
TII492 Intelligent Transport Systems (ITS) - Equipment Supply and Installation Framework - Generation 2 - Lot 4

Volume A: Works Requirements

Part 2: Works Specification

June 26

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Scope of Works

The scope of the Works includes all obligations and deliverables specified in the Works Requirements and the Framework Agreement. Framework agreements shall include the supply, or the supply and installation of ITS Equipment - Lot 4.

Preamble to the Specification

The Specification referred to in the Contract shall be the Specification for Works (SPW) in TII Publications (Standards) published by TII as a collective group of documents under the Construction and Commissioning activity within the online TII Publications system (<http://www.tiipublications.ie/>), current on the date 10 working days prior to the tender returns date or, if applicable, the extended tender returns date and incorporating all amendments current on that date and as extended by the following:-

- a) Appendix 0/1: Contract-specific Additional, Substitute and Cancelled Clauses, Tables and Figures;
- b) Appendix 0/2: Contract-specific minor alterations to existing Clauses, Tables and Figures;
- c) The Numbered Appendices listed in Appendix 0/3;
- d) Appendix 0/4 containing a list of the drawings referred to in the Specification.

An Additional Clause as indicated by a suffix 'AR' in Appendix 0/1 is a Contract-specific alteration.

A Substitute Clause as indicated by a suffix 'SR' in Appendix 0/1 is a Contract-specific alteration.

A Cancelled Clause indicated by a suffix 'CR' in Appendix 0/1 is a Contract-specific alteration.

Insofar as any of the Numbered Appendices may conflict or be inconsistent with any provision of the SPW the Numbered Appendices shall always prevail.

Any reference in the Contract to a part of the SPW or Appendix shall be deemed to refer to the corresponding Substitute part of the SPW or Appendix listed in Appendix 0/1 or 0/2.

Where a part of the SPW is altered, any original Table/Figure referred to in the part of the SPW shall apply unless the Table/Figure is also altered. Where a Table/Figure is altered, any reference in a part of the SPW to the original Table/Figure shall apply to the altered Table/Figure.

Where a part of the SPW relates to work goods or materials that are not required for the Works it shall be deemed not to apply.

Any Appendix referred to in the SPW that is not used shall be deemed not to apply.

References in the SPW to "NRA Road Construction Details" shall be taken to refer to Standard Construction Details (SCD) in TII Publications (Standards) published by TII as a collective group of documents under the Construction and Commissioning activity within the online TII Publications system (<http://www.tiipublications.ie/>), current on the date 10 working days prior to the tender returns date or, if applicable, the extended tender returns date.

Text shown in grey highlight applies only to Contracts where the applicable Conditions of Contract is either the Public Works Contract for Civil Engineering Works Designed by the Employer, the Public Works Contract for Minor Building and Civil Engineering Works Designed by the Employer.

Text shown in square brackets immediately following text shown in grey highlight, if any, is deemed to replace the text in grey highlight for Contracts where the applicable Conditions of Contract is the Public Works Contract for Civil Engineering Work Designed by the Contractor.

Throughout the SPW and Appendices to the SPW, the following interpretations shall apply:

- "Base Course" shall mean "Binder Course".
- "Roadbase" shall mean "Base".
- "Wearing Course" shall mean "Surface Course".
- "UK Department of Transport" shall mean "Highways England".

Appendix 0/1: Contract-Specific Additional, Substitute and Cancelled Clauses and Tables and Figures included in the Contract

List of Additional Clauses, Tables and Figures

Clause/Table/ Figure Number	Title	Written on Page Number following
Clauses		
116.6AR	Privately and Publicly Owned Services or Supplies	5
116.7AR	Privately and Publicly Owned Services or Supplies	5
116.8AR	Privately and Publicly Owned Services or Supplies	5
116.9AR	Support of Existing Structures and Services	5
116.13AR	Transport Infrastructure Ireland	6
124.10AR	Substances Hazardous to Health	6
170AR	Protection of Water Quality	6
170.1AR	Protection of Water Quality	6
171AR	Works by other Contractors	6
171.1AR	Works by other Contractors	6
172AR	Records	6
172.1AR	As Built Record Drawings	6
172.2AR	Condition Surveys (Dilapidation Surveys)	6
172.3AR	Manufacturer's Instructions, Catalogues	7
174AR	Independent Check Certificate for Temporary Works	7
174.1AR	Independent Check Certificate for Temporary Works	7
177AR	Environmental Management	8
177.1AR	Environmental Management	8
178AR	Waste Management	8
178.1AR	Waste Management Plan and Records	8
178.2AR	Disposal of Surplus Soil and Demolition Rubble	8
571AR	Lowering or Raising of Existing Service Ducts or Cables	8
571.1AR	General	8
1536AR	Technology Installation Competency	8
1536.1AR	Technology Installation Competency - General Requirements	8
1537AR	Dimensional Survey	9
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1901.6AR	Protection of Steelwork against Corrosion – Introduction	10

Clause/Table/ Figure Number	Title	Written on Page Number following
1221.1 AR	School Warning Sign	11
1222.1 AR	Periodic Time Based School Warning Sign (PTBS)	13
1223.1 AR	Speed Detector	15
Tables		
Table 0/1AR	Abbreviations	16
Table 0/2AR	Definitions, Symbols and Abbreviations specific to Clause 006	16
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Additional Clauses, Tables and Figures

Clause No.	Title and written text
116.6AR	<p>Privately and Publicly Owned Services or Supplies <i>Gas Networks Ireland Pipelines</i></p> <p>Where excavation or construction work is to be carried out in the vicinity of Gas Networks Ireland Pipelines, the Contractor shall apply, at least two weeks in advance of the works, for a Permit under the Gas Networks Ireland Permit to Work/Excavation Permit system. All works in the vicinity of Gas Networks Ireland Distribution Pipelines are to be carried out in accordance with the requirements of Gas Networks Ireland. Reference to Bord Gáis, Bord Gáis Networks, Bord Gáis Éireann and Bord Gáis Éireann Distribution shall be deemed to refer to Gas Networks Ireland.</p>
116.7AR	<p>Privately and Publicly Owned Services or Supplies <i>Utilities/Services</i></p> <p>Before commencing any excavation, the Contractor shall notify and liaise with all relevant stakeholders including, Local Authority, Utility Companies, Uisce Éireann (formerly Irish Water), Gas Company, etc. so that all available information regarding the location of underground services and working restrictions imposed by same is ascertained prior to such excavation. The Contractor shall pay all fees associated with the requirement of these authorities to be on site during the excavation works. It is the responsibility of the Contractor to satisfy itself of the accuracy of available records and to bear any costs associated with doing so.</p>
116.8AR	<p>Privately and Publicly Owned Services or Supplies <i>Underground Utilities/Services</i></p> <p>The Contractor shall consult the responsible authorities and utility providers before commencing excavation about the position and type of underground service, including all drainage and water mains likely to be encountered. It is the Contractors responsibility to accurately locate all services on site. For the purposes of this Clause the Contractor shall provide in his initial Contract Sum for pipe and cable detection equipment for his own use on site. Electricity cables must be located using cable detection equipment and the Contractor shall not assume cables are located at a minimum depth.</p>
116.9AR	<p>Support of Existing Structures and Services <i>Utilities/Services</i></p> <p>The Contractor shall be responsible for maintaining all sewers, drains, pipes, gas mains, cables, other services and structures encountered in excavations and during the works. All services shall be temporarily supported or diverted by the Contractor</p>

Clause No.	Title and written text
	during the construction of the Works and subsequently shall be amended, altered or remade to the reasonable satisfaction of the Employer's Representative and the person, company or authority in whom they are vested.
116.13AR	<p>Transport Infrastructure Ireland</p> <p>Transport Infrastructure Ireland (TII) is the name of the agency that has replaced the National Roads Authority (NRA).</p>
124.10AR	<p>Substances Hazardous to Health</p> <p>For specific requirements or restrictions and measures to be taken and monitoring refer to 120.</p>
170AR	<p>Protection of Water Quality</p>
170.1AR	<p><i>Protection of Water Quality</i></p> <p>The Contractor shall undertake the Works in such a manner as to avoid degradation of water courses and sea water quality either by pollution from oil spills, or contamination due to concreting or grouting operations, or by causing turbidity due to disturbance of silt or spoil from operations.</p> <p>Specific measures to be taken to prevent the above shall include the following:</p> <ul style="list-style-type: none"> • Contractor's plant, equipment etc. shall be free of any mechanical defects and be well maintained so as to prevent soil or fuel leaks into the adjacent lagoon. • The Contractor shall so arrange that the cleaning out of concrete delivery trucks and equipment does not cause run-off to enter local watercourses. • Special care shall be taken with respect to the use, application and storage of waterproofing materials and paint coatings throughout the Works. The Contractor's method statement should make specific reference to measures for the protection of water quality. • Measures to ensure no spillage of fuel or cement based material or any other leakages occur to local watercourses for the duration of the Works.
171AR	<p>Works by other Contractors</p>
171.1AR	<p>Works by other Contractors</p> <p>Works to be undertaken by "Other Contractors" are outlined in 126.</p> <p>During the progress of the Works, the Contractor shall liaise with and take measures required by the other contractors, for the support and full protection of the Works undertaken by the other contractor.</p> <p>The Contractor shall include for the programming consequences of such activities of these Contractors in its programme to the satisfaction of the Employer's Representative.</p>
172AR	<p>Records</p>
172.1AR	<p>As Built Record Drawings</p> <p>The Contractor shall be required to submit as built records drawings in accordance with the requirements detailed in 128.</p>
172.2AR	<p>Condition Surveys (Dilapidation Surveys)</p> <p>The Contractor shall carry out a condition survey of the road surface, prior to any work that will affect it. The survey shall be carried out by prior arrangement with both</p>

Clause No.	Title and written text
	<p>the Local Authority and the Road Authority and at a time agreed by same but shall be in advance of works.</p> <p>The survey shall be carried out by a Chartered Surveyor or Chartered Engineer who shall be employed by independent consulting engineers, who will be retained and paid by the Contractor. The survey shall include a description of all existing defects together with photographs. The surveys shall be carried out two weeks prior to any work that will affect the road surface. Two copies of the survey reports shall be submitted to the Employer and two copies to the Employer's Representative. A further copy shall be retained by the Contractor.</p> <p>The survey record shall record the condition of the existing road surface and shall include the following:</p> <ol style="list-style-type: none"> 1. Description of the road surface and general condition of all defects recorded 2. Length and width of all cracking 3. Condition of adjacent pavements 4. Comments on condition from the Chartered Surveyor or Chartered Engineer <p>Within two weeks after completing work affecting the existing road surface the Contractor shall repeat items 1 to 4 above and issue two copies of the report to the Employer's Representative.</p>
172.3AR	<p>Manufacturer's Instructions, Catalogues</p> <p>The Contractor shall supply to the Employer's Representative the following items, prior to incorporation into the Works;</p> <p>Details of all proprietary current manufacturer's instructions and explanatory brochures to be used in the Works.</p> <p>Test results and certificates for all items and investigations whether the tests or investigations are carried out on Site or off Site.</p> <p>Operating instruction for items.</p> <p>References for all materials and processes used in the Works. References shall include origin, comprehensive description, manufacturer, supplier, copies of relevant parts of standards and specification and any other information necessary to reproduce the item.</p>
174AR	<p>Independent Check Certificate for Temporary Works</p>
174.1AR	<p><i>Independent Check Certificate for Temporary Works</i></p> <p>The Contractor shall provide independent check certificates for significant elements of temporary works.</p> <p>The checking organisation shall be independent of the temporary works design organisation. The check shall be carried out by a Chartered Engineer with relevant experience. The checker may not make reference to the temporary works designer's calculations in order to fulfil his/her duties.</p> <p>The following elements of work require independent check certification:</p> <ol style="list-style-type: none"> (i) Temporary Electrical Works; (ii) Signage Erection; (iii) Any other elements considered necessary by the Contractor. (iv) A pro forma of the Independent Check Certificate for Temporary Works is given in 132.

Clause No.	Title and written text
	Independent Check Certificates shall be submitted to the Employer's Representative a minimum of four weeks in advance of execution of the associated temporary works.
177AR	Environmental Management
177.1AR	<i>Environmental Management</i> Environmental Management shall be undertaken by the Contractor in accordance with 133.
178AR	Waste Management
178.1AR	Waste Management Plan and Records All waste material arising from the Works shall be dealt with in compliance with the relevant legislation and regulations including the Waste Management Acts, 1996–2024, the Environmental Protection Agency Acts, 1992–2024, Planning and Development Acts, 2000–2024, The Roads Acts, 1993–2024 and European Communities (Waste Directive) Regulations 2025, also known as S.I. No. 166/2025, each as amended and supplemented and in force for the duration of the Works and the Contractor shall be deemed to have provided for and allowed for all costs associated with lawfully dealing with waste material in the Tender Sum.
178.1AR - continued	Appropriate site management control shall be demonstrated at all times to minimise the potential for pollution of the environment For the avoidance of doubt the Contractor shall prepare, and comply with the provisions of, a Waste Management Plan for the project as detailed in the guidelines contained in the TII Publication "GE- ENV-01101 - The Management of Waste from National Road Construction Projects". The Contractor shall submit a Waste Management Plan to the Employer's Representative a minimum period of 2 weeks in advance of any works commencing on the site. The Contractor shall maintain detailed records and receipts for all movements of waste materials from the site, for inspection by the Employer's Representative.
178.2AR	Disposal of Surplus Soil and Demolition Rubble The materials to be disposed off site are classified as "wastes" and are subject to the provisions of the "Waste Management Act" 1996. The facilities at which such materials are discarded must have a waste licence from the EPA or where the EPA decides, must have a waste permit from the Local Authority.
571AR	Lowering or Raising of Existing Service Ducts or Cables
571.1AR	General Lowering or raising of existing services shall include for hand digging around the ducts and the undermining of the ducts to attain the level of cover required in the Contract. Temporary support to the relevant utility company's apparatus may be required. The Contractor shall liaise with all relevant utility companies during the works, provide any temporary supports and make good any damage caused to the ducts or cables.
1536AR	Technology Installation Competency
1536.1AR	Technology Installation Competency - General Requirements The Contractor shall be prepared to demonstrate to the satisfaction of the Employer's Representative, in advance of commencing the installation of

Clause No.	Title and written text
	<p>equipment, the competency of the Contractor's Personnel to carry out the connection, installation, testing and commissioning of each of the following:</p> <p>i. Advance Matrix Indicator (AMI);</p> <ul style="list-style-type: none"> i. Variable Message Sign – Pictogram ii. Variable Message Sign – Text; iii. Automatic Number Plate Recognition (ANPR); iv. Surveillance Closed Circuit Television (CCTV); v. Automatic Incident Detection (AID); vi. Communications Infrastructure; and vii. Power Infrastructure; <p>For this purpose, the Contractor shall submit to the Employer's Representative at least 2 weeks in advance of incorporating into the Works the following:</p> <p>i. The Contractor's personnel proposed to carry out the Works. The details shall include:</p> <ul style="list-style-type: none"> • Names, addresses (work and email) and contact numbers (mobile and landline); • Details of experience, training and education that demonstrate their competence to carry out the Works; • Training provided to the Contractor's Personnel to undertake their roles; • Health & Safety training; <p>ii. The Contractor's Personnel' levels of electrical competence for dealing with the following (where appropriate):</p> <ul style="list-style-type: none"> • Exposure to the risk of electric shock during installation or other duties; or • Making electrical circuits "dead' for the purpose of others working on the equipment <p>The level of competence required for any person to carry out work on electrically energised equipment shall always be in accordance with safe working practices and in accordance with the current editions of the following Standards:</p> <ul style="list-style-type: none"> • IS 10101 National Rules for Electrical Installations, 2020 by NSAI • The Safety, Health and Welfare at Work (General Application) Regulations 2023; • Current ESB Regulations, Codes of Practice and Guidelines including ESB National Code of Practice for Customer Interface 2025 <p>Only Contractor's Personnel, whose details have been submitted by the Contractor to the satisfaction of the Employer's Representative and have completed inductions with all relevant Third Parties, shall carry out the duties defined in this Contract.</p>
1537AR	Dimensional Survey
1537.1AR	<p>Dimensional Survey – General Requirements</p> <p>Where equipment is to be installed or mounted onto existing gantry structures or infrastructure provided by others as part of the Works, the Contractor shall carry out a dimensional survey prior to the production or procurement of equipment to ensure that proposed equipment and mounting arrangement are compatible with the existing mounting infrastructure.</p>

Clause No.	Title and written text
	<p>The Contractor shall take into account measurements obtained during the dimensional survey in development of proposed equipment mounting arrangement and brackets where equipment is to be installed on existing infrastructure.</p> <p>A unique referencing system shall be applied by the Contractor to relate individual frame assemblies to proposed equipment. The Contractor shall submit results of this dimensional survey to the Employer's Representative for review 2 weeks in advance of the production or procurement of equipment.</p> <p>A full dimensional survey shall be carried out on each structure where equipment is to be installed and shall take into account but not limited to the following elements:</p> <ul style="list-style-type: none"> • VMS-P signage frames and closing off plate; • VMS-T signage frames and closing off plate; • AMI signage frames and closing off plate; • SRS AMI; • CCTV; • ANPR; • RSU; • OBU; • CMU; • Equipment Cabinet base mounting arrangement; and • Gantry cable management system on existing gantries.
<p>1901.6AR</p>	<p>Protection of Steelwork against Corrosion – Introduction</p> <p>Corrosion protection of steelwork shall be undertaken by a Contractor certified to EN ISO 9001:2015 for quality management related to the application of corrosion protection systems to structural steelwork. The Contractor shall submit to the Employer's Representative a Quality Plan. The Quality Plan shall include the following items as a minimum.</p> <ol style="list-style-type: none"> 1. General Requirements <ol style="list-style-type: none"> 1.1. Definition of the product to be provided. 1.2. The Organisation's management strategy for undertaking corrosion protection works, including clear and sustainable performance objectives. 1.3. The structure of the Organisation describing delegated responsibilities, the line of command and stating the name of the Organisation's Manager responsible for the contracted work. 1.4. Identification of the relevant parts of the Organisation's documented quality system relevant to the product or service being provided.* 1.5. The processes for the selection of staff.* 1.6. The control, maintenance and selection of equipment. 1.7. The processes for communications between Customer and Organisation. 2. Contract Specific Information <ol style="list-style-type: none"> 2.1. Name and contact details of Customer and/or Client contact(s). 2.2. Details of the communications required between the Organisation's staff and the Customer/Client or any other party including liaison with An Garda Síochána, the TII appointed Road Operator, Transport Infrastructure Ireland and other organizations or individuals as appropriate. 2.3. Work programme and details of deliverables including risk assessments method statements.

Clause No.	Title and written text
	<p>2.4. Storage, handling, application and disposal of corrosion protection materials.</p> <p>2.5. Details and control of quality records, including receipt, examination and submission to Client and Customer of certificates of registration, test results, sample retention and origins of materials used.</p> <p>2.6. Control of non-conforming product.*</p> <p>2.7. The maximum number of people that a Foreperson shall control at any one time.</p> <p>2.8. *Copies of the Organisation’s general procedures covering these items shall be made available for examination by the Employer’s Representative and copies are to be provided when requested.</p>
<p>1221.1 AR</p>	<p>School Warning Sign Each School Warning Sign shall conform to the following specification.</p> <p>Housing</p> <p>a) Dimensions: The minimum housing dimensions shall be 900mm wide and 1150mm tall, it shall be deep enough to contain all the necessary hardware.</p> <p>b) Materials: Materials used for housing and front panels shall be resistant to corrosion in accordance with EN 12899-1:2007, 5.3.5 and shall conform to the European Standard for the appropriate material where it exists. Manufacturers using materials not covered by European Standards shall demonstrate the durability of the material by reference to an appropriate European Technical assessment.</p> <p>c) Maintenance: The manufacturer shall ensure that all maintenance activities required on the sign can be easily carried out. All signs shall have all necessary fixing points installed to carry out all necessary maintenance of the sign and additional devices attached to the sign support. All parts of the sign shall be securely connected to the Sign Housing. Each sign enclosure shall be lockable.</p> <p>d) Marking and Labelling All Sign enclosures shall be clearly, durably and visibly marked with the following information;</p> <ol style="list-style-type: none"> 1. Name or identifying mark of the manufacturer; 2. Name and registered address of the manufacturer; 3. Product name and characteristics; 4. Electrical and physical ratings for the connection the supplies e.g. rated or ranged voltage, current, frequency and wattage; <ul style="list-style-type: none"> • Year of manufacture. <p>e) Protection - The sign enclosure shall be suitably IP rated for the environment in which it will be operating.</p> <p>Sign material The sign background shall be Grey. The sign face “W 141: School Ahead, TSM December 2024” shall be 600mm in size and shall be manufactured from Engineering Grade Material.</p>

Flashing Amber Signals (Lantern's)

2 No. 200mm diameter flashing amber signals shall be installed in the housing. The Optical requirements of the Flashing Amber Signals shall conform to EN 12966:2014+A1:2018.

Color Chromaticity (Yellow C2)

Luminance L2

Luminance Ratio R2

Beam Width B5

Minimum number of Pixels = 150

When switched on the Lantern's shall flash intermittently at a speed of between 60 and 80 flashes per minute, it should be possible to remotely change the flash frequency of the lanterns.

Power Requirements

Each sign shall be capable of being readily converted from Main's to Solar or from Solar to Mains. Power supply to mains powered signs is standard single phase 220/240V AC.

Battery and Solar Panels

The batteries and solar panels shall be adequately specified and sized to ensure that the School Warning signs can communicate at least once per day with the ATMS Server, the Flashing Lanterns can be activated for at least 5 number 20 minute periods per day for a total of 30 school days without charging from the solar panel, at all other times the sign is in sleep mode. The solar panel shall be adequately specified and sized to ensure that it can in normal operating conditions maintain the sign and charge the battery.

Clips, Brackets and Cables

All clips, brackets and cables necessary for the installation of the sign and ancillary devices onto existing sign supports or new sign supports shall be provided and shall include anti-theft devices. All cables shall be contained within the sign, where it is not possible to contain the cables within the sign enclosure, they shall be suitable protected to ensure they cannot be tampered with.

Sign Interface Device

The Sign Interface device is responsible for the overall control of the display and gathering and reporting statistics to the ATMS Server situated in the MOCC, or alternative server.

Communications Device

Each sign shall include a communications device which can communicate with the TII ATMS Server or Servers over either a 4G, 5G or a GPRS network. The device shall allow remote management / communications with all connected devices including, but not limited to, School Sign and Traffic Counter. The device shall be assigned its own unique IP address. The Client shall provide a SIM Card for use in each communications device.

Programming and Fault Reporting

Each sign shall be capable receiving and storing the activation times for the school year.

Each sign shall be capable of contacting the ATMS server or third party server and notifying it of the following faults:-

- LED Failure;
- Lantern Failure;

Clause No.	Title and written text
	<ul style="list-style-type: none"> • Display Driver Failure; • Low Power Voltage (Solar Signs).
1222.1 AR	<p>Periodic Time Based School Warning Sign (PTBS) Each Periodic Time Based School Warning Sign shall conform to the following specification.</p> <p>Housing</p> <p>a) Dimensions The minimum housing dimensions shall be 945 mm wide and 2015 mm tall, it shall be deep enough to contain all the necessary hardware.</p> <p>b) Materials Materials used for housing and front panels shall be resistant to corrosion in accordance with EN 12899-1:2007, 5.3.5 and shall conform to the European Standard for the appropriate material where it exists. Manufacturers using materials not covered by European Standards shall demonstrate the durability of the material by reference to an appropriate European Technical assessment.</p> <p>c) Maintenance The manufacturer shall ensure that all maintenance activities required on the sign can be easily carried out. All signs shall have all necessary fixing points installed to carry out all necessary maintenance of the sign and additional devices attached to the sign support. All parts of the sign shall be securely connected to the Sign Housing. Each sign enclosure shall be lockable.</p> <p>d) Marking and Labelling All Sign enclosures shall be clearly, durably and visibly marked with the following information:</p> <ul style="list-style-type: none"> • Name or identifying mark of the manufacturer; • Name and registered address of the manufacturer; • Product name and characteristics; • Electrical and physical ratings for the connection the supplies e.g. rated or ranged voltage, current, frequency, wattage; and • Year of manufacture. <p>e) Protection The sign enclosure shall be suitably IP rated for the environment in which it will be operating.</p> <p>Sign material The sign background shall be Grey. The sign face “W 141: School Ahead, TSM December 2024” shall be 600mm in size and shall be manufactured from Engineering Grade Material</p> <p>Speed Roundel and Flashing Amber Signals (Lantern’s)</p> <p>a) The Lantern: 2 No. 200mm diameter flashing amber signals shall be installed in the housing. The Optical requirements of the Flashing Amber Signals shall conform to EN 12966-1:2005/PRA1.</p> <p style="text-align: center;">Color Chromaticity (Yellow C2)</p>

Luminance L2
Luminance Ratio R2
Beam Width B3 – B5
Minimum number of Pixels = 150

When switched on the Lantern's shall flash intermittently at a speed of between 60 and 80 flashes per minute, it should be possible to remotely change the flash frequency of the lanterns.

b) The Speed Limit Roundel (Symbol):

The following speed limits are allowed: 50 kph; or 60 kph. The speed limit shall be 600mm "RUS 043 or RUS 042 Speed Limit". When switched on the sign shall stay on until it is switched off. The Optical requirements of the Flashing Amber Signals shall conform to EN 12966-1:2005/PRA1.

Color Circle = RED C2
Chromaticity Text = White C2
Luminance L2
Luminance Ratio R2
Beam Width B5
Minimum number of pixel-rows of Circle = 2
Minimum number of pixel-rows of Speed Limit = 2
Minimum number of pixel-rows of text = 1

Power Requirements

Each sign shall be capable of being readily converted from Main's to Solar or from Solar to Mains. Power requirements within the sign should be low voltage. Power supply to mains powered signs is standard single phase 220/240V AC.

Battery and Solar Panels

The batteries and solar panels shall be adequately specified and sized to ensure that the School Warning signs can communicate at least once per day with the ATMS Server, the Flashing Lanterns can be activated for at least 5 number 20 minute periods per day for a total of 30 school days without charging from the solar panel, at all other times the sign is in sleep mode. The solar panel shall be adequately specified and sized to ensure that it can in normal operating conditions maintain the sign and charge the battery.

Clips, Brackets and Cables

All clips, brackets and cables necessary for the installation of the sign and ancillary devices onto existing sign supports or new sign supports shall be provided and shall include anti-theft devices.

All cables shall be contained within the sign, where it is not possible to contain the cables within the sign enclosure they shall be suitable protected to ensure they cannot be tampered with.

Sign Interface Device

The Sign Interface device is responsible for the overall control of the display and gathering and reporting statistics to the ATMS Server situated in the MOCC.

