feeder cables into the TSE cabinet;
 - (f) install the TMU and associated interconnection cables in the TSE cabinet;

- (g) provide VDIM equipment access at sites not incorporated with a Gantry Site; and
- (h) test and commission the installation to prove the complete vehicle detection for incident management installation in accordance with Section 10.

5.5.5.12 Not Used

5.5.5.13 Prior to the issue of the Acceptance Certificate the Company shall carry out all necessary adjustments to the detection equipment parameters of each VDIM site to ensure the accuracy of the vehicle detection parameters comply with Section 5.5.5.7, for sub surface inductive loop sites.

5.5.5.14 Transport Scotland shall provide the initial configuration of the TMUs. The Company shall carry out the calibration and any further adjustments of each VDIM site during off peak and peak time traffic flow conditions to determine the necessary adjustments to the initial configurations. This shall be achieved through testing and fine tuning of the equipment at the following intervals:

- (a) during initial commissioning prior to operational handover and road opening to Users;
- (b) between 14 days and 28 days following the opening of the road to Users; and
- (c) between 112 days and 140 days following the opening of the road to Users.

5.5.6 Variable Message Sign Facilities

5.5.6.1 Transport Scotland shall supply the VMS to be mounted on gantries; the standalone VMS complete with cantilever; and Ambient Light Monitoring (“ALM”) equipment detailed in Appendix A of this Part 3, for installation by the Company.

5.5.6.2 The Company shall install VMS facilities and equipment in accordance with the requirements of this Part 3 and Clause 1535 of the Specification.

5.5.6.3 The Company shall install VMS of Type MS4VMS in accordance with the following criteria:

- (a) at Gantry Sites;
- (b) at standalone (non-Gantry Site) locations; and
- (c) each MS4VMS shall be visible to any User 300 metres or more upstream of the MS4VMS, and shall not be obscured by other road infrastructure, trees or shrubs.

5.5.6.4 Not Used

5.5.6.5 For each Gantry equipped with an MS4VMS the Company shall:

- (a) install the MS4VMS on the Gantry superstructure on the nearside (to the left of lane 1 / hard shoulder) of the superstructure above the top-structural member of the Gantry as detailed in Part 2.
- (b) provide access, and associated brackets, fixings and cable management systems;
- (c) provide appropriate fixing arrangements between the Gantry and the TSIE;
- (d) provide, install and terminate interconnecting power and communication cables in accordance with MCE2214B between the MS4VMS and the TSE cabinet – which will house the RSC;
- (e) provide appropriate local power isolation for the sign such that a maintenance operative can isolate power to the sign at the maintenance location;
- (f) ensure that the VMS is aligned for optimum visibility by drivers; and
- (g) test and commission the installation to prove the complete MS4VMS installation in accordance with Section 10.

- 5.5.6.6 The dimensions of the Gantry mounted MS4VMS shall be approximately 5000 millimetres (width), 600 millimetres (breadth / depth) and 3500 millimetres (height). The weight of the MS4VMS sign shall be approximately 1200 kilograms. Exact measurements will be provided in December 2012.
- 5.5.6.7 For each standalone MS4VMS the Company shall:
- (a) install the MS4VMS sign on the TSIE provided cantilever;
 - (b) provide access, and associated brackets, fixings and cable management systems;
 - (c) provide appropriate fixing arrangements between the foundation and structure, and between the structure and the TSIE;
 - (d) provide, install and terminate interconnecting power and communication cables between the MS4VMS – which will house the RSC – and the TSE cabinet as necessary;
 - (e) ensure that the VMS is aligned for optimum visibility by drivers; and
 - (f) test and commission the installation to prove the complete MS4VMS installation in accordance with Section 10.
- 5.5.6.8 The dimensions of the cantilever mounted MS4VMS shall be approximately 8,360 millimetres (width), 300 millimetres (breadth / depth) and 2,720 millimetres (height). The weight of the MS4VMS sign shall be no greater than 1,600 kilograms. The weight of the support frame shall be no greater than 4420 kilograms and vertical post shall be approximately 2400 kilograms. Exact measurements will be provided in December 2012.
- 5.5.7 Lane and Speed Control Signalling Facilities**
- 5.5.7.1 Transport Scotland shall supply the Lane and Speed Control Signalling equipment, the Cable Marshalling Unit (“**CMU**”), and ALM equipment as detailed in APPENDIX A of this Part 3, for installation by the Company.
- 5.5.7.2 The Company shall install Lane and Speed Control Signalling facilities and equipment in accordance with the requirements of this Part 3 and Clauses 1538 and 1548 of the Specification.
- 5.5.7.3 The Company shall install and align the Lane and Speed Control Signalling equipment as detailed in the MCX0069 series drawings.
- 5.5.7.4 The Company shall locate Lane and Speed Control Signalling Gantries and equipment in accordance with APPENDIX C of this Part 3, unless otherwise agreed with Transport Scotland.
- 5.5.7.5 All supporting infrastructure shall be designed to accommodate installation of an LCU above each carriageway lane, where required, as detailed in APPENDIX C of this Part 3.
- 5.5.7.6 All cable management, communications and power networks shall be designed to accommodate Lane and Speed Control facilities above carriageway lanes and hard shoulders to accommodate future hard shoulder operation.
- 5.5.7.7 Not Used
- 5.5.7.8 For each Lane and Speed Control Signalling site, the Company shall:
- (a) provide the Gantry at the locations outlined within APPENDIX C of this Part 3
 - (b) install and terminate ALM and interconnecting cables as necessary;
 - (c) install the CMU in a maintainable position within the gantry adjacent to the LCUs;

