SCOTTISH MINISTERS' REQUIREMENTS

SCHEDULE 9 PART 1

SPECIFICATION FOR OPERATIONS (1)

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SCOTTISH MINISTERS' REQUIREMENTS

SCHEDULE 9 PART 1

SPECIFICATION FOR OPERATIONS

PREAMBLE TO THE SPECIFICATION

1. The Specification for Operations shall be the *Specification for Highway Works*, published by The Stationery Office (formerly HMSO) as Volume 1 of the Manual of Contract Documents for Highway Works, as modified and extended by the following:

   (i) Appendix 0/1: Contract-specific Additional, Substitute and Cancelled clauses, Tables and Figures,

   (ii) Appendix 0/2: Contract-specific minor alterations to existing clauses, Tables and Figures,

   (iii) the Numbered Appendices listed in Appendix 0/3, and

   (iv) Appendix 0/5: Special national alterations of the Overseeing Organisation of Scotland, Wales or Northern Ireland.

   Appendix 0/4 contains a list of the drawings.

2. The relevant publication date of each page of the *Specification for Highway Works* is given in the Schedule of Pages and Relevant Publication Dates.

3. An Additional clause as indicated by a suffix 'A' in Appendix 0/5 is an alteration originating from the Overseeing Organisation of Scotland, Wales or Northern Ireland. An Additional clause as indicated by a suffix 'AR' in Appendix 0/1 is a Contract-specific alteration.

4. A Substitute clause as indicated by a suffix 'S' in Appendix 0/5 is an alteration originating from the Overseeing Organisation of Scotland, Wales or Northern Ireland. A Substitute clause as indicated by a suffix 'SR' in Appendix 0/1 is a Contract-specific alteration.

5. A Cancelled clause as indicated by a suffix 'C' in Appendix 0/5 is an alteration originating from the Overseeing Organisation of Scotland, Wales or Northern Ireland. A Cancelled clause indicated by a suffix 'CR' in Appendix 0/1 is a Contract-specific alteration.

6. Insofar as any of the Numbered Appendices may conflict or be inconsistent with any provision of the Specification for Highway Works the Numbered Appendices shall always prevail. Additionally, Numbered Appendices 0/1 and 0/2 shall take precedence over Numbered Appendix 0/5.

7. Any reference in this Specification to a clause number or Appendix shall be deemed to refer to the corresponding Substitute clause number or Appendix listed in Appendix 0/1, 0/2 or 0/5.

8. Where a clause is altered any original Table/Figure referred to in the clause shall apply unless the Table/Figure is also altered. Where a Table/Figure is altered any reference in a clause to the original Table/Figure shall apply to the altered Table/Figure.

9. Where a clause in the Specification relates to work goods or materials which are not required for the Operations it shall be deemed not to apply.

10. Any Appendix referred to in the Specification which is not used shall be deemed not to apply.

11. Where a clause in the Specification is prefixed by an # this indicates that this particular clause has a substitute National Alteration for one or more of the Overseeing Departments of Scotland, Wales or Northern Ireland. Substitute or additional National clauses shall be used within countries to which they specifically apply and they are deemed to replace corresponding clauses in the main text of the Specification as appropriate. The substitute National clauses are located at the end of the relevant Series together with the additional National clauses of the Overseeing Organisations.

12. Subject to the provisions of paragraph 13 below and other Parts of the Scottish Ministers' Requirements, the roles and functions of the Overseeing Organisation shall be undertaken by the Director or, if waived by the Director, the Operating Company.

13. Where the Specification provides for the Overseeing Organisation to require a test, waive the requirement for a test or alter testing frequency, the Operating Company shall exercise such decisions in accordance with the Scottish Ministers' Requirements stated in this Contract.

14. In this Specification any reference to the Contractor shall be deemed to be a reference to the Operating Company unless otherwise stated.

15 British Standards and British Standard Codes of Practice incorporated in this Contract by a reference which does not include a date shall be the respective editions current on the date 42 days prior to the date on which the Final Tender Submission shall be submitted.

SPECIFICATION FOR HIGHWAY WORKS

Schedule of Pages and Relevant Publication Dates

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000	1	March 1998
000	3F	May 2005
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100	2	May 2001
100	W1F	May 2005
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6120AR	Maintenance of Lit Sign Units	
6121AR	Maintenance of Traffic Signals	
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6124AR	Maintenance of High Mast Lighting	
6125AR	Incident Response	
6126AR	Not used	N/A
6127AR	Removal of Graffiti, Posters and Encrusted Deposits	
6128AR	Not used	N/A
6129AR	Not used	N/A
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1202SR	General Requirements for Permanent Traffic Signs	
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1803SR	Amendments to Steel Bridge Group Model Project Specification	
2101SR	Bridge Bearings General	
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List of Cancelled Clauses, Tables and Figures

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	None	N/A

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Clause No	Title	Page No
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3006	Planting	
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3009	Establishment Maintenance for Planting	
3010	Maintenance of Established Trees and Shrubs	
3011	Management of Waterbodies	