Clause No.	Title and written text														
	<p>Communications Device</p> <p>Each sign shall include a communications device which can communicate with the TII ATMS Server or alternative Servers, including the Contractors Fault Monitoring System over either a 4G, 5G or a GPRS network. The device shall allow remote management / communications with all connected devices including School Sign, Weather Detector and Traffic Counter. The device shall be assigned its own unique IP address. The Client shall provide a SIM Card for use in each communications device.</p> <p>Programming and Fault Reporting</p> <p>Each sign shall be capable receiving and storing the activation times for the school year. Each sign shall be capable of contacting the ATMS or alternative third party Server and notifying it of the following faults:-</p> <ul style="list-style-type: none"> • LED Failure • Lantern Failure • Symbol Failure • Display Driver Failure • Low Power Voltage (Solar Signs) 														
1223.1 AR	<p>Speed Detector</p> <p>a) Requirements</p> <table border="0"> <tr> <td>Detection</td> <td>Movement, selectable uni- or bidirectional</td> </tr> <tr> <td>Classification</td> <td>General classification of different categories of vehicles – motorcycles, cars, LCV's, HCV's, etc.</td> </tr> <tr> <td>Memory</td> <td>Storing all vehicle movements for a 30-day period</td> </tr> <tr> <td>Interface</td> <td>Interface with the Sign Interface Device, plus further transfer of count data to TII ATMS Server</td> </tr> <tr> <td>Operating Mode</td> <td>Counting – speed, profile, gap, one value per vehicle</td> </tr> <tr> <td>Data Output</td> <td>ASCII, decimal, 1 line per vehicle, delimiter ‘;’</td> </tr> <tr> <td>Housing</td> <td>Suitable to function within the Sign Enclosure</td> </tr> </table> <p>b) Sign Interface with the TII ATMS Server</p> <p>The Speed Detector should be capable of communicating with the TII ATMS Server, using the communications device. Remote management of the Speed Detector from the TII ATMS Server is required.</p> <p>c) Housing</p> <p>The housing should be suitable housing for the environment in which it will be working, all brackets necessary for mounting the Weather Detector to the Sign enclosure or the sign support shall be included.</p> <p>d) Clips, Brackets and Cables</p> <p>All clips, brackets and cables necessary for the installation of the sign and ancillary devices onto existing sign supports or new sign supports shall be provided and shall include anti-theft devices.</p> <p>All cables shall be contained within the sign, where it is not possible to contain the cables within the sign enclosure, they shall be suitable protected to ensure they cannot be tampered with.</p>	Detection	Movement, selectable uni- or bidirectional	Classification	General classification of different categories of vehicles – motorcycles, cars, LCV's, HCV's, etc.	Memory	Storing all vehicle movements for a 30-day period	Interface	Interface with the Sign Interface Device, plus further transfer of count data to TII ATMS Server	Operating Mode	Counting – speed, profile, gap, one value per vehicle	Data Output	ASCII, decimal, 1 line per vehicle, delimiter ‘;’	Housing	Suitable to function within the Sign Enclosure
Detection	Movement, selectable uni- or bidirectional														
Classification	General classification of different categories of vehicles – motorcycles, cars, LCV's, HCV's, etc.														
Memory	Storing all vehicle movements for a 30-day period														
Interface	Interface with the Sign Interface Device, plus further transfer of count data to TII ATMS Server														
Operating Mode	Counting – speed, profile, gap, one value per vehicle														
Data Output	ASCII, decimal, 1 line per vehicle, delimiter ‘;’														
Housing	Suitable to function within the Sign Enclosure														

Table 0/1 AR: Abbreviations

Not used. A combined table of abbreviations / glossary of terms is included in Volume A – Part 1.

Table 0/2 AR: Definitions, Symbols and Abbreviations specific to Clause 006

Abbreviation	Meaning
AVCP	Assessment and Verification of Constancy of Performance. The method for assessing the conformity of construction products to harmonised technical specifications including the amount of involvement from a notified body.
CPR	Construction Products Regulation
CPD	Construction Products Directive
DoP	Declaration of Performance Information about the performance of the construction product in relation to the essential characteristics contained in harmonised technical specifications.
FPC	Factory production control. The documented, permanent and internal control of production in a factory, in accordance with the relevant harmonised technical specification.
hEN	Harmonised European Standard

Table 0/3 AR: Equivalent terms between CPR and CPD

CPR	CPD
System of Assessment and Verification of Constancy of Performance (AVCP)	System of attestation of conformity
Declaration of Performance (DoP)	Declaration of Conformity
Basic Requirements for Construction Works (BRCW)	Essential Requirements
Essential characteristics	Characteristics
Determination of product type	Initial type-testing

Symbols and abbreviations not covered above shall be as per the applicable European Standard.

List of Substitute Clauses, Tables and Figures

Clause/Table/Figure Number	Title	Written on Page Number following
Not Used		

List of Cancelled Clauses, Table and Figures

Clause/Table/Figure Number	Title	Written on Page Number following
Not Used		

Appendix 0/2: Contract-Specific Minor Alterations to Existing Clauses, Tables and Figures included in the Contract

Table 4: List of Altered Clauses, Table and Figures.

Clause/ Table/Figure Number	Title						
1977.2	Requirements for Bridges, Parapets, Bearings, CCTV Masts, Cantilever Masts, Steel Lighting Columns and Bracket Arms and other Road Structures: Protective Systems. In Table 19/6 within the Type I (M) – High Build Epoxy (two-pack) / Polyurethane (two-pack) finish, delete:						
	<i>Steel</i>	Clean, bright Sa21/2 or St3 quality steel	<i>Item No.</i>	115	116	168	300
	<i>Min dry film thickness per coat (µm)</i>		100		50		
	And replace with:						
<i>Steel</i>	Clean, bright Sa21/2 or St3 quality steel	<i>Item No.</i>	115	115	116	168	425
<i>Min dry film thickness per coat (µm)</i>		125	125	125	50		
117.1	Delete “Guidance for the Control and Management of Traffic at Road Works” and replace with “Chapter 8 of the Traffic Signs Manual”.						
117.8	Delete “Clause 3.6.1” and replace with “Clause 3.5.1”.						
Clause No. 136.1	Delete “The Contractor shall undertake property condition surveys on all buildings and Structures within 50 meters of the extents of the Lands Made Available by the Employer for the Works and where applicable the Lands Made Available by the Contractor for the Works and all other buildings and Structures that the Contractor shall consider appropriate relative to their proximity to the Works” and replace with “Where the nature of the works are such that they have the potential to impact on adjoining property, as agreed with the Employers Representative, the Contractor shall undertake property condition surveys on all buildings and Structures within 50 meters of the extents of the Lands Made Available by the Employer for the Works and where applicable the Lands Made Available by the Contractor for the Works and all other buildings and Structures that the Contractor shall consider appropriate relative to their proximity to the Works”						
Series 1500	Delete “Motorway” And insert “ National Road”						

Appendix 0/3: List of numbered Appendices referred to in the Specification and included in the Contract

1. General

- 1.1. This Appendix 0/3 comprises a list of the Numbered Appendices referred to in the TII Specification for Works and included in this Contract.
- 1.2. Responsibility for the compilation/completion of the appendices is indicated by the following symbols:
- E Employer compiles
 - C Contractor to compile and submit to the Employer's Representative
 - E/C Employer partially compiles and Contractor completes and submits to the Employer's Representative
 - T/C Tenderer compiles and returns with its Tender. Post award of the Contract, the Contractor reviews and submits to the Employer's Representative
 - P The symbol 'P' indicates that the appendix is a national pro-forma and the format must not be altered.

Where a Contractor or Tenderer is required to compile or complete an Appendix, they shall do so in accordance with the Notes for Guidance on the Specification for Works and providing information similar to that stated in the sample appendices as a minimum.

Appendix 0/3 is comprised of two lists, A and B, of Numbered Appendices as follows.

List 'A' is a complete list of the Numbered Appendices referred to in the Specification for Works with those not adopted marked "Not Used". Those identified by the letters 'T' or 'C' shall be compiled by the Tenderer or the Contractor respectively.

List 'B' gives a list of Contract – specific Numbered Appendices devised for this Contract.

List 'A': List of Numbered Appendices Referred to in the Specification for Works

Volume No.	Completed By	Appendix No.	Title
			INTRODUCTION
A – Part 2	E	0/1	Contract-Specific Additional, Substitute and Cancelled Clauses and Tables and Figures included in the Contract
A – Part 2	E	0/2	Contract-specific Minor Alterations to Existing Clauses and Tables included in the Contract. Contract-Specific Minor Alterations to Existing Clauses, Tables and Figures included in the Contract
A – Part 2	E	0/3	List of Numbered Appendices Referred to in the Specification and Included in the Contract
A – Part 2	E	0/4	List of Drawings included in the Contract

Volume No.	Completed By	Appendix No.	Title
			PRELIMINARIES
Not Used	Not Used	1/1	Accommodation and Equipment for the Employer's Representative
Not Used	Not Used	1/2	Vehicles for the Employer's Personnel
Not Used	Not Used	1/3	Communication System for the Employer's Personnel
A – Part 2	E	31	Working and Fabrication Drawings
A – Part 2	E	32	Testing to be carried out by the Contractor
Not Used	Not Used	1/6	Supply and Delivery of Samples to the Employer's Representative
A – Part 2	E	82	Site Extent and Limitations on Use
Not Used	Not Used	1/8	Operatives for the Employer's Representative
A – Part 2	E	86	Control of Noise and Vibration
Not Used	Not Used	1/10	Principal Structures to be Designed by the Contractor
A – Part 2	E	92	Structural Elements and Other Features to be Designed by the Contractor
Not Used	Not Used	1/12	Setting Out and Existing Ground Levels
A – Part 2	E	93	Programme of Works
A – Part 2	E	97	Monthly Statements
Not Used	Not Used	1/15	Accommodation Works
A – Part 2	E	98	Privately and Publicly Owned Services and Supplies
A – Part 2	E	102	Traffic Safety and Management
A – Part 2	E	115	Temporary Diversions for Traffic
A – Part 2	E	117	Routeing of Vehicles
Not Used	Not Used	1/20	Recovery Vehicles for Breakdowns
Not Used	Not Used	1/21	Information Boards
A – Part 2	E	119	Progress Photographs
A – Part 2	E	120	Substances Hazardous to Health
A – Part 2	E	121	Quality Management Schemes
A – Part 2	E	124	Product Certification Schemes
A – Part 2	E	125	NSAI Agrément certificates
			SITE CLEARANCE
A – Part 2	E	2/1	List of Buildings, etc. to be Demolished
Not Used	Not Used	2/2	Filling of Trenches & Pipes
A – Part 2	E	2/3	Retention of Material Arising from Site Clearance
Not Used	Not Used	2/4	Explosives and Blasting
Not Used	Not Used	133	Hazardous Materials

Volume No.	Completed By	Appendix No.	Title
			FENCING AND ENVIRONMENTAL NOISE BARRIERS
Not Used	Not Used	3/1	Fencing, Gates and Stiles
Not Used	Not Used	3/2	Fencing - TII Road Construction Details
			ROAD RESTRAINT SYSTEM (VEHICLE AND PEDESTRIAN)
Not Used	Not Used	4/1	Safety Barriers
Not Used	Not Used	4/2	Pedestrian Restraint Systems
Not Used	Not Used	4/3	Safety Barrier Terminals
Not Used	Not Used	4/4	Safety Barrier Maintenance
Not Used	Not Used	4/5	Anti-Glare Screens
Not Used	Not Used	4/6	Safety Barriers: TII Road Construction Details
Not Used	Not Used	4/7	Vehicle Parapet Systems
			DRAINAGE AND SERVICE DUCTS
Not Used	Not Used	5/1	Drainage Requirements
Not Used	Not Used	5/2	Service Duct Requirements
Not Used	Not Used	5/3	Surface Water Channels and Drainage Channel Blocks
Not Used	Not Used	5/4	Fin Drains and Narrow Filter Drains and Geotextiles for Filter Drains
Not Used	Not Used	5/5	Combined Drainage and Kerb Systems
Not Used	Not Used	5/6	Linear Drainage Channel Systems
Not Used	Not Used	5/7	Drainage and Service Ducts – TII Standard Construction Details
Not Used	Not Used	5/8	Thermoplastics Structural Wall Pipes and Fittings
Not Used	Not Used	5/9	Attenuation
			EARTHWORKS
Not Used	Not Used	6/1	Requirements for Acceptability & Testing of Earthworks Materials
Not Used	Not Used	6/2	Requirements for Dealing with Class U2 Unacceptable Material
Not Used	Not Used	6/3	Requirements for Excavation, Deposition, Compaction (Other than Dynamic Compaction)
Not Used	Not Used	Not Used	Not Used
Not Used	Not Used	6/5	Geotextiles Used to Separate Earthworks Materials
Not Used	Not Used	6/6	Fill to Structures & Fill Above Structural Foundations
Not Used	Not Used	6/7	Sub-Formation, Capping, Preparation & Surface Treatment of Formation
Not Used	Not Used	6/8	Topsoiling, Grass Seeding and Turfing

Volume No.	Completed By	Appendix No.	Title
Not Used	Not Used	6/9	Earthwork Environmental Bunds, Landscape Areas, Screening Mounds, Strengthened Embankments
Not Used	Not Used	6/10	Ground Anchorages, Crib Walling and Gabions
Not Used	Not Used	6/11	Swallow Holes & Other Naturally Occurring Cavities & Disused Mine Workings
Not Used	Not Used	6/12	Instrumentation & Monitoring
Not Used	Not Used	6/13	Ground Improvement
			ROAD PAVEMENTS - GENERAL
Not Used	Not Used	7/1	Permitted Pavement Options
Not Used	Not Used	7/2	Excavation & Reinstatement of Existing Surfaces
Not Used	Not Used	7/3	Surface Dressing Product (End Performance)
Not Used	Not Used	7/4	Bituminous Sprays
Not Used	Not Used	7/5	Road Pavements: TII Standard Construction Details
Not Used	Not Used	7/6	Breaking Up of Perforation of Existing Pavement
Not Used	Not Used	7/7	Surface Treatment
Not Used	Not Used	7/8	Not Used
Not Used	Not Used	7/9	Cold Milling (Planning) of Bituminous Bound Flexible Pavement
Not Used	Not Used	7/10	Microsurfacing
Not Used	Not Used	7/11	High Friction Surfacing
Not Used	Not Used	7/12	Low Energy Bound Mixtures
Not Used	Not Used	7/21	Recipe Surface Dressing
			KERBS, FOOTWAYS AND PAVED AREAS
Not Used	Not Used	11/1	Kerbs, Footways and Paved Areas
Not Used	Not Used	11/2	Access Steps
Not Used	Not Used	11/3	Kerbs, Footways and Paved Areas: TII Road Construction Details
			TRAFFIC SIGNS
Not Used	Not Used	12/1	Traffic Signs: General
Not Used	Not Used	12/2	Traffic Signs: Reflective Markers
Not Used	Not Used	12/3	Traffic Signs: Road Markings & Studs
Not Used	Not Used	12/4	Traffic Signs: Cones, Cylinders, FTD's and Other Traffic Delineators
Not Used	Not Used	136	Traffic Signs: Traffic Signals
Not Used	Not Used	12/6	Traffic Signs: Special Sign Requirements on Gantries
Not Used	Not Used	12/7	Traffic Signs: Preparation and Finish of Metal and Other Surfaces

Volume No.	Completed By	Appendix No.	Title
			ROAD LIGHTING COLUMNS AND BRACKETS
Not Used	Not Used	13/1	Information to be Provided by the Employer's Representative when Specifying Road Lighting Columns & Brackets
Not Used	Not Used	13/2	Column & Bracket Data Sheets 1 & 2
Not Used	Not Used	13/3	Instructions for Completion of Column and Bracket Data Sheets
Not Used	Not Used	13/4	Certification for Lighting Columns
Not Used	Not Used	13/5	Road Lighting Column and Brackets: TII Standard Construction Details
			ELECTRICAL WORK FOR ROAD LIGHTING AND TRAFFIC SIGNS
Not Used	Not Used	14/1	Site Records
Not Used	Not Used	14/2	Location of Lighting Units & Feeder Pillars
Not Used	Not Used	14/3	Temporary Lighting
Not Used	Not Used	14/4	Electrical Equipment for Road Lighting
Not Used	Not Used	14/5	Electrical Equipment for Traffic Signs
Not Used	Not Used	14/6	Preparation and Finish of Metal and Other Surfaces
			MOTORWAY COMMUNICATIONS
Not Used	Not Used	15/1	Motorway Communications
			PILING AND EMBEDDED RETAINING WALLS
Not Used	Not Used	16/1	General Requirements for Piling
Not Used	Not Used	16/2	Precast Reinforced and Prestressed Concrete Piles and Precast Reinforced Concrete Segmental Piles
Not Used	Not Used	16/3	Bored Cast-in-Place Piles
Not Used	Not Used	16/4	Bored Piles Constructed Using Continuous Flight Auger and Concrete or Grout Injection Through Hollow Auger Stems
Not Used	Not Used	16/5	Driven Cast-in-Place Piles
Not Used	Not Used	16/6	Steel Bearing Piles
Not Used	Not Used	16/7	Reduction of Friction on Piles
Not Used	Not Used	16/8	Non-Destructive Methods for Testing Piles
Not Used	Not Used	16/9	Static Load Testing of Piles
Not Used	Not Used	16/10	Diaphragm Walls
Not Used	Not Used	16/11	Hard/Hard Secant Pile Walls
Not Used	Not Used	16/12	Hard/Soft Secant Pile Walls
Not Used	Not Used	16/13	Contiguous Bored Pile Walls
Not Used	Not Used	16/14	King Post Walls

Volume No.	Completed By	Appendix No.	Title
Not Used	Not Used	16/15	Steel Sheet Piles
Not Used	Not Used	16/16	Integrity Testing of Wall Elements
Not Used	Not Used	16/17	Instrumentation for Piles and Embedded Walls
Not Used	Not Used	16/18	Support Fluid
			STRUCTURAL STEELWORK
Not Used	Not Used	18/1	Requirements for Structural Steelwork
			PROTECTION OF STEELWORK AGAINST CORROSION
Not Used	Not Used	19/1	(Specification for Works) Sheet No. Form BE/P1 (New Works) Paint System Sheet
Not Used	Not Used	19/2	Requirements for Other Work
A – Part 2	E	139	(Specification for Road Works) Form BE/P2 Paint Data Sheet
Not Used	Not Used	19/4	(New Works) Form BE/P3 Paint Sample Despatch List: Sheet 1 and Sheet 2
Not Used	Not Used	19/5	(New Works) General Requirements
Not Used	Not Used	19/6*	(Specification for Road Works) Form BE/PE1 (Maintenance) Paint System Sheet 1
Not Used	Not Used	19/6	(Specification for Works) Form BE/P1 (Maintenance) Paint System Sheet 2
Not Used	Not Used	19/7	(Maintenance) Requirements for Other Work
Not Used	Not Used	19/8	(Maintenance) General Requirements
			WATERPROOFING FOR CONCRETE STRUCTURES
Not Used	Not Used	20/1	Form PWS Proprietary Waterproofing System
Not Used	Not Used	20/2	Waterproofing for Concrete Structures
			BRIDGE BEARINGS
Not Used	Not Used	21/1	Bridge Bearing Schedule
			PARAPETS
Not Used	Not Used	22/1	Parapet Schedule
			BRIDGE EXPANSION JOINTS AND SEALING OF GAPS
Not Used	Not Used	23/1	Bridge Deck Expansion Joint Schedule
Not Used	Not Used	23/2	Sealing of Gaps Schedule (other than in Bridge Deck Expansion Joints)
			BRICKWORK, BLOCKWORK AND STONEMWORK
Not Used	Not Used	24/1	Brickwork, Blockwork and Stonework
Not Used	Not Used	24/2	Brickwork, Blockwork and Stonework: TII Standard Construction Details
			SPECIAL STRUCTURES

Volume No.	Completed By	Appendix No.	Title
Not Used	Not Used	25/1	Requirements for Corrugated Steel Buried Structures
Not Used	Not Used	25/2	Requirements for Reinforced Soil and Anchored Earth Structures
Not Used	Not Used	25/3	Requirements for Reinforced Clay Brickwork Retaining Walls of Pocket Type and Grouted Cavity Construction Structures
			MISCELLANEOUS
Not Used	Not Used	26/1	Ancillary Concrete
Not Used	Not Used	26/2	Bedding Mortar
Not Used	Not Used	26/3	Cored Thermoplastic Node Markers
			WATERMAINS, UTILITIES AND ACCOMMODATION WORKS
Not Used	Not Used	27/1	Requirements for Watermains
Not Used	Not Used	27/2	Watermains: TII Standard Construction Details
			TRENCHLESS INSTALLATION OF ROAD DRAINAGE & SERVICE DUCTS
Not Used	Not Used	28/1	Trenchless and Minimum Dig Techniques
			CCTV SURVEY OF ROAD DRAINAGE SYSTEMS
Not Used	Not Used	29/1	CCTV Survey of Road Drainage Systems

List "B": List of Contract Specific Numbered Appendices Devised for the Contract

Volume No.	Completed By	Appendix No.	Title
A – Part 2	E	126	Works by Other Contractors
A – Part 2	E	128	As Built Record Drawings
1	(E)	131	Condition Survey (Dilapidation Surveys)
A – Part 2	E	132	Independent Check Certificate for Temporary Works
A – Part 2	E	133	Environmental Management
Not Used	Not Used	15/2	Motorway Communications: Maintenance

Appendix 0/4: List of Drawings included in the Contract

Contract Specific Drawings - Supplied to Each Tenderer

[Not Used]

Standard Drawings – Supplied to Each Tenderer

[Not Used]

Standard Drawings – Inspected by Tenderers

[Not Used]

Standard Drawings – Brought into the Contract by Reference

The Standard Construction Details (SCD) in TII Publications (Standards) contain the following drawings brought into the Contract by reference. Unless otherwise stated below the whole drawing is brought into the Contract.

Drawing No.	Title	Aspect/Alternative(s) Required if Not Whole Drawing
CC-SCD-01501	Installation Drawing TCC - Ducts for Motorway Cables at Interchange Overbridges	
CC-SCD-01502	Installation Drawing TCC - Ducts for Motorway Cables at Interchange Underbridges	
CC-SCD-01503	Installation Drawing TCC - Ducts for Motorway Cables for Single Bridges	
CC-SCD-01504	Installation Drawing TCC - Network Ducts Sections	
CC-SCD-01505	Installation Drawing TCC - Network Ducts Plan View	
CC-SCD-01506	Installation Drawing TCC - Network Ducts Deep Transverse Ducts	
CC-SCD-01507	Installation Drawing TCC - Local Ducts to Cabinet Sites	
CC-SCD-01508	Installation Drawing TCC - Equipment Cabinet Arrangement Typical Plinth Layout and Local Ducts	
CC-SCD-01509	Installation Drawing TCC - Cabinet Arrangements General Layout	
CC-SCD-01510	Installation Drawing TCC - Duct Installation Longitudinal Ducts	
CC-SCD-01511	Installation Drawing TCC - Duct Installation Local Ducts	
CC-SCD-01512	Installation Drawing TCC - Duct Installation Transverse Ducts	
CC-SCD-01513	Installation Drawing TCC - Duct Installation Spacer and Strapping	
CC-SCD-01514	Installation Drawing TCC - Duct Installation Mechanical Duct Plug	

Drawing No.	Title	Aspect/Alternative(s) Required if Not Whole Drawing
CC-SCD-01515	Installation Drawing TCC - Comms I Chambers	
CC-SCD-01516	Installation Drawing TCC - Chambers Cable Support for Comms I	
CC-SCD-01517	Installation Drawing TCC - Comms II Chambers	
CC-SCD-01518	Installation Drawing TCC - Comms III Chambers	
CC-SCD-01519	Installation Drawing TCC - Cable Installation Cable Marking	
CC-SCD-01520	Installation Drawing TCC - Cable Management Joint Chamber	
CC-SCD-01521	Installation Drawing TCC - Cable Management Details	
CC-SCD-01522	Installation Drawing TCC - Typical Access Steps	
CC-SCD-01523	Installation Drawing TCC - Typical Safety Handrail Details	
CC-SCD-01524	Installation Drawing TCC - Maintenance Vehicle Lay-by Typical Lay-by Layout	
CC-SCD-01525	Installation Drawing TCC - Detector Loop Slot Details Sheet 1	
CC-SCD-01526	Installation Drawing TCC - Detector Loop Slot Details Sheet 2	
CC-SCD-01527	Installation Drawing TCC - Detector Loop Slot Details Sheet 3	
CC-SCD-01528	Installation Drawing TCC - Detector Loop Slot Details Sheet 4	
CC-SCD-01529	Installation Drawing TCC - Cross Cutting Corners of Slots	
CC-SCD-01530	Installation Drawing TCC - Inductive Loop Test Certificate	
CC-SCD-01531	Installation Drawing TCC - Loop Joint Chamber - Sheet 1	
CC-SCD-01532	Installation Drawing TCC - Loop Joint Chamber - Sheet 2	
CC-SCD-01533	Installation Drawing TCC - Detector Loop Layout - Sheet 1	
CC-SCD-01534	Installation Drawing TCC - Detector Loop Layout - Sheet 2	
CC-SCD-01535	Installation Drawing TCC - Detector Loop Layout - Sheet 3	
CC-SCD-01536	Installation Drawing TCC - Detector Loop Layout - Sheet 4	

Drawing No.	Title	Aspect/Alternative(s) Required if Not Whole Drawing
CC-SCD-01537	Installation Drawing TCC - Detector Loop Layout - Sheet 5	
CC-SCD-01538	Installation Drawing TCC - Loop (Inductive) - All Purpose Roads Details of Feeder Cable Slots	
CC-SCD-01539	Installation Drawing TCC - Loop (Inductive) - All Purpose Roads Detail of Cable Entry to the Footway	
CC-SCD-01540	Installation Drawing TCC - Loop (Inductive) - All Purpose Roads Details of Carriageway Chamber	
CC-SCD-01541	Installation Drawing TCC - Loop (Inductive) - All Purpose Roads Detail of Signal Duct Chamber	
CC-SCD-01542	Installation Drawing TCC - Loop (Inductive) - All Purpose Roads Chevron Loops	
CC-SCD-01543	Installation Drawing TCC - Loop (Inductive) All - Purpose Road Turning, Queue and Speed Measuring Loops - Sheet 1	
CC-SCD-01544	Installation Drawing TCC - Loop (Inductive) All - Purpose Road Speed Measuring Loops - Sheet 2	
CC-SCD-01545	Installation Drawing TCC - Loop (Inductive) All - Purpose Road Speed Measuring Loops - Sheet 3	
CC-SCD-01546	Installation Drawing TCC - Loop (Inductive) All - Purpose Road Typical Loop Configuration	
CC-SCD-01547	Installation Drawing TCC - Loop (Inductive) All - Purpose Road Mova Loops	
CC-SCD-01548	Installation Drawing TCC - Cabinet Enclosure Single Bay - Sheet 1	
CC-SCD-01549	Installation Drawing TCC - Cabinet Enclosure Single Bay - Sheet 2	
CC-SCD-01550	Installation Drawing TCC - Cabinet Enclosure Double Bay - Sheet 1	
CC-SCD-01551	Installation Drawing TCC - Cabinet Enclosure Double Bay - Sheet 2	
CC-SCD-01552	Installation Drawing TCC - Typical Roadside Cabinet Layout Type A - Front	
CC-SCD-01553	Installation Drawing TCC - Typical Roadside Cabinet Layout Type A - Rear	
CC-SCD-01554	Installation Drawing TCC - Typical Roadside Cabinet Layout Type B - Front	
CC-SCD-01555	Installation Drawing TCC - Typical Roadside Cabinet Layout Type B - Rear	
CC-SCD-01556	Installation Drawing TCC - Typical Roadside Cabinet Layout Distribution Node - Front	

Drawing No.	Title	Aspect/Alternative(s) Required if Not Whole Drawing
CC-SCD-01557	Installation Drawing TCC - Typical Roadside Cabinet Layout Distribution Node - Rear	
CC-SCD-01558	Installation Drawing TCC - Roadside Cabinet Heater Connections	
CC-SCD-01559	Installation Drawing TCC - Typical Outstation Layout (Gantry Signals)	
CC-SCD-01560	Installation Drawing TCC - Telephone Installation Without Safety Barrier	
CC-SCD-01561	Installation Drawing TCC - Telephone Installation With Ducting/Chamber Details	
CC-SCD-01562	Installation Drawing TCC - Detail of Telephone Installation Behind Safety Barrier	
CC-SCD-01563	Installation Drawing TCC - Detail of Blister Surface Paving Slab	
CC-SCD-01564	Installation Drawing TCC - ERT Plinth - Level with Road Surface and Kerb Around Plinth to Maintain Drainage	
CC-SCD-01565	Installation Drawing TCC - ERT Unique Identification Number - Label	
CC-SCD-01566	Installation Drawing TCC - ERT Unique Identification Number - Label Small	
CC-SCD-01567	Installation Drawing TCC - Gantry Earthing and Bonding	
CC-SCD-01568	Installation Drawing TCC - Typical Earth Bonding System for Gantry and Cantilever Structures	
CC-SCD-01569	Installation Drawing TCC - Single Pole Installation Typical Plinth Layout and Local Ducts	
CC-SCD-01570	Installation Drawing TCC - Multiple Pole Installation Typical Plinth Layout and Local Ducts	
CC-SCD-01571	Installation Drawing TCC – Pole Installation Without Cabinet Typical Plinth Layout	

HCD published by The Stationery Office as Volume 3 of the Manual of Contract Documents for Highway Works contains the following drawings brought into the Contract by reference. Unless otherwise stated below the whole drawing is brought into the Contract.