- (d) provide, install and terminate interconnecting power and communication cables in accordance with MCE0107B between the TSIE and the TSE cabinet as necessary;
 - (e) install, align and test the TSIE detailed in APPENDIX A of this Part 3 and associated interconnection cables; and
 - (f) test and commission the installation to prove the complete Lane and Speed Control Signalling installation in accordance with Section 10.
- 5.5.7.9 The Company shall provide supporting infrastructure at future live compliance and future mock compliance gantry sites as detailed in APPENDIX C of this Part 3 to allow Transport Scotland to install MSS compliance equipment as required in the future. This shall include provision of infrastructure to cater for both mock, and live compliance sites. The MSS compliance system includes an External Aspect Verification (“EAV”) camera located in the verge in advance of the Gantry Site.
- 5.5.7.10 The Company shall ensure that infrastructure provided is suitable for operation with the Highways Agency HADECS 3 compliance system.
- 5.5.7.11 The Company shall provide the following supporting infrastructure at future mock compliance sites:
- (a) provide fixing brackets on gantries above each running lane to allow MSS compliance equipment to be installed by Transport Scotland’s specialist contractor;
 - (b) provide a suitable fixing arrangement for an EAV camera mast and 2x100mm diameter ducts to run between the EAV foundation and the associated TSE cabinet site. The final location of the EAV foundation shall be determined by the Company based on the alignment and viewing angle of the respective LCUs;
- 5.5.7.12 The Company shall provide the following supporting infrastructure at future live compliance sites:
- (a) all supporting infrastructure detailed within 5.5.7.11; and
 - (b) an equipment cabinet foundation suitable for a 600(S) type cabinet.
- 5.5.7.13 The Company shall ensure that the Active Equipment installed on the Gantry is aligned for optimum visibility by Users.
- 5.5.8 Motorway Access Control Facilities**
- 5.5.8.1 Transport Scotland shall supply the MAC equipment detailed in APPENDIX A of this Part 3, for installation by the Company.
- 5.5.8.2 MAC units are used to enable the control of access to the motorway network from the local road by displaying speed restriction and lane open or closed wicket signs, together with associated amber and red lantern indications.
- 5.5.8.3 The Company shall install MAC facilities and equipment in accordance with the requirements and Clause 1538 of the Specification.
- 5.5.8.4 The Company shall install MAC equipment at the approximate locations detailed in APPENDIX C of this Part 3:
- (a) at both the nearside and offside at the beginning of the merge Slip Road such that they are visible to Users prior to committing to join the merge Slip Road; and
 - (b) no greater than 100 metres from the TSE cabinet housing the control equipment for those MAC units.
- 5.5.8.5 For each MAC site, the Company shall:

- (a) provide the foundations for the MAC Units, TSE and power supply cabinets;
- (b) provide, install and terminate interconnecting power and communication cables between the TSE cabinet and the MAC unit termination point;
- (c) install the MAC posts, MAC units and associated interconnection cables;
- (d) provide safe access and working area to the MAC site; and
- (e) test and commission the installation to prove the complete MAC installation in accordance with Section 10.

5.5.9 Journey Time Facilities

- 5.5.9.1 Transport Scotland shall supply the JT equipment detailed in APPENDIX A of this part 3, for installation by the Company.
- 5.5.9.2 The Company shall install JT facilities and equipment in accordance with the requirements and the Specification.
- 5.5.9.3 The Company shall take cognisance of the two types of JT equipment being supplied as TSIE, namely JT type A and JT type B equipment. Both types are based on Automatic Number Plate Recognition ("ANPR") technology.
- 5.5.9.4 The Company shall provide and install mounting arrangements for JT type A and JT type B equipment on the Gantries identified in APPENDIX C of this Part 3 and in accordance with the following criteria:
 - a) JT type A cameras being issued as TSIE are capable of covering two adjacent lanes of carriageway running in the same direction when located over the centre of the two lanes;
 - b) JT type B cameras being issued as TSIE are capable of covering one carriageway lane;
 - c) The mounting arrangements for both JT type A and JT type B equipment shall be adjustable in the horizontal and vertical planes so as to allow the JT equipment to be focused on the centre of the lane(s) to be monitored;
 - d) The mounting arrangements shall locate the equipment adjacent to the LCU; and
 - e) JT type A and JT type B equipment shall be mounted on physically separate mounting arrangements from one another so as to allow independent maintenance of the equipment.
- 5.5.9.5 The mounting arrangements for both JT type A and JT type B equipment shall be retractable into the Gantry walkway so that maintenance can be carried out in a safe manner from within the Gantry.
- 5.5.9.6 The Company shall install JT type A and JT type B equipment on Gantries at Sites detailed in APPENDIX C of this Part 3.
- 5.5.9.7 For each JT equipment site, the Company shall:
 - (a) submit to Transport Scotland not less than three months from the date of requirement of JT equipment the lengths of JT interconnecting power and communication cables required to allow connection between the gantry mounted JT equipment and the TSE cabinet;
 - (b) install and terminate interconnecting power and communication cables between the TSIE and the TSE cabinet;
 - (c) install the TSIE and associated interconnection cables;
 - (d) provide facilities and access to Transport Scotland's specialist provider in relation to JT type B equipment; and

- (e) test and commission the JT Type A installation to prove the complete JT equipment installation in accordance with Section 10.

5.5.10 Not Used

5.5.11 Equipment Numbering

- 5.5.11.1 The Company shall utilise TSE numbering based on the Transport Scotland chainages contained in APPENDIX C.of this Part 3.
- 5.5.11.2 The Company shall provide numbering for all TSE in accordance with Clause 1519 of the Specification.
- 5.5.11.3 The Company shall consult, and comply with the requirements of the Transport Scotland regarding the marker post numbering system used to develop the TSE numbering system.

5.6 Spares

- 5.6.1 The Company shall provide to Transport Scotland's Nominated TSIE Store additional items of the Passive Network as spare parts as detailed in APPENDIX B of this Part 3.
- 5.6.2 These additional items of the Passive Network shall be provided to Transport Scotland 14 days prior to the issue or deemed issue of the relevant Taking-Over Certificate.

6 Traffic Signs and Road Markings

6.1 General

- 6.1.1 The Company shall provide traffic signs on Gantries and road markings in accordance with Section 1.9 of Part 2 that shall provide a coherent and unambiguous signing and signalling system to the road Users.
- 6.1.2 Additional requirements for traffic signs installed on Gantries, including power supplies for lighting are described in Part A.