Additional Clauses and Tables

Clause No.		Title and Written Text
070AR		**Equality Act**
	1	The Operating Company shall follow the guidance given in the *Roads for All: Good Practice Guide for Roads* in all Operations.
	2	Where the guidance given in the *Roads for All: Good Practice Guide for Roads* conflicts with the *Specification for Highway Works*, the "good practice guide" shall take precedence.
	3	Compliance with the *Roads for All: Good Practice Guide for Roads* shall not absolve the Operating Company from any liability under the *Equality Act.*
170AR		**Licences Servitudes Wayleaves and Rights of Access**
	1	The Operating Company shall gain access to boundary fences and adjacent areas from the Unit.
	2	If, in the opinion of the Operating Company, access from the Unit is impractical then the Operating Company shall notify the Overseeing Organisation of any licences, servitudes, wayleaves or rights of access that are needed to enable the work to be undertaken.
	3	The Operating Company shall not, under any circumstances, gain access across private land without the written permission of the Overseeing Organisation.
171AR		**Not used**
172AR		**Not used**
173AR		**Not used**
174AR		**Not used**
175AR		**Operating Company Vehicle**
		The Operating Company fleet vehicles used on the Trunk Road network shall comply with the livery requirements given in Appendix 1/75. As required by Clause 4.1.3 of Schedule 1, during each Winter Service Period, all vehicles actively involved in maintenance and management Operations shall be fitted with winter tyres on all wheels. Winter tyres are tyres marketed as such which are designed for enhanced traction and grip at low temperatures.
176AR		**Incident Support Unit and Trunk Road Incident Support Service Operatives' Uniforms**
		Each of the Operating Company's Incident Support Unit and Trunk Road Incident Support Service operatives shall wear the appropriate Incident Support Unit and Trunk Road Incident Support Service operatives' uniform when engaged in Incident Support Unit and Trunk Road Incident Support Service Operations on the Unit. The uniform requirements are given in Appendix 1/76.

Clause No.		Title and Written Text
370AR		**Repairs to and Renewal of Existing Fencing**
	1	Repairs to and renewal of existing fences shall comply with the relevant clauses in this Series.
	2	Repairs to and renewals of existing fences shall match the existing material and dimensions as far as is practicable. Repairs to and renewal of mammal proof fencing shall be undertaken in accordance with the specifications given in Appendix 3/1
371AR		**Snow Fences**
	1	Snow fences shall be in accordance with the recommendations set out in *Transport and Road Research Laboratory Report LR 362 Snow Fences* by L E Hogbin dated January 1970 and shall comply with the quality management schemes detailed in Appendix A.
372AR		**Rabbit, Hare and Deer Fence Specifications**
	1	**Rabbits and Hares** Fences to protect planting areas from rabbits and hares shall be in accordance with the following specification: Post and mesh fence with a galvanised hexagonal wire mesh 1200 millimetres wide having maximum openings of 31 millimetres and 1.25 millimetres (18 gauge) wire. Mesh to be affixed to two galvanised line wires of minimum 4 millimetres in diameter at 900 millimetres and 150 millimetres above ground level using galvanised fixing rings every 600 millimetres on top wire and 1200 millimetres on bottom wire. Mesh to be buried to 150 millimetres depth and returned outwards from protected area. End and change of direction posts to be 125 millimetres diameter round section, 1.87 metres long and driven 770 millimetres into the ground. Strut to be 65 millimetres round section located in notch on main post and held in the ground by 0.6 metre split rail. Line posts to be 1.6 metres long and 65 millimetres square section driven 500 millimetres into the ground at 4 metre centres. Mesh also to be fixed to line posts by six staples per post.
	2	**Deer** Fences to protect planting areas from deer shall be in accordance with the following specification: (i) 1.80 metres high timber post and 4 wire deer fence with rectangular wire mesh. (ii) Fence shall be constructed to the details on HCD Drawing H12 and British Standard 1722 Parts 2 & 3 with the following additions and amendments: (a) Top rectangular wire mesh to be type C/6/90/30. (b) Bottom rectangular wire mesh to be type C/8/80/15.

Clause No.		Title and Written Text
		(c) Timber posts and struts are to be for a 1.8 metres high fence selected from either Table 4 or 5 from British Standard 1722 Part 3. Timber straining posts are to be 2.90 metres length, 178 millimetres minimum diameter. (d) Intermediate posts are to be set or driven into the ground to a depth of 0.6 metres. Straining posts shall be set into the ground to a depth of 1.0 metre. (e) Struts are to be anchored in the ground in rammed backfill with a 450 x 102 x 51 millimetres timber thrust plate attached to the end of the strut. (f) 4 line wires complying with the requirements of Clause 2.1 British Standard 1722 Part 2, shall be provided set 50, 850, 1750, 1800 millimetres above ground level. The wire mesh shall be attached to the line wires to the details of Clause 3.3.2.4 British Standard 1722 Part 2. (g) Intermediate posts are to be provided at intervals not exceeding 2.75 metres. (h) Existing ground must be trimmed to maintain the 50 millimetres distance between the ground and the bottom of the fence.
	4	**Otters** Fences shall be in accordance with the following specification: Post and mesh fences in accordance with British Standard BS 1722: Part 2 Specification for rectangular wire mesh and hexagonal wire netting fences with a wire mesh having maximum openings of 50 millimetres square, wires in accordance with British Standard BS 4102: Specification for steel wire products for fences, galvanised in accordance with British Standard BS 443: 1982 Specification for testing wire coatings on steel wire and for quality requirements with wires of not less than 3 millimetres in diameter, a height above ground level of 1.50 metres (which includes a 300 millimetre 45 degree outward splay at the top of the fence), a depth below ground of 300 millimetres, with a further 300 millimetre lap laid horizontally out from the fence and a single strand of galvanised wire of not less than 4 millimetres in diameter securely fixed to the wire mesh at ground level; (refer to CIRIA C646 – Wildlife Fencing Design Guide 2006)
470AR		**Repairs to Safety Barriers**
	1	Repairs to safety barrier systems shall comply with the requirements of British Standard 7669-3 and BS EN 1317-1.
	2	Repairs of safety barrier systems shall be carried out in accordance with TD 19/06 and the manufacturers' latest drawings and instructions.
	3	All accident damage repairs shall be carried out using the same type of safety barrier system as currently exists at the location.