Drawing No.	Title	Aspect/Alternative(s) Required if Not Whole Drawing
MCX 0145 (sheet 1)	Installation Drawing NMCS 1 & 2 - Labels for cabinets 600, 609, & post 75	
MCX 0145 (sheet 3)	Installation Drawing NMCS 1 & 2 - Type I Labels for Gantries	

MCX 0145 (sheet 4)	Installation Drawing NMCS 1 & 2 - System identification of labels for cabinets and posts 75/85	
MCX 0137.	Installation drawing NMCS - Method of sealing cable ends	
MCX 0171	Installation Drawing NMCS	
MCE 1109	Post Type 75E	

Standards & Specifications – Brought into Contract by Reference

Relevant Highways Agency MCG, MCH, MCE and TR specifications, and other specifications and standards as required, including but not limited to:

Document No.	Title/Reference
BS 1363-2	13A plugs, socket outlets, adaptors and connection units.
BS 3757	Specification for rigid PVC sheet.
BS 3864-1	Graphical symbols, safety colours and safety signs.
BS 4800	Schedule of paint colours for building purposes.
BS 60297	Mechanical structures for electrical and electronic equipment.
BS 60947-3	Low voltage switchgear and controlgear.
BS 61000-6-2	Electromagnetic Compatibility (EMC)
BS 6121	Mechanical cable glands: Code of practice for selection, installation and inspection of cable glands and armour glands.
BS 7430	Code of practice for protective earthing of electrical installations.
BS 7671	Requirements for Electrical Installations
BS EN 60068-2-14	Environmental testing. Tests. Test N. Change of temperature
BS EN 60068-2-30	Environmental testing. Tests. Test Db and guidance: Damp heat, cyclic (12 h + 12 h cycle)
BS EN 60068-2-6	Environmental testing. Tests. Test Fc. Vibration (sinusoidal)
BS EN 60320	Appliance couplers for household and similar general purposes.
BS EN 60529	Degrees of protection provided by enclosures (IP Code)
BS EN 60898-3	Circuit breakers for overcurrent protection.
BS EN 61008-1	Residual Circuit operated circuit breakers without integral overcurrent protection.
BS EN 62444	Cable glands for electrical installations
BS EN 9606	Qualification testing of welders. Fusion welding. Steels
BS ISO 3864-1	Graphical symbols. Safety colours and safety signs. Design principles for safety signs and safety markings
EIA 568B.2-1	Commercial Building Telecommunications Cabling Standard - Part 2:Balanced Twisted-Pair Cabling Components
ETSI EN 302 663	ITS-G5 Access layer specification for Intelligent Transport Systems operating in the 5 GHz frequency band

ETSI EN 302 636 series	Vehicular Communications
ETSI TS 102 792	Mitigation techniques to avoid interference between European CEN Dedicated Short Range Communication (CEN DSRC) equipment and Intelligent Transport Systems (ITS) operating in the 5 GHz frequency range
ETSI EN 302 637-2	Basic Set of Applications; Part 2: Specification of Cooperative Awareness Basic Service
ETSI EN 302 637-3	Basic Set of Applications; Part 3: Specifications of Decentralized Environmental Notification Basic Service
EN 1090	Execution of steel structures and aluminium structures
EN 12899-1	Fixed, vertical road traffic signs. Fixed signs
EN 12966-1	Vertical road signs—Part 1: Variable message signs
EN 50293	Road traffic signal systems. Electromagnetic compatibility
EN 55022	Information technology equipment. Radio disturbance characteristics. Limits and methods of measurement;
EN 60950-1	Information technology equipment – Safety – Part 1: General requirements
EN 61000	Electromagnetic compatibility (EMC). Limits. Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems. Equipment with rated voltage current ≤ 75 A and subject to conditional connection;
EN ISO 1461	Hot dip galvanized coatings on fabricated iron and steel articles -- Specifications and test methods
ET101:2008	National Rules for Electrical Installations
ICEA S-87-640	Standard for Optical Fiber Outside Plant Communications Cable
ITS Directive 2010/40/EU	Delegated Regulation of 13.3.2019 supplementing ITS Directive 2010/40/EU of the European Parliament
ITU-T G.652	Characteristics of a single-mode optical fibre and cable
MCE0110	NMCS2 Ambient Light Monitor (ALM) Equipment Requirements
TIA FOTP-104	Fiber Optic Cable Cyclic Flexing Test
TIA FOTP-169	Chromatic Dispersion Measurement of Single-Mode Optical Fibers by the Phase-Shift Method
TIA FOTP-20	Optical Fibres- Part 1- 46: Measurement Methods and Test Procedures-Monitoring of Changes in Optical Transmittance
TIA FOTP-25	Impact Testing of Optical Fiber Cables
TIA FOTP-3	Procedure to Measure Temperature Cycling Effects on Optical Fiber Units, Optical Cable, and Other Passive Fiber Components
TIA FOTP-33	Optical Fiber Cable Tensile Loading and Bending Test
TIA FOTP-37	Fiber optic cable bend test, low and high temperature.
TIA FOTP-41	Compressive Loading Resistance of Fiber Optic Cables
TIA FOTP-59	Measurement of Fiber Point Discontinuities Using an OTDR
TIA FOTP-61	Measurement of Fiber or Cable Attenuation Using on ODR

TIA FOTP-78	IEC 60793-1-40 Optical Fibres - Part 1-40: Measurement Methods and Test Procedures – Attenuation
TIA FOTP-82	Fluid Penetration Test for Fluid-Blocked Fiber Optic Cable
TIA-492CAAA	EN-Detail Specification for Class IVa Dispersion-Unshifted Single-Mode Optical Fibers
TIA-598	Optical Fibre Cable Colour Coding
TIAFOTP-81	Compound Flow (Drip) Test for Filled Fiber Optic Cable
TR1100	General technical requirements for motorway communication equipment.
TR2033	Technical requirements for weatherproof cable and connector assemblies.
TR2043	NMCS2 Signal Site Equipment
TR2130	Environmental Tests for Communications Equipment and Portable and Permanent Road Traffic Control Equipment for use on Trunk Roads
TR2161	Network control armoured energy cable.
TR2180	Protective Surface Coatings for Communications Equipment, Frames and Housings fabricated from Aluminium or Steel for use on and adjacent to the Strategic Road Network
TRG0600	Self-Certification Procedures for Statutory Approval of Traffic Control Equipment

Appendix 1/4: Working and Fabrication Drawings

1. The Contractor shall submit to the Employer’s Representative calculations, test reports, data sheets, etc. in support of his detailed working and fabrication drawings listed below any other works which are required under 92. Such documents shall remain the property of the Employer’s Representative.
2. The Contractor shall submit one electronic copy (in PDF format or equivalent approved format) of all relevant documents to the Employer’s Representative at least four weeks in advance of the date on which the Contractor proposes to commence such works.
3. Drawings shall be to an appropriate scale and standard and in enough detail to enable the Employer’s Representative to assess the Contractor’s proposals.
4. Working and fabrication drawings shall be supplied by the Contractor for all the elements of the Works designed by or on behalf of the Contractor and for proprietary products.
5. The following working and/or fabrication drawings shall be submitted by the Contractor to the Employer’s Representative for review.

Series	Description of Work
100	Traffic Management and Control
1500	Variable Message Signs (VMS-P) including mounting and fixing arrangement
1500	Variable Message Signs (VMS-T) including mounting and fixing arrangement
1500	Advanced Matrix Indicator (AMI) including mounting and fixing arrangement
1500	Slip Road Signal (SRS) AMI including mounting and fixing arrangement
1500	CCTV Camera Bracket
1500	ANPR Camera Bracket
1500	C-ITS Roadside Unit (RSU) mounting and fixing arrangement
1500	Gantry cable management system including fixing arrangement
1500	Gantry mounted cabinets / enclosures including fixing arrangement
1500	Motorway Communications – ITS Layouts
1500	Motorway Communications – Equipment Cabinet layouts
1500	Electrical Schematics
1500	Telecommunications Infrastructure Drawings and Schematics

Appendix 1/5: Testing to be carried out by the Contractor

1. General

- 1.1. Tests comparable to those specified in this Appendix will be necessary for any equivalent work, goods or materials proposed by the Contractor (See sub-Clause 105.4)
- 1.2. (IL) indicates that an Irish National Accreditation Board (INAB) test report or certificate is required.
- 1.3. Unless otherwise shown in this Appendix tests for work or materials as scheduled under any one Clause are required for all such work, goods or materials in the Works.
- 1.4. Cube strength tests are not required for concrete complying with Clause 2602.
- 1.5. Unless otherwise shown in this Appendix test certificates for work, goods or materials as scheduled under any one Clause are required for all such work, goods or materials in the Works.
- 1.6. Testing to be carried out by the Contractor in accordance with this 32 shall be undertaken in a laboratory approved by the Employer's Representative. The Contractor shall provide details of his proposed laboratory / laboratories to the Employer's Representative within 1 week of the Starting Date.
- 1.7. The Contractor shall allow the Employer's Representative every reasonable opportunity and facility to inspect and monitor the sampling and testing processes. The Contractor shall notify the Employer's Representative of who is performing sampling and testing, where and when samples and testing are being carried out and be able to demonstrate that the INAB required is being complied with.
- 1.8. If additional sampling and testing is required in excess of that stated in this Appendix or elsewhere in the Specification due to non-compliance with the Specification, then the cost of the additional sampling and testing shall be borne by the Contractor.
- 1.9. On a weekly basis the Contractor shall submit to the Employer's Representative a programme of its anticipated testing regime for the following week's work. The programme shall be submitted to the Employer's Representative by 1200 hrs on the Friday preceding the week of testing.
- 1.10. The Contractor shall ensure the timely undertaking of all testing and submission of all results to the Employer's Representative. The Contractor shall submit to the Employer's Representative, on a daily basis, a list of all samples/tests taken that day.
- 1.11. The Contractor shall note that this Appendix should be read in conjunction with Volume A - Part 4 – Section 1: Testing and Commissioning Specification for works to be undertaken in relation to the testing and commissioning of the Motorway Communications equipment and cabling installed as part the Works

Table 1/5/1 Testing to be carried out by the Contractor.

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 1500					
1506	Multipair communications cable		Each cable	Required	
	Fibre optic communications cable	ILM and ODTR	Each cable	Required	
	Copper communication cable		Each cable	Required	
	Power supply cable for communications systems		Each cable	Required	
1518	Motorway communications and power cable		Each cable	Required	
	Motorway optical fibre communications cable	ILM and ODTR	Each cable	Required	
1522	Detector Loops				
	Cable			Required	Certification that completed cables comply with the specification stated in Appendix 15/1 is required.
	Epoxy Resin			Required	Certification that the epoxy resin complies with Clause 1523 is required.
	Feeder Cable			Required	Certification that completed cables comply with the

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
					specification stated in Appendix 15/1 is required.
	Joints	Pull Test (4 kpf)	Each Crimp		
	Installation	Series Resistance	Each Loop	Required	Certification in accordance with Clause 1523 is required.
		Insulation Resistance			
		Inductance			
1530	Pipes for Motorway Communications Ducts				
	UPVC				Product Certification Scheme applies Certificates are provided for in the relevant standard but should normally not be required except for pipes which are not quality marked in accordance with relevant standard.
	Plastics (see Table 5/1)				
	Other Materials			Required	NSAI Agreement Certificate or equivalent required.
	Thermoplastic structured wall pipes and fittings				Required
Pipe Bedding	Grading and fines content		1 per week (min of 3)*	Required	

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
		Water Soluble Sulphate (WS) Content (IN)	5 per source*		
		Resistance to fragmentation (IL)	1 per source*		
1532	Chambers				
	Precast Concrete				Product certification scheme applies
	Corrugated galvanised steel			Required	Product certification scheme applies
	Manhole Steps				Product certification scheme applies
	Steel fitments				
	Covers, grates and frames				Product certification scheme applies
	Cover Bolts				Quality management scheme applies
1533	Cable Ducts				
	Mandrel test	Test specified in Clause 1533	Each duct	Required	Certificate that each length of duct between chambers satisfies the mandrel test is required
	Air test	Test specified in Clause 1533	Each duct	Required	Certificate that each length of duct between chambers satisfies the air test is required.
Series 1900					

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
1903	Abrasives	Grading	1 per batch		
		Hardness			
1909	Galvanised Coatings	Test specified in EN ISO 1461	1 set of tests per delivery load		
	Thermally sprayed aluminium metal coatings	Tests specified in IS EN ISO 2063	1 set per 100m ² of coating		
	Aluminium coating material			Required in accordance with IS EN ISO 14919	
1910	Thermally sprayed aluminium metal coating	Pull off adhesion test in accordance with IS EN ISO 4624, IS EN ISO 2063 or 'ASTM D4541-Type III'	At the start of the works and every 50m ²		
	Thermally sprayed aluminium metal coating (excepted areas)	Grid test specified in IS EN ISO 2063	1 set per 100m ² of coating		
1911, Table 19/2B	Hot dip galvanised coating to fasteners	Tests specified in IS EN ISO 10684	1 per 200 fasteners		
1912	Paints				
	'A' and 'B' Samples	Provision of samples for 'A' and 'B' sample tests			Samples selected in accordance with Clause 1912
		Specific gravity	As required by rate of 'A' and 'B' sampling		See NG 1912, 7; Appendix 19/4, Not 4;

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
		Colour match	As required by rate of 'A' and 'B' sampling		See NG 1912, 7
1914	Coating System				
	Minimum film thicknesses	Minimum dry film thickness measurements in accordance with IS EN ISO 2808	Required – representative testing		
	Adhesion	Pull off adhesion test in accordance with IS EN ISO 4624, IS EN ISO 2063 or ASTM D4541 – Type III	Required – representative testing		
	Defects	Visual assessment supplemented by appropriate testing	Required		[Any additional tests should be scheduled in 32]
	Defects – pin holing or porosity	Low or high voltage detectors in accordance with ASTM G62-07	Required – representative testing excluding corners, bolted joints or welds		
1972	Abrasives	Grading	1 per batch		
		Hardness			
1974	Thermally sprayed aluminium metal coatings	Tests specified in IS EN ISO 2063	1 set per 100m ² of coating		
	Aluminium coating material			Required in accordance with IS EN ISO 14919	
1975	Thermally sprayed aluminium metal coating	Pull off adhesion test in accordance with IS EN ISO 4624, IS EN ISO 2063 or 'ASTM D4541-Type III'	At the start of the works and every 50m ²		

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
	Thermally sprayed aluminium metal coating (excepted areas)	Grid test specified in IS EN ISO 2063	1 set per 100m ² of coating		
1978	Paints 'A' and 'B' Samples	Provision of samples for 'A' and 'B' sample tests			Samples selected in accordance with Clause 1978
		Specific gravity	As required by rate of 'A' and 'B' sampling		See NG 1978, 7; Appendix 19/4, Note 4;
		Colour match	As required by rate of 'A' and 'B' sampling		See NG 1978, 7
Series 500					
501	Pipes for drainage and service ducts				
	Vitrified clay				Product Certification Scheme applies
	Concrete – PC/SRC	Not exceeding 900mm dia			
	Concrete- Pre-stressed				
	Iron - Cast				
	Iron Ductile				
	UPVC				
	Plastics (see Table 5/1)				
	Corrugated steel	(Manufacturer's tests)		Required (AASHTO)	
	Corrugated steel bitumen protection				
Concrete PC/SRC exceeding 900mm dia	(Manufacturer's tests)	As per Clause 509.10	Required		
Other materials			Required	NSAI Agrément Certificate or equivalent required	

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
503	Pipe Bedding	Grading and fines content (Washing and sieving method to be used)	1 per week (min of 3)	Required	
		Water Soluble Sulphate (WS) content (IN)	5 per source		
		Resistance to fragmentation (IL)	1 per source		
505	Filter medium backfill	Plastic index (IL)	1 per source	Required	
		Grading and fines content (Washing and sieving method to be used)	1 per 500 tonnes		
		Water Soluble Sulphate (WS) content (IL)	5 per source		
		Resistance to fragmentation (IL)	1 per source		
506	Sealing existing drains				
	Concrete				
	Grout				
507	Chambers	Precast concrete			Product certification scheme applies
		Corrugated galvanised steel	(Manufacturer's tests)	Required	Product certification scheme applies
		Manhole steps			Product certification scheme applies
		Steel fitments			
		Covers, grates and frames			Product certification scheme applies
		Cover bolts			Quality management scheme applies
508	Gullies and pipe junctions				

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
	Precast concrete				Product certification scheme applies
	Cast iron and steel				
509	Watertightness of joints	Air test	All pipelines with watertight joints	Required	
512	Backfill to pipe bays	Grading	1 per 50 tonnes (min of 3)		
		Water Soluble Sulphate (WS) content (IL)	5 per source		
513	Permeable backing to earth retaining structures				
	Granular Material	Piping Ration (as CI 513)	1 per 100 tonnes (min of 3)		
		Permeability (as CI 513)			
Precast hollow concrete blocks	(Manufacturer's tests)		Required		
514	Fin Drains	(Manufacturer's tests)		Required	INAB (or equivalent) certification applies
515	Narrow Filter Drains				
	Geotextile, pipes and fittings	(Manufacturer's tests)		Required	INAB (or equivalent) certification applies
	Granular fill	Plastic Index (IL)	1 per source	Required	
		Resistance to fragmentation (IL)			
		Water soluble sulphate (WS) content (IL)	5 per source		
		Oxidisable sulphides (OS) content and total potential sulphate (TPS) content (IL)	1 per week (min of 3)	Required	
		Grading and fines content			
Permeability (IL)	1 per source				
516	Combined drainage and kerb systems	Load Test	A minimum of 1 test per 1000m for each type and source	Required	Certification that the system complies with Clause 516 is required
		(Manufacturer's tests)		Required	

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments	
517	Linear drainage systems	Load test	A minimum of 1 test per 1000m for each type and source	Required	Certification that the system complies with Clause 517 is required	
518	Thermoplastic structured wall pipes and fittings	(Manufacturer's tests)		Required	INAB (or equivalent) certification applies	
519	Geotextiles for filter drains	Geotextiles for filter drains	(Manufacturer's tests)	1 per source	Required	
Series 600						
601, 631 to 633, 635 to 637, 640	Acceptable material					
		Class	General Description			
		1	General granular fill	Grading	1 test per 1,000m ³ for each source*	
				Uniformity Coefficient	1 test per 1,000m ³ for each source*	
				MCV	As required*	
				MC	1 test per 1,000m ³ for each source*	
					1C only	LA Coefficient (IL)
		2	General Cohesive fill	Grading	1 test per 1,000m ³ for each source*	
				Plastic Limit	1 test per 1,000m ³ for each source*	
				MC	1 test per 500m ³ for each source*	
	Undrained Shear Strength			1 test per 1,000m ³ for each source (min of 2 total per source)*		
	Effective Angle of Internal Friction and Effective Cohesion			1 test per 1,000m ³ for each source (min of 2 total per source)*		

Clause	Work, Goods or Material		Test	Frequency of Testing	Test Certificate	Comments		
601, 631 to 633, 635 to 637, 640 (cont.)	3	Landscape Fill	Grading (IL)	1 test per 2,000m ³ for each source*				
			MC (IL)	1 test per 2,000m ³ for each source*				
			MCV (IL)	1 test per 1,000m ³ for each source*				
	4	5	Selected Granular Fill	Grading	1 test per 500m ³ (min of 1 per day during topsoiling works)*			
				(Class 6A, 6B & 6C)	Grading	1 test per 1,000m ³ for each source*		
					Uniformity Coefficient	1 test per 1,000m ³ for each source*		
					Plastic Limit (IL)	1 test per 2,000m ³ for each source*		
					LA Coefficient (IL)	1 test per 1,000m ³ for each source (min of 2 total per source)*		
				(Class 6C Only)	Moisture Content (IL)	1 test per 2,000m ³ for each source*		
				(Class 6A & 6C Only)	Slake Durability (IL)	1 test per 1,000m ³ for each source (min of 2 total per source)*		
Class 6F1, 6F2 & 6F3)				Grading	1 test per 500m ³ for each source*			
(Class 6A & 6C Only)	Optimum MC (IL)	1 test per 500m ³ for each source*						

Clause	Work, Goods or Material			Test	Frequency of Testing	Test Certificate	Comments	
601, 631 to 633, 635 to 637, 640 (cont.)				MC	1 test per 500m ³ for each source*			
				LA Coefficient (IL)	1 test per 1,000m ³ for each source*			
				Slake Durability (IL)	1 test per 1,000m ³ for each source*			
				Total Sulphur Content (IL)	1 test per source (source approval)*			
				Class RA (asphalt) content (IL)	2 per source*			
				Bitumen Content (IL)	2 per source*			
				(Class 6G)	Grading	1 test per 250m ³ for each source (min of 2 total per source)*		
					LA Coefficient (IL)	1 test per 500m ³ for each source (min of 1 total per source)*		
				(Class 6H Only)	Grading	1 test per 200m ³ for each source*		
					Plastic Limit (IL)	1 test per 500m ³ for each source*		
					LA Coefficient (IL)	1 test per 200m ³ for each source*		
					MC (IL)	1 test per 200m ³ for each source*		
					MCV (IL)	1 test per 200m ³ for each source*		
					pH Value (IL)	Source approval and 1 test per 500m ³ for each		

Clause	Work, Goods or Material			Test	Frequency of Testing	Test Certificate	Comments	
601, 631 to 633, 635 to 637, 640 (cont.)					source (min of 1 test per week)*			
				Chloride Ion Content (IL)	Source approval and 1 test per 500m3 for each source (min of 1 test per week)*			
				Oxidisable sulfides (IL)	Source approval and 1 test per 500m3 for each source (min of 1 test per week)*			
				Resistivity (IL)	1 test per source (source approval)*			
				Redox Potential (IL)	1 test per source (source approval)*			
				(Class 6I & 6J Only)	Grading	1 test per 200m3 for each source*		
				Uniformity Coefficient	1 test per 500m3 for each source*			
				MC (IL)	1 test per 200m3 for each source*			
				MCV (IL)	1 test per 200m3 for each source*			
				Effective Angle of Internal Friction and Effective Cohesion (IL)	1 test per 200m3 for each source (min of 1 test per week)*			
				Coefficient of friction and adhesion (IL)	1 test per source (source approval)*			
				pH Value (IL)	Source approval and 1 test per 500m3 for each			

Clause	Work, Goods or Material				Test	Frequency of Testing	Test Certificate	Comments	
601, 631 to 633, 635 to 637, 640 (cont.)						source (min of 1 test per week)*			
					Chloride Ion Content (IL)	Source approval and 1 test per 500m3 for each source (min of 1 test per week)*			
					Water soluble sulfate content (IL)	Source approval and 1 test per 500m3 for each source (min of 1 test per week)*			
					Oxidisable sulfides (IL)	Source approval and 1 test per 500m3 for each source (min of 1 test per week)*			
					Resistivity (IL)	1 test per source (source approval)*			
					Redox Potential (IL)	1 test per source (source approval)*			
					Organic Content (IL)	1 test per source (source approval)*			
					Microbial Activity (IL)	1 test per source (source approval)*			
					LA Coefficient (IL)	1 test per 200m3 for each source*			
					Slake Durability (IL)	1 test per 500m3 for each source*			
					(Class 6K, 6L & 6M)	Grading	1 test per 200m3 for each source*		
						Plastic Limit (IL)	1 test per 500m3 for each source*		

Clause	Work, Goods or Material			Test	Frequency of Testing	Test Certificate	Comments	
601, 631 to 633, 635 to 637, 640 (cont.)				Resistivity (IL)	1 test per source (source approval)*			
				Water soluble sulfate content (IL)	Source approval and 1 test per 500m3 for each source (min of 1 test per week)*			
				Oxidisable sulfides (IL)	Source approval and 1 test per 500m3 for each source (min of 1 test per week)*			
				Chloride Ion Content (IL)	Source approval and 1 test per 500m3 for each source*			
				pH Value (IL)	Source approval and 1 test per 500m3 for each source (min of 1 test per week)*			
				(Class 6K & 6M Only)	Uniformity Coefficient	1 test per 500m3 for each source*		
				Optimum MC (IL)	1 test per 200m3 for each source*			
				MC (IL)	1 test per 200m3 for each source*			
				MCV (IL)	1 test per 200m3 for each source*			
				LA Coefficient (IL)	1 test per 200m3 for each source (min of 1 total per source)*			

Clause	Work, Goods or Material				Test	Frequency of Testing	Test Certificate	Comments
601, 631 to 633, 635 to 637, 640 (cont.)				(Class 6N1, 6N2 & 6P)	Grading	1 test per 200m3 for each source*		
					LA Coefficient (IL)	1 test per 200m3 for each source*		
					Undrained Shear Strength (IL)	As Required		
					Effective Angle of Internal Friction and Effective Cohesion (IL)	Source approval and 1 test per 500m3 for each source (min of 1 test per week)*		
					Permeability (IL)	Source approval and 1 test per 500m3 for each source*		
					MC	1 test per 200m3 for each source*		
					MCV (IL)	1 test per 200m3 for each source*		
					pH Value (IL)	Source approval and 1 test per 500m3 for each source*		
					Water soluble sulfate content (IL)	Source approval and 1 test per 500m3 for each source (min of 1 test per week)*		
					Oxidisable sulfides (IL)	Source approval and 1 test per 500m3 for each source (min of 1 test per week)*		

Clause	Work, Goods or Material			Test	Frequency of Testing	Test Certificate	Comments		
601, 631 to 633, 635 to 637, 640 (cont.)				Slope Stability (IL)	Source approval and 1 test per 500m3 for each source*				
				Slake Durability (IL)	1 test per 200m3 for each source*				
				(Class 6Q)	Testing and frequency as per Class 1 Material with the addition of the following:				
				Water soluble sulfate content (IL)	1 test per 200m3 for each source (min of 1 total per source)*				
				Oxidisable sulfides (IL)	Source approval and 1 test per 500m3 for each source (min of 1 test per week)*				
				Chloride Ion Content (IL)	1 test per 200m3 for each source (min of 1 total per source)*				
				pH Value (IL)	1 test per 200m3 for each source (min of 1 total per source)*				
				6	Selected Cohesive Fill	Grading/mc/MCV (IL)	1 per 400 tonnes	Required	Results demonstrating suitability to be submitted prior to use.
						PL (IL)	Daily		
						Water soluble sulphate content (IL)	Weekly		
	pH/chloride ion content (IL)	Weekly							
	Undrained shear parameters (IL)	1 per 500 tonnes		Refer to Appendix 6/1					
		CBR (IL)							

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
	7 Miscellaneous Fill	MCV (IL)	Daily		
601.11 & 601.12	Fill adjacent to cementitious material or metallic items	Water Soluble sulphate content (IL)	1 per 400 tonnes or per location if less than 400 tonnes		
		Oxidisable sulfides (IL)	1 test per 250m3 (min of 1 test per location)*		
602.2	Material within 350mm of designed final surface of road or central reserve.	Frost heave (IL)	1 per 5000 m3	Required	
609 & 621	Geotextiles used to Separate Earthworks Materials	Durability	1 test per source/supplier*		
		Tensile load	1 per 400 square metres	Required	Tests and test certificates are required as scheduled in Appendices 6/5 and 6/9
		Permeability	1 test per 500m2 (min of 1 test per source/supplier)*		
		Pore size	1 test per 500m2 (min of 1 test per source/supplier)*		
		CBR Puncture Resistance	1 test per 500m2 (min of 1 test per source/supplier)*		
612	Compaction of fill			Required	
	Method compaction	Field dry density (IL)	1 per 400 tonnes		
		Optimum mc (2.5 kg rammer/vibrating hammer method) (IL)	Each class or sub class of material		
End product compaction	Field dry density (IL)	1 per 400 tonnes			