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- 7 Structures**
- 7.1 General**
- 7.1.1 The Company shall provide Gantry Sites at the locations detailed within APPENDIX C of this part 3. The Company may relocate the Gantry Site locations longitudinally by up to ten metres upstream or downstream of the verge location at ground level to suit design requirements.
- 7.1.2 In exceptional circumstances, the Company may propose alternative locations for Gantry Sites than those detailed in Section 7.1.1 to suit their road alignment design. The relocated Gantry Sites (and TSE mounted on the gantry) shall be agreed in writing with Transport Scotland.
- 7.1.3 If, as a consequence of the Company's design, it is necessary for the Company to provide additional Gantry Sites then the Company shall agree the location in writing with Transport Scotland. In addition, the Company shall be liable for Transport Scotland's costs associated with the provision of TSIE for such additional Gantry Sites.
- 7.1.4 The Company shall confirm to Transport Scotland the location of all Gantry Sites, providing OS grid references.
- 7.1.5 To allow Transport Scotland to install additional TSE in the future at Gantry Sites over and above that specified in APPENDIX C of this Part 3 every Gantry shall be designed and provided to accommodate the following:
- (a) MS4VMS;
 - (b) CCTV;
 - (c) LCU above all running lanes and the hard shoulder;
 - (d) ALM equipment;
 - (e) Journey Time equipment;
 - (f) The largest static advance direction signs provided in accordance with Part A1;
 - (g) Static signing;
 - (h) ancillary components such as connection boxes, lighting, isolation devices and the like.
- 7.1.6 The Company shall provide on the Gantry for TSE, detailed in APPENDIX C of this Part 3, fixings, brackets and cable management system for TSIE to be installed, aligned and maintained.
- 7.1.7 The Company shall ensure that the TSIE and equipment provided by the Company in Section 7.1.5 (a), (b), (c), (d), and (e) can be aligned to suit the visibility and operational requirements specified in the Contract.
- 7.1.8 The New Works Requirements for structures associated with the TSE are detailed in Schedule 2: Part 4
- 7.1.9 Transport Scotland will provide information to the Company regarding the size and weight of the TSIE.
- 7.1.10 Prior to Gantry fabrication, the Company shall fabricate a model Gantry section at the Company's TSE Assembly Point to which the Company shall assemble Gantry mounted TSIE to prove the Gantry structure as designed will be of the correct dimensions and attachments to mount the TSIE and ensure maintenance requirements are achievable. The Company shall consult and comply with the requirements of Transport Scotland when assembling Gantry mounted TSIE and proving maintenance access requirements.

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8 Vehicle Restraint Systems

8.1 General

8.1.1 New Works Requirements for VRS in regard to TSE are detailed in Part 2.

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9 Site Investigations

9.1 General

- 9.1.1 Trial pits to locate existing TSE shall be undertaken in accordance with Clause 1524 of the Specification.
- 9.1.2 New Works Requirements for geotechnical or other investigations in regard to TSE are detailed in Part 2.

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10 Testing and Certification

10.1 General

- 10.1.1 Requirements for testing and commissioning are given in Section 10 and in Specification Appendix 0/5 and Appendix 1/5 of Schedule 2: Part 4.
- 10.1.2 Not Used.
- 10.1.3 Not Used.
- 10.1.4 The Company shall undertake the connection of new TSE on to the existing Traffic Scotland network in a phased and / or sectional manner to avoid any potential detrimental effect on the performance, operation or stability of the instation software and Active Equipment.
- 10.1.5 The Company shall test and commission all TSE to ensure that all Active Equipment and the Passive Network are commissioned in a stable and controlled manner, minimising the risk associated with connecting devices to the live network supporting the TSS. The Company shall achieve this through a combination of phased testing, physical separation of longitudinal communication networks from existing TSE and also software protection techniques.
- 10.1.6 The Company shall ensure that the risk of Users or the public from being distracted by the testing of light or sound emitting devices is minimised.
- 10.1.7 The Company shall provide to Transport Scotland in accordance with the Certification Procedure a Commissioning, Testing and Inspection Plan ("**CTIP**") that sets out the scope, timescale and responsibility for all connection and disconnection of TSE and testing and commissioning of TSE to complete the New Works. The CTIP shall include, but shall not be limited to the method, planning, scheduling and coordination of the following:
- (a) pre-site tests;
 - (b) pre-installation tests;
 - (c) installation tests; and
 - (d) SATs.
- 10.1.8 The CTIP shall contain methods of testing and commissioning and shall be supported by flowcharts, test descriptions and expected test results.
- 10.1.9 The Company shall utilise the appropriate sections of Transport Scotland's installation and test document MCS602 to develop the CTIP.
- 10.1.10 The Company shall consult and comply with Transport Scotland in creation of the CTIP and ensure that both Transport Scotland and the Company are satisfied with the content not less than three months prior to the commencement of any commissioning works.
- 10.1.11 The Company shall through implementing the CTIP demonstrate and ensure that the TSE installed in the New Works is fully commissioned and operational from the roadside and TSCC. The confirmation of unsuccessful and successful testing shall be documented and details made available to Transport Scotland at the end of each type of test detailed in Section 10.1.7.
- 10.1.12 Where tests are unsuccessful the Company shall undertake investigations to determine the cause of failure and shall notify the Transport Scotland in writing what shall be done by the Company to correct the failure. The Company shall undertake testing, investigation and corrections until tests are successful.
- 10.1.13 When requested in writing by the Company, the Transport Scotland shall provide all reasonable assistance, such as access to the TSCC and testing and modifications to the TS system and core network upstream of and including the core switch, as and when

required throughout the testing and commissioning process. The notification periods required by Transport Scotland are detailed in Section 3.1.4.

- 10.1.14 Transport Scotland will accept back into Transport Scotland's Nominated TSIE Store all TSIE notified by the Company as faulty. The faulty TSIE, or part thereof, will be replaced or repaired by the Transport Scotland as detailed in Section 3.2.12.

10.2 Pre-Site and On Site Tests

- 10.2.1 All TSE supplied to the Company as TSIE shall have been subject to appropriate production, factory acceptance and validation testing by the Transport Scotland to confirm that it is of suitable quality and achieves the Transport Scotland's TSE requirements.

- 10.2.2 Transport Scotland shall also undertake appropriate TSE pre-issue tests prior to releasing the TSE to the Company.

- 10.2.3 The Company may have a representative present at any appropriate TSE pre-issue tests to be undertaken by Transport Scotland. Any request to attend such testing shall be made in writing to Transport Scotland at least 28 days prior to the start of an appropriate TSE pre-issue tests. The Company should note that some items of TSE are procured in bulk ahead of time, and for such items it may not be possible for the Company to have a representative present for the pre-issue tests.

- 10.2.4 The Company shall undertake a visual inspection of all TSIE to determine if the equipment is physically damaged. These inspections and subsequent actions if damage is noted shall be undertaken as follows:

- (a) for TSIE uplifted from Transport Scotland's Nominated TSIE Store the Company shall undertake inspections at the time of uplift. Damage shall be reported to the operator of Transport Scotland's Nominated TSIE Store where a written record of any damage shall be agreed and recorded with the operator. Depending on the nature of the damage, the operator will determine if the TSIE can be uplifted by the Company for use in the New Works.
- (b) for TSIE issued from Transport Scotland's supplier and delivered to the Site, the Company shall undertake inspections at the time of delivery. If damage is present the Company shall take digital photographs that display the time and date on the image and immediately send by email the photographic evidence of damage to Transport Scotland. Transport Scotland will determine if the TSIE should be returned to the supplier or if an on site repair can be undertaken by Transport Scotland's supplier. The Company shall document the on site repairs agreed with Transport Scotland that require to be undertaken. If on site repairs cannot be undertaken the Company and Transport Scotland shall jointly agree that the TSIE shall be uplifted by the provider or immediately returned on the supplier's delivery vehicle.