Clause No.		Title and Written Text
		The type of post used shall depend on the results from examination of post foundations and, where necessary, loading tests being carried out by the Operating Company in accordance with Annex B of British Standard 7669-3.
471AR		**Repairs to Existing Pedestrian Guardrail**
	1	Repairs to existing pedestrian guardrail will generally be the taking down of parts or sections of existing guardrail and the erection in their place of new parts or sections following accident damage or long term deterioration of the guardrail.
	2	When existing posts and concrete footings are removed and new posts and concrete footings are installed in the same location, any remaining voids shall be filled with concrete and the surrounding surface reinstated to match the existing. Concrete shall be mix ST1.
	3	Existing bolts nuts and washers shall not be reused.
	4	Repairs to pedestrian guardrails shall be carried out using panels and posts which match the original installation as closely as possible.
	5	Repaired and renewed pedestrian guardrail shall comply with clause 411.
	6	The Operating Company shall remove damaged sections of guardrail and close the resulting opening using suitable temporary guardrail.
	7	The Operating Company shall make permanent repairs using panels to match existing.
	8	Permanent repairs shall be carried out in accordance with the requirements of Schedule 7 Part 1 Paragraph 2.2 and, in any case, no later than 28 days after the removal of the damaged sections.
472AR		**Re-Tensioning Of Safety Barriers**
		Tensioned Corrugated Beam Safety Barrier
	1	Tensioned Corrugated Beam Safety Barrier shall be re-tensioned in accordance with British Standard 7669: Part 3, Section 2.
	2	Tensioning between any two limits shall not proceed until each limit is anchored sufficiently securely to resist the load effects due to tensioning.
	3	Tensioning shall be undertaken only when the ambient temperature is between -5°C and 25°C.
	4	Tensioning assemblies should be located not more than 70.5 metres apart and each installation should incorporate at least one adjuster assembly. If the inspection prior to re-tensioning indicates that additional tensioning assemblies are required, these shall be supplied and fitted by the Operating Company as part of the re-tensioning operation.
	5	On completion of tensioning, the centre of each screw securing beams to posts shall not be closer than 25 mm ±2 mm to the end of the slotted hole in the beam.
		Wire Rope Safety Barrier

Clause No.		Title and Written Text
	6	Wire Rope Safety Barrier shall be re-tensioned in accordance with British Standard 7669: Part 3, Section 2.5.
	7	Tensioning between any two limits shall not proceed until each limit is anchored sufficiently securely to resist the load effects due to tensioning.
	8	Tensioning shall be undertaken only when the ambient temperature is between 30°C and -10°C.
	9	The ambient temperature shall be recorded by the Operating Company.
		Tensioned Rectangular Hollow Section Beam Safety Barrier
	10	Assembly and tensioning shall be carried out in accordance with British Standard 7669: Part 3, Section 2.4.
	11	Tensioning between any two limits shall not proceed until each limit is anchored sufficiently securely to resist the load effects due to tensioning.
	12	Tensioning shall be undertaken only when the ambient temperature is between 10°C and 20°C.
	13	Tensioning assemblies shall be located not more than 70.5 m apart and each installation shall incorporate at least one tensioning assembly. If the inspection prior to re-tensioning indicates that additional tensioning assemblies are required, these shall be supplied and fitted by the Operating Company as part of the re-tensioning operation.
473AR		**Painting of Pedestrian Guardrails and Handrails**
	1	Painting of Pedestrian Guardrails and Handrails shall be carried out in accordance with Series 5000 – Maintenance Painting of Steelwork, including clause 5007SE Paint and Similar Protective Coatings as contained in the Manual of Contract Documents for Highway Works.
	2	All primed surfaces shall be painted with one coat of undercoating of the colour appropriate to the colour of finishing coat.
	3	Two finishing coats shall be applied.
570AR		**Rodding Eyes**
	1	Rodding eyes shall be either a Type 1 single or Type 2 double arrangement.
	2	Rodding eyes shall not be used for pipe diameters in excess of 225mm.
	3	The connecting pipe shall be laid at an angle of 45° to the horizontal.
	4	The connecting pipes shall be surrounded with 150mm concrete mix ST2 for the full depth of the connection and extending 150mm beyond the connection with the main drain.
	5	Covers and frames shall comply with the loading category of British Standard EN 124 as stated in Appendix 5/1 with a clear opening of 150mm or 225mm.
	6	Covers and frames shall be bedded and haunched with mortar to clause 2404 mix designation (ii) and set flush with the surface.
	7	Bedding mortar shall be a maximum of 25mm thick and placed directly on the concrete surround.