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
618	Topsoiling and grass seeding	Rate of spread of fertiliser	1 per 1000m2	Required	
		Rate of spread of seeding			
		Chemical analysis of fertiliser	1 per source		
		Grass seed germination and purity (Manufacturer's test)	1 per source	Required prior to sowing	
622 639	Earthworks for reinforced earth and anchored earth structures	Redox potential	5 locations within the affected area	Required	
	Reinforcing elements	Coeff. of friction	Each type of element with each type of fill		
	Anchor elements	Adhesion			
624	Ground Anchorages	Proof Loading	Every anchor		
626	Gabions	Gabion mesh	Source Approval	Required	
642	Earthworks materials adjacent to structures	Constrained soil modulus (M)*	3 on each side of each structure		
614	Lime and Cement Improvement - U1	Water soluble sulfate content	Source Approval		
		Organic Content	Source Approval		
		Rate of spread	1 per 500m ²		
Series 800					
801 802 804 805 806 807 808 809	Unbound mixtures placed within 500mm of cement bound materials, concrete pavements, structures or products	Acid Soluble sulphate content (IL)	1 per 400 tonnes or per location if less than 400 tonnes	Required	
		Water-soluble sulfate (WS) content (IL)	1 per 400 tonnes or per location if less than 400 tonnes		
	Unbound mixtures placed adjacent to metallic structural elements forming part of the Works	Oxidisable sulfides (OS) content (IL)	1 per 400 tonnes or per location if less than 400 tonnes		

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments	
	Unbound mixtures	Grading and fines content	1 per 1000 tonnes or minimum of 2 per day			
		Flakiness index (IL)	1 per week			
		Los Angeles Coefficient (IL)	2 per year			
		Methylene Blue (IL)	1 per week			
		Water absorption (IL)				
		Magnesium Sulphate Soundness (IL))	1 per 2 years			Required
		Types A, B, C & D granular material	OMC (IL)	2 per year		Declared values from the factory production control system operated by the producer to be provided
			Moisture Content	1 per 1000 tonnes or minimum of 2 per day		
		Types B, C, D & E granular material	Liquid Limit (IL)	1 per week		
		Types A & C granular material	CBR (IL)	1 per week		
			Density (IL)	2 per year		
		Type C granular material	Percentage of crushed or broken particles and of totally rounded particles in coarse aggregates	1 per month		
Type A granular material	Plasticity index (IL)	1 per week				
810 821 822 823 824 825 826	Cement Bound Mixtures	Water soluble sulphate (WS) content (IL)	1 per 200m3 for each source (min of 5 total per source)*	Required		
Oxidisable sulphides (OS) content (IL)		1 per 200m3 for each source (min of 5 total per source)*				

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
		Tests for control and checking of HBM	Tests specified in Table 8/15 and Table 8/16		
		Coefficient of linear expansion (IL)	[As required]		
		Tests for laboratory mixture design	As specified in Clause 826		
Series 900					
901, 925, 937, 938, 942, 943	Aggregates for bituminous materials			Required	IS EN 13108-21 Factory Production Control procedures apply. The test certificate is the CE Mark for the mixture
	Resistance to fragmentation (hardness)	Resistance to fragmentation (IL)	Monthly		
	Resistance to freezing and thawing (durability)	Soundness (IL)	1 per source		
		Water absorption (IL)			
	Cleanness	Sieve test (mass passing 0.063mm sieve) (IL)	Monthly		
	Shape	Flakiness index (IL)	Monthly		Washing and sieving method to be used
	Blastfurnace slag	Bulk density (IL)	1 per 500 tonnes		
		Soundness (IL)	Once every 4 months		
		Dicalcium silicate disintegration (IL)	1 per 500 tonnes		
		Iron disintegration (IL)	1 per 500 tonnes		
	Steel slag	Bulk density	1 per 500 tonnes		
		Volume stability (IL)	1 per 500 tonnes		

Clause	Work, Goods or Material		Test	Frequency of Testing	Test Certificate	Comments
		Course aggregate for surface courses	Resistance to polishing (PSV) (IL)	1 per source		
			Resistance to surface abrasion (AAV) (IL)	1 per source		
	Binders for bituminous materials		Penetration (IL)	1 per 750 tonnes	Required	IS EN 13108-21 Factory Production Control procedures apply. The test certificate is the CE Mark for the mixture. Except where specifically called for in the Specification for Road Works, the inclusion of polymer modified bitumen is subject to TII approval.
			Softening point (IL)	1 per 750 tonnes		
			[Other IS EN tests]	[As required]		
902	Reclaimed bituminous materials		Recovered penetration (IL)	1 per 1000 tonnes or one per day whichever is greater	Required	
903 906 907 909 to 912 916 925 929 930 937	Bituminous mixtures		Grading (IL)	BS EN 13108-21 Factory Production Control (FCP) procedures apply. In addition, a minimum of 1 per 375 tonnes or minimum 2 per five-day period or part thereof	Required	The test certificate is the CE Mark for the mixture. The site samples shall be split with one sample going to the FPC process and the second sample stored for possible audit test purposes.
		Binder content (IL)				

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
938 942 943			whichever is greater of the FPC samples shall be retrieved from the delivery vehicle on arrival at site.		
911	Hot Rolled Asphalt surface course (Design Mixtures)	Design Binder content	1 per source	Required	The test certificate is the CE Mark for the mixture.
915	Coated chippings for application to Hot Rolled Asphalt Surfacing	Hot sand test (IL)	1 per source		
		Rate of spread (IL)			
		Determination of resistance to fragmentation – Los Angeles coefficient (IL)	Monthly		
		Determination of particle size distribution (IL)	1 per 75 tonnes		
		Binder content (IL)	1 per 75 tonnes		
		Determination of particle shape of aggregates – Flakiness Index (IL)	Monthly		
		Determination of the polished stone value (PSV) (IL)	2 per year per source		
		Determination of resistance to surface abrasion – Aggregate Abrasion Value (AAV) (IL) 2 per year per source	2 per year per source		
918	Slurry Sealing				
		Site control tests	Tests specified in Clause 918	As required in Clause 918	
919	Surface Dressing				

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
	Aggregates	Other IS EN / BS tests			As required in IAT guidelines
		Penetration (IL)	1 per 750 tonnes		
	Binder	Softening point (IL)	1 per 750 tonnes		As required in IAT guidelines
		Other IS EN / BS tests			
	Rate of spread binder	Tests specified in IAT Publication "Guidelines for Surface Dressing in Ireland"	Daily		
921	Surface macrotexture	Volumetric Patch (IL)	As required in Clause 921	Required	
924	High friction surfaces				
	Aggregate	Resistance to polishing (Manufacturer's test) (PSV) (IL)	1 per source	Required	
		Determination of particle size distribution (IL)	1 per source		
	Binder	Rate of spread			
	Cured Binder	Tensile strength	2 per 1000m ² /shift		
		Elongation			
929	Base and binder Course Asphalt Concrete (Design Mixtures)	Permanent Works – In situ air void content (IL)	As required by Clause 929	Required	
		Permanent Works – Refusal air void content (IL)			
		Permanent Works – Deformation resistance			
		Deformation resistance (design)		Required	The test certificate is the CE Mark for the mixture
		Stiffness (design)			
930	EME 2	Permanent Works – In situ air void content (IL)		Required	

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
		Richness modulus (design)			The test certificate is the CE Mark for the mixture
		Duriez (design)			
		Deformation Resistance (design)			
		Stiffness (design)			
937	Stone mastic asphalt (SMA) regulating course	Permanent Works – In situ air void content (IL)	As required	Required	
		Permanent Works – Deformation resistance			
		Binder drainage (design)	As required	Required	The test certificate is the CE Mark for the mixture
		Deformation resistance (design)			
938	Porous asphalt	Relative hydraulic conductivity (IL)	As required	Required	In addition European in-situ drainability testing required
943	Hot Rolled Asphalt surface course and binder course (performance related design mixtures)	Permanent Works – In situ air void content (IL)	As required	Required	
		Permanent Works – Deformation resistance			
		Deformation resistance (design)	As required	Required	The test certificate is the CE Mark for the mixture
906 929 930 937 943	Bituminous mixtures	Compaction control (IL)	As required by BS 594987 and the individual clauses of SRW	Required	
Series 1000					

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments	
1001	Cement types as stated in sub-Clause 1001.3					
	Cements (all types)		Chloride content	Monthly		
	Ground granulated blastfurnace slag		Sulphate content	Monthly		
			Acid-soluble alkali content	Daily (PC) Weekly (PFA ggbs)		
	Aggregates		Grading and fines content	1 per delivery		
			Shell content (IL) (Only required where marine aggregates are used)	Monthly		
			Flakiness index (IL)	Monthly		
			Resistance to fragmentation (IL)	Every 6 months		
			Chloride ion content (IL)	Daily		
			Acid soluble sulphate content (IL)	Monthly		
		Fine aggregate	Acid-soluble material (IL)	Monthly		
	Water		Tests specified in IS EN 1008	[As required].		
			Chloride content	Monthly		
			Sulphate content	Monthly		
			Acid-soluble alkali content	Weekly		
	Admixtures		Chloride content	1 per consignment	Required (BS 934-2)	
			Sulphate content	1 per consignment	Required	
Acid-soluble alkali content			1 per consignment			
1002 1003 1004 1044	Concrete		Air content test (IL)	As required in Table 10/9	Required	
			Density of in situ Concrete cores (IL)	As required in Table 10/9		
			Cube strength (IL)	As required in Table 10/9		

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments	
1005	Consistence	Compaction index (IL)	As required in Table 10/9			
		Vebe (IL)				
1011	Dowel bars, Tie bars		1 per arrangement	Required (BS 4449)	Product certification scheme applies	
1012	Dowel bars and supporting cradles	Load test				
	Sheathed dowel bars	Bond stress				4 bars
	Cranked tie bars (coated)	Bend test				4 bars
		Salt fog cabinet	4 bars			
1015	Joint filler board		Weathering test	3 per source	Normally undertaken by manufacturer	
			Compression and recovery	4 per source		
			Extrusion	1 per source		
	Cork filler	Immersion in water	2 per source			
		Immersion in acid	2 per source			
1016 1017	Applied sealants		Initial Penetration	1 per 1000m or 1 per day	Required (BS EN 14188-1, BS 2499-2, BS 5212-1, BS 5212-2), (IS EN 13880-2, IS EN 13880-3, & BS 4254)	
			Resilience	1 per 1000m or 1 per day		
	Compression seals				Required (ASTM D2628) (BS 2752) (BS 4443-4,	
			Compression set	1 per type of seal		
			Immersion in oil	1 per type of seal		

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
				Method 10 and IS EN ISO 2440 (IS EN ISO 1856) (BS 903: Part A16 or IS ISO 1817)	
	Self-expanding cork seal	Tests specified in Clause 1017	1 per type of seal	Required	
1026	Surface macrotexture	BS EN 13036-1	1 per day (set of 10)	Required	
1044		Volumetric Patch			
		Technique (IL)			
1027	Aluminised curing compound	Efficiency Index	1 per source		
Series 1100					
1101	Precast concrete kerbs, channels, edgings and quadrants	Bending strength	Minimum of 8 per 1000 units of each product (IS EN 1340)	Required	
1102	In situ asphalt kerbs	Grading	1 test per 500 metres laid	Required	
		Binder Content			
1104	Precast concrete flags	Bending strength	Minimum of 8 per 1000 units of each product (IS EN 1339)	Required	
	Bedding	Granular material			
		Mortar			

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
1107	Concrete block paving	Compressive strength	Minimum of 8 per 1000 units of each product (IS EN 13389)	Required	
1108	Clay pavers	Bending strength	Minimum of 8 per 1000 units of each product (IS EN 1344)	Required	
		Skid resistance	Minimum of 8 per 1000 units of each product (IS EN 1344)		
1109	Cellular grass paving systems				NSAI Agrément certificate or equivalent scheme applies
Series 1200					
1202	Permanent traffic signs			Required	Certification that the traffic sign is capable of passing the tests in "Certification Scheme, Specification, and Guidance for the Construction of Traffic Signs- TS4" and the specified

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
					parts of BS 873 is required.
1209	Holding down bolts and anchorages to bases of permanent bollards			Required	Certification that the holding down bolts and anchorages are capable of complying with the performance requirements of BS 873: Par 3 is required.
1211	Thermoplastic road marking materials	Test specified in the Standard/ Specification given in CI 1211.			Quality management and product certification schemes apply. Sampling procedures shall be as given in the specified Standard / Specification
	Road marking paints			Required (Standard/ Specification given in CI 1211)	Quality management and product certification schemes apply
1213	Permanent traffic cones and traffic cylinders			Required	Certification that permanent traffic cones and cylinders have been tested and comply with BS

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
					873: Part 8 is required.
	Flat traffic delineators	Tests specified in BS 873: Part 8	2 of each size and category/type	Required	Certification that FTD's have been tested and comply with Clause 1213 is required
		Tests specified in Clause 1213			
	Other traffic delineators			Required	Certification that the delineators have been tested and comply with Clause 1213 is required.
	Temporary cones, cylinders, FTD's and other delineators	Test specified in Appendix 12/4			
1215	Traffic Signals				Quality management scheme applies. Statutory approval of equipment applies
	Cables				Product certification scheme applies
	Controllers	Tests specified in 136	Each controller before delivery to Site and again after installation		
	Cabling	Tests a, b, c, e, f, g, h, j as defined in sub- Clause 1424.2	Each traffic signals installation	Required	Certification that the installation complies with the National Rules for Electrical Installations is required.

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
1216	Thermoplastic road marking materials	Tested for the requirements of the specification in accordance with I.S. EN 1436 initially on application and as detailed during the guarantee period.		Required	Quality management and product certification schemes apply.
1217	Retroreflecting road studs	Test specified in the Standard/ Specification given in Clause 1217		Required	Quality management and product certification schemes apply
Series 1300					
1305	Anchorage for use in drilled holes	Tensile load (Manufacturer's tests)		Required	To provide well attested and documented evidence
1306	Anchorage in drilled holes to columns with flange plates	Loading test on site	1 per 50 anchorages	Required	
1310	Welding	Welding procedures (manufacturer's tests)	(Every seven years)		
		Welding qualification (Manufacturer's tests)	(Every two years)		Quality management scheme applies
		Production testing (Manufacturer's tests)	(Clause 1310 (7.1.4))		
	Welded joints	Destructive testing			
1313	GFRP laminates	Loss on ignition	1 per 200 production columns		
		Colour fastness	1 per batch		
		Electric strength			
		Water absorption			
		Impact strength			
1314	Brackets for laminating GFRP lighting columns				

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
	Polyurethane foam	Bulk density	1 per batch		
		Surface hardness			
		Apparent bulk density	2 per batch		
		Impact strength			
		Flexural stress			
Series 1400					
1421	Cable				Product certification scheme applies
1424	Lighting Units	Tests specified in Clause 1424	Each unit	Required	Product certification scheme applies.
	Networks	Tests specified in Clause 1424	Each network	Required	Certification that the installation complies with the National Rules for Electrical Installations is required
Series 1600					
1601	Soil samples In situ soil tests			Required	
1602 to 1606, 1610 to 1615	Concrete			Required	
	Grout				
	Reinforcement				
	Prestressing				
	Steelwork				
	Welding				
	Protection against corrosion				
1606	Coatings for protection against corrosion	Adhesion	As required in Appendix 16/6		
1607	Reduction of friction on piles				Refer to Appendix 16/7
1608	Integrity testing				Refer to Appendix 16/8

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
1616	Dynamic testing				Refer to Appendix 16/16
1609	Static load testing of piles			Required	Refer to Appendix 16/9
1612	Self hardening slurry mixes				Refer to Appendix 16/12
1617	Instrumentation				Refer to Appendix 16/17
1618	Support fluids	To be proposed by the Contractor			Refer to Appendix 16/
Series 1700					
1702 1703 1704	Cement types as stated in sub-Clause 1702.1			Required	Certificate to be provided monthly* for each type of cement. Quality management and product certification schemes apply.
	Cements (all types)	Chloride content	Monthly		Tests to be carried out by the manufacturer and results included on the test certificates required above
	Ground granulated blastfurnace slag	Sulphate content	Monthly		
			Acid-soluble alkali content	Daily (PC)	
	Aggregates	Petrographic tests	At commencement of contract, at change of source and bi-annually thereafter		

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments	
		Grading and fines content	1 per delivery (min 1 weekly per source)		Results of routine control tests by the manufacturer/ supplier to be provided. Product certification scheme applies	
		Shell content (IL)	Monthly			
		Flakiness index (IL)	Monthly			
		Resistance to fragmentation (IL)	Every 6 months			
		Drying shrinkage (IL)	Monthly			
		Chloride content (IL)	Daily			
		Sulphate content (IL)	Monthly			
		Blastfurnace slag	Bulk density (IL)	1 per 500 tonnes		
			Stability (IL)	1 per 500 tonnes		
			Sulphur Content (IL)	1 per 500 tonnes		
		Water	Tests specified in IS EN 1008	At commencement of contract, at change of source and bi-annually thereafter		
			Chloride content	Monthly		
			Sulphate content	Monthly		
			Acid-soluble alkali content	Weekly		
		Admixtures	Chloride content	1 per consignment	Required (BS 934-2)	Product certification scheme applies
	Sulphate content		1 per consignment	Required		

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
		Acid-soluble alkali content	1 per consignment		
1707	Concrete	Cube strength (IL)	Prestressed concrete – 2 cubes from 12m ³ or 2 batches whichever represents the lesser volume	Required	Contractor to cast and test sufficient copies to demonstrate cube strength before transfer
			Reinforced Concrete - 2 cubes from 24 m ³ or 4 batches whichever represents the lesser volume		
			Mass Concrete – 2 cubes from 50 m ³ or 50 batches whichever represents the lesser volume		
			Additional cubes for special purposes		
		Cube strength identity testing as described in Appendix 17/4 (IL)	2 cubes from each of 2 samples of each batch		Refer to Appendix 17/4
		Density			Refer to Appendix 17/1
		Modulus of elasticity			Refer to Appendix 17/1 for method
		Fresh Concrete	Consistence (IL)	Each batch	

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
		Air content	Each batch of air entrained concrete		
		Cement content	1 for every 1000 m3		
		Water/cement ratio			
1709	Silane			Required for each delivery	Certificate that the silane complies with Clause 1709 is required (CI 1709.2)
		Refractive Index	Three samples		
		Trial panels			
1710	Concrete packing Mortar packing Epoxy resin bonding agent Precast concrete manufactured off Site				
		Cube strength (Manufacturer's tests)			Contractor to make available records of tests by manufacturer
1711	Grouting and Duct Systems for Post-tensioned Tendons				CARES Scheme for Supply and Installation of Post-tensioned Systems In Concrete Structures or an equivalent scheme is required. Quality management and product certification schemes for cement apply

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments	
		Full scale trials			See sub-Clause 1711.1 and Appendix 17/6	
		Air pressure tests			See sub-Clause 1711.3 and Appendix 17/6	
		Duct assembly verification tests			See sub-Clause 1711.3 and Appendix 17/6	
		Wall thickness of ducts after tensioning			See sub-Clause 1711.3 and Appendix 17/6. Contractor shou	
		Fluidity	See Table 17/7			See sub-Clause 1711.8 and sub-Clause 1711.9 and Table 17/8
		Bleeding				
		Volume change				
		Cube Strength Sieve				
		Sedimentation				
			Admixtures			Required
1712	Reinforcement					
		Steel bars			Required (BS 4449 & IS EN 10080)	
		Steel wire			Required (BS 4482 & IS EN 10080)	

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
	Steel fabric			Required (BS 4483 & IS EN 10080)	
	Stainless steel			Required (BS 6744)	
1713	Fabricated reinforcement			Required	Certification that fabricated reinforcement complies with the routine inspection/testing requirements of BS 8666 is required if the fabrication is not covered by a product certification scheme listed in 124
1716	Reinforced jointing systems	Permanent elongation Characteristic strength (Manufacturer's tests)		Required for each type of connection	NSAI Agrément certificate or equivalent scheme to apply
1717	Reinforcement metal arc welding	Welding procedure approval (BS 7123) Welder approval (BS 7123)	As required in BS 7123		Tests should be carried out by an independent testing body specified in BS 8666
1718	Prestressing Tendons				
	Steel wire		Required (BS 5896)		
	Steel bar		Required (BS 4486)		
	Seven-wire Strand		Required		
	Pre-stressing steel (all types)	Proof load Breaking load			

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
		Elongation Ductility Relaxation Modulus of elasticity			
	Super strand to BS 5896 or other than lowest strength 3-7 mm dia wires to BS 5896	0.1% proof load Breaking load	Each reel		
1724	Post-tensioning anchorages	Tests in accordance with IS EN 13391	1724	Post-tensioning anchorages	
1726	Stainless steel bar			Required (BS 6744)	
1727	Inspection and testing of structures and components	As required by Appendix 17/4	As required in Appendix 17/4	Required	
Series 1800					
1801 1803	Structural steels to IS EN 10025, IS EN 10210			Required	Inspection certificates Type 3.1b as defined in Clause 3.1 of IS EN 10204
	Structural steels to BS 7668			Required (BS 7668)	Inspection certificates Type 3.1b as defined in Clause 3.1 of IS EN 10204
	Stainless steels to BS 970, IS EN 10084, IS EN 10087 and IS EN 10095			Required (BS 970, IS EN 10084, IS EN 10087 and IS EN 10095)	

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
	Stainless steels to IS EN 10029, IS EN 10048, IS EN 10051, IS EN 10258, IS EN 10259			Required (IS EN 10029, IS EN 10048, IS EN 10051, IS EN 10258, IS EN 10259)	
	Steel plate	Ultrasonic testing	100% of all welds where throat thickness of weld exceeds 30mm in cruciform and t-joints, within the zone indicated in Figure 3 of BS5400: Part 6:1999.	Required IS EN10160	
	Bolts, nuts and washers				Quality management scheme applies
	All types except HSFG	Tests specified in BS 4395: Part 2	As required in BS 4395:Part 2		
	HSFG	Tests specified in BS 4395: Part 1 or Part 2	As required in BS 4395: Part 1or Part 2		
	Welding electrodes				
	Covered steel			Required (IS EN 499)	
	Wire			Required (BS 4165)	
	Welding				
	Welding procedures	Tests specified in IS EN ISO 15614	As required in IS EN ISO 15614 and Appendix 18/1		Results to be reported in accordance with

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
					Annex A of IS EN ISO 15614
	Welder qualifications	Tests specified in IS EN 287: Part 1	As required in IS EN 287:Part 1	Required (IS EN 287: part 1)	Certificate to be in accordance with Annex B of IS EN 287: Part 1
	Butt weld 'run-off' plates	Destructive tests specified in BS 5400:Part 6	As required in BS 5400: Part 6		
	Butt welds and adjacent areas of steelwork	Visual inspections	100% of all welds		Visual inspections to be carried out using the methods recommended in IS EN 970
		Magnetic particle inspection	As required in BS 5400 : Part 6 and Appendix 18/1		
		Ultrasonic testing	As required in BS 5400 : Part 6 and Appendix 18/1		
	Fillet welds	Visual inspections	100% of all welds		Visual inspections to be carried out using the methods recommended in IS EN 970
		Magnetic particle inspection	As required in BS 5400 : Part 6 and Appendix 18/1		
		Ultrasonic testing	As required in BS 5400 : Part 6 and Appendix 18/1		
	Flame cutting and shearing	Tests to demonstrate procedures comply with BS 5400:Part 6:1999 and Appendix 18/1	As required in Appendix 18/1		

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
	Stud shear connectors	Fixing (BS 5400 : Part 6)	Each stud		
		Bending (BS 5400 : Part 6)	1 in 50 (min 2 per piece)		
	Flame cutting and shearing	Tests to demonstrate procedures comply with BS 5400:Part 6:1999 and Appendix 18/1	As required in Appendix 18/1		
	Closed SHS in main chords	Leak Test	Each SHS in main chords of truss	Required	Method to be approved by the Employer's Representative
	Stud shear connectors	Fixing (BS 5400 : Part 6)	Each stud		
Series 1900					
1903	Abrasives	Grading	As required		
		Hardness			
1909	Galvanized Coatings	Test specified in EN ISO 1461	As required		
	Aluminium and zinc spray coatings	Tests specified in IS EN ISO 2063	As required		Areas to be tested to be in accordance with Clause 1910
		Aluminium coating material	Required (IS EN 1301-1)		
		Zinc coating material	Required (IS EN 1179)		
	Sherardized coatings	Tests specified in IS EN 13811	As required		
	Zinc electroplated coatings	Tests specified in BS 7371: Part 12	As required		
	Plating to high strength friction grip and tension control bolts				

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments	
1910	Metal spray coatings	Tensile test specified in IS EN ISO 2063	1 set of tests per 250m2 of coating			
		Grid test specified in IS EN ISO 2063	1 set of tests per 250m2 per coating			
1912	Paints	'A' and 'B' Samples	Specific gravity	In accordance with CI 1911 and CI 1912		
			Colour match			
			Composition			
			Application characteristics			
1972	Abrasives	Grading	1 per batch			
		Hardness				
1974	Aluminium and zinc spray coatings	Tests specified in IS EN ISO 2063	1 set per 250 m ² of coating		Areas to be tested to be in accordance with Clause 1975	
		Aluminium coating material		Required (IS EN 1301-1)		
		Zinc coating material		Required (IS EN 1179)		
		Sherardized coatings	Tests specified in IS EN 13811	1 set per 500 No. fasteners		
		Zinc electroplated coatings	Tests specified in BS 7371: Part 12	1 set per 500 No. fasteners		
		Plating to high strength friction grip and tension control bolts				
1975	Metal spray coatings	Tensile test specified in IS EN ISO 2063	1 set per 250 m ² of coating			
		Grid test specified in IS EN ISO 2063	1 set per 250 m ² of coating			
1976	Paints	'A' and 'B' Samples	Specific gravity	In accordance with CI 1976 and CI 1978		
			Colour match			
			Composition			

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
		Application characteristics			
Series 2000					
2003	Permitted waterproofing systems				NSAI Agrément Certificate or equivalent applies
	Additional bituminous protection	Tests specified in IS EN 13108-4	1 per 15 tonnes		Sampling to comply with IS EN 13108-4
	Stability value	Tests specified in IS EN 13108-4	1 per 15 tonnes		
2004	Permitted waterproofing systems				NSAI certification or equivalent applies
2008 2009	Waterproofing membrane	Tensile strength, elongation at break (BS ISO 37)	2 tests per deck		Tests results to be provided to the Employer's Representative
		Tear strength (BS ISO 34-1)	2 tests per deck		
		Deck adhesion (Clause 2008.5)	Three tests per 500m2 of sprayed membrane or deck whichever is the lesser		
		"Holiday Test"	Three tests per 500m2 of sprayed membrane or deck whichever is the lesser		
Series 2100					
2101	Complete Bridge bearings	Tests specified in Appendix 21/1	As required in Appendix 21/1		

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 2400					
2401	Masonry cement			Required (IS EN 413-2)	Quality management scheme applies
		Chloride content	Monthly		Test to be carried out by the manufacturer and results included on the test certificate
2402	Sand			Required per consignment (IS EN 13139)	
		Chloride content	Monthly		Test to be carried out by the manufacturer and results included on the test certificate
2404	Mortar admixtures			Required (IS EN 934-3)	Product certification scheme applies
2405	Lime			Required (IS EN 459-1)	
2406	Bricks				
		Clay	Active soluble salt content (IS EN 772-5) Compressive strength (IS EN 772- 1) Water absorption (IS EN 772-7) Freeze/thaw resistance		
		Calcium silicate		Required IS EN 771-2)	

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
	Concrete			Required IS EN 772-2)	
2407	Bricks				
	Concrete			Required (IS EN 772-2)	
2408	Manufactured Stone	In accordance with IS EN 771-5		Required	
2410	Stainless Steel				
2411	Wire/fabric			Required (IS EN 10088-1)	
	Bars			Required (BS 6744)	
Series 2500					
2501	Materials for corrugated steel buried structures			Type approval applies	
	Steel plate			Required as appropriate to the standard or specification listed in TII BD 12 and Appendix 25/1.	
	Nuts and bolts				
	Metal coating				
	Protective coating				
	Paved invert system				
2502	Materials for reinforcing elements, prefabricated facing and capping units and washers			NSAI Agrément Certificate or equivalent applies	
	Carbon steel strip			Required (IS EN 10025-1)	Silicon content and mechanical

Clause	Work, Goods or Material		Test	Frequency of Testing	Test Certificate	Comments
					and IS EN 10025-2)	properties to be stated on the certificate
		Stainless steel strip			Required (IS EN 10029, IS EN 10048, IS EN 10051 and IS EN ISO 9445)	Mechanical properties to be stated on the certificate
	Reinforcing bar for anchor elements				Required (IS EN 10080 and BS	Tests scheduled for welding and galvanizing of anchor elements under Series 1700 and Series 1900 respectively are required
	Materials for fasteners					
		Steel alloy			Required (IS EN ISO 898-1, IS EN ISO 4016, IS EN ISO 4018 and IS EN ISO 4034)	Tests for galvanizing scheduled under Series 1900 are required
		Stainless steel			Required (IS EN 10088-1, IS EN ISO 3506-1 and IS EN ISO 3506-2)	

Clause	Work, Goods or Material		Test	Frequency of Testing	Test Certificate	Comments
		Bolts, screws and nuts			Required (IS EN ISO 898-1 and IS EN ISO 4016, IS EN ISO 4018 and IS EN ISO 4034)	Tests for galvanizing scheduled under Series 1900 are required
2503	Materials for Reinforced Clay Brickwork Retaining Walls of Pocket-type and Grouted Cavity Construction					
		Clay bricks	Compressive strength (IS EN 772-1) Water absorption (IS EN 772-7) Freeze/thaw resistance	1 set of tests per type of brick*		
Series 2600						
2601	Bedding mortar materials				Required for each batch	Certification in accordance with Clause 2601 is required
	Bedding Mortar	Flow cone test	Each batch			Laboratory tests (IL)
		Compressive strength				
		Expansion test				
		Water absorption				
		Elastic stability	1 per source			
		Flow cone test Compressive strength	Each load			Site control tests

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
2604	Plastic coating to fencing posts, gates and ancillaries	Impact test Adhesion Retention of adhesion Salt spray Accelerated weathering (Manufacturer's tests)		Required (BS 1722-16)	Records of all tests to be available for inspection
Series 2700					
2703	Polyethelene Pipes				
		Butt fusion joints	Tensile test to WIS 4- 32-08	As required in Appendix 27/1	Test Report to be made available to the Engineer's Representative
		Electrofusion joints	Double cantilever cleavage test to WIS 4-32-08	As required in Appendix 27/1	Test Report to be made available to the Engineer's Representative
2708	Integrity of pipes, joints and fittings	Pressure drop test to IS EN 815	As required in Appendix 27/1		Test Records to be made available to the Engineer's Representative
2709	Watermain disinfection	Chlorine residual test	As required		Test Records to be made available to the Engineer's Representative
		Bacteriological testing	As required		Test Records to be made available to the Engineer's Representative

Appendix 1/7: Site Extent and Limitations on Use

1. Extent of the site

1.1. The extent of the site shall include inter alia:

- a) The extent of the site shall be defined by the location of each piece of ITS equipment to be installed and shall extend to include all areas within the road boundary required by the contractor to allow them to carry out the work.
- b) Areas outside the area provided by the Employer where the Contractor is required to carry out permanent works defined in the Contract.
- c) Areas required for traffic management measures by the Contractor in compliance with Clauses 117 and 118 of the Specification and subject to the consent of the Relevant Authority and written approval of the Employer's Representative. If the Contractor proposes the use of areas outside the Area Provided by the Employer for temporary advance signing and traffic management, he shall submit his proposals to the Employer's Representative for approval and relevant areas shall be included within the site.
- d) Any further land acquired by or conveyed to the Employer (from any person, including the Contractor) from time to time for the purposes of the execution and completion of the Works.
- e) Further lands designated as Public Road as per the Roads Act 1993, beyond the extent of the lands described in (a) to (d) above, which shall be required to provide Traffic Signs.
- f) Areas required for the installation, alteration and removal of plant for statutory or other bodies. The use of these areas shall be limited by the terms of the wayleaves acquired by the statutory or other bodies for execution of the Works.
- g) On areas outside the Area Provided by the Employer, it should be noted that the Contractor shall be restricted to only those activities and to the durations which are necessary for the carrying out of the Works. On completion, the areas shall be reinstated to their original condition, to the satisfaction of the Employer's Representative.