- 10.2.5 TSIE inspected by the Company in accordance with Section 10.2.4 and not deemed to be satisfactory for including in the New Works shall be repaired or replaced by Transport Scotland in accordance with Section 3.2.

10.3 Pre-installation Tests

- 10.3.1 At the Company's Traffic Scotland Equipment Assembly Point the Company shall for each item of VMS equipment assemble all equipment and interconnecting cables to form a single combined arrangement prior to pre-installation testing and installation on Site for each:

- (a) Gantry including gantry mounted MS4VMS and LCU;

(b) Standalone MS4VMS; and

(c) MAC;

The pre-installation tests shall be undertaken using the RSC and ALM equipment allocated to the items of VMS equipment being tested.

- 10.3.2 The pre-installation tests shall include a 100 hour soak test of fully connected TSE at the Company's Traffic Scotland Equipment Assembly Point to demonstrate and confirm the correct connection, operation, configuration and compatibility with the communications devices prior to installation on Site. For LCUs this test shall be undertaken with the units mounted and connected on the gantry in their final positions. The Company shall advise Transport Scotland in writing of the dates for these tests for each Gantry Site or TSE site at least 14 days prior to the test date.
- 10.3.3 To assist in the pre-installation tests Transport Scotland will issue a test rig to the Company comprising of a configured multi-purpose controller, housed in a cabinet suitable for the installation of TSIE controlling equipment for the TSE being tested. The Company shall advise Transport Scotland in writing of the dates on which specific items of TSIE are to be tested not less than one month prior to the commencement of the pre-installation tests, to allow Transport Scotland to arrange for suitable test software to be available to the Company.
- 10.3.4 Any faulty or non-operational TSIE identified during or at the end of the 100 hour soak test shall be notified within 24 hours to Transport Scotland and shall either be replaced by the Company with fully functioning TSIE issued by Transport Scotland, or repaired by Transport Scotland in accordance with Section 3.2. Under these circumstances the 100 hour soak test shall be repeated so that all TSE has completed testing in accordance with Section 10.3.2.
- 10.3.5 Any faulty or non-operational equipment, other than TSIE, identified during or at the end of the 100 hour soak test shall not be installed on Site and shall be replaced immediately by the Company with fully functioning equipment. Under these circumstances the 100 hour soak test shall be repeated as a complete test.
- 10.3.6 All TSE listed in section 10.3.1 shall be fully tested and demonstrated as fully operational in accordance with the CTIP.

10.4 Installation tests

- 10.4.1 Transport Scotland requires the Company to test and commission the Passive Network.
- 10.4.2 The Company shall undertake all testing of fibre optic, multi-pair, loop and power cables in accordance with the requirements of this Part 3 and with Clauses 1506 and 1518 of the Specification and Appendix 1/5 of Part 4. The Company shall not undertake testing of sub surface vehicle detection loops until the final pavement surface course works are complete.
- 10.4.3 The Company shall undertake end to end testing of the installed fibre optic and multi-pair cables. The Company shall also test each dedicated link or circuit to each TSE location.
- 10.4.4 The Company shall test ducts and chambers in accordance with Clauses 1533 and 1532 of the Specification.
- 10.4.5 Cabinet installations shall be tested in accordance with Clause 1508 of the Specification and any specific manufacturer supplied testing regimes.
- 10.4.6 Active Equipment shall not be installed within cabinets on Site until permanent power supplies in accordance with Section 5.3 have been installed, tested and certified and all environmental protection such as cabinet seals has been completed and certified.

- 10.4.7 Active Equipment shall not be connected to the Passive Network until all tests for the individual Passive Network components have been successfully completed and certified.
- 10.4.8 All TSE shall be fully tested and demonstrated as fully operational in accordance with the CTIP.
- 10.4.9 Any faulty or non-operational TSIE identified during or at the end of these installation tests shall be notified within 24 hours to Transport Scotland and replaced by the Company with fully functioning TSIE issued by Transport Scotland in accordance with Section 3.2.
- 10.5 Site Acceptance Tests (SAT)**
- 10.5.1 The Company shall carry out three stages of SAT after installation of the TSE as follows:
- (a) Standalone SATs on all installed TSE.
- These tests shall demonstrate and provide certification that the TSE is functionally operational locally at each of the individual sites prior to connection to the core communication network.
- (b) Pre-commissioning SATs.
- In addition to the cable tests in accordance with the Specification and prior to connection of the end device Active Equipment onto the existing TSE, the Company shall carry out tests to prove that the IP network links across the Site are continuous and stable. The Company shall ensure that all IP links and devices across the Site can be controlled from the core communications system centered around the core switch located at the transmission station detailed in section 5.2.4.
- (c) Commissioning SATs.
- These tests shall be carried out immediately after connection of the Active Equipment to the existing TSE, and shall demonstrate and provide certification that the Active Equipment has been successfully commissioned with the existing TSE such that it is fully operated and controlled from the TSCC. As this relies on Transport Scotland's core network and Traffic Scotland control system, Transport Scotland shall assist the Company in undertaking the Commissioning SATs in accordance with the CTIP. Transport Scotland will transfer the TSE on to the TSS live network and undertake final integration with assistance from the Company.
- 10.5.2 The extent of standalone and pre-commissioning SATs identified in Section 10.5.1 (a) and (b) shall be maximised prior to commencing commissioning SATs identified in 10.5.1 (c).
- 10.5.3 The Company shall ensure that the Active Equipment is connected to the existing TSE in a top down manner during SATs. The main core network links in the transmission stations shall be commissioned first, then connections from the core network in transmission stations to the local communications equipment at the roadside cabinets, then connections from the local communications equipment to the roadside equipment.
- 10.5.4 Any faulty or non-operational TSIE identified during or at the end of these SATs shall be notified within 24 hours to Transport Scotland and shall either be replaced by the Company with fully functioning TSIE issued by Transport Scotland, or repaired by Transport Scotland in accordance with Section 3.2.

10.6 Standalone SATs

- 10.6.1 Standalone SATs shall comprise full operational and configuration testing of all TSE at each individual site group but shall be in isolation from the core communications network and Instation. A site group comprises of all TSE at a TSE cabinet site, or a remote site where the TSE is not adjacent to, but is connected to, a TSE cabinet. All TSE shall be tested upstream from the main incoming communications interface using the same infrastructure and network configuration that will be used during operation. The Company shall determine the order of testing, either by site or by function that best fits with the Construction Programme.
- 10.6.2 The Company shall test all TSE for operational functionality and compatibility with all other TSE within the group to confirm the configuration and correct TSE addressing with the design. During local testing, the documentation that will be held within the TSE cabinets shall be verified and corrected where necessary.