Clause No.		Title and Written Text
571AR		**Renewal of Filter Drain Material**
	1	Filter drain material shall be renewed by replacing the filter media with Type B material in accordance with Table 5/5 of clause 505.
	2	The depth of the existing material to be removed from within the trench shall be the depth to invert level of the pipe or the depth to the level of the underside of siltation if this is higher than invert level of the pipe. This depth shall be determined in advance of excavation and replacement operations by the excavation of trial pits.
	3	The width of the existing material within the trench to be removed shall be that of the existing drain filter material at the invert level of the pipe or at the level of the underside of siltation if this is higher than invert level of the pipe. This width shall be determined in advance of excavation and replacement operations by the excavation of trial pits.
	4	The trench shall be back-filled up to ground level or where the filter material is to be covered with red chippings to the underside of the red chippings with Type B material in accordance with Table 5/5 of clause 505.
	5	If required, any geotextile membrane present shall be replaced with new material equivalent to that removed.
	6	Where the filter drain is to be completely renewed, it shall be constructed in accordance with Highway Construction Detail drawing Number F2 with Type B material.
	7	Where the existing filter drain material is recycled it shall be tested in accordance with clause 710.
572AR		**Closed Circuit Television Surveys**
		Definition
	1	For the purposes of this clause, "drain" shall be deemed to include sewers, drains, filter drains, ducts, piped grips, combined drainage and kerb systems and linear drainage channel systems.
		Extent of Survey and Method to be Used
	2	Wherever instructed to do so or where subject to an Order, the drains shall be inspected by closed circuit television, all in accordance with Series 9000, MCHW 5.9, Parts 1-5, so that all cracks, blemishes, encrustations, open joints, silt, debris, collapsed sections, roots, vermin and alignment can be observed.
	3	Television cameras shall be drawn by cables and winches self-propelled tractor driven or fixed to rods.
	4	Where the survey of a drain length is stopped by a blockage in the drain, the drain shall be surveyed in the opposite direction on the other side of the blockage.
		Records
	5	The Operating Company shall provide a record on Digital Versatile Disc (DVD) of all drain lengths showing a continuous record of data displayed automatically on the monitor screen containing the following information:

Clause No.		Title and Written Text
		(i) automatic update of the camera's metreage position in the drain line, (ii) date of survey, (iii) direction of survey, (iv) pipe dimensions, and (v) length/location reference.
	6	The DVD recordings shall become the property of the Scottish Ministers.
		Photographs
	7	(i) Photographs shall be taken of Defects and samples of average condition. (ii) Where colour in-line photography is used, photographs shall be taken at intervals not exceeding 5 metres. (iii) Durable half plate prints shall be provided. (iv) The photographs shall be identified in relation to the metreage of the place taken and shall show clear definition and accurately reflect what is shown on the monitor. (v) The speed of the camera in the drain shall be limited to: 0.10 m/s for drains of diameter less than 200mm, 0.15 m/s for diameters exceeding 200mm but not exceeding 300mm, and 0.20 m/s for those exceeding 300mm.
		Reports
	8	(i) All reports shall be presented to the Overseeing Organisation in accordance with the format laid down in the *Manual of Sewer Condition Classification* – 4th Edition, published by the Water Research Council. (ii) Each chamber shall be recorded on a separate sheet except for buried chambers which may be included within a length. (iii) Photographs shall be mounted and shall follow the relevant page of the report. (iv) All dimensions shall be in metric units. (v) The report shall include the depth measured from cover level to invert for every drain in each chamber. (vi) One copy of the report shall be provided within 14 days of completion of each survey or if required by the Overseeing Organisation each section of the survey.
573AR		**High Pressure Water Jetting**
		High pressure water jetting shall be carried out using water which complies with sub-Clause 1702.3 by a jetting pump with a variable output up to 220l/minute at a minimum of 14N/mm^2. Minimum water storage capacity shall be 4.5 cubic metre. A minimum length of 180 metres of 25 millimetre diameter jetting hose shall be provided.
670AR		**Siding Out**