2. Limitations on Use of the site

- 2.1. The site shall be used solely for the execution and completion of the Works including the correction of Defects in the Works.
- 2.2. Where the execution and completion of the Works affects lands and property the Contractor shall provide suitable temporary access having regard to the use of the lands and property.
- 2.3. The Contractor shall not use areas of land with a temporary right of access for any purpose other than the execution and completion of the Works including the storage and assembly of equipment and correction of Defects.
- 2.4. The Contractor shall reinstate all areas of land which have been temporarily occupied to the satisfaction of the affected landowner, occupier and the relevant authorities.
- 2.5. Prior to entering parcels of land not acquired in their entirety, the Contractor shall erect suitable fencing (either permanent or temporary), at his own cost taking into account adjacent land usage, to maintain Site security and exclude the general public.
- 2.6. The Contractor's attention is drawn to 86 of the Specification concerning limitations on noise and vibration. The Contractor shall take account of the fact that site availability for works

shall be time restricted in accordance with the requirements of 86 and shall programme his work accordingly.

- 2.7. The Contractor's use of the site shall be limited to the constraints and restrictions contained within this 82, 93 and 102 of the Specification.
- 2.8. All sites are shared with the Employer's Personnel and Third Parties. Table 1/7/1 provides a schedule of appointed Road Operator's and Third Parties. The Contractor shall liaise with and comply with the requirements of the Employer's Personnel and Third Parties when programming the Works. In the event that other works are being undertaken at these locations, the Contractor shall liaise with any other contractors undertaking works at the same location when programming and proposing traffic and pedestrian management measures and co-ordinate the works with these other contractors to minimise disruption to the general public. Contact details for the Employer's Personnel are provided in 126.

Table 1/7/1 Schedule of appointed Road Operator's currently maintaining and / or operating sections of the road network.

Contract Area Category	Category Owner	Road Operator/Contractor
MMaRC A	TII	Globalvia Jons
MMaRC B	TII	Colas JV
MMaRC C	TII	Egis Lagan
M50 PPP	M50 (Concession)	M50 (Concession)
Dublin Port Tunnel	TII	Eirto
Cork Jack Lynch Tunnel	TII	Eirto
M50 eMOS	TII	TII
M1 Dundalk PPP	Celtic Roads Group (Dundalk)	Northlink
M11 Gorey Enniscorthy PPP	Gorey to Enniscorthy M11 PPP Ltd	BAM Civil & Iridium
M3 PPP	EuroLink (M3)	EuroLink (M3)
N11 Arklow Rathnew PPP	N11 Arklow Rathnew PPP Ltd	BAM Civil
N25 New Ross PPP	New Ross N25 By-Pass D.A.C.	BAM Civil & Iridium
M17/M18 PPP	DirectRoute (Tuam)	ALIS
M6 Galway PPP	N6 (Concession) Ltd	N6 (Operations)
N4/N6 Kinnegad PPP	EuroLink (M4)	EuroLink (M4)
M7/M8 Portlaoise PPP	Celtic Roads Group (Portlaoise)	Midlink
M8 Fermoy PPP	DirectRoute (Fermoy)	Lagan O&M
N25 Waterford City PPP	Celtic Roads Group (Waterford)	Southlink
N18 Limerick Tunnel PPP	DirectRoute (Limerick)	Egis Lagan
M50 (MTFO ITS DC)	TII	Swarco
Road Network	TII	Swarco
Winter Maintenance	TII	LA
Pavement Condition & Asset Management Roads/Active Travel & Greenways	TII	LA/MMaRC
Pavement Condition & Asset Management Roads/Active Travel & Greenways	TII	LA/MMaRC
Pavement Condition & Asset Management Roads/Active Travel & Greenways	TII	LA/MMaRC
Signs & Lines	TII	LA/MMaRC
Structures (NEW Build)	TII	LA/MMaRC

Contract Area Category	Category Owner	Road Operator/Contractor
Structures (Existing Maintenance)	TII	LA/MMaRC
Pavement Engineering & Specification	TII	LA/MMaRC/PPP
Network Asset Management	TII	
Route Lighting	TII	LA/MMaRC/PPP
Third Party/Road Opening Consents	TII	LA/MMaRC/PPP
Permanent Speed Limits	TII	LA/MMaRC/PPP
Telecoms Interactions (Gibabit Act)	TII	LA/MMaRC/PPP
Motorway Operations Control Centre	TII	TII
Road Works Speed Limit	TII	MMaRC/PPP

2.9. The Contractor shall ensure that temporary facilities, parked vehicles and plant, equipment and the like are not situated within the site area or outside the site so as to adversely affect users of the public road or adjacent land-users or businesses.

2.10. The Employer shall be entitled to enter upon the Works or any part thereof with or without plant or equipment without conditions before Substantial Completion of the Works.

3. Additional Particular Limitations on Use of Certain Lands

3.1. The Contractor must give a minimum of 72 hours advance notice to property owners where scheduled Works have the effect of removing or limiting access to properties. A written record of this advance notice must be provided to the Employer's Representative prior to commencement of these Works.

4. Site Information

4.1. As part of each Framework Agreement Contract, the Contractor shall be deemed to have inspected and examined the site and the surroundings and to have satisfied himself before the date of the Contract as to the form and nature of the site, the extent, nature and difficulty of the Works and the materials necessary for the completion of the Works, the means of communication and the restrictions of access to the site and in general to have obtained for himself all necessary information as to risk, contingencies and all other circumstances influencing or affecting the Works. The Contractor shall not be entitled to any extension of time or to any additional payment on the grounds of any misunderstanding or misinterpretation of any such matter, nor shall the Contractor be released from any of the risks accepted or obligations undertaken by him under the Contract or grounds that he did not or could not have foreseen any matter which might affect or have affected the execution of the Works.

5. Public Safety

5.1. The Contractor shall be responsible for complying with all statutory requirements with respect to public safety for all Works in connection with this Contract. The Contractor's particular attention is drawn to the requirements of the Safety, Health and Welfare (at Work) Act 2005 (as amended and enacted) and the Safety, Health and Welfare at Work (Construction) Regulations 2013 (and amendments thereto).

5.2. The Contractor shall allow for taking all necessary precautions to protect members of the public in general who may venture near to or within the site boundary.

5.3. The Contractor shall submit to the Employer prior to commencement of the Works, for his comment, proposals for complying with these requirements.

- 5.4. The Contractor shall take all necessary precautions to prevent trespassers onto the site.
- 5.5. The Contractor shall notify the Employer of the person delegated with the responsibility for Site safety.

Appendix 1/9: Control of Noise and Vibration

1. General

- 1.1. The Contractor shall comply with the current national guidelines as specified in the TII Guidelines for the Treatment of Noise and Vibration in National Road Schemes (2004) and the TII Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes (2014).
- 1.2. The Contractor shall comply with the contents and recommendations of BS 5228: Code of Practice for Noise and Vibration Control on Construction and Open Sites together with the specific requirements of this 86. Further to Clause 109 of the Specification, the Contractor's attention is particularly drawn to sections 5, 8 and 10 of the British Standard. Notwithstanding the above, the Contractor shall refer to CIRIA Project Report 70, to minimise noise.
- 1.3. The Contractor shall liaise with the Employer's Representative, Employer, relevant Employer's Personnel and Local Authority to determine and agree the working hours at each site location. The Contractor shall commence the consultation process with the Employer and all relevant stakeholders a minimum of 4 weeks prior to the Contractor commencing Works within the site. This process shall be completed a minimum of 7 days in advance of the commencement of works at a particular location.
- 1.4. The Contractor shall be liable for and shall indemnify the Employer against any expense, liability, loss, claim or proceedings whatsoever in respect of damage, noise, vibration, fumes, dust, smoke and other nuisance and any alleged nuisance or any negligence on the part of the Contractor arising out of or in the course of or by reason of the carrying out of the Works.
- 1.5. The Contractor shall take all necessary precautions to avoid excessive electromagnetic disturbance of apparatus outside the site.
- 1.6. The Contractor must ensure that all electrical equipment and plant is suppressed so as to cause no unacceptable electrical or other interference to surrounding properties.

2. Noise Control

- 2.1. The Contractor shall employ the best means practicable to minimise the noise produced by on Site operations.
- 2.2. The noise levels (refer to paragraph 3.1) scheduled for periods outside the normal working hours shall only be permitted when written consent has been given by the Employer's Representative to exceptional working under the other provisions of this Contract. Otherwise, there shall be no construction noise outside normal working hours.
- 2.3. The ambient noise level, LAeq (refer to paragraph 3.2) from all sources when measured 2.0 metres above the ground at noise monitoring locations shall either not exceed the appropriate level given in Table 1/9/1 or not exceed by more than 3dB(A) the existing ambient noise level LAeq (refer to paragraph 3.3) at the monitoring locations measured over the same period, whichever level is greater. The maximum sound level at any noise monitoring locations shall not exceed the level given in the Table 1/9/1 of this Appendix.
- 2.4. The Contractor shall employ the best practical means to minimise noise produced by his operations including plant maintenance and shall comply with the recommendations in BS 5228 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise.

- 2.5. Any plant such as generators and pumps shall be surrounded by an acoustic enclosure to the approval of the Employer's Representative which shall restrict the noise level to not less than 5dB(A) below levels quoted in the schedule to this Appendix.
- 2.6. The Contractor shall comply, in particular, with the following requirements:
- a) All machinery and equipment used during the Works shall be the quietest of its type for carrying out the work required and shall be maintained in good efficient working order and shall be fitted with effective exhaust silencers;
 - b) All machinery and equipment shall be operated and maintained in accordance with the manufacturer's written recommendations, including the use and maintenance of any specific noise reduction measures;
 - c) Machines in intermittent use shall be shut down in the periods between works or throttled down to a minimum. Generators, or any other plant, shall not be left running/operational after hours unless in an emergency and agreed with the Employer's Representative;
 - d) The Contractor shall organise his operations with regard to the positioning of machinery and equipment so as to minimise noise impacts on adjacent properties;
 - e) Static machines shall be sited as far away as practicable from inhabited buildings;
 - f) Where it is necessary to provide power for the running of traffic signals, pumps, etc., at any time outside normal working hours, then the sources of such power shall be from mains electricity, except if the Employer's Representative agrees in writing that alternative plant may be used after consultation with the relevant Local Authority;
 - g) Good relations with people living and working in the vicinity of the Works are important. People who are likely to be affected by the noise shall be informed, by letter drop or other appropriate means, of any Works to be carried out outside normal working hours. Notification of the public shall take place at least one week prior to the commencement of Site Works;
 - h) The period referred to as "night" for the purposes of the Contract shall be from 19:00 hours to 07:00 hours.
- 2.7. TII guidelines provide indicative noise levels that are considered to be typically acceptable, though more stringent limits are appropriate where pre-construction noise levels are low. Limits are suggested for both the 1-hour "A" weighted equivalent continuous noise level (LAeq,1hr) and for the maximum noise level (LAm_{ax}). While limits are suggested for evening working and for working daytimes on Sundays and Bank Holidays it is assumed that the explicit permission of the Employer would be required before non-emergency Works are conducted at these times.
- 2.8. When permitted by the Employer's Representative any work on Sundays and all work on official public holidays shall take place only between the hours of 0900 hours and 1600 hours.
- 2.9. The Contractor shall furnish such information as may be required by the Employer's Representative in relation to noise levels emitted by plant or equipment used or installed on the site or which the Contractor intends to use or install on the site and also afford all reasonable facilities to enable such Authorities to carry out such site noise-monitoring as may be necessary.
- 2.10. The Employer's Representative shall have the right to order the Contractor to cease using any item of plant insufficiently silenced or generating noise levels in excess of those specified.

- 2.11. Compliance with these conditions and the other requirements of the Contract will not of itself constitute any grounds for defence against any proceedings, whereby any occupier of premises may complain to a Court of law of a noise nuisance.
- 2.12. On occasions when Works are permitted at night or on Sundays, the delivery of materials outside normal working hours shall be prohibited and the noise limits outlined in this 86 of the Specification shall apply.
- 2.13. The Contractor shall appoint a site representative responsible for all matters relating to noise and vibration. The Contractor shall also prepare a Construction noise and vibration management plan for the Works. Such management plans shall be submitted to the relevant Local Authority for consent in advance of the commencement of any Construction. The effectiveness of such management plans shall be monitored throughout Construction in areas close to receptors. This shall include noise monitoring as required. The location of such noise monitoring shall be agreed in advance with the Local Authority and shall be detailed in the Construction noise and vibration management plan.
- 2.14. The Contractor shall provide and maintain at least one sound level meters on Site and they shall be periodically calibrated in accordance with BS 7580: Part 1 or BS 7580: Part 2, as appropriate. The sound level meter shall be located / relocated in various areas along the site as may be directed by the Employer's Representative.
- 2.15. The Contractor shall supply, erect, construct, maintain, move, remove and monitor such equipment or structure as may be required to measure the level of noise on or adjacent to the site and off-site Areas and to demonstrate compliance with the noise limits given in Table 1/9/1 of this 86. Copies of the results of noise measurements shall be supplied to the Employer's Representative by the Contractor within 3 days of the taking of any such measurements.
- 2.16. No Plant used on Site shall be permitted to cause a public nuisance due to noise. All Plant used on the Works shall be the quietest of its type practical for carrying out the work required and shall be maintained in good condition with regard to minimising noise output.
- 2.17. All necessary measures shall be employed including, but not limited to, the use of mufflers on pneumatic tools, the use of effective exhaust silencers, the use of non-reciprocating Plant and the use, where practical, of effective sound reducing enclosures to ensure all Plant used in connection with the Works operates with the minimum of noise. If any piling activities are required under the Works it shall be carried out using noise reducing systems, unless otherwise accepted by the Employer's Representative.
- 2.18. All compressors shall be 'sound reduced' models fitted with properly lined and sealed acoustic covers which shall be kept closed whenever the machines are in use and all ancillary pneumatic percussive tools shall be fitted with mufflers or silencers of the type recommended in writing by the manufacturers. Pumps and static mechanical Plant and the like shall be enclosed by acoustic sheds or screens. Machines in intermittent use shall be shut down in the periods between Works when they are not in use or throttled down to a minimum.
- 2.19. The Contractor shall remove from the site and off-site Areas any item of Plant or Contractor's equipment which in the opinion of the Employer's Representative is considered to be ineffectively silenced.
- 2.20. Any Contractor's Plant or equipment, such as generators and pumps and the like, which shall be required to work outside the normal working hours as defined in this 86 of the Specification, shall be surrounded by an acoustic enclosure, to the written acceptance of the Employer's Representative which shall restrict the noise levels to the levels given in Table 1/9/1 of this 86 of the Specification.

Table 1/9/1 Total noise levels are monitoring locations.

Period	Hours	LAeq [dB(A)]	LAmix [dB(A)]
Monday to Friday	7:00 – 19:00	70	80
Monday to Friday	19:00 – 7:00	60	65
Saturday	8:00 – 18:00	65	75
Saturday	18:00 – 8:00	60	65
Sundays and Public Holidays	00:00 – 24:00	60	65

Notes to Table 1/9/1:

- (i) Noise levels relate to free field conditions. Where noise monitoring locations shall be located 1 metre from the façade of buildings, the permitted noise levels may be increased by 3dB(A).
- (ii) The ambient noise level LAeq, is the total LAeq from all the noise sources in the vicinity over the specified period.
- (iii) The existing ambient noise level LAeq, at the control station is the total LAeq from all the noise sources in the vicinity over the specified period prior to the commencement of the Works.
- (iv) Maximum sound level shall be the highest value indicated on a sound level meter which meets the requirements of IS EN 61672:1 Class 1 or 2 set to SLOW response and frequency weighting A or an integrating - averaging sound level meter to IS EN 61672:2.
- (v) Throughout the contract, compliance with the limits set out in the 89 shall be assessed using the methods set out in BS 5228.
- (vi) These guidelines do not preclude more stringent criteria being required at sensitive locations.

3. Vibration Control

- 3.1. The Contractor shall employ the best practical means to minimise vibration produced by his operations, including machinery and equipment selection and maintenance, and shall comply with the recommendations in BS 5228 (Noise and Vibration Controls on Construction and Open Sites; Part 1: Code of Practice for basic information and procedures for noise and vibration control).
- 3.2. Vibration generated by the Contractor’s activities shall not adversely affect the structural and serviceability performance of any building and structure outside the boundaries of the site.
- 3.3. The vibration limits included in Table 1/9/2 below shall be complied with throughout the site, and the Contractor shall ensure that no exceedance of these limits shall occur within the site boundary.
- 3.4. The Contractor shall comply with BS6472: 1992 Evaluations of Human Exposure to Vibration in Buildings (1Hz-80Hz). Any vibration monitoring carried out shall also be in compliance with BS6472: 1992.

Table 1/9/2 Maximum allowable vibration during road construction in order to minimise the risk of building damage.

Frequency (Hz)	Corresponding Maximum Peak Particle Velocity (mm/sec)
Less than 10	8
10 – 50	12.5
50 – 100 and above	20

- 3.5. The maximum permitted peak particle velocity generated by the construction of the Works shall not exceed the peak particle velocities at locations described and for the frequencies given in Tables 1/9/3 and 1/9/4 below.

Table 1/9/3 Limits for Intermittent Vibration.

Structure Type	Max PPV (mm/sec) – Intermittent Vibration		
	Frequency <10 Hz	Frequency 10 – 50 Hz	Frequency 50 – 100 Hz
Residential Properties, similar Structures and adjacent to masonry elements of bridges	5	10	15
Residential Properties (occupied)	4	8.5	10
Steel and Reinforced Concrete Structures	15	30	40
Robust Underground services (*)	15	30	60
Elderly & Dilapidated Services (**)	10	20	40

Table 1/9/4 Limits for Continuous Vibration.

Structure Type	Max PPV (mm/sec) – Intermittent Vibration		
	Frequency <10 Hz	Frequency 10 – 50 Hz	Frequency 50 – 100 Hz
Residential Properties, similar Structures and adjacent to masonry elements of bridges	2.5	5	7.5
Residential Properties (occupied)	2.0	4.5	5.0
Steel and Reinforced Concrete Structures	7.5	15	20
Robust Underground services	7.5	15	30
Elderly & Dilapidated Services	5.0	10	20

- 3.6. Ground borne vibrations shall not be permitted at sites of freshly placed concrete, i.e. concrete less than 48 hours old.
- 3.7. The Contractor shall employ the best practical means to minimise vibration produced by his operations, including plant maintenance, and shall comply with the recommendations in BS

5228 Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration.

- 3.8. To ensure compliance with the specified vibration limit, monitoring shall be undertaken by the Contractor using a digital seismograph as described in Section 3.1 of this Appendix. Such monitoring shall include locations outside the limits of the site. The Contractor shall provide for at least 2 No. separate vibration monitoring stations to be in operation at each site at any one time.
- 3.9. The Contractor shall monitor ground vibrations at locations where vibration generated by Contractor's activities could adversely affect the structural integrity of nearby structure or where the limits stated in Table 1/9/3 and Table 1/9/4 respectively are likely to be exceeded. The Contractor shall submit details of vibration monitoring locations on an ongoing basis throughout the duration of the Works to the Employer's Representative for review. Each vibrograph shall be certified as being in proper working order and shall unless otherwise approved, record vibrations in three directions simultaneously with a print-out showing the amplitude and frequency of the vibrations.

4. Vibration Monitoring Equipment

- 4.1. The type of instrumentation suitable for monitoring vibration shall be a digital seismograph having the following minimum specification:
- (i) Minimum sampling rate 1000 samples/second/channel;
 - (ii) Capable of recording Peak Particle Velocity (Directly), Peak Acceleration (Calculated), Peak Displacement (Calculated), Frequency at the Peak Velocity (Calculated);
 - (iii) Dual Mode instrument having (a) Self Triggering Mode and (b) Continuous Monitoring Mode;
 - (iv) Transducer - 3 orthogonally mounted transducers on one mounting unit
 - (v) Frequency Range - 4.5 to 200Hz;
 - (vi) Minimum Resolution - 0.05mm/second, velocity;
 - (vii) Range - 0 to 100mm/second, velocity;
 - (viii) Record of Events - hard copy printout and storage on solid state memory or disc for subsequent printout; and
 - (ix) Power – 120 volts mains for continuous unattended operation on construction site plus internal battery with minimum of 24 hours capacity.

Appendix 1/11: Structural Elements and Other Features to be Designed by the Contractor

1. The structural elements or other features defined in the agreement shall be designed by the Contractor to comply with the design specifications therein.

Appendix 1/13: Programme of Works

1. General Requirements

- 1.1. The Contractor shall provide the programme of Works in accordance with sub-clause 4.9 of the Conditions of Contract and in accordance with the following specific requirements of this 93.
- 1.2. The Contractor's planning activities and planning system must be organised to update the Programme on a fortnightly basis to coincide with the fortnightly progress meeting. The activities shown on the programme schedule must relate directly and accurately to the Milestone Activities in the Pricing Document.
- 1.3. The Contractor shall provide the programme in the form of an electronic bar chart, created using Microsoft Project software, produced as a result of a "critical path analysis" and must abide by the constraints stated or implied in the Contract. It shall show the level of detail appropriate to each stage of the Works and all activities and restraints, each of which shall be given a short title. All events shall be numbered and annotated with the earliest start, the latest start, the earliest finish and the latest finish for each activity. The relevant resources to undertake each activity shall also be shown on the programme, including supervisory staff, plant and labour which the Contractor proposes to employ to complete the works. The Contractor shall include a cash flow projection based on his proposed programme, section by section. The critical path shall be clearly shown on the programme. An electronic MS Project format will be provided, such as .mpp. A pdf copy of the programme shall also be submitted.
- 1.4. Where the sequence of work on Site is varied, the Contractor is to revise the construction programme to reflect such amendments and obtain the Employer's Representative's agreement prior to the next weekly update.
- 1.5. The Contractor shall, wherever possible, achieve a continuous rate of progress on individual operations. The Contractor should avoid only partially completing an operation and then leaving it for an extended period.
- 1.6. Progress of the work must be assessed against the base and the planned progress detailed on the Programme. The work must be monitored by the Contractor using a system whereby all activities are uniquely identified and related to relevant activities for the whole of the works. All reports and management information are to be agreed with the Employer's Representative. The Contractor shall monitor his own performance against the Contract programme and prepare comprehensive reports for the Employer's Representative at agreed intervals in which particular reference is made to the viability of, Substantial Completion of the Works or a Section of the Works and any other dates shown.
- 1.7. All revision/updates to the above stated programme shall be supplied in approved digital formats to the Employer's Representative.
- 1.8. Where, for a Works Item, there is a local concentration of individual distinct operations which cannot be satisfactorily represented in enough detail on the Gantt chart for the full length of the execution and completion of the Works, for example at a junction or at a structure, then an individual bar chart detailing such activities shall be provided to the Employer's Representative.
- 1.9. Additionally, and notwithstanding any other provision of this Contract, the Employer's Representative shall have the right to require the Contractor to provide a bar chart for any part of the execution and completion of the Works and the Contractor shall comply with such requirement at the cost of the Contractor. Bar charts shall list the location and description of activities to which they refer and show for each listed activity a horizontal bar

indicating the start, duration and end date of that operation plotted to a horizontal scale of time.

- 1.10. Additionally, and notwithstanding any other provision of the Contract, the Employer's Representative shall have the right to require the Contractor to introduce additional activities into the bar chart and the Contractor shall comply with such requirement at the cost of the Contractor.
- 1.11. The Contractor must also submit to the Employer's Representative and Site Controller on a weekly basis a schedule of all works to be executed on the following week detailing specific work details and site location in order to consult and liaise with the relevant Site Controller to ascertain relevant Permits to Work and requirements in relation to the works.
- 1.12. The Contractor must submit to the Employer's Representative a weekly progress report. The progress report is to be prepared and issued two days before each Site meeting and shall include:
 - A statement of overall progress compared to that previously reported.
 - A proposed weekly programme to be submitted by midday on the preceding Friday.
 - A weekly progress summary in line with the accepted programme.
 - A weekly crew location look-ahead for the forthcoming week.
 - Actual progress achieved compared with that planned on the baselined construction programme, together with explanations of any differences. The report must cover in detail both activities on the critical path and activities that are crucial to completion, any changes in the critical path, coming critical activities and activities approaching criticality.
 - Any trends in progress shall be identified and where appropriate duration to completion of key activities shall be reported. Actual and potential sources of delay shall be highlighted, together with proposed corrective action and measures to mitigate the impact of delay.
 - (Activity status reports shall be produced for all activities in progress identifying for each activity: planned and actual start and finish dates, +/- weeks, % complete as planned, % actually complete and duration remaining to completion).
 - A report on off-site progress of procurement, lead-in activities and manufacture/fabrication activities.
 - Details of instructions issued and requested, and any confirmation of instructions issued by the Contractor.
 - Records of any incidents that may result in an insurance claim, affect tenants trading, or reported under the health & safety requirements.
 - Current technical queries.
 - Contract date for completion and sectional/phased completion dates, together with any extension of time agreed or being claimed (including reasons).
 - Labour (number and description of tradesmen, labourers and supervisors), plant (number, type and capacity of all plant excluding hand tools) and materials schedules; identifying any shortages and stating corrective action being taken.
 - Provide a monthly labour return, classified by trade, giving a total number of personnel employed on Site and indicating the number of new starts.