10.7 Pre-commissioning SATs

- 10.7.1 In addition to the cable tests in accordance with the Specification and prior to connection of the end device Active Equipment onto the existing TSE, the Company shall carry out tests to prove that the IP network links across the Site are continuous and stable. The Company shall ensure that all IP links and IP devices across the Site can be controlled from the core communications system centered around the core switch located at the transmission station detailed in section 5.2.4.
- 10.7.2 To prevent interaction with existing live devices, the fibres allocated for use within the site shall be distinct from all existing live equipment thereby creating a virtual, independent network for this Contract.
- 10.7.3 Following successful completion of testing and certification the Company shall connect the longitudinal fibre and multi-pair cables to the core network under Transport Scotland's supervision.
- 10.7.4 The Company shall ensure that Transport Scotland's software configuration of the Active Equipment installed within the Site shall have no adverse impact on the existing live TSE – this may be through the use of De-Militarized Zone ("DMZ") or similar protection techniques as detailed in the CTIP.

10.8 Commissioning SATs

- 10.8.1 After successful completion of the pre-commissioning SATs detailed in Section 10.7, the Company shall complete Commissioning SATs and detection calibration prior to the road opening to Users. Transport Scotland shall assist the Company in undertaking the Commissioning SATs in accordance with the CTIP.
- 10.8.2 The Company shall undertake testing in accordance with the CTIP of all installed TSE from the TSCC to demonstrate that the Active Equipment has been successfully commissioned with the existing TSE such that it is operational and controlled from the TSCC. Transport Scotland will make available to the Company one workstation to undertake these tests.
- 10.8.3 In the event that the SATs are unsuccessful the Company shall, together with Transport Scotland, undertake testing and modifications to identify and remedy the cause of the unsuccessful test, as follows:
- (a) The Company shall repeat the testing in Section 10.5.1 and undertake modifications to the TSE downstream of the core switch detailed in Section 10.7 as necessary; and

- (b) Transport Scotland will undertake testing and modifications of the TS system and core network upstream of and including the core switch detailed in Section 10.7.
- 10.8.4 Following any modifications undertaken in accordance with Sections 10.8.3 the Company shall repeat the testing in accordance with Section 10.8.2.
- 10.8.5 Not Used.

10.9 Transport Scotland Integration

- 10.9.1 Once the Company has successfully completed the Commissioning SATs Transport Scotland will transfer the TSE across to the TSS live network and undertake final integration with the assistance of the Company. The assistance to be provided by the Company may include, but is not limited to, traffic management, test engineers and fault finding/locating of any faults preventing completion of integration. If required the Company shall either replace faulty TSIE with fully functioning TSIE issued by Transport Scotland, or assist Transport Scotland in repairing the faulty TSIE.

10.10 Operational Calibration

- 10.10.1 The Company shall undertake operational calibration of VDIM Equipment as required to ensure that the TSIE performs in accordance with the relevant design element at various periods after all the Site Roads are open as detailed in Section 5.5.5.13 and the CTIP.

11 Documentation and Training

11.1 Documentation

- 11.1.1 The Company shall provide documentation regarding the provision, installation, composition, testing and commissioning of the TSE to allow future operation, maintenance, alteration and demolition by Transport Scotland or its service providers, agents and third parties
- 11.1.2 The Company shall comply with the requirements of Clauses 1504 and 1540 of the Specification and submit the TSE documentation for review in accordance with the Certification Procedure in Part 1 and Part 5. The TSE documentation shall include, but shall not be limited to, the following information:
- (a) equipment documentation;
 - (b) as-built drawings in AutoCAD ® format to NDS 1624-09;
 - (c) testing and certification documentation;
 - (d) operational, maintenance and service manual; and
 - (e) documentation as required by Highways Agency Specification TR 1100.
- 11.1.3 The Company shall provide the cabling, testing and completion certificates associated with new, upgraded or amended power supply network and its distribution to the TSE in accordance with BS 7671: Requirements for Electrical Installations.
- 11.1.4 In addition to the recording of as-built information as the work progresses the Company shall also provide documentation described in this Section 11 to Transport Scotland in accordance with the Certification Procedure at three stages as follows:
- (a) a draft set at least 21 days prior to the commissioning period stated in Section 3.5.2;
 - (b) a final draft set prior to the road being open to Users; and
 - (c) the final set in accordance with the Agreement.

11.2 Training

- 11.2.1 The Company shall provide comprehensive training for all Company provided components of the Passive Network that Transport Scotland's maintainers, installers and operators may use to carry out their duties on TSE. This training shall be tailored to suit each of the following groups:
- (a) management / supervisors / operators;
 - (b) installation, testing and commissioning personnel; and
 - (c) maintenance personnel.
- 11.2.2 The training shall include classroom and site based components as necessary to demonstrate the equipment, procedures and safe handling and shall accommodate six staff in each of the groups detailed in Section 11.2.1.
- 11.2.3 The Company shall produce training manuals and documentation to be used in the training that will subsequently be incorporated with the documentation of Section 11.1.
- 11.2.4 Successful training shall be provided and completed at least 28 days before the commissioning on Site of any Active Equipment. The Company shall submit in accordance with the Certification Procedure in Part A1 a training programme identifying the recommended group of staff to attend and the time periods designated.

- 11.2.5 At the end of the course those trained shall be able to expand, maintain and support the Active Equipment provided by the Company without any ongoing support from the Company.
- 11.2.6 The Company shall at the end of the course provide feedback forms for the participants to complete. Transport Scotland shall review the completed feedback forms in accordance with the Certification Procedure to determine if the training has been comprehensive and has been understood by the attendees. Should Transport Scotland determine that the training has not informed, either in part or in full as appropriate, the Company shall then improve and repeat the training course within 14 days of notification by Transport Scotland.

12 Programme

12.1 General

- 12.1.1 In addition to the requirements of APPENDIX E of this Part 3, the Company shall, in accordance with the Certification Procedure, provide a detailed programme for the ITS works to Transport Scotland 56 days prior to any ITS works being undertaken on Site.
- 12.1.2 The Construction Programme shall include all appropriate references to these New Works Requirements and shall provide details of:
- (a) submission of TSE design and design data;
 - (b) Passive Network diversions, re-routing or relocation;
 - (c) commencement on site for surveys and preparation;
 - (d) commencement of Temporary Works and each Temporary Works activity;
 - (e) all disconnections and connections to TSE;
 - (f) access to TSCC or other TS facilities;
 - (g) uplift of all TSIE from the TS nominated store;
 - (h) delivery of all client equipment direct from the supplier;
 - (i) incremental installation of all TSE;
 - (j) testing of all TSE;
 - (k) commissioning of all TSE;
 - (l) power network diversions;
 - (m) order, and completion of individual incoming power supplies from the Electricity Supply Company;
 - (n) requirement for site data or the host systems amendments; and
 - (o) issue of draft and final documentation.