<table>
<tr><th>Clause No.</th><th></th><th>Title and Written Text</th></tr>
<tr><td></td><td>1</td><td>Siding out shall be carried out at the edges of carriageways, footways and paved areas but may be extended to more general areas for the breaking up and removal of excessive or hardened dirt or weeds or any other undesirable material on the carriageway, footway or paved surface.</td></tr>
<tr><td></td><td>3</td><td>Footways shall be sided out up to and including any existing footway edging or to a specified width of line.</td></tr>
<tr><td></td><td>4</td><td>Where the sided out edges do not exceed a height of 75mm above the existing footway surface they may be trimmed with a vertical face.</td></tr>
<tr><td></td><td>5</td><td>Where they exceed a height of 75mm above the existing paved surface they shall be trimmed to an approximately 45 degree battered face.</td></tr>
<tr><td>770AR</td><td></td><td>Not used</td></tr>
<tr><td>771AR</td><td></td><td>Concrete Pavements Repair Systems</td></tr>
<tr><td></td><td>1</td><td>Repair materials to be used on the Trunk Road network for the repair of concrete pavements shall be approved in accordance with the Specification for Highway Works, Volume 0 Section 3, Part 1 SA 1/08, Annex C, Type Approval for Pavement Materials.</td></tr>
<tr><td></td><td>2</td><td>The materials shall be used in accordance with the manufacturer's written instructions and certification procedures.</td></tr>
<tr><td>970AR</td><td></td><td>Not used</td></tr>
<tr><td>971AR</td><td></td><td>Stone Mastic Asphalt (SMA) Surface Course</td></tr>
<tr><td></td><td></td><td>General</td></tr>
<tr><td></td><td>1</td><td>Stone mastic asphalt shall comply with the general requirements of Series 700 and 900 and the specific requirements of sub-clauses 2 to 39 of this clause.</td></tr>
<tr><td></td><td>2</td><td>Stone mastic asphalt shall be produced in mixing plants (that shall be registered to the British Standard EN ISO 9001) using 'Sector Scheme for the Production of Asphalt Mixes', described in Appendix A.</td></tr>
<tr><td></td><td>3</td><td>The design for SMA to clause 971AR shall be to the general requirements of clause 942 and shall specifically comply with the requirements for wheel tracking and sensitivity to water.
The Operating Company shall declare target aggregate gradings and binder contents prior to commencement of the Operations.</td></tr>
<tr><td></td><td>4</td><td>The nominal installation depths shall be classified into three categories as given in Table 9/70.</td></tr>
<tr><td></td><td></td><td>TABLE 9/70 – Nominal Installation Depth Classifications
<table>
<tr><td>Type</td><td>Type A</td><td>Type B</td><td>Type C</td></tr>
<tr><td>Nominal installation depth (mm)</td><td><18</td><td>18 to 25</td><td>>25</td></tr>
</table></td></tr>
<tr><td></td><td></td><td>Aggregates</td></tr>
<tr><td></td><td>5</td><td>Coarse aggregate shall be crushed rock or crushed slag complying with clause 901.</td></tr>
</table>

Clause No.		Title and Written Text
	6	The shape of the coarse aggregate shall comply with a maximum flakiness index of Category FI25 as defined in British Standard EN 13043, clause 4.1.6.
	7	Fine aggregate shall comply with clause 901 and shall comprise crushed fine aggregate derived from rock, slag or gravel, which may be blended with not more than 50% of natural sand.
	8	The resistance to polishing of the coarse aggregate shall have a minimum declared PSV category specified in Appendix 7/1 in accordance with British Standard EN 13043, clause 4.2.3. The resistance to abrasion of coarse aggregate shall have a maximum AAV specified in Appendix 7/1 in accordance with British Standard EN 13043, clause 4.2.
		Filler
	9	Added filler aggregate shall be hydrated lime, crushed limestone or Portland Cement, in accordance with the requirements of British Standard 594-1 and shall be not less than 2% by mass of total aggregate.
		Binder
	10	Bitumen shall comply with British Standard EN 12591 or BS 3690-3 and shall be produced in plants (that shall be registered to British Standard EN ISO 9001) using 'Sector Scheme for the Supply of Paving Grade Binders', described in Appendix A.
	11	The binder shall not be harder than penetration reference 50 (paving grade 40/60).
	12	If the deformation resistance requirement in sub-clause 18 of this clause shall not be required, then the binder penetration reference shall be as specified in Appendix 7/1.
		Binder Modifiers
	13	Binder modifiers pre-blended with bitumen or binder modifiers, including natural or man-made fibres, which are added or blended with base bitumen, complying with British Standard EN 12591, of the stated penetration range at the mixing plant, shall have a British Board of Agrément HAPAS Roads and Bridges Certificate. In the event that no such Certificates have been issued, binder modifiers, pre-blended modified binders or additives shall not be used without the prior written approval of the Overseeing Organisation.
	14	In the event that no British Board of Agrément HAPAS Roads and Bridges Certificates have been issued, the Operating Company shall provide with its design a data sheet giving details of the properties of the modified binders or additives proposed including those referred to in Appendix 7/1. The Operating Company shall provide the rheological product identification data for pre-blended modified binders in accordance with clause 928.
		Mixture