- Any difficulties and delays in the execution of subcontracts, stating corrective action being taken.
- 1.13. Subsequent to the production of the progress report, the Contractor shall, if necessary, update the programme and/or method statement to demonstrate how he proposes to overcome any delays which may have occurred. The recommendations, changes in logic and/or durations shall be submitted to the Employer's Representative in the form of a schedule indicating both the previous and amended data.
- 2. Schedule of Stated Constraints**
- 2.1. The Contractor's attention is drawn to the restrictions and constraints for the Works as detailed in the Works Requirements.
- 2.2. The list of constraints is not considered exhaustive and all others suggested or implied, within the Contract documents or considered prudent by the Contractor for any reason whatsoever including, but not limited to, its inspection of the site and off-site areas, shall be taken into account by it in formulating its tender and programme in accordance with the provisions of the Contract.
- 2.3. Further to other provisions of this 93, the programme shall allow for all of the following as a minimum:
- Phasing of the Works – the Contractor will ensure that the phasing of the works ensures that the road is kept open to traffic during the Works and that no closures of the road is permitted.
 - Traffic Safety and Management – Refer to 102. The requirements of these clauses are to be considered in the preparation of the programme and detailed programmes are to be prepared and submitted to the Employer's Representative, for each area of tie-in with the existing road network.
 - Maintenance of accesses to private dwellings and businesses.
 - Constraints due to work to privately and publicly owned services and supplies, possessions of railways, property, wayleaves and the like;
 - Constraints imposed by the requirements of relevant authorities including, but not limited to, the Inland Fisheries Ireland, the Office of Public Works and the National Parks and Wildlife Service.
 - Constraints imposed by complying with the requirements of Irish Rail;
 - Constraints imposed by accommodating facilities for local authority, public or private utility undertakers and other contractors;
 - Constraints imposed by inclement weather conditions;
 - Constraints imposed by seasonal variations in working hours and working conditions;
 - Constraints imposed on construction activities;
 - Constraints imposed by the certification procedure;
 - Constraints imposed by the integration in to the operating environment and existing systems;
 - Provision of environmental protection prior to main construction operations.

The Contractor shall allow sufficient time within his programme of Works to allow for the written consent by the Employer's Representative of subcontractors and all other approvals,

acknowledgements of receipt and the like as shall be required in accordance with the provisions of the Contract.

3. Level of Detail of Programme

3.1 The level of detail required for the programme shall not be less than the following:

3.1.1 Level 1 Programme Submissions:

- a) Traffic Management measures including operation of Site accesses, Contractor's equipment crossings and temporary diversions and the like;
- b) Phasing of the Works: the Contractor shall consider any requirements for phasing of the Works;
- c) Each motorway communication and axillary works by construction heading;
- d) Noise insulation works.

3.1.2 Level 2 Programme Submissions:

The level of detailed required shall include the following, as a minimum:

- a) All alterations or additions to privately and publicly owned services and supplies, including, but not limited to, start and end dates of each such alteration;
- b) Traffic management measures including start and end dates of each temporary traffic diversion;
- c) Each motorway communication and axillary works.

3.1.3 Level 3 Programme Submissions:

A further breakdown of items and other details as may be required either by the Contractor and / or the Employer's Representative shall be provided.

Appendix 1/14: Monthly Statements

1. General

- 1.1. The monthly statements submitted to the Employer's Representative by the Contractor in accordance with Clause 11 of the Conditions shall, whenever dealing with matters covered by the Bills of Quantities as included in Volume C of the Contract documents (Pricing Document), they shall be set out under Part and Section headings similar to those in the Bills of Quantities and shall separately identify each item and specify quantity, unit, rate and value. In respect of all other matters referred to in Clause 11.1, the Contractor shall separately show in the statement quantities, units and rates of goods and/or materials required as a result of a Change Order.
- 1.2. Where the Contractor's monthly statements include works for which the Contractor considers extra payment is due, then reference to orders given by the Employer's Representative, notices given by the Contractor in accordance with the Contract and relevant records shall be stated.
- 1.3. At monthly intervals during the Contract, the Contractor must submit detailed factual progress reports to the Employer's Representative. The progress reports must show clearly and accurately the status of all activities.
- 1.4. The report must begin with a detailed review of the HSE performance of the project both in the preceding month and for the project to date.
- 1.5. If any delivery has an adverse effect on the Contract Programme, the Contractor must state the remedial action taken to ensure that delays do not occur. The Contractor must be responsible for expediting the delivery of all material and equipment to be provided by him and his sub-contractors.
- 1.6. The site construction and installation portion of the progress report must report against each item (refer to Appendix 15/1, 30/1 and 30/2), giving the percentage completion and the projected completion date of work in relation to the agreed Contract Programme.
- 1.7. The monthly progress reports must be set out in a format accepted by the Employer's Representative and forwarded promptly so that on receipt, the information contained therein, is not more than seven days out of date. A digital copy must be supplied to the Employer's Representative.

Appendix 1/16: Privately and Publicly Owned Services and Supplies

1. General

- 1.1. The Contractor shall consult with all the relevant public utility and private service owners before commencing any Works in their vicinity and shall satisfy himself as to the exact position of existing services which may affect or be affected by the construction of the Works. The Employer shall be under no liability for any error, misstatement or omission, and none of such information shall constitute a contract or part of a contract between the Employer and the Contractor and shall not create a duty of care by the Employer to the Contractor.
- 1.2. The Contractor shall make arrangements with the relevant authorities and owners of private and public services and supplies for the co-ordination of his work with all work which needs to be done by them or their contractors concurrently with the Works. Compliance with the periods of notice given in this Appendix does not relieve the Contractor of his obligations.
- 1.3. The Contractor shall make arrangements with the relevant authorities and owners of private and public services and supplies for the phasing of all necessary disconnections, diversions and the like of privately and publicly owned services and supplies affected by, or forming part of, the Works.
- 1.4. Private services to individual properties have not generally been listed or shown on the drawings.
- 1.5. Disconnected apparatus shall be removed by the Contractor only with the prior consent of the authority concerned.
- 1.6. Should any leakages or damage be discovered, the Contractor shall immediately notify the Employer's Representative and the owners of the service.
- 1.7. The Contractor shall be responsible for all traffic management associated with the Works in connection with all publicly and privately-owned services/utilities, supplies and otherwise required to be carried out in accordance with the Contract including the requirements of this 98. The Contractor shall refer to the Health and Safety Authority publication "Code of Practice for Avoiding Danger from Underground Services" and any other relevant publications when dealing with or working nearby underground utilities and services.
- 1.8. The Contractor shall refer to the ESB publication "Code of Practice on Overhead Electricity Lines in Construction" and any other relevant publications when dealing with or working nearby overhead lines.

2. Emergency Call-Out Procedure

- 2.1. Prior to the commencement of the Works the Contractor shall advise all of the relevant utility/service providers and all residents, occupiers and facilities management companies of the buildings in the vicinity of the scheme of the Contractor's and utility/service providers contact telephone number(s) to be used in the event of damage or disruption to a service, e.g. telecommunications/data, electricity, water services.
- 2.2. In the event of the Contractor becoming aware of damage or disruption occurring to any privately or publicly owned services during the course of the Works the Contractor shall immediately make contact with the utility/service providers to ensure that services are restored as quickly as possible.
- 2.3. In the event of the Contractor becoming aware of damage or disruption occurring to any privately or publicly owned services during the course of the Works the Contractor shall ensure a competent person within their employ is available at all times throughout normal

working hours or is available on-call at all times outside of normal working hours to perform the following tasks:

- i. Make contact with the necessary utility/services provider providing all details regarding damage or disruption to any privately or publicly owned services in accordance with the utility/service provider requirements as attached.
- ii. Notify the Employers Representative or, in the Employers Representatives absence, a representative of the Employers Representative of the disruption to the utility/service provider's service and advise him/her of what steps have been taken to repair the damage and/or restore the service.
- iii. Assist in the restoration of service by providing labour, plant and materials, if requested by the utility/service provider, at no additional cost to the Employer.
- iv. Notify the emergency services and relevant local authority as necessary.

3. Participation of Work by, or for, Statutory Undertakers and Others

3.1. Electricity Supply Board (ESB)

3.1.1. The Contractor is responsible for contacting ESB Networks to ensure early and adequate mobilisation, therefore, preventing any delay to the Contract. The Contractor shall adhere to all ESB Networks requirements. In order to minimise delays to the construction programme, the relevant local authority will make direct payment to ESB Networks for all parts of the permanent Works carried out directly by ESB Networks.

3.1.2. The Contractor shall be responsible for all other aspects listed in this 98 and wherever else is required by these Works Requirements. The Contractor shall consult with and comply with the requirements of ESB Networks.

3.1.3. ESB Networks will execute all cabling works in connection with the proposed diversions with all other works being carried out by the Contractor. The works to be carried out by the Contractor include, but not limited to the works described below:

- (i) Excavating slit trenches at a minimum of 50m centres along both sides on the road in advance of breaking ground to determine the precise route for new ducts and to location the existing ducts
- (ii) Excavation of cable trenches to allow for dropping of overhead cables
- (iii) Trench excavation, laying of ducts, backfilling, temporary reinstatement, re-excavation to allow for cable pulling and running cables up each property and permanent reinstatement as appropriate
- (iv) Protecting existing services at all times
- (v) Brush, mandrel and rope all ducts
- (vi) Concrete surround where required
- (vii) Backfilling of trenches and permanent reinstatement as appropriate.
- (viii) Attendances on ESB networks

3.1.4. Ducts for cabling for ESB shall be red in colour and shall be 50mm diameter, 100mm diameter and 125mm diameter as shown on the drawings. Material specification for ESB ducts is given in Appendix 5/2. All ducting to be supplied by the Contractor.

3.1.5. ESB Networks approved marker tape shall be provided to ducts in footpaths trenches and road trenches.

- 3.1.6. New chambers and ducting associated with the ESB diversions are to be constructed in accordance with ESB's standard details and specifications.
- 3.1.7. The Contractor shall be liable for and required to indemnify ESB against any liability, loss, claim or proceedings for injuries to any person or property, insofar as any such injury or damage arising out of or in the course of or by reason of the installation required to carry out the work.
- 3.1.8. The Contractor shall be required to provide ESB with an "As Constructed" drawing showing the location of ducts laid for ESB Networks.
- 3.1.9. The Contractor shall also be asked to dig a trial hole at a random location to prove depth and locations of ducting. ESB works will not commence on Site until "As Constructed" drawings have been provided and the ducts installed and proven with a mandrill.
- 3.2. eir
- 3.2.1. The Contractor is responsible for contacting eir to ensure early and adequate mobilisation, therefore, preventing any delay to the Contract. The Contractor shall adhere to all eir requirements.
- 3.2.2. eir will execute all cabling works in connection with the proposed diversions with all other works being carried out by the Contractor. The works to be carried out by the Contractor include, but not limited to the works described below:
- (i) Excavating slit trenches at a minimum of 50m centres along both sides on the road in advance of breaking ground to determine the precise route for new ducts and to locate the existing ducts
 - (ii) Construction of chambers and jointing chambers
 - (iii) Trench excavation, laying of ducts, backfilling, temporary reinstatement, re-excavation to allow for cable pulling and running cables up each property and permanent reinstatement as appropriate.
 - (iv) Brush, mandrel and rope all ducts
 - (v) Protecting existing services at all times
 - (vi) Removal of redundant poles and completing new footpaths once poles have been removed.
 - (vii) Concrete surround where required.
 - (viii) Attendances on eir
- 3.2.3. Ducts for cabling for eir shall be uPVC, 110mm diameter and black in colour. All ducts shall have a wall thickness of 2.5-3.0mm and a spigot at one end. Ducts with collars may not be used. 50mm uPVC ducts are required for connection to individual properties as shown on the drawings.
- 3.2.4. Marker tape shall be provided to ducts in trenches.
- 3.2.5. New chambers and ducting associated with diversions are to be constructed in accordance with eir's standard details and specifications.
- 3.3. Uisce Éireann (formerly Irish Water) and relevant Local Authority Water Services
- 3.3.1. All existing foul sewers interfered with during the Works shall be replaced on a like for like basis.

- 3.3.2. The Contractor shall be responsible for making arrangements with Uisce Éireann (formerly Irish Water) and relevant Local Authority Water Services Department for the phasing into his programme of Works, all work which has to be supervised by these authorities, or their appointed agents, which shall be carried out concurrently with the Works.
- 3.4. Telecoms
- 3.4.1. The Contractor shall execute all works in connection with the protection of these existing fibre optic services and laying of new spare ducting
- 3.4.2. The Works to be carried out by the Contractor include, but not limited to the Works described below:
- (i) Excavating slit trenches at a minimum of 50m centres along both sides on the road in advance of breaking ground to determine the precise route for new ducts and to locate the existing ducts.
 - (ii) Laying of steel protection plates over the existing ducts in areas of new road surfacing and car parking bays as shown on the drawings for the permanent protection of the ducts.
 - (iii) Temporary protection of the ducts as the Works progress
 - (iv) Trench excavation, laying of ducts, backfilling and permanent reinstatement as appropriate.
 - (v) Brush, mandrel and rope all ducts
 - (vi) Concrete surround where required.

Appendix 1/17: Traffic Safety and Management

1. General

- 1.1. Safety of road users and all other persons operating on the Network shall be the primary consideration in the design, implementation, maintenance and removal of traffic management measures. The Contractor shall be responsible for the planning, design, implementation, maintenance and removal of traffic safety and management measures required in order to facilitate the Works.
- 1.2. The Contractor shall comply with the requirements of any relevant Authority regarding traffic safety and management. The Contractor shall be responsible for obtaining from the relevant Road Authority any statutory orders or other legal requirements required to be made or notices required to be published in connection with his traffic safety management and diversion proposals.

2. Traffic Safety and Management Requirements

2.1. Introduction

- 2.1.1. The Contractor shall comply at all times with the requirements of Chapter 8 of the Traffic Signs Manual 2024, published by the Department of Transport and any additional requirements of TII Publications. The period of closure shall be the minimum to facilitate the Works.

2.2. Road Space Booking System

- 2.2.1. The Contractor shall apply a minimum of six weeks in advance of all works for all road space bookings where the deployment of temporary traffic management is envisaged. The Contractor shall make a road space booking using a web-based application and database, currently operated and maintained by the MOCC Operator. The Contractor shall liaise with the MOCC Operator and provide all information as required by the MOCC Operator to assist and co-ordinate the displaying of advance warning information on VMS signage to the road users pertaining to the Works. The Contractor shall confirm the road space booking one week before the event. If the Contractor does not confirm the road space booking one week before the event, the booking shall be cancelled. Following confirmation of the road space booking, the Contractor shall apply to the MOCC Operator for temporary road or lane or hard shoulder closures on the Network.
- 2.2.2. The Contractor shall not install any Temporary Traffic Management Scheme (TTMS) on the Network without a confirmed road space booking.

2.3. Traffic Safety and Management Consultation

- 2.3.1. The Contractor shall consult with An Garda Síochána, the relevant TII appointed Road Operators as scheduled in Table 1/7/1 of 82 or Local Road Authority, a minimum of six weeks in advance of carrying out any works, which shall affect public traffic.
- 2.3.2. The Contractor shall phase any work which affects the public traffic in a manner acceptable to, An Garda Síochána, the Employer's Representative and the relevant TII appointed Road Operators or Local Road Authority.
- 2.3.3. The Contractor shall liaise with and agree the working hours with the relevant TII Road Operators, any affected local authorities, An Garda Síochána and the Employer's Representative a minimum of two weeks in advance of commencement of the Works.
- 2.3.4. Without prior approval by the Employer's Representative, the erection and removal of any traffic management or temporary diversion shall not be carried out during the following hours:

- 2.3.5. Monday to Saturday - 07.00 to 10.00 hours and 16.00 (13.30 on Fridays) to 19.30 hours and on any local or national public holiday.
- 2.4. Employer's Traffic Management Information System
- 2.4.1. The Contractor shall comply with the requirements of the TII traffic management information system. The traffic management information system records details of all ongoing and planned traffic management works on the entire road network.
- 2.4.2. Prior to commencing any traffic management works, the Contractor shall access the system in order to determine whether other works are being undertaken in the vicinity. In the event that other traffic management works are being carried out, the Contractor shall liaise and co-ordinate with the contractor carrying out the works in order to minimise disruption to the general public.
- 2.4.3. The Contractor shall upload the following information to the traffic management information system:
- Traffic management plans and drawings;
 - Details and minutes of all Traffic Safety and Management Consultations
 - Temporary traffic management plans and drawings; and
 - Contingency plans.
- 2.4.4. Following the submission of data and commencement of traffic management works on Site, the Employer may carry out a site visit and an independent inspection of the Works. Following the site visit, the Contractor shall be required to comply with any recommendations outlined by the Employers Inspector.
- 2.5. Road Types
- 2.5.1. The Contractor shall be required to undertake works on the following road types with varying AADT (Average Annual Daily Traffic) volumes and speed limits:
- Motorways
 - Motorway Junctions and Slip Road
 - Dual Carriageways
 - Single Carriageways
 - Roads, Private Roads and other Ways Affected by the Works
- 2.5.2. The Contractor shall implement traffic management measures at the above road types as follows;
- 2.5.2.1. Motorways
- Traffic safety and management measures shall be provided by the Contractor to maintain flow of traffic on each carriageway as set out below. All traffic lanes to be 3.5m minimum width:
- (i) All existing lanes of traffic each shall be maintained in each direction along the motorway at all times between 6AM and 10PM seven days a week for the entire duration of the Works throughout the site.
 - (ii) Closure of the hard shoulder shall be permitted for the Works for a maximum distance of 4km in length subject to appropriate notice periods and agreement with the relevant Third Parties. The minimum permitted distance between the end of one

- traffic management deployment and the start of the next traffic management deployment shall be no less than 5km.
- (iii) Lane closures may be permitted along each carriageway between 10PM and 6AM with a minimum of two adjacent lanes in each direction to be available to traffic at all times when traffic flows of no more than 2,500 vehicles per hour per direction are predicted. Any closures are subject to the appropriate notice periods and agreement with the relevant Third Parties and shall be agreed 8 weeks in advance of the commencement of the Works in any part of the site. Unless approved by the Employer's Representative, Traffic management measures shall not be permitted on the traffic lanes between 6AM and 10PM. The maximum permitted length of a lane closure shall be 4km and the minimum permitted distance between the end of a lane closure and the start of the next lane closure shall be no less than 5km.
 - (iv) In exceptional circumstances where a further number of lanes are required to be made non-available, the Contractor shall seek the approval the relevant Third Parties. The Contractor shall demonstrate that the proposal is manageable and will have minimal traffic disruption. The approval shall be at the discretion of the Employer and relevant Third Party.
 - (v) The maximum traffic volume for a single lane traffic shall be 1,700 vehicles per hour per direction. Where traffic volumes are determined to be in excess of the limits stated above, the lane closure shall be terminated as soon as practicable and all lanes made available. The Contractor shall comply with the requirements of the TII appointed Road Operator throughout this period.
 - (vi) Lane closures shall not be permitted during Christmas and New Year holidays or between Friday and Monday inclusive of any bank or public holiday weekend.
 - (vii) The Contractor shall undertake traffic counts prior to setting out all traffic management installations. Records of these counts shall be maintained by the Contractor for review at any time by the Employer's Representative.

2.5.2.2. Motorway Junctions and Slip Road

Traffic safety and management measures shall be provided by the Contractor to maintain flow of traffic on the carriageway as set out below.

- (i) All traffic lanes shall be maintained on the junctions and slip roads at all times between 6AM and 10PM seven days a week for the entire duration of the Works.
- (ii) Lane closures on the junction slip road lanes may be permitted between 10PM and 6AM subject to appropriate notice periods and agreement with the relevant Third Parties. Traffic management measures shall not be permitted on the traffic lanes between 6AM and 10PM.
- (iii) Full closures of the junction slip roads may be permitted between 10PM and 6AM subject to appropriate notice periods and agreement with the relevant Third Parties. Traffic management measures shall not be permitted on the traffic lanes between 6AM and 10PM.
- (iv) A full slip road closure shall not be permitted on two opposing carriageway direction merge or diverge junction slip roads at the same junction at any one time.
- (v) A full slip road closure shall not be permitted on two adjacent junction diverge slip roads in the same direction of travel at any one time.
- (vi) Where a full junction merge closure exists, a slip road lane closure shall not be permitted on the previous upstream junction diverge slip road or the previous upstream opposing carriageway direction merge slip road. Accordingly, where a full junction diverge closure exists, a slip road lane closure shall not be permitted on the next downstream junction merge slip or the next downstream opposing carriageway direction diverge slip road.

- (vii) Slip Road lane closures shall not be permitted during Christmas and New Year holidays or between Friday and Monday inclusive of any bank or public holiday weekend.

2.5.2.3. Dual Carriageways

AADT Volume greater than 20,000

Traffic safety and management measures shall be provided by the Contractor to maintain flow of traffic on both carriageways as set out below. All traffic lanes to be 3.5m minimum width.

- (i) Both lanes of traffic shall be maintained in each direction along the Dual Carriageway at all times between 6AM and 10PM seven days a week for the entire duration of the Works throughout the site.
- (ii) Closure of the hard shoulder shall be permitted for the entire duration of the Works at a particular site on Type 1 Dual Carriageways.
- (iii) Reduced lane running (maximum single lane closure at any one time) may be permitted along each carriageway between 10PM and 6AM subject to the installation of appropriate additional traffic management measures in accordance with the requirements set out above. Traffic management measures shall not be permitted on the traffic lanes between 6AM and 10PM.

AADT Volume less than or equal to 20,000.

Traffic safety and management measures shall be provided by the Contractor to maintain flow of traffic on both carriageways as set out below. All traffic lanes to be 3.5m minimum width.

- (i) All lanes of traffic shall be maintained in each direction along the Dual Carriageway at all times between 6AM and 10AM and between 4PM and 10PM seven days a week for the entire duration of the Works throughout the site.
- (ii) Closure of the hard shoulder shall be permitted for the entire duration of the works on Type 1 Dual Carriageways.
- (iii) Reduced lane running (maximum single lane closure at any one time) may be permitted along each carriageway between 10AM and 4PM and 10PM and 6AM subject to the installation of appropriate additional traffic management measures in accordance with the requirements set out above. Traffic management measures shall not be permitted on the traffic lanes between 6AM and 10AM and between 4PM and 10PM.

2.5.2.4. Single Carriageways

AADT Volume greater than 5,000

Traffic safety and management measures shall be provided by the Contractor to maintain flow of traffic on the carriageway as set out below. Existing traffic lanes shall be maintained to 3.5m minimum width.

- (i) Traffic shall be maintained in each direction along the Single Carriageway at all times between 6AM and 10AM and between 4PM and 7PM seven days a week for the entire duration of the works on each site.
- (ii) Closure of the hard shoulder, where present, shall be permitted for the entire duration of the works at a particular site on Type 1 Single Carriageways with a minimum 2.5m wide hard shoulder.
- (iii) Man operated temporary traffic signals to allow a reduced shuttle operation may be permitted between 10AM and 4PM subject to the installation of appropriate

additional traffic management measures in accordance with the requirements set out above. Traffic management measures shall not be permitted on the traffic lanes between 6AM and 10AM and between 4PM and 10PM.

AADT Volume less than or equal to 5,000

Traffic safety and management measures shall be provided by the Contractor to maintain flow of traffic on the carriageway as set out below. Existing traffic lanes shall be maintained to 3.5m minimum width.

- (i) Traffic shall be maintained in each direction along the Single Carriageway at all times between 6AM and 10AM and between 4PM and 7PM seven days a week for the entire duration of the works on each site.
- (ii) Closure of the hard shoulder, where present, shall be permitted for the entire duration of the works at a particular site on Type 1 Single Carriageways with a minimum 2.5m wide hard shoulder.
- (iii) Man operated temporary traffic signals to allow a reduced shuttle operation may be permitted between 10AM and 4PM subject to the installation of appropriate additional traffic management measures in accordance with the requirements set out above. Traffic management measures shall not be permitted on the traffic lanes between 6AM and 10AM and between 4PM and 10PM.

2.5.2.5. Roads, Private Roads and other Ways Affected by the Works

Traffic safety and management measures shall be provided by the Contractor to maintain flow of traffic on the carriageway as set out below.

- (i) Vehicular Traffic
The carriageway is to be kept open with the existing number of traffic lanes to be maintained at all times unless agreed otherwise with the Employer's Representative, the Local Authority, the Road Authority and An Garda Síochána advance of commencing the Works.
The traffic management restricting the carriageway shall be capable of being removed by the Contractor at short notice if traffic congestion level becomes unacceptable. An unacceptable level is defined when the traffic experiences delays exceeding 8 minutes at the approach to the area of working. If such congestion is experienced the relevant Third Party may require that the lane restrictions are removed immediately and may not recommence until the congestion level has reduced and is unlikely to reach an unacceptable level within the following 2 hours.
- (ii) Pedestrian Traffic
The Contractor shall programme the works with the aim of ensuring the safety of pedestrians / cyclists at all times and keeping the disruption to pedestrians / cyclists to an absolute practical minimum. Two weeks in advance of commencing works, the Contractor shall submit to the Employer's Representative a method statement to demonstrate how safety shall be ensured and disruption minimised.

3. Risk Assessments

- 3.1. Before deciding on the type of traffic management to be used for a particular Temporary Traffic Management Scheme, the Contractor shall undertake a risk assessment to rank the safety of different options. This shall particularly be used to determine the timing of the Temporary Traffic Management Scheme and whether a lane closure or mobile lane closure is the most appropriate method. The risk assessment shall include an assessment of the implications for roads affected by any diverted traffic.

- 3.2. The risk assessment shall include not only the possible risk to those directly involved in the traffic management and the subsequent Temporary Traffic Management Schemes on the Network, but also the possible risk to road users who may be affected both within and on the approaches to the traffic management measures. In addition, it should also consider, but not be restricted to, the road type, wide and/or abnormal loads, the location, the time of day, the time of year, the anticipated volume of traffic, the nature and method of carrying out the Temporary Traffic Management Scheme. The Contractor shall also consider what additional measures may be appropriate to enhance safety in the particular circumstances which prevail for the operations at the location in question.
- 3.3. The Contractor shall submit the detailed risk assessment to the Employer's Representative with the Traffic Management Plan.

4. Notice Requirements

- 4.1. The Contractor shall be subject to all Legal Requirements in relation to temporary closures. The period for traffic diversions or restrictions shall be the absolute minimum required to facilitate construction of the works.
- 4.2. All applications relating to road closures, traffic orders, Lane Occupations, signs or signals shall be submitted to the relevant TII appointed Road Operator and TII in writing and require the following notice:
- (i) amending or making traffic orders – 8 weeks
 - (ii) requests for road closures or traffic diversions: 8 weeks;
 - (iii) authorising of non-prescribed signs – 6 weeks;
 - (iv) authorising temporary traffic signals: 6 weeks; and
 - (v) moving signs to be compatible for Road Works with the state of the Works as described in Clause 117.11: 8 weeks.