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Appendices to Part 3

APPENDIX	DESCRIPTION
A	Transport Scotland Issued Equipment
B	Passive Network spares to be provided by Company
C	Gantry site and Active Equipment Locations
D	Not Used
E	Strategy of ITS works for Traffic Scotland Equipment document
F	Traffic Scotland Service

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APPENDIX A

THIS IS APPENDIX A TO PART 3 OF THE NEW WORKS REQUIREMENTS

TRANSPORT SCOTLAND ISSUED EQUIPMENT

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APPENDIX A

TRANSPORT SCOTLAND ISSUED EQUIPMENT

The following Active Equipment and Passive Equipment components shall be issued by Transport Scotland for use or installation in the New Works as required:

Emergency Roadside Telephones (with reference to Section 5.5.1 of Part 3)		
Item	Company to collect from Transport Scotland's TSIE Nominated Stores	Issued from Transport Scotland's Supplier
Highways Agency type 354 emergency telephone	Yes	No
Voice Gateways (VG) with a maximum capacity of 48 number voice circuit channels (total) at each VG Site	Yes	No

Closed Circuit Television ("CCTV") (with reference to Section 5.5.2 of Part 3)		
Item	Company to collect from Transport Scotland's TSIE Nominated Stores	Issued from Transport Scotland's Supplier
CCTV mast (Remote 15m)	Yes	No
Bolt group fixing and template	Yes	No
CCTV camera – Monitoring only	Yes	No
Pan, tilt and zoom unit	Yes	No
Local Video base station, RS485 or FSK to Ethernet converter and Ethernet switching equipment as necessary	Yes	No
All necessary communications interconnecting cables including pre-fabricated, booted, Category 5e Ethernet and fibre patch leads within cabinets.	Yes	No

Data Service (with reference to Section 5.5.4 of Part 3)		
Item	Company to collect from Transport Scotland's TSIE Nominated Stores	Issued from Transport Scotland's Supplier
TMUs complete with detector cards	Yes	No
WIM Piezo Electronic Sensors	Yes	No

WIM Temperature Probes	Yes	No
WIM fixing resin	Yes	No
Communications equipment consisting of Ethernet switches and/or Broadband type (DSL) modems and interconnecting wiring within cabinets.	Yes	No

<p>VDIM (with reference to Section 5.5.5 of Part 3)</p>		
Item	Company to collect from Transport Scotland's TSIE Nominated Stores	Issued from Transport Scotland's Supplier
TMUs complete with detector cards	Yes	No
Communications equipment consisting of Ethernet switches and/or Broadband type (DSL) modems and interconnecting wiring within cabinets.	Yes	No

<p>VMS (with reference to Section 5.5.6 of Part 3)</p>		
Item	Company to collect from Transport Scotland's TSIE Nominated Stores	Issued from Transport Scotland's Supplier
MS4VMS (Gantry Mounted)	No	Yes
Cabinet mounted VMS Controller	Yes	No

MS4VMS (Standalone) including vertical post, support frame and ALM as required	No	Yes
Bolt group fixing and template	Yes	No
Communications equipment consisting of Ethernet switches and/or Broadband type (DSL) modems and interconnecting wiring within cabinets.	Yes	No

Lane and Speed Control Signalling (with reference to Section 5.5.7 of Part 3)		
Item	Company to collect from Transport Scotland's TSIE Nominated Stores	Issued from Transport Scotland's Supplier
LCU	No	Yes
LCU roadside controller	Yes	No
CMU	No	Yes
Communications equipment consisting of Ethernet switches and/or Broadband type (DSL) modems and interconnecting wiring within cabinets.	Yes	No
ALM Equipment	Yes	No

Motorway Access Control ("MAC") (with reference to Section 5.5.8 of Part 3)		
Item	Company to collect from Transport Scotland's TSIE Nominated Stores	Issued from Transport Scotland's Supplier
MAC Units	No	Yes
MAC Controller	Yes	No
Mounting posts for the MAC units	No	Yes
Communications equipment consisting of Ethernet switches and/or Broadband type (DSL) modems and interconnecting wiring within cabinets.	Yes	No

Journey Time Equipment (with reference to Section 5.5.9 of Part 3)		
Item	Company to collect from Transport Scotland's TSIE Nominated Stores	Issued from Transport Scotland's Supplier
Journey time monitoring detection camera heads	Yes	No
Local processing units as required	Yes	No
Communications equipment consisting of Ethernet switches and/or Broadband type (DSL) modems and interconnecting wiring within cabinets.	Yes	No

Ancillary Equipment		
Item	Company to collect from Transport Scotland's TSIE Nominated Stores	Issued from Transport Scotland's Supplier
Multi-purpose controllers (MPC)	Yes	No
Active communications equipment including switches, routers, DSL, DSLAM modems, line protection devices and patch leads (fibre and Cat5e) within cabinets.	Yes	No
All necessary communications system interconnecting cables including pre-fabricated, booted, Category 5e Ethernet and fibre patch leads within cabinets.	Yes	No
Uninterruptible power supply (UPS) for Emergency telephone voice gateway equipment, for a minimum of 3 hours	Yes	No
Pre-configured Combined Equipment Cabinets (CECs)	No	Yes
Populated power supply cabinets, i.e. termination pillars (TP), distribution units (TEDP) and combined termination pillars and traffic equipment distribution pillars (TP/TEDPs)	Yes	No

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APPENDIX B

THIS IS APPENDIX B TO PART 3 OF THE NEW WORKS REQUIREMENTS

PASSIVE NETWORK SPARES TO BE PROVIDED BY THE COMPANY

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APPENDIX B

PASSIVE NETWORK SPARES TO BE PROVIDED BY COMPANY

- A. One 1100 metre length of 30 pair copper communication cables to the requirements of Section 5.2.5.2;
- B. One 2000 metre length of 24 fibre cores to the requirements of Section 5.2.5.2;
- C. One of each type of cabinet used in the New Works where not supplied as TSIE. Cabinets shall include appropriate power distribution units and environmental control equipment.