Clause No.		Title and Written Text
	15	The binder drainage of the loose mixture at the target composition at a temperature of 175°C in accordance with Draft for Development (DD) 232: 1996 shall not be more than 0.3% by total mass of mixture.
	16	The agreed binder content for the mixture shall be the target binder content ± 0.6%.
		Job Standard Mixture Approval
	17	Details of the design for the proposed mixture from each asphalt mixing plant shall be submitted to the Overseeing Organisation. The information may be obtained from either a job mixture trial or from the use of the mixture on a previous contract carried out in accordance with this clause, and shall include all the following particulars: (i) bitumen penetration reference, (ii) quantities of binder and aggregate, (iii) aggregate source and grading, (iv) proprietary name and generic type of binder modifier, (v) quantity of any binder modifier, including natural or man-made fibres added at the mixer, and (vi) modified binder and mixture data requirements specified in Appendix 7/1.
	18	If a modified binder, including any proportion of the modifier, is not fully recovered on analysis for determination of binder content, details of alterations to the test method or the correction necessary to the results, together with supporting data, shall be submitted to the Overseeing Organisation with the design of the proposed mixture for written consent prior to the use of the binder.
	19	The mixture shall be submitted to the Overseeing Organisation who shall then approve it in writing as the Job Standard Mixture, provided that: (i) the design of the mixture proposed complies with sub-clauses 1 and 3 of this clause, (ii) information has been submitted in accordance with sub-clauses 17 and 18 of this clause, and (iii) information submitted in accordance with sub-clause 18 of this clause has been approved in writing by the Overseeing Organisation.
	20	If the design for the mixture or constituent materials of a Job Standard Mixture is changed by the Operating Company, details of the revised mixture shall be submitted for written approval in accordance with sub-clause 17 of this clause.
	21	Job Standard Mixture trials may be carried out on or off the Site, however material laid for a Job Standard Mixture trial on Site which complies with this Specification may form part of the binder/regulating course in the permanent work.

Clause No.		Title and Written Text
		If carried out off the Site, trials may be arranged independently or in conjunction with other work.
		Mixing
	22	Unless otherwise specified by the supplier of the modified binder, stone mastic asphalt shall be mixed at a temperature in accordance with the requirements of British Standard 4987-1:2005 for the penetration reference of the bitumen. This shall be done in such manner that a homogeneous mixture of aggregate, filler, bitumen and additive is produced. At the time of mixing the coarse aggregate shall be in a surface dry condition.
		Transportation
	23	The transportation of Stone Mastic Asphalt shall be in accordance with BS 594987.
		Permanent Works
	24	When specified in Appendix 7/1, sampling and testing shall be carried out to establish compliance of material laid in the permanent work.
		Sampling from the Laid Material
	25	Samples of uncompacted material shall be taken from the paver as near to where the cores shall be taken as is practicable, in accordance with British Standard EN 12697 Part 27:2001 and British Standard EN 12697 Part 28:2001.
	26	Six 200 mm diameter cores shall be cut, where practical from the centre of the Lane, out of material from each mixing plant: (i) from material laid specially in a Job Standard Mixture approval trial, (ii) from the first 1 km length of stone mastic asphalt from a mixing plant laid in the permanent work, or (iii) within three days of laying stone mastic asphalt from a mixing plant in the permanent work, where less than 1 km length has been laid whichever occurs first.

Clause No.		Title and Written Text
	27	The 200 mm diameter cores shall be cut within three days of laying the material unless they have been cut under the requirements of sub-clause 26 of this clause. The cores shall be transported as soon as possible to the laboratory. If the storage period is less than four days, the storage temperature shall be within the range 0°C to 25°C. For storage beyond four days, the temperature shall be within the range 0°C to 5°C. Cores shall be stored on a flat face on a horizontal surface, and shall not be stacked. Site storage of cores where unavoidable and conditions of transportation shall be as close as is practicable to the laboratory conditions. The storage temperature and times, including whilst cores are on Site, shall be recorded.
	28	Three pairs of 150 mm diameter cores shall be cut at the same meterages as the 200 mm diameter core. One core of each pair shall be taken from the centre of the Lane adjacent to the 200 mm diameter core and one whose centre shall be between 500 mm and 1000 mm from the edge of the mat.
	29	Cores shall be taken after the stone mastic asphalt has cooled to ambient temperature and not less than 12 hours after laying and before trafficking unless otherwise specified in Appendix 7/1. The walls and base of all holes from which core samples shall have been cut shall be painted with hot bitumen or cold applied polymer modified intermediate or premium grade bitumen emulsion containing normally 60% binder immediately prior to making good. Core holes shall be backfilled with materials compacted to refusal with a circular headed vibrating hammer in layers not exceeding 75 mm thick. Hot base material shall be similar to existing pavement.
	30	In the permanent work, after the first 6 cores have been recovered and where the required thickness of the material exceeds 25 mm, for material from each mixing plant, not less than one pair of 200 mm diameter cores shall be cut from the centre of the Lane every 1 Lane kilometre laid. Where the day's production is less than 1 Lane kilometre, not less than one pair of 200 mm diameter cores shall be cut from the centre of the Lane.
		Tests and Calculations
	31	For each un-compacted sample, the compositional analysis shall be carried out in accordance with British Standard EN 12697 corrected by any correction factor approved under sub-clause 16 of this clause.
	32	Each six consecutive 200 mm diameter cores of material from the same mixing plant shall form a set of cores on a running basis. For each set, the wheel-tracking rate and rut depth shall be determined in accordance with the procedure in British Standard 598-110:1998 at the test temperature specified in Appendix 7/1.