5. Planned Closures

- 5.1. To close any section of public road temporarily, the Contractor shall first discuss his proposals with the Employer's Representative, the Road Authority and An Garda Síochána accordance with Section 2.3 of this 102. Following this consultation, the Contractor shall give a minimum of eight weeks' notice in writing to the relevant Road Authority of his intention to close any public road.
- 5.2. Prior to the issue of a road closure order, the Contractor shall supply, erect and subsequently promptly remove information including variable message signs informing the public of the proposed road closures at least two weeks in advance of the proposed closure date. These information signs shall include portable variable message sign and the Contractor shall locate them at positions agreed with the Employer's Representative at locations within 2km of the site. These shall state the closure date and be erected in locations to be approved by the Employer's Representative and comply with the other requirements of this 102 of the Specification.
- 5.3. The Contractor shall supply, erect and maintain all signs, variable message signs, lighting and barriers to affect the closure and any necessary diversionary routes to the satisfaction of the Employer's Representative and the Road Authority.
- 5.4. All diversion signs shall be in place at least 2 hours prior to start of a road closure for final inspection. The signs shall be taken down within 2 hours after the end of the closure/diversion. Temporary signs for diverting traffic shall conform to the traffic signs detailed in Chapter 8 of the Traffic Signs Manual 2024.

6. Publicity

- 6.1. At least from 2 weeks in advance with daily repeat in the week prior to the proposed implementation of the traffic safety and management measures, the Contractor shall advise AA Roadwatch to make notices on local and national radio to advertise to the general public the proposed works and estimated period for traffic management and diversions.

7. Traffic Management Plan

- 7.1. The Contractor shall appoint a Traffic Management Engineer who shall be a Chartered Engineer, suitably experienced in Traffic Management and who is to be approved by the Employer and the Road Authority at each site location, to prepare traffic management plans.
- 7.2. The Traffic Management Engineer shall liaise with and comply with the requirements of the Road Space Booking System when programming Traffic Management Works. If other works are being undertaken at these locations, the Traffic Management Engineer shall liaise with the contractor carrying out the other works when proposing traffic and pedestrian management measures and co-ordinate his works with these other contractors to minimise disruption to the general public.
- 7.3. At least 3 weeks prior to commencement of any works, the Contractor shall submit a Traffic Management Plan prepared by the Traffic Management Engineer which shall have been previously agreed with the Employer's Representative, the Road Authority and An Garda Síochána. This Traffic Management Plan should consider any programme constraints outlined in 93 and the following minimum information:
- (i) Temporary Traffic Management and Safety proposals including diversions of traffic routes, details of all specially constructed routes, sign details and positions and other controls to be implemented, details of temporary or alteration to any existing road markings, details and locations of temporary safety barriers, details and location of shuttle working and traffic control points;
 - (ii) allowances and contingencies for access by emergency service vehicles, public transport and access for road users, including breakdowns and breakdown recoveries;
 - (iii) the details, date and duration envisaged for road or lane closures including partial closures and details of works sequencing affecting traffic flows on any part of the Network and any other areas where traffic safety and management measures are required for the construction and completion of the Services;
 - (iv) the dates for notifications to third parties e.g. Local Authorities, An Garda Síochána, Relevant Authorities and maintenance contractors on Connecting Roads;
 - (v) proposals for facilitating public transport services;
 - (vi) details of the plant that will be working in the vicinity and the measures to be implemented to ensure public safety near the site;
 - (vii) incorporation of any public relations issues arising from the safety and management measures;
 - (viii) copies of completed applications, notifications or agreements made with any authority with respect to the arrangements for the temporary removal/diversion of traffic signs and signals, street lighting, roads, utilities, telecommunication etc;
 - (ix) phasing of works (include the details of orders that have been made or are being made in respect of roadworks);
 - (x) temporary road lighting;

- (xi) restrictions arising from the use of substances hazardous to health;
- (xii) risk assessments;
- (xiii) safety proposals for supervising the operation of mechanical plant;
- (xiv) method statements for preventing mud and dust on roads;
- (xv) a works programme for implementation of the Temporary Traffic Management Schemes (TTMS) showing the timing of the operations;
- (xvi) a statement of the anticipated effects of each TTMS on traffic flows on adjacent affected national, regional or local roads; and
- (xvii) details of flows and route numbers of buses affected by each TTMS. This should include the anticipated effects of the TTMS on bus journey times and reliability.

7.4. Drawings shall be required for each section of the works showing the traffic management for the works in all areas including works in adjacent areas. The drawings shall include (where appropriate):

- (i) general layouts;
- (ii) temporary diversions;
- (iii) roadwork speed limits (if proposed);
- (iv) position of all traffic control points;
- (v) position and details of temporary regulatory and directional signs;
- (vi) for each movement, number and width of lanes proposed, identifying which movements are exclusive and which are shared;
- (vii) extent of lane closures;
- (viii) access and site locations for Contractor plant;
- (ix) signing and coning or barrier details for the lane closures required to set up and take down the TTMS;
- (x) position and extent of temporary safety barriers;
- (xi) the times when lane closures will be set up and removed;
- (xii) location of Contractor's store for all traffic management equipment required for the particular traffic management operation;
- (xiii) temporary road markings;
- (xiv) temporary road lighting;
- (xv) provision for pedestrians and other non-motorised users where existing facilities are affected, including footpath width and crossing points;
- (xvi) temporary traffic signals and positioning of traffic cones and road/pedestrian safety barriers;
- (xvii) proposals for closing roads or diverting traffic including details of diversion route proposals.

7.5. Drawings showing the Contractors traffic management plans shall be to a scale not less than 1:2,000, supplemented by drawings at 1:500 scales as necessary or required by the Employer.

8. Road Safety Audits

- 8.1. The Contractor shall be subject to the full statutory procedures outlined in the Temporary Closing of Roads Regulations.
- 8.2. Stage 2 and Stage 3 of the Road Safety Audits shall be carried out by the Contractor on temporary traffic management stages unless they are not judged by the Employer's Representative, following discussions with the relevant Roads Authority and An Garda Síochána, to be sufficiently complex or major to require a Road Safety Audit. Stage 3 safety audits shall be carried out for traffic management in place for longer than 3 working days.
- 8.3. For a Stage 2 Road Safety Audit, the Contractor shall submit to the Employer's Representative two signed copies of a Road Safety Audit Certificate for each audited traffic layout stage, not less than fourteen days before implementation of the traffic management stage. One copy will be returned to the Contractor signed in acknowledgement of receipt by the Employer's Representative within seven days of receipt.
- 8.4. For a Stage 3 Road Safety Audit, the Contractor shall submit to the Employer's Representative, two signed copies of a Road Safety Audit Certificate for each audited stage no less than three days before implementation of the traffic management. One copy will be returned to the Contractor signed in acknowledgement in receipt by the Employer's Representative within seven days of receipt. No awaited temporary traffic management stage shall be put into operation until a Road Safety Audit Certificate has been signed by the Designer and the Contractor.

9. Traffic Safety and Control Officer (TSCO)

- 9.1. The Contractor shall appoint a Traffic Safety and Control Officer as required by Clause 117 of the Specification who shall make all arrangements necessary for traffic safety and control. The Traffic Safety and Control Officer shall have one or more nominated deputies. The Contractor shall provide the Employer's Representative with the names of this Officer and his nominated deputies and with telephone numbers or details of other means by which they or at least one of them can be contacted at any time. The Traffic Safety and Control Officer or his nominated deputy shall be on Site at all times when work is proceeding and shall be readily available at any time of the day or night to deal with matters related to traffic safety and control.
- 9.2. The Traffic Safety and Control Officer or his nominated deputy shall be in a position to put into immediate effect any traffic measures necessary to ensure the safety of the public. The Contractor shall operate a two-way radio or other communication system to enable the appropriate level of communication to be undertaken. Mobile telephones shall be carried by the TSCO to ensure contact is possible at all times.
- 9.3. The Traffic Safety and Control Officer, or in his absence his deputy, shall be entirely responsible for:
 - (i) Liaison with the Employer's Representative, the TII appointed Road Operator, TII and An Garda Síochána in all matters relating to traffic management;
 - (ii) The management of traffic during periods when traffic restrictions are necessary, and ensuring that all traffic management requirements are met;
 - (iii) Immediately notifying An Garda Síochána, the TII appointed Road Operator and the Employer's Representative of any accidents or emergencies;
 - (iv) Ensuring the safe working of machinery and personnel, and ensuring that all personnel engaged on the works are aware of the Contractor's obligations and duties in respect of site safety when working on or adjacent to a live carriageway;

- (v) Notifying the Employer’s Representative of any deterioration in traffic management equipment and trafficked road surfaces;
- (vi) Submitting to the Employer’s Representative weekly information sheets detailing all traffic management operations, traffic incidents and breakdowns.
- (vii) Arranging that all elements of the Network occupied by the Contractor are patrolled and inspected at all times (24 hours per day, 7 days a week) and equipment attended to and maintained and in the case of accidents have replacement signs, cones, bollards and lights and the like erected without delay.

The frequency of patrols for TTMS shall be as below:

Road Category	Frequency/24 hours	At intervals of not more than:
Motorways, dual carriageways and all interchange slip roads	8 times	3 hours
Single carriageway roads	6 times	4 hours

10. Maintenance Requirements

- 10.1. The Contractor shall, in accordance with Clause 117, be responsible for the maintenance of all traffic management provisions under the Contract. The Contractor shall monitor the public roads while any lane and / or carriageway occupations are in force during the Works. Any defects identified shall be rectified immediately to the satisfaction of the Employer’s Representative.
- 10.2. The Contractor shall provide a 1.4m high temporary solid pedestrian guardrail/barrier between works areas and pedestrian areas with suitable means of access and egress, wherever the Works introduce a hazard to passing pedestrians.
- 10.3. The Contractor shall keep a daily record of all defects, the times when they were identified or reported to it, the action taken to correct the defects and the times when they were successfully corrected. A copy of this record shall be forwarded to the Employer’s Representative on the following day, until the completion of those works requiring lane or carriageway occupation.
- 10.4. In the event of an accident occurring adjacent to any of the works, the Contractor shall immediately contact An Garda Síochána, the TII appointed Road Operator and the Employer’s Representative informing them of the following:
 - Location of the accident; and
 - The seriousness of the accident and whether any persons are trapped or pinned, whether the collision involves vehicles carrying inflammable, corrosive or hazardous substances, whether there is any possibility of ignition from leaking chemicals.
- 10.5. The Contractor shall provide telephone numbers of a minimum of 3 No. personnel who can be contacted by An Garda Síochána and / or Employer’s Representative both during and outside normal working hours and who shall be responsible for initiating action should it be reasonably required in the event of an emergency. The Contractor shall ensure that sufficient personnel and spare signs and cones and other traffic management material are available at all times to make good damage to any traffic control layout.
- 10.6. When a contra-flow is in operation, an Emergency Lane shall be provided at all times for emergency vehicles unless otherwise agreed with the Employer’s Representative. The emergency lane shall be kept free of materials, plant and stationary vehicles but it may be used for works access. The route shall be signed and delineated in order to ensure easy and free flow access for any emergency vehicle.

- 10.7. Once broken down or damaged vehicles and debris have been removed, the Contractor shall, on the direction of the Employer's Representative, restore the road surface to its original condition to the satisfaction of the Employer's Representative. The Contractor shall submit to the Employer's Representative within 48 hours fully detailed and separate records of plant, labour and materials used for restoration and reinstatement for record purposes.
- 10.8. The Contractor shall ensure that all signs, cones, barriers, delineators and bollards used in connection with the Works shall be inspected and, if necessary, cleaned regularly, at intervals not greater than one week and when necessary. The Contractor shall ensure that all reflective patches and sleeves on cones or other delineators are cleaned or replaced at intervals of not greater than seven days, or as necessary to maintain effective reflectivity.
- 10.9. The Contractor shall assist An Garda Síochána in moving wide/abnormal loads through the Works by modifying the signing/coning as necessary. Signs/cones so moved shall be replaced immediately the abnormal loads have passed through the Works.

11. Traffic Management Co-ordination Meetings

- 11.1. Following the commencement of works at each site, or as required by the Employer's Representative, meetings shall be held consisting of representatives of the following organisations:
- (i) The relevant Road Authority and affected TII appointed Road Operator;
 - (ii) An Garda Síochána;
 - (iii) The Employer's Representative;
 - (iv) The Contractor:
 - a. Contractor's Supervisor;
 - b. Traffic Safety and Control Officer; and
 - c. Traffic Management Engineer.
- 11.2. Other interested parties may also attend should the Employer's Representative deem it necessary.

12. General

12.1. Site Vehicles, Personnel and Plant

- 12.1.1. No staff of the Contractor other than personnel erecting and removing temporary traffic management signs shall work on any part of the Network which is not properly signed and coned off unless specifically rendering assistance to any Relevant Authority and working under their direction.
- 12.1.2. All employees must be individually and specifically warned not to step into any part of the carriageway outside the coned area.
- 12.1.3. The Employer's Representative shall be entitled to instruct workmen on any matter relating to safety of personnel and traffic safety and control, including signing and coning, and shall if such instruction is given the Employer's Representative shall also notify the Project Supervisor for the Construction Stage (PSCS) as appropriate.
- 12.1.4. All employees must wear full PPE including class 3 hi-vis, reflective clothing.
- 12.1.5. A stop of up to 15 minutes on hard shoulders shall be permitted for inspection and surveying purposes without the need for traffic management measures so long as vehicles are authorised with appropriate livery and flashing beacons in place.

- 12.1.6. All personnel working on or adjacent to trafficked roads shall be submitted with printed copies of appropriate safety instructions and receive training as necessary.
- 12.1.7. No personnel or items of plant (other than that required for signing and coning operations) shall enter a newly closed off area until such times as the traffic has been satisfactorily diverted.
- 12.1.8. Staff of the Contractor whose duties require them to carry out surveys, inspections and investigations on the Network in connection with any operations shall be required to be in possession of an identity pass issued by the Contractor, which shall be notified to the Employer.
- 12.1.9. All drivers including those delivering plant and materials shall be given clear instructions regarding the traffic arrangements applicable at any particular time.
- 12.1.10. No site vehicles shall exceed 30kph when travelling within the working areas of the site, and a maximum 15kph speed limit is to be observed by site traffic adjacent to works in progress, accommodation or standing plant. Temporary site speed limit signs are to be erected as appropriate, or as directed by the Employer's Representative.
- 12.1.11. All vehicles and mobile plant used on the site by the Contractor, his sub-contractors and suppliers must be fitted with an audible reversing warning sign.
- 12.1.12. No site vehicles are permitted to drive against the normal flow or to face oncoming traffic, except when agreed in advance by the Employer's Representative for the performance of essential operations.
- 12.1.13. Construction vehicles, or the vehicles of the Contractor's sub-contractors or suppliers, shall only enter or leave the working areas of the site via approved accesses and egresses. Construction vehicles, or the vehicles of the Contractor's sub-contractors or suppliers, shall not be permitted to use roads, accesses or temporary carriageways within the site and off-site areas while they are open to use by public vehicles
- 12.1.14. Non-essential vehicles, particularly private cars, shall not enter the working areas (Employers Personnel's vehicles with appropriate flashing beacons are permitted access to site).
- 12.2. Vehicle Lighting
- 12.2.1. All vehicles and plant engaged in the works or entering/exiting the working areas shall have roof mounted double amber flashing lamp, as required by sub-clause 117.14 of the Specification for Works. The lamp shall be used in the circumstances stated in sub-clause 117.14 of the Specification for Works, or as directed by the Employer's Representative, or An Garda Síochána. Hazard warning lights shall not be used as an alternative to the roof mounted amber flashing lamp.
- 12.3. Signs, Road Lighting and Traffic Signals
- 12.3.1. The Contractor shall supply, erect and maintain all signs, driver information signs and barriers to the satisfaction of the road authority.
- 12.3.2. Driver information signs and variable message signs shall be provided at locations on each approach to the works as follows:
- Driver information signs:– all locations;
 - Variable message signs:– at all locations of works;
- 12.3.3. Where road lighting exists over a length of road covered by a traffic management system then this shall be maintained or modified such that the standard of lighting while the traffic management measures are in force is equal to that existing.

- 12.3.4. All lamps which are used to delineate roadworks or temporary obstructions shall show a yellow light.
- 12.3.5. Where traffic signals are proposed, the optical performance of all portable traffic control signals shall comply with the requirements for high density traffic control signals as specified in BS 505.

13. Protection of Existing Works and Amenities

- 13.1. The Contractor shall take all necessary precautions to safeguard all existing buildings and works from damage by construction activity, plant operation, ground water movement, ground movement and settlement and all other activities associated with the execution of the Contract. The Contractor shall make all necessary records (photographic or otherwise) of existing structures and other properties that could be affected by execution of the works prior to the commencement of construction.

Appendix 1/18: Temporary Diversion for Traffic

1. General Requirements

- 1.1. If any lane closures are deemed necessary for the completion of any stage of the Works, the Contractor shall consult with the relevant TII appointed Road Operator to arrange the necessary measures be implemented. Any lane closures will only be permissible between the hours of 22:00 and 06:00. In the event of a motorway access slip lane being the subject of a closure, the relevant TII appointed Road Operator shall be consulted to agree diversion route and standing diversion procedures to be put into effect.
- 1.2. The Contractor shall maintain access for all domestic, industrial, educational and commercial properties and the like throughout the course of the works. The Contractor shall phase its works to minimise disruption to businesses and local residents.
- 1.3. The Contractor shall design, construct and maintain all temporary diversion routes including any temporary roadways, footpaths, cycle tracks and the like that are deemed necessary, by the Employer or the Contractor, for temporary diversion of traffic, cyclists and pedestrians in order to facilitate the execution of the Works. The Contractor shall comply with the requirements of 102 when developing his proposals for any such temporary diversions.
- 1.4. Appropriate signage including variable message signs complying with the requirements of Chapter 8 of the Traffic Signs Manual 2024 shall be supplied and erected and maintained by the Contractor for all temporary diversions of traffic.
- 1.5. At least 6 weeks before proposing any temporary traffic diversions associated with works, the Contractor shall consult and comply with the Road Authority and An Garda Síochána and shall then submit an outline of his requirements to the Employer's Representative for his comments. Following this, the Contractor shall submit a formal application to the appropriate Authority for any statutory orders or approvals required to be made or notices required to be published. The Contractor shall allow a period of 6 weeks for the orders or approvals to be made and notices to be published.
- 1.6. The Contractor shall provide, install, maintain and remove temporary road markings, traffic signs and barriers as necessary.
- 1.7. The Contractor shall provide, install, maintain and remove temporary fencing/barriers shall be provided to separate pedestrians from vehicular traffic.
- 1.8. When alternate one-way (shuttle) working of traffic is permitted by the Employer's Representative, the Contractor shall provide and maintain manned or vehicle activated electric traffic light control signals and such traffic signs as may be approved in writing by the Employer's Representative and the Local Authority.
- 1.9. The Contractor shall locate vehicle activated electronic traffic light control signal and such traffic signs at locations agreed with An Garda Síochána and the bus service operators where existing facilities are affected by the Works.
- 1.10. The Contractor shall supply to the Road Authority and An Garda Síochána details of the following for each temporary road diversion:
 - (i) Phasing of the Works;
 - (ii) Drawings showing traffic management layouts including as follows:
 - position of traffic signs (including variable message signs) and signals;
 - width of lanes;

- parking areas;
- safety zones; and
- entry points for Site and off site areas vehicles and the like.

1.11. Publicity

- 1.11.1. At least 4 weeks in advance with weekly repeat and daily repeat in the week prior to the proposed diversion of any temporary diversions required for the works the Contractor shall advise AA Roadwatch to make notices on local roads to advertise to the general public the proposed diversions.

Appendix 1/19: Routeing of Vehicles

1. General Requirements

- 1.1. The Contractor shall provide, erect and maintain such traffic signs, lamps, barriers and the like, complying with Clause 117 of the Specification for Works as may be required to ensure the observance of the requirements and restrictions detailed in this Appendix.
- 1.2. The Contractor shall restrict the passage of constructional plant, equipment and materials, to and from the site and off-site areas, to Permitted Access Routes.
- 1.3. The Contractor shall establish and comply with the requirements of the TII appointed Road Operator in respect to heavy vehicles (concrete lorries, etc.).
- 1.4. Site and off-site areas access/egress points shall be designed taking into account existing traffic volumes and anticipated type and volumes of site generated traffic.

2. Permitted access route to and from the site

- 2.1. The permitted access routes to and from each site are to be agreed with the Employer's Representative and the TII appointed Road Operator at least one week in advance of commencement of works. The Contractor, his subcontractors and suppliers, shall use only these access routes for all purposes in connection with the works unless otherwise agreed with the Employer's Representative and the TII appointed Road Operator. Contraflow lanes are not permissible.
- 2.2. The Permitted Access Routes to and from the site and off site area shall be via National Routes only and from the same side of the road as the site locations.

3. Movement of Machinery and Plant across Public Roads

- 3.1. The Contractor shall, where he proposes to move machinery and plant across public roads, submit details of the layout of the crossing, and all proposed signing, safety equipment and controls proposed.

4. General Use and Cleaning of Public Roads

- 4.1. The Contractor shall take every precaution to prevent sharp objects, dirt, mud or other material being dropped on roads being part of the Works, or spread by traffic associated with the Works onto areas which are made available for public use by the Contractor, whether such traffic is the Contractor's own vehicles, the sub-contractors or his supplies of vehicles hired by any of the above. All vehicles leaving a work area and entering a traffic lane shall have its wheels and underbody cleaned when necessary to avoid mud and dirt being deposited on the public road. The Contractor shall clean roadways of any such sharp objects, dirt, mud or other materials that may be spilt or spread by traffic travelling to or from the site in connection with the Works, whether such traffic belongs to the Contractor, his sub-contractors or his suppliers. This work must be carried out immediately after deposition of sharp objects, dirt, spoil, etc. on the roadway.
- 4.2. On completion of the Work, the Contractor shall leave the site in a neat and tidy condition to the satisfaction of the Employers Representative. Carriageway and footpath surfaces shall be thoroughly swept and freed from sharp objects, dirt, mud and loose chippings. Boundary walls, fences and adjacent properties shall be cleaned of any splashing or dirt which may be attributed to the work on the Contract and paintwork shall be touched up where it has been damaged due to the Contractor's activity. If, during the Works, ground or surfaces, to be left undisturbed, are damaged, the Contractor shall be responsible for reinstating same to their original state. All work shall be carried out to the satisfaction of the relevant TII appointed Road Operator and the Employers Representative.

- 4.3. The Contractor shall comply with the maximum permissible loads for public roads in Ireland and where requested by the Employers Representative shall provide evidence of compliance of delivery of material to site.

Appendix 1/22: Progress Photographs

1. General

- 1.1. The following schedule describes the progress photographs to be taken in accordance with Clause 122 of the Specification:
- 1.2. The Contractor shall photograph all equipment tags and labels at each site.
- 1.3. Digital photography shall be required.
- 1.4. Digital images shall be taken with a professional single lens reflex (SLR), 12 million pixel or more digital camera shot at highest resolution and saved in a tif or highest quality jpeg format with a minimum resolution of 0.5 megabytes, unless otherwise instructed in writing by the Employer's Representative. All associated metadata is to be supplied with the digital images.
- 1.5. Copyright of all progress photographs shall become the property of the relevant Local Authority prior to development/printing.
- 1.6. 1 no. proof / index print of each digital image and made available to the Employer's Representative.
- 1.7. Proof / index prints shall be made available to the Employer's Representative within seven days of exposure. Any that shall be deemed unacceptable by the Employer's Representative shall be retaken immediately.
- 1.8. All photograph prints shall be labelled and presented in suitably sized albums to the written approval of the Employer's Representative. Each album shall have an index print or prints for easier identification.
- 1.9. A searchable database of photographs shall be provided
- 1.10. All analogue negatives shall be stored in sleeves and shall be labelled with negative number plus written data, including time, date and a description. All images shall be provided in a digital format to the Employer's Representative on a weekly basis. All images shall be georeferenced and shall include a file name, shot number and encoded time / date.
- 1.11. All progress photographs shall be reproduced and supplied to the Employer's Representative in a digital format. The digital format used shall be approved in writing by the Employer's Representative.
- 1.12. Additional progress photographs shall be taken, as required by the Employer's Representative.
- 1.13. Each set of ground photographs shall be taken from the same georeferenced locations, as agreed with the Employer's Representative.

Appendix 1/23: Substances Hazardous to Health

1. General Requirements

- 1.1. All work shall be carried out with due regard to the Safety, Health and Welfare at Work (Construction) Regulations 2019 or any subsequent relevant legislation.
- 1.2. The Contractor shall provide the Employer's Representative with a copy of his Safety Statement and shall revise it as necessary in the light of any revised or additional obligations required by law.
- 1.3. The statement shall include the Contractor's detailed procedures to be followed in the event of any accident including minor incidents.
- 1.4. The Contractor shall be required to provide temporary screening. This temporary screening shall protect members of the general public in close proximity to the Works including motorists and other road users.
- 1.5. The screening shall be of sufficient construction to protect the public from substances potentially hazardous to health which are being used by the Contractor or are a result of the Works.
- 1.6. Once erected, the screening shall reduce the concentrations of these substances within the air to levels which are below European Union guidelines and in accordance with the Safety, Health and Welfare at Work (Chemical Agents) (Amendment) Regulations 2021 and subsequent amendments. Any monitoring necessary shall be the responsibility of the Contractor.
- 1.7. For minor cutting with hand tools a fine water spray should be used.
- 1.8. Live carriageways are to be protected from dust or spray arising from construction which might otherwise reduce visibility.
- 1.9. The Contractor's Safety and Health Plan shall include procedures for dealing with substances hazardous to health which are specific to this Site.
- 1.10. The Contractor shall submit to the Employer's Representative his proposals for complying with the above requirements 14 days in advance of the use of the potentially hazardous Chemical Agent.

2. Restrictions in Relation to Working Practices

- 2.1 The Contractor shall take all reasonable precautions to use substances that are not known to be hazardous to health for use in the construction of the Works. Where the use of such substances is unavoidable, the Contractor shall ensure that all employees are advised of the proper methods for use of such substances and the consequences of not following recommended use.
- 2.2 These substances shall be stored in accordance with the manufacturer's recommendations.
- 2.3 Where potentially hazardous substances are encountered during any part of the Works, the Contractor shall seek the advice of a specialist subcontractor regarding the identification, treatment and disposal of such substances.
- 2.4 The Contractor shall ensure that all hazard sheets for materials to be used in the Works are displayed prominently in the stores, and that all employees can read and understand these sheets. In any event, the Contractor shall ensure that toolbox talks address the subject of all materials to be used in the Works and their potential risks.
- 2.5 Suitable PPE equipment shall be provided by the Contractor to his staff at all times.

Appendix 1/24: Quality Management Schemes

1. General

- 1.1. The Contractor shall establish and implement a quality management scheme to establish quality assurance systems and shall prepare a Quality Plan.
- 1.2. The quality management scheme shall be described in the Quality Plan and shall be submitted to the Employers Representative for review not later than 21 days after the Contract date.
- 1.3. The Quality Plan shall include inter alia the following details:
 - (i) Contractor's Organisation and Management
Including the organisation of the Contract, line command and communication links between parties involved in the Contract on and off site.
Names, roles, responsibilities and authority of principals and key personnel.
 - (ii) Identification of the parts of the Contractor's Quality Management System relevant to the Works.
 - (iii) Supply Chain Management.
Including details of control and communication processes, assessment of the supplier's and sub-contractor's quality management systems and quality control capabilities, monitoring arrangements, review and acceptance of work items being undertaken by the sub-contractor or supplier.
 - (iv) Document Control
Controls relevant to the Works, including the control and processing of testing results, materials and workmanship certification and quality records.
The management of quality records in accordance with IS EN 9001.
The control and scheduling of all documentation to be submitted to the Employers Representative as required by the Specification throughout the Works.
 - (v) Resource Management
Including details of relevant skills and experience of personnel involved in the Works.
The relevant training and/or competency assessment certificates and/or registration/skills cards.
 - (vi) Method Statements
Method Statements for initial items of work and scheduling for all other method statements required.
- 1.4. The Contractor shall prepare method statements for all major elements of the Contract and as required by various appendices to the Specification. Each method statements shall be submitted to the Employer's Representative a minimum of four weeks prior to commencement of the relevant Works for review and to a timetable included in the Quality Plan.

2. Scheme

- 2.1. The following is a list of accepted quality management schemes referred to in clauses 104.3 and 104.4 of Series 100 Specification for Works.
- 2.2. Description: Manufacture of Industrial Fasteners and Associated Items

2.2.1. Certification Bodies:

- (i) British Standards Institute
389 Chiswick High Road, London W4 4AL, UK
- (ii) Lloyd's Register Quality Assurance Ltd.
Hiramford, Middlemarch Office Village, Siskin Drive, Coventry CV3 4FJ, UK
- (iii) National Standards Authority of Ireland
Glasnevin, Dublin 9

2.2.2. Specification

Nuts, bolts and fixings shall be in accordance with the 1800, 2200 and 2500 Series of Specification and shall be manufactured to the requirements of the following Standards.