Note 1: The Company shall deliver the spares, A – C inclusive, to Transport Scotland's TSIE Nominated Stores

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APPENDIX C

THIS IS APPENDIX C TO PART 3 OF THE NEW WORKS REQUIREMENTS

GANTRY SITE AND ACTIVE EQUIPMENT LOCATIONS

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APPENDIX C

GANTRY SITE AND ACTIVE EQUIPMENT LOCATIONS

Road + Direction	Contract Chainage (See Note 1)	Transport Scotland Chainage	Future Mock Compliance Site	Future Live Compliance Site	LCU	ALM	MS4 VMS	Standalone MS4VMS	MAC	CCTV	JT type A	JT type B	CEC 2 Bay	WM	Data Service Site
m8 eb on	130	6434							X						
m8 eb	370	6410					X								
m8 eb G01	570	6390	X		X		X				X				
m8 eb G02	1020	6345	X	X	X	X									
m8 eb G03	1340	6313	X	X	X	X									
m8 eb off	1340	6313			X										
m8 eb G04	1970	6250	X	X	X	X									
m8 eb G05	2200	6227	X		X	X			X	X	X				
m8 eb	2300	6217													X
m8 eb off	2300	6217													X
m8 eb G06	2700	6177	X		X	X					X				
m8 eb	-260	6116							X						
m8 w b G07	-245	6114	X		X	X			X						
m8 w b	0	6090							X						
m8 w b	80	6084							X						
m8 w b	425	6047							X						
m8 w b G08	600	6030	X		X	X				X					
m8 w b off	600	6030			X										
m8 w b G09	1190	5971	X		X	X			X		X				
m8 w b G10	1990	5891	X		X	X									
m8 w b	2550	5835							X						X
m8 eb	2550	5835													X
m8 w b G11	2795	5810	X		X	X									
m8 w b	4000	5690													X
m8 eb	4000	5690													X
m8 eb	4100	5680					X								
m8 w b	4350	5655							X						
m8 w b	5600	5530					X	X							
m8 eb	6500	5440													X
m8 eb off	6500	5440													X
m8 w b	6500	5440													X
m8 w b off	6500	5440													X
m8 w b	6920	5398					X	X		X					
m8 eb	8000	5290													X
m8 eb off	8000	5290													X
m8 w b	8040	5286													X
m8 w b off	8040	5286													X
m8 eb	8270	5263					X								
m8 eb	8325	5257							X						
m8 w b	9500	5140							X						
m8 w b	10500	5040							X						
m8 eb	10570	5033							X						
m8 w b	11500	4940							X						
m8 eb	12050	4885					X								
m8 w b	12050	4885					X								
m73 sb G21	1630	1441	X		X	X									
m73 nb	1120	1390					X								
m73 sb G22	830	1361	X		X	X									
m73 nb	1278														X
m73 nb on	1278														X
m73 sb G23	1278		X		X	X									X
m73 sb off	1278				X										X
m73 sb on	1880	1221					X								
m73 nb G24	1680	1201	X		X	X									
m73 nb off G24	1680	1201			X										
m73 sb	1500	1183							X						
m73 nb off G26	1380	1171	X		X	X	X								
m73 nb G26	1380	1171			X										
m73 sb on G25	1380	1171	X		X	X	X								
m73 sb G25	1380	1171			X										
m73 sb	1100	1143					X								
m73 nb G27	890	1122	X	X	X	X									
m73 sb G28	690	1102	X	X	X	X									X
m73 nb	600	1093					X	X							X
m73 sb G29	290	1062	X		X	X	X			X	X				
m73 sb off	290	1062			X					X	X				
m73 nb G30	220	1055	X	X	X	X				X	X				

Road + Direction	Contract Chainage (See Note 1)	Transport Scotland Chainage	Future Mock Compliance Site	Future Live Compliance Site	LCU	ALM	MS4 VMS	Standalone MS4VMS	MAC	CCTV	JT type A	JT type B	CEC 2 Bay	WM	Data Service Site
m74 sb on	10080	1549													
m74 nb G51	9780	1579	X		X	X				X					
m74 nb off	9780	1579			X										
m74 sb	9350	1622								X					
m74 sb G52	9340	1623	X		X	X	X								
m74 nb G53	9140	1643	X	X	X	X									
m74 nb off	9140	1643			X										
m74 sb	8810	1676									X				
m74 nb G54	8250	1732	X	X	X	X									
m74 sb G55	8250	1732	X		X		X								
m74 nb	7800	1777													X
m74 sb	7800	1777													X
m74 sb G56	7450	1812	X	X	X	X									
m74 nb G57	7450	1812	X	X	X	X				X	X	X			
m74 sb G31	6970	1860	X	X	X	X									
m74 sb G32	6730	1884	X	X	X	X									
m74 sb off	6730	1884			X										
m74 sb G33	6520	1905	X		X	X									
m74 nb on	6410	1916								X					
m74 sb on	6350	1922								X					
m74 nb	6340	1923									X				
m74 sb G34	6280	1929	X		X	X						X	X		
m74 sb off	6280	1929			X							X	X		
m74 nb G39	5840	1973	X		X	X									
m74 m73 nb G35	5800	1977	X		X	X									
m74 nb	5590	1998									X				
m74 nb off G36	5410	2016	X		X	X									
m74 nb G37	4910	2066	X		X	X									
m74 nb off G37	4910	2066			X										
m74 nb G38	4630	2094	X	X	X	X									
m74 sb	4320	2125					X	X							
m74 nb	4050	2152									X				X
m74 sb	4050	2152													X
m74 nb G40	3920	2165	X	X	X	X									
m74 sb	3280	2229									X				X
m74 nb	3280	2229													X
m74 nb G42	3100	2247	X	X	X	X									
m74 sb	1900	2367					X								
m74 nb	1900	2367					X								
m74 nb	1600	2397									X				
m74 sb	1330	2424													X
m74 sb off	1330	2424													X
m74 nb	1300	2427													X
m74 nb on	1300	2427													X
m74 sb on	650	2492													X
m74 nb off	650	2492													X
m74 sb	500	2507													X
m74 nb	500	2507													X
m74 sb	0	2557									X				
m74 sb	-280	2585									X				
m74 sb	-1000	2657													X
a725 nb	-520							X	X						X
a725 sb	-520														X
a725 sb	300									X					X
a725 sb on	300														X
a725 nb	300														X
a725 nb off	300														X
a725 nb	650									X					
a725 nb	760										X				
a725 nb on	1000														X
a725 sb off	1000														X
a725 sb	1700							X	X						X
a725 nb	1700														X
b7071 nb	100														X
b7071 sb	100														X

Note 1: All Chainages are approximate – exact location to be determined by the Company in accordance with the provisions of the Agreement.