Clause No.		Title and Written Text
	33	For each 150 mm diameter core the bulk density shall be determined in accordance with the procedure in British Standard EN 12697-6:2003. The bulk density at a chainage shall be the mean from the two cores taken at a chainage. Subsequent to determining the bulk density, the maximum density shall be determined from the pair of the cores in accordance with BS EN 12697-5:2002.
	34	The air void content of each pair of 150 mm diameter cores shall be calculated to ± 0.1% as follows: Air voids content = $\frac{(1- \rho) \times 100\ \%}{\rho\ Max}$ where: ρ shall be the bulk density in accordance with British Standard EN 12697-6 (Mg/m^3), and ρ Max shall be the maximum density in accordance with British Standard EN 12697-5 (Mg/m^3).
		Compliance Requirements
	35	When determined in accordance with British Standard EN 12697-1 and British Standard EN 12697-2 the compositional analysis shall demonstrate compliance with following: (i) the binder content on analysis shall not differ from the target binder content declared by the Operating Company by more than ± 0.6%, and (ii) the aggregate grading shall not differ from that declared by the Operating Company.
	36	Deformation resistance shall be determined in accordance with the requirements of clause 952 and the deformation values specified in Appendix 7/1.
	37	The air voids content shall be not more than 6% for a pair of cores at a chainage and shall be not more than 4% for the mean of any six consecutive determinations from pairs of cores from material from the same mixing plant. When the Stone Mastic Asphalt is being used as a regulating course at thicknesses below 30 mm, the appropriate limiting void contents shall be 8% and 6% respectively.
		Reporting Results
	38	Where it is specified in Appendix 1/5 that the Operating Company is responsible for testing, the individual determinations including location of samples and results from all tests, shall be given to the Overseeing Organisation in writing within two weeks of the material having been laid.

Clause No.		Title and Written Text
		Surface Preparation
	39	Existing surfaces shall be prepared in accordance with the requirements of British Standard 594987:2010 and Series 700 clauses. Bond coats and tack coats shall be in accordance with clause 920 except that where the thickness of the stone mastic asphalt is less than 20 mm, only polymer modified bond coats shall be used.
		Laying
	40	Unless required otherwise in Appendix 7/1, stone mastic asphalt shall be laid and compacted in accordance with the requirements of clause 901, to the thickness stated in Appendix 7/1.
		Weather Conditions
	41	The weather conditions specified in clause 945 shall not apply to stone mastic asphalt laid in accordance with this clause.
	42	The manufacturer's recommendations for the use of modified binders in various weather conditions for laying and compaction temperatures of the modified stone mastic asphalt shall be submitted to the Overseeing Organisation with details of the modified binder required under sub-clause 9 of this clause and shall include information on early trafficking particularly in hot weather.
		Temporary Trafficking
	43	The Operating Company shall ensure that the pavement material has adequately cooled and hardened in accordance with clause 903, before it is subjected to temporary traffic.
	44	The material shall not be trafficked if its surface temperature exceeds 25°C unless the maximum temperature within the mat has fallen below 35°C.
972AR		**Grip Testing**
		General Requirements
	1	The surface course skid resistance shall be measured using the Grip Tester braked –wheel fixed-slip device in accordance with British Standard 7941-2:2000, or equivalent devices possessing appropriate validation shall conform with *Table 2.4 Minimum Grip Number* of clause 974AR. All surface course materials laid in accordance with clause 974AR shall have Skid Resistance carried out with a Grip Tester in accordance with the requirements for testing using the Grip Tester given in clause 974AR. Where Proprietary SMA surface courses to Series 900 clause 942 or clause 971AR material are laid in areas of greater than 2000m² the surface course material shall also be tested using the Grip Tester at four weeks and six months (clause 974AR Table 2.4) for the appropriate Site class. The results shall be forwarded to the Overseeing Organisation within seven days of the Grip Test being completed for monitoring purposes.

Clause No.		Title and Written Text
		Survey Procedure
	2	Prior to any testing of the surface course commencing a full calibration check shall be carried out at the nominated reference Site at the start of each testing day.
	3	All testing Sites shall be pre-surveyed by the Operating Company to ensure that start and end points can be identified. These points shall be marked by the Operating Company.
	4	Where a Site contains multiple Lanes, only the near side Lane or nearest side Lane, excluding the hard shoulder, shall be tested.
	5	Each section shall be tested twice with the Grip Tester. If the section average values of these first two tests are within 0.02, then the first run shall be reported as the survey result.
	6	After each survey both speed and water flow shall be checked and if out with tolerance for 75% of the section the run shall be repeated. If speed tolerance is out of tolerance due to congestion or other factors occurred on the section, the Site shall be revisited when a compliant run can be carried out. Tolerance for speed shall ± 10% and tolerance for water flow shall be ± 20%.
	7	GPS data shall be recorded and referenced to the Overseeing Organisation IRIS referencing system. GPS data shall have accuracy better than 5m and shall be collected with a minimum update of 0.1 seconds.
		Reporting
	8	The Operating Company shall submit to the Overseeing Organisation a printed report in addition to test data provided in an electronic format. Copies of calibration Certificates, ongoing calibration results /checks and reference Site checks shall be included within this report which shall be forwarded to the Overseeing Organisation within seven days of the Grip Test being completed.
	9	The report shall include test data in the following formats: (i) Tabular data showing the section average of all valid runs for the survey with the 1st valid run being indicated as the test result, (ii) A colour coded map, and (iii) A graphical output based on the tabular data.
	10	The Operating Company shall submit monthly reports of all test results including details of the location along with the findings to the Overseeing Organisation.
	11	Data shall be reported in a format compatible with IRIS, preferably CSV files.
		Longer-Term Skid Resistance
	12	After two years trafficking and within the SCRIM testing season, skid resistance will be measured by Transport Scotland (via SCRIM) in accordance with HD 28/04 (DMRB 7.3.1).