BS 3410	Specification for metal washers for general engineering purposes
BS 4320	Specification for metal washers for general engineering purposes
BS 4395	Specification for high strength friction grip bolts and associated nuts and washers for structural engineering
IS EN 14399 Pts 1 to 10	High-strength structural bolting assemblies for preloading
IS EN ISO 898	Mechanical properties of fasteners
IS EN ISO 4014	Hexagonal head bolts Product Grades A and B
IS EN ISO 4016	Hexagon head bolts Product grades C
IS EN ISO 4017	Hexagon head screws Product grades A and B
IS EN ISO 4032	Hexagon nuts, style 1 Product grades A and B
IS EN ISO 4034	Hexagon nuts Product grades A and B

Alternatively nuts, bolts and fixings shall be manufactured to the dimensions and tolerances of the Standards listed above, using materials to the following Standards:

BS 6105	Specification for corrosion resistant stainless-steel fasteners
ASTM A325-89	Specification for high strength bolts for structural steel joints

Note 1:

Where the Contractor can demonstrate that the fastener required is made by fewer than three firms within this scheme, the requirement to conform with the scheme shall not apply.

Note 2:

Where the Contractor obtains fasteners from a stockist, the stockist shall be registered under Part 1 of the BSI Registered Stockist System, or equivalent. The system requirement shall be 'Level A, Quality Assured Material with Lot Traceability (P00012)'. Where the

Contractor can demonstrate that the fastener required is supplied by fewer than three stockists within this system, the requirement to comply with the System shall not apply.

2.3. Description: Manufacture of Portland Cement

2.3.1. Certification Bodies

- (i) British Standards Institute
389 Chiswick High Road, London W4 4AL, UK
- (ii) The Certification & Inspection Department
National Standards Authority of Ireland
Eolas, Glasnevin, Dublin 9

2.3.2. Specification

Cement shall be in accordance with the 1700 and 2400 Series of the Specification and shall be manufactured to comply with all of the appropriate requirements of one of the following Standards.

IS EN 197-1	Composition, specifications and conformity criteria for common cements
IS EN 197-4	Cement. Composition, specifications and conformity criteria for low early strength blast furnace cements
BS 1370	Specification for low heat Portland cement
BS 4027	Specification for sulphate – resisting Portland cement
BS 4246	Specification for high slag blast furnace cement
BS 6588	Specification Portland pulverised fuel ash cements.

2.4. Description: Traffic Sign Manufacture

2.4.1. Certification Bodies

National Standards Authority of Ireland
Northwood, Dublin 9

2.4.2. Specification

All Works shall be in accordance with the relevant clauses of the 1200 series of the Specification for Works and shall be manufactured to comply with all the appropriate requirements of the following Standards:

- (i) TS4 – Guidelines, Certification Scheme, and Specification for the Construction of Traffic Signs.
- (ii) National Rules for Electrical Installations ET101:2000 (Electro Technical Council of Ireland).
- (iii) ETSI and ISO standards for C-ITS.

Appendix 1/25: Product Certification Schemes

1. General

1.1. The following is a list of both marked and unmarked product certification schemes accepted in the Contract and referred to in Clause 104 of the Specification.

1.2. Marked Schemes

	a. Kitemark	b. Irish Standard
Certification Body	British Standards Institute 389 Chiswick High Road, London W4 4AL	National Standards Authority of Ireland Eolas, Glasnevin, Dublin 9

BS No. Equivalent Irish Standard or Euronorm	Title	Specification Series
IS EN 197	Cement: - Composition, Specifications and Conformity Criteria for common cements	1600 1700 2400 2600
IS EN 12620	Aggregates for concrete	1600 1700 2400
BS 1370	Specification for low heat Portland Cement	1700

1.3. Other Marked Schemes

1.3.1. Electric Cables

	British Approvals Service or Inspection Dept for Cables (BASEC)	The Certification & Inspection Dept, National Standards Authority of Ireland
Certification Body	360 Salisbury Boulevard Milton Keynes Bucks MK9 2AF	Eolas, Glasnevin, Dublin 9

BS No. Equivalent Irish Standard or Euronorm	Title	Specification Series
BS 5467	Specification for armoured cables with thermosetting insulation for electricity supply for rated voltages of up to and including 600/1000V and up to and including 1900/3300V	1600 1700 2400 2600
BS 6004	Specification for PVC-insulated cables (non-armoured) for Electric power and lighting	1600 1700 2400
BS 6346	Specification for PVC-insulated cables for electricity supply	1700

Appendix 1/26: NSAI Agrément certificates

1. General

- 1.1. 125 contains a list of types of work, goods or materials for which proprietary products are required to have an NSAI Agrément Certificate or equivalent.

Table 1/26/1 Requirements for Agrément Certificates

Description	Specification Series
Prefabricated Temporary Road Marking Material	1200
Reflecting Road Studs	1200
Traffic Signal and Control Equipment	1200
Motorway Communications & Control	1500

- 1.2. Where types of work, goods or material for which proprietary products are required to have an NSAI Agrément Certificate, a British Agrément Board certificate or equivalent shall be acceptable.

2. General

- 2.1. 125 contains a list of types of work, goods or materials for which proprietary products are required to have an NSAI Agrément Certificate or equivalent.

Table 1/26/2 Requirements for Agrément Certificates

Description	Specification Series
Prefabricated Temporary Road Marking Material	1200
Reflecting Road Studs	1200
Traffic Signal and Control Equipment	1200
Motorway Communications & Control	1500

- 2.2. Where types of work, goods or material for which proprietary products are required to have an NSAI Agrément Certificate, a British Agrément Board certificate or equivalent shall be acceptable.

Appendix 1/71: Works by Other Contractors

1. General

- 1.1. Works including resurfacing, utility and services works, ground investigation works and other construction works will be taking place within the site, the surrounding road network and other lands adjacent to the site during the Contract period. The Contractor shall liaise with the contractors undertaking such works and provide unrestricted access to facilitate all such works.
- 1.2. 126 outlines contact details of other contractors undertaking works within the site. The Contractor shall take full account of these works in programming the Works. In the event that the works are concurrent, the Contractor shall liaise with the contractor carrying out the other works when programming and proposing traffic and pedestrian management and diversion and co-ordinate the Works with these other contractors to minimise disruption to the general public.
- 1.3. During the Works, the Contractor shall liaise with and take measures required by the other contractors, for the support and full protection of works undertaken by the other contractors.
- 1.4. The Contractor shall facilitate any works or supervision necessary by any Utility Companies or Statutory Undertakers, including, inter alia, Transport Infrastructure Ireland, Local Authorities, Gas Networks Ireland, Uisce Éireann (formerly Irish Water), ESB Networks, eir, Virgin Media, or their agents within the site, whether necessary for the provision of the Works or otherwise. Refer also to 98 for further requirements.
- 1.5. The Contractor shall liaise with all TII appointed Road Operators where works are to be carried out within the respective area of operation and maintenance and shall take all measures necessary with respect to obtaining approval, permits to work, complying with third party works protocols, requirements and restrictions. As part of the Interface Agreements procedure in accordance these Works Requirements, the Contractor shall liaise with the relevant TII appointed Road Operators and obtain current requirements and restrictions. The Contractor shall liaise with newly appointed Road Operators as required during the Contract.
- 1.6. The Contact details shall be updated by the Contractor in the event of new contractors being appointed to other Contract Areas.
- 1.7. The Contractor shall collaborate with the NIMS Contractor to support the integration of any installed ITS Equipment with the NIMS Solution. Such support by the Contractor shall include, if required, attendance at the NIMS Contractor test environment, located within 30km of Dublin.
- 1.8. The Contractor shall attend Technical Integration Meetings with the Employer's Representative, the NIMS Contractor and other Third Parties as required and work collaboratively to discuss and resolve any technical issues raised with respect to the integration of the equipment with the NIMS Solution.

Table 1/71/1 Schedule of contact detail of Works by Other Contractors

Contract / Works Area	Contractor	Email	Tel No.
TII Road Network	Swarco	darren.cole@swarco.com	01263 5370
MMARC Area A	TII appointed MMARC Contractor	To be confirmed	01263 5370

Contract / Works Area	Contractor	Email	Tel No.
MMARC Area B	TII appointed MMARC Contractor	To be confirmed	01263 5370
MMARC Area C	TII appointed MMARC Contractor	To be confirmed	01263 5370
M50 Project Road	M50 Concession Ltd.	info@m50concession.com	1800 775050
Dublin Tunnel	ERTO	To be confirmed	01263 5370
eFlow Tolling gantry	Turas Mobility Services	info@turasmobility.com	0818501050
NIMS	Kapsch	To be confirmed	01263 5370

2. Requirements when working with MOCC operator equipment or systems

- 2.1. All Works associated with changes to equipment and systems that are under the responsibility of the MOCC operator shall follow the Dublin Tunnel operator Change Control Procedures.
- 2.2. The Contractor shall submit all change control applications in draft format to MOCC operator a minimum of 6 weeks before the change is required. A copy of the Dublin Tunnel operator Change Control form is included below. The Contractor shall attend meeting as required ERTO Change Control Board meeting held on a bi-weekly basis.
- 2.3. The Contractor shall address any comments / queries from MOCC operator in a prompt and comprehensive manner.
- 2.4. The Contractor shall maintain and submit a schedule of all change control applications, including those planned, in draft, submitted & closed, on the last Friday of every month to the Employer's Representative for review.

Appendix 1/72: As Built Records Drawings

1. As-Built Drawing Content

1.1. General

- 1.1.1. The Contractor shall prepare and submit a detailed set of scalable as-built record drawings, recording any constructed Works.
- 1.1.2. As-Built Record drawings shall be prepared in accordance with TII CC-CMG-04001 – Preparation and Delivery Requirements for As-Built Records and this 128.
- 1.1.3. The Contractor shall submit one electronic copy of the as-built record drawings, with appropriate files in Microsoft Word, Excel and Adobe .pdf format, of all Works as it proceeds. All drawings will also be available in AutoCAD format .dwg.
- 1.1.4. The Contractor shall maintain and submit to the Employer's Representative interim as-built drawings of the Works on request.
- 1.1.5. As-built record drawings shall be submitted to the Employer's Representative 7 days prior to the Contractor's request for Substantial Completion of a Section.
- 1.1.6. The Contractor shall make any amendments or corrections to the as-built drawings required subsequent to the original submission and shall re-submit the whole to the Employer's Representative for review 7 days prior to the Contractor's request for Substantial Completion of the Installation.
- 1.1.7. The Contractor submit to the Employer's Representative for review 2 week prior to the Contractor's request for Substantial Completion of the Works.
- 1.1.8. Drawings shall be prepared for, inter alia:
 - i. Motorway Communications ITS Cable & Equipment Schematic;
 - ii. Motorway Communications ITS Electrical Schematics;
 - iii. Motorway Communications ITS Fibre Schematics;
 - iv. For each power supply interface, electrical interface, power distribution cabinet and mini pillar energising motorway communications equipment, details of each incoming and outgoing electrical circuits;
 - v. For each cabinet installed, details, circuits and layout of installed equipment;
 - vi. All elements designed by the Contractor.
- 1.1.9. Drawings shall include but not be limited to:
 - All standard, typical and specific details pertaining to the design;
 - All configuration plans and wiring diagrams;
 - Component drawings;
 - General arrangement details;
 - Fully coordinated plan layouts for earthworks, foundations, earthing, structures, ducting, drainage, surfacing and building service layouts and details;
 - Signs;
 - For each chamber, cabinet and motorway communication equipment installed or maintained, the reference number there within;

- Cabinet position relative to edge of carriageway, chainage marker and equipment installed within;
 - For each cabinet installed, the destination of each circuit, location and details of any cable reduction joints;
 - For every cabinet, post, ITS equipment device, gantry structure and chamber, the exact marker post location, position relative to the edge of carriageway and type;
 - For every cabinet, the type of equipment contained within where this differs from as shown on the design drawings;
 - For each power supply interface, electrical interface and power distribution cabinet, the rating, cable type energising motorway communications equipment;
 - Power and Fibre communication cable joint position/chainage within the network;
 - All test certificates and commissioning reports for the services in the Works; and
 - Any such information as will facilitate future maintenance of the Works.
- 1.1.10. Plan layouts, general arrangement and plan location drawings shall be drawn in context with the surrounding environment, to demonstrate how newly constructed elements tie in and link with the adjacent works.

2. As-built Drawing Deliverables

- 2.1. The following as-built information shall be submitted by the Contractor to the Employer's Representative:
- One electronic drawing file (including reference files and any drawings referred to within the main body of the as-built drawing), one plotfile and one hard copy of interim as-constructed drawings shall be submitted to the Employer's Representative on request.
 - On completion of the Works, one electronic drawing (including reference files and any drawings referred to within the main body of the as-built drawing), one plotfile and two full size hard copies of the as-constructed record drawings shall be submitted to the Employer's Representative.
 - On review of this data a further signed full size hard copy shall be submitted to the Employer's Representative.

3. Drawings

3.1. General

- 3.1.1. The Contractor shall create and maintain drawings within the specifications as laid out in this Appendix.
- 3.1.2. A brief description of the drawing requirements will include but not be exclusive to:
- All design criteria will be drawn to the Project grid;
 - Global origin must be set to world coordinates;
 - All design data to be drawn at a scale of 1:1;
 - All master design files will be submitted at agreed intervals;
 - All files must be named in accordance with the drawings in the Contract;
 - All drawings numbers must be in accordance with the drawings in the Contract;

- Working units must be set to 1000mm per m and 1 pos unit per mm;
- Drawings shall not contain any additional contractor's address or telephone number other than that shown on the standard drawing sheet;
- No changes are to be made to the submitted alignment chainage;
- Transmittals will accompany all submittals of drawing data, itemising each individual item, submitted CD's to be labelled and have cross reference of transmittal clearly on it;
- Where there is a series of drawings to be produced along the entire length of the line the Project 'snake' should be used as a guide, sets will be itemised individually and include 'Sheet of' in the title and clearly show continuation markers;
- Where drawings are included within reports they are not deemed to have been officially submitted;
- All submittals will include hard copy, design files, drawing files and plotfiles; and
- Email submittals must be accompanied by a formal transmittal as email transfers are not deemed to be contractual.

4. Electronic Data

- 4.1. This section details the mechanism and modes for electronic data transfer of drawings between all parties. The following drawing submittal specifications shall be used unless directed otherwise by the Employer's Representative.
- 4.2. All drawings submitted for formal review shall be provided in the following formats, to be agreed with the Employer's Representative:
- AutoCAD DWG format
- 4.3. The following standards shall also apply:
- Each transfer shall be fully documented to detail items such as layer use, cross-referenced files, necessary directory structure, etc.
 - Data transfers shall be readable using equipment currently employed by the Employer's Representative.
 - Generally, the current version of all application software, shall be deemed to be standard, as long as it is compliant with the operating characteristics of the Employer's Representative's computer systems.

Appendix 1/73: Condition Survey (Dilapidation Surveys)

1. General

- 1.1. The Contractor shall undertake a condition survey of the road pavement structure prior to the commencement of any works and after completion of any works that will affect the road surface;
- 1.2. The Contractor shall provide an initial digital record of each site; and
- 1.3. Within 24 hours of carrying out any works at a location the Contractor shall submit a digital record to the Employer's Representative.

Appendix 1/74: Independent Check Certification for Temporary Works

Name of Project: _____

Name of Structure: _____

Name of Checking Organisation: _____

1. We certify that reasonable skill and care has been used in the checking of the design of the temporary works comprising (insert description) with a view to securing that:

(i) The design has been carried out in accordance with:

(insert design standards)

(ii) The design proposal We certify that reasonable skill and care has been used in the checking of the design of the temporary works comprising (insert description) with a view to securing that:

(describe the permanent works)

(iii) The design of the temporary works has been accurately translated onto the following drawings:

(insert the drawing and schedule numbers)

Signed (Checker): _____

Name: _____

Title: _____

Date: _____

2. Receipt of this Certificate is acknowledged.

Signed: _____
on behalf of the Employer's Representative

Name: _____

Date: _____

Appendix 1/77: Environmental Management

1. General

- 1.1. The Contractor shall establish and implement, during the provision of the Works, an Environmental Operating Plan consistent with and analogous to the NRA “Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan” and to the TII “The Management of Waste from National Road Construction Projects” (GE-ENV- 01101, 2017)
- 1.2. The Environmental Operating Plan shall be structured to differentiate between and address separately all the following:
 - (i) short term impacts of construction activities;
 - (ii) required mitigation measures that relate to the provision or operation of the Works;
 - (iii) any other commitments made in respect of the provision of the Works procedures;
 - (iv) processes and resources provided in order to avoid wherever possible environmental accidents and pollution, to encourage reduced consumption of resources; and
 - (v) processes and resources provided to restrict the production of waste and to promote good relationships with the relevant Authorities and Statutory Undertakers.
- 1.3. The Environmental Operating Plan shall include site-specific method statements for all Works activities where there shall be or may be a risk of environmental damage, which:
 - (i) shall show how the proposed methods of construction shall reduce impacts and how contingency plans and emergency procedures shall limit damage caused by accidents, spillages or other unforeseen events and
 - (ii) shall ensure that such method statements and the like shall include notification procedures for the relevant Authorities and Statutory Undertakers.
- 1.4. The Contractor shall appoint a site Environmental Manager to develop, implement and maintain the Environmental Operating Plan. The Environmental Manager should possess sufficient training, experience and knowledge appropriate to the nature of the task to be undertaken for completion of the Works.
- 1.5. The Contractor shall submit to the Employer’s Representative details of the Environmental Operating Plan, method statements and a Waste Management Plan prior to the commencement of the Works.
- 1.6. The Contractor shall comply with the requirements of TII Publications GE-ENV-01101 The Management of Waste from National Road Construction Projects.
- 1.7. All construction and operations shall be carried out in accordance with the Control of Water Pollution from Construction Sites; Guidance for Consultants and Contractors (SP156) (CIRIA, 2002).
- 1.8. Soil storage areas will be sited away from drains and appropriate measures put in place to ensure containment of run-off and leachate. The storage of oils, hydraulic fluids, etc shall be undertaken in accordance with current best practice for oil storage (Enterprise Ireland, BPGCS005).
- 1.9. The pouring of concrete, sealing of joints, application of water-proofing paint or protective systems, curing agents, etc will be completed in the dry to avoid pollution of the freshwater environment.

- 1.10. Fuels, lubricants and hydraulic fluids for equipment used on the construction site will be carefully handled to avoid spillage, properly secured against unauthorised access or vandalism, and provided with spill containment according to codes of practice.
- 1.11. Waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the site for disposal or re-cycling.
- 1.12. Throughout all stages of the construction phase of the project, the Contractor shall ensure that good housekeeping is maintained at all times and that all site personnel are made aware of the importance of the requirement to avoid pollution of all types;
- 1.13. All machinery and plant used shall be regularly maintained and serviced and will comply with appropriate standards to ensure that leakage of diesel, oil and lubricants is minimised. Such maintenance will be carried out in areas remote from water bodies.
- 1.14. Foul drainage from site will be removed to a suitable treatment facility or discharged to a septic tank system constructed in accordance with EPA guidelines and Irish Water requirements.
- 1.15. Water Quality Measures: In order to minimise any potential for deterioration in water quality from storm water discharges the following measures shall be implemented:
 - All material including oils, solvents and paints shall be stored within temporary bunded areas or dedicated bunded containers;
 - Refuelling shall take place in a designated bunded area away from surface water gullies, drains and water bodies, in the event of refuelling outside of this area, fuel will be transported in a mobile double skinned tank;
 - All machinery and plant used shall be regularly maintained and serviced and will comply with appropriate standards to ensure that leakage of diesel, oil and lubricants is minimised;
 - Spill kits and hydrocarbon absorbent packs will be available and trip trays will be used during refuelling;
 - All relevant personnel will be fully trained in the use of this equipment;
 - Where soil/made ground and subsoil stripping occur, the resulting excavated soil fractions will be segregated into inert, non-hazardous and /or hazardous fractions (in accordance with Council Decision 2003/33/EC, the EPA water classification criteria at certain licensed landfills in Ireland);
 - The excavation and handling of inert material will be carefully managed in such a way as to prevent any potential negative impact on the environment;
 - The height of stored topsoil will not exceed 2m;
 - Stored contaminated materials shall be covered at night;
 - All associated hazardous construction waste will be stored within temporary bunded storage areas prior to removal by an appropriate EPA or relevant Local Authority approved waste management contractor;

Appendix 2/5: Hazardous Materials

1. General

- 1.1. Appropriate measures must be taken to safeguard the health of the Contractor's operatives and the general public.
- 1.2. Hazardous materials arising from site clearance and/or excavations shall be disposed of only at sites licensed by the Local Authority of the area for the arisings or other licensing authorities.

Appendix 12/5: Traffic Signals

1. Detector Loops

- 1.1. Installation of detector loops (including slot cutting, cabling etc.) shall comply with Clause 1217 of the Manual of Contract Documents, TII publications and any other detail as specified in the Works Requirements.
- 1.2. The use of specialised equipment (e.g. motorised road saw for slot cutting) shall be executed by experienced, fully trained personnel holding any required valid CSCS cards.
- 1.3. A dedicated double insulated "Loop" cable to the UK TR2029 specification shall be used for all loops - refer www.ukroads.org/webfiles/TR2029D.pdf. Whereby such cable is able to withstand a hot-pour bitumen backfill directly without burning or scorching the outer insulation layer, then TII CC-SPW-01500 – Section 22 shall not apply.

2. Dual Carriageway/Motorway

- 2.1. Installation of detector loops (including slot cutting, cabling etc.) shall comply with Clause 1217 of the Manual of Contract Documents, Specification for Roadwork's Volume 1 and any other detail as specified in the Works Requirements.
- 2.2. The use of specialised equipment (e.g. motorised road saw for slot cutting) shall be executed by experienced, fully trained personnel holding any required valid CSCS cards.
- 2.3. A dedicated double insulated "Loop" cable to the UK TR2029 specification shall be used for all loops - refer www.ukroads.org/webfiles/TR2029D.pdf. Whereby such cable is able to withstand a hot-pour bitumen backfill directly without burning or scorching the outer insulation layer, then TII CC-SPW-01500 – Section 22 shall not apply.

3. Loop Testing

- 3.1. In accordance with Clause 1217, the Contractor shall, before and after backfilling the slots, measure the series resistance, the insulation resistance and the inductance of each loop circuit. In addition, the Contractor shall record on a suitable test certificate the site reference, the loop reference, the length of feeder cable on each loop circuit, the date of the test, the prevailing weather conditions and ambient temperature. The results shall be submitted to the Employer's Representative for approval. The Contractor shall, as directed by the Employer's Representative, correct or replace any loop, loop tail or feeder cable which fails the above tests.
- 3.2. The following tests shall be conducted at the detector equipment cabinet. If a roadside loop connection chamber is used the loop only shall also be tested.
- 3.3. The required measurements shall be made in accordance with the following instructions and shall be recorded. The inductance measured shall be compared to the calculated inductance using the specified formula. The importance of measuring these parameters before backfilling cannot be stressed too highly, as it may allow problems to be rectified at a stage which is the least disruptive and costly.
 - 3.3.1. Series Resistance

The series resistance shall be measured between the two conductors of a feeder cable comprising a loop circuit at the equipment housing. When corrected to 20°C the series resistance shall not exceed 12.1 ohms per kilometre of conductor. The measurement shall remain stable for a period of one minute. The maximum permissible resistance is 5 ohms.
 - 3.3.2. Insulation Resistance

With the two conductors of a feeder cable comprising a loop circuit connected together, the insulation resistance between the feeder cable conductors and a good earth point shall be 100 Megohms or greater measured at a test voltage of 500 V d.c applied for at least one minute.

3.3.3. Inductance

The inductance shall be measured using a calibrated inductance meter of accuracy $\pm 2\%$ reading +2 digits between the two conductors of a feeder cable comprising a loop circuit with no vehicles over or traversing the loop and with no other adjacent loop circuit energised. The measured inductance of the loop circuit shall not vary by more than 20% from the theoretical value for the loop circuit calculated as follows:

Loop feeder

Inductance, L_f :	$L_f = \text{length (in metres)} \times y$ (where $y = 0.79\mu\text{H/m}$ for two pair armoured feeder cable)
Loop tail inductance, L_t :	$L_t = \text{length (in metres)} \times 0.64\mu\text{H/m}$
Total Loop inductance, L_l :	$L_l = (0.2 \times P \times N^2 \times \ln D/a)\mu\text{H}$ (where: $N = \text{number turns}$, $P = \text{perimeter of loop (metres)}$, $D = \text{distance between longest sides of loop (metres)}$, $a = 3\text{mm}$ for 3 turn loop, $\ln = \text{naperian or natural log}$)
Total inductance, $L = L_f + L_t + L_l \mu\text{H}$	

3.4. Contractors should be aware that measured loop inductances should be similar for a pair of loops in the same lane. For example, if one loop of a pair measures 100uH, the other loop of the pair should be similar. If the second loop measures 150uH then it would indicate a mismatch between loop turns. Both must be three turns and should be re-checked for correct turns before backfilling. Similar action should be taken if a discrepancy becomes apparent between pairs of loops in the same lane.

3.5. A plan to a scale of 1:500 with detailed insets 1:200 of each as-built loop installation shall be submitted by the Contractor to the Employer’s Representative. These shall be delivered within one calendar month of the issue of the appropriate Certificate of Completion. The drawings shall show:

- i. North point, street layout and names where applicable;
- ii. Ducts, cable runs and type of cable in each run;
- iii. Position of all joints and inspection chambers;
- iv. Dimensions of loops and number of turns in each loop.

TII TEST SCHEDULE SHEET – INDUCTIVE LOOPS

Site Name & Ref No. _____ Route _____ No. of Lanes _____

Date Loops Installed _____ Date Loops Tested _____

Installed By (Capitals) _____ Test By (Capitals) _____

(Mark as “existing” if not constructed by signee)

LOOP TEST SCHEDULE

Direction (N,S,E,W)				
2 / 4 or 6 Lane Site – ID below follows tagging as detailed in drawing 12/5/4/a	Series Resistance Ohms (Ω)	Insulation Resistance MegaOhms (MΩ)	Inductance (Theoretical) μH	Inductance Measured μH
Lane 1 Loop 1				
Lane 1 Loop 2				
Lane 3 Loop 5				
Lane 3 Loop 6				
Lane 5 Loop 9				
Lane 5 Loop 10				
Lane 7 Loop 13				
Lane 7 Loop 14				
Lane 2 Loop 3				
Lane 2 Loop 4				
Lane 4 Loop 7				
Lane 4 Loop 8				
Lane 6 Loop 11				
Lane 6 Loop 12				
Lane 8 Loop 15				
Lane 8 Loop 16				

Are Loops Tail Pairs labelled on site (Please tick)

YES	<input type="checkbox"/>
NO	<input type="checkbox"/>

An original signed, legible, handwritten copy of this sheet must be forwarded to the Employer’s Representative for each Inductive Loop site.

Signed: _____

End of Test Schedule

Appendix 19/3: (Specification for Works) Form BE/P2 Paint Data Sheet

NSAI Agrément, BBA HAPAS Road and Bridges
 or equivalent Certificate Reference and Date

Manufacturer

Item No.

Registered Description

Brand Name and Reference No.

Consistency and Method of Application

Weight per 5 Litres (kg)

Specific gravity

Colour:

For two-pack paints

Base:

Activator

Mixed Components:

Volume Solids %

- For two pack paints volume solids % for mixed paint:
- VOC content g/l (mixed):
- Manufacturer's Minimum Dry Film
- Thickness Range
- Recommended lower mdft:
- Recommended upper mdft:
- Full Application Instructions:
- Mix ratio:
- Flash Point:

		5°C	10°C	20°C	30°C
Dry Times (hours)	Surface Dry				
	Hard Dry				
Overcoating Times (hours)	Minimum				
	Maximum				
Pot Life (hours)					

Cleaning Solvent State effects on Drying Times
 of Temperatures below 20°C

Manufacturer's Application Restrictions, e.g. for
 Temperatures or Humidity