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APPENDIX D: NOT USED

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APPENDIX E

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STRATEGY OF ITS NEW WORKS FOR TRAFFIC SCOTLAND EQUIPMENT DOCUMENT

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APPENDIX E

STRATEGY OF ITS NEW WORKS FOR TRAFFIC SCOTLAND EQUIPMENT DOCUMENT

To demonstrate to Transport Scotland the Company's understanding of the Company's potential impact to the Traffic Scotland Service and its obligations, the Company shall prepare a "Strategy for Delivery of the ITS works for Traffic Scotland Equipment" document that identifies and captures all obligations within the Agreement. The Company shall consult and comply with the requirements of Transport Scotland when developing this document.

The Scope of the Strategy for Delivery of the ITS works for Traffic Scotland Equipment document shall include but not be limited to the following:

- (a) Company's proposals and approach for the ITS works;
- (b) An overview of the obligations that the Company shall undertake associated with TSE;
- (c) Who is involved in the Company's ITS delivery team and the role/obligation they shall undertake;
- (d) Curriculum vitae for the Company's following key staff that shall be engaged to undertake the roles of:
 - (i) ITS Project Manager;
 - (ii) ITS Design Lead and Design Checker;
 - (iii) ITS Infrastructure implementation Lead;
 - (iv) ITS Testing and Commissioning Lead;
 - (v) Transport Scotland Issued Equipment Controller, and
 - (vi) ITS Liaison person.
- (e) A communications and consultation plan detailing how the Company shall communicate with the:
 - (i) Company's ITS delivery team;
 - (ii) other aspects of the project such, as the Road Connections teams; and
 - (iii) Transport Scotland, the Traffic Scotland Service providers, Glasgow City Council, North Lanarkshire Council and South Lanarkshire Council, Police and other third parties with an interest in the design and delivery of the ITS works.
- (f) A detailed explanation of each of the stages involved in the delivery of the ITS works and at the minimum the Company shall include these stages:
 - (i) how obligations shall be programmed and a high level ITS programme indicating when each of the stages shall take place together with linkages to the overall Construction Programme to highlight the necessary window of opportunity to complete ITS works prior to opening the Site Road;
 - (ii) a separate section detailing how the Company shall ensure the delivery of an operational Traffic Scotland Service utilising the TSE that shall be available when the Site Road is to be open to Users;
 - (iii) how the TSE documentation and all records shall be structured, prepared and populated on an ongoing basis from pre investigation stage through to handover and final document and records submission in accordance with the Contract;
 - (iv) investigations to be undertaken prior to commencing the Design;

- (v) approach to the design and checking (all aspects including cable diversion, equipment relocation) with emphasis on how the design supports the objectives of the Traffic Scotland Service and the minimisation of risk to Traffic Scotland Maintenance operatives and the road User;
- (vi) procedure for ordering and recording the current status of Transport Scotland Issued Equipment and confirmation of what equipment the Company shall provide;
- (vii) details of procedures and safeguards that will be implemented to ensure the continuous capability of Transport Scotland to provide the Traffic Scotland Service. Details shall include the impact on the existing Traffic Scotland Service and TSE and details of the sequence of diversions, relocations and removals that shall take place Details of how the cable damage and TSE damage reporting will take place and how attend to damage and repair times shall be complied with;
- (viii) construction and installation of TSE works on the roads including self auditing;
- (ix) how TSE installation into the TSE cabinets and termination of roadside cables shall be undertaken;
- (x) procedure for local commission and testing without any connection to the existing Traffic Scotland system to prove that all TSE forming part of the New Works is operational;
- (xi) procedure for commissioning and testing on the live Traffic Scotland System;
- (xii) procedure for all other testing works, and
- (xiii) procedure for undertaking of remedial works;
- (g) Tthe Company's understanding of Transport Scotland's obligations in regard to Traffic Scotland Service; and
- (h) The Company's proposals demonstrating how the energy requirements for the TSE can initially be minimised through the design and secondly be provided through sustainable energy sources.
- (i) The Strategy for Delivery of the ITS works for Traffic Scotland Equipment document shall have a number of audiences and purposes and the Company shall include consideration of these audience and purposes during the preparation o the document. These audiences and main purposes are:
- (j) Transport Scotland – to gain confidence that the Company understands the obligations and that the approach taken is appropriate;
- (k) Traffic Scotland Service providers so they understand what is happening and when so they can plan for additional responsibilities, and
- (l) Company's teams so that they understand what is happening and realise that there has to be a window of opportunity for the Company's ITS team to gain access to the Site to ensure an uninterrupted operational Traffic Scotland Service during the New Works and immediately prior to the road opening.

APPENDIX F

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TRAFFIC SCOTLAND SERVICE

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APPENDIX F TRAFFIC SCOTLAND SERVICE

The national Traffic Scotland Service was established by the Scottish Ministers to support the delivery of the Government's purpose of sustainable economic growth. In this regard the specific objectives of Traffic Scotland Service are to:

- (a) Improve journey time reliability;
- (b) Reduce disruption caused by incidents, roadworks and events;
- (c) Minimise the effects of congestion by the provision of alternative route advice;
- (d) Allow travellers to make informed decisions concerning route, time, and means of transport by the provision of credible and accurate travel information,;and
- (e) Improve safety and security for travellers.

The management of the Traffic Scotland Service is undertaken by Transport Scotland's Network Operations team who form part of Transport Scotland's Trunk Road Network Management Directorate. The Traffic Scotland Service is delivered through the Traffic Scotland Operator (TSOp) on behalf of Transport Scotland.

The Traffic Scotland Operator and Infrastructure Services Contractor ("**TSOISC**") carries out its operational duties from the TSCC for Transport Scotland's Trunk Road and Bus Operations Directorate 24 hours a day, 7 days a week.

Transport Scotland renews Traffic Scotland Service providers' contracts at predefined periods, as a consequence these providers may change prior to and during the Contract. Transport Scotland's current providers in regard to Traffic Scotland Service and TSE are:

- (a) TSOISC – this provider undertakes the operations and data service related to the Traffic Scotland service together with the maintenance, renewal, and provision of TSE;
- (b) Traffic Scotland Systems Contract ("**TSSC**") - this provider maintains and develops the software and associated instation hardware of the Traffic Scotland systems, in addition this provider is the design authority with respect to the IP communitations and infrastructure; and
- (c) Supplier of sign and signalling equipment.

From early 2013 the TSCC will be located just outside of Edinburgh adjacent to the Forth Road Bridge in a newly constructed building.

Transport Scotland continues to incrementally upgrade the existing TSE to Internet Protocol (IP) communications and modify the Traffic Scotland Instation/software. The Company shall be required to protect and integrate with Transport Scotland's TSE.

More information about the Traffic Scotland Service can be found at www.trafficscotland.org.uk.