Clause No.		Title and Written Text
973AR		**Grip Tester**
		General
	1	The Director will provide the Grip Tester and, except where otherwise specified, the Operating Company shall maintain and operate it.
	2	The Grip Tester will be handed over to the Operating Company by Commencement of Service Date 1.
	3	The Operating Company shall store the Grip Tester undercover in a secure location.
		Maintenance
	4	The Operating Company shall maintain the Grip Tester in accordance with the *Grip Tester MK2 D-TYPE Maintenance Manual*, except where otherwise specified.
	5	Maintenance referred to in clauses 2.3 (Annual Maintenance) and 2.4 (Calibration) of *Grip Tester MK2 D-TYPE Maintenance Manual* are the responsibility of the supplier and will be paid for by the Scottish Ministers. The Operating Company shall arrange for this maintenance and delivery and return of the Grip Tester to the supplier.
	6	In addition to the requirements of *Grip Tester MK2 D-TYPE Maintenance Manual* the Operating Company shall ensure that the Grip Tester is regularly maintained in a clean and presentable condition ensuring required functionality at all times.
	7	The Operating Company shall be responsible for any loss or damage to the Grip Tester and for effecting such additional insurance as may be necessary to cover the risk of such loss or damage from any cause.
		Vehicle
	8	The Operating Company shall supply an appropriate vehicle which may be dedicated or multi purpose. The vehicle will be fitted out by the Grip Tester supplier at the expense of Scottish Ministers during Mobilisation Period 1 not later than 30 days prior to Commencement of Service Date 1. The Operating Company shall arrange for this fitting out and delivery and return of the vehicle to and from the supplier.
		Staff
	9	A minimum of two operatives is required to operate the apparatus, a driver and a Grip Tester operator. The Grip Tester operator shall be appropriately experienced and qualified.
	10	Initial training by the supplier of the operatives, and Skid Resistance Manager in terms of operation, maintenance and software use will be arranged at the start of the Mobilisation Period and at the expense of Transport Scotland. Any additional training shall be provided at the expense of the Operating Company.
		Operations
	11	An annual certification process shall be undertaken for each Grip Tester to be used on the Unit. The procedure shall be carried out in accordance with

Clause No.		Title and Written Text
		ASTM E1844 test procedures where network machines are verified against a reference machine. The testing procedure must produce a check that machines are within a ± 0.02GN tolerance of each other. An additional certification check shall be carried out monthly to ensure that machines continue to read within specification.
	12	In addition to pre-survey checks as per section 2.1 of the *Grip Tester MK2 D-TYPE Maintenance Manual*, the checks shall be conducted in accordance with clause 974AR, except where otherwise specified.
	13	The calibration check is not necessarily required where use relates to the rapid deployment of the Grip Tester to spillage Sites. In these instances a simple relative measurement can be obtained to reveal the differential at the spill Site by taking measurements either side of the spillage area.
	14	The Operating Company shall provide a written procedure for the calibration of the Grip Tester prior to any survey. The procedure will be reviewed and approved by the Overseeing Organisation.
		Apparatus
	15	The Operating Company shall provide one laptop along with the appropriate software to operate the apparatus in accordance with the Roadbase Grip Tester Survey Software for Roads User Manual.
	16	The supplier will provide three user manuals: *Grip Tester Maintenance Manual, Roadbase Grip Tester Survey Manual*, and the *Grip Tester Automatic Watering System Operations Manual.*
974AR		**TS2010 Stone Mastic Asphalt (SMA) Surface Course**
		General
	1	The TS2010 stone mastic asphalt (SMA) shall conform to British Standard EN 13108-5:2006 where applicable and with TS2010 Surface Course Specification and Guidance Issue 01 (December 2010). Where the requirements of TS2010 Surface Course Specification and Guidance differ from other clauses, standards and specifications, the requirements of *TS2010 Surface Course Specification and Guidance* shall take precedence.
	2	Conformity shall be established in accordance with British Standard EN 13108-20:2006 and British Standard EN 13108-21:2006 although formal CE marking is not currently required.
	3	The requirements of clauses 901 and 903 apply and the performance guarantee shall be to clause 942.15 and 942.16.
	4	Any references made to tables in this clause shall be deemed to be references to those in TS2010 Surface Course Specification and Guidance.
975AR		**Overband Sealing**
	1	The Operating Company shall use systems holding Highway Authorities Product Approval Scheme certification and the system shall be applied in accordance with Highway Authorities Product Approval Scheme requirements

Clause No.		Title and Written Text
		The minimum skid resistance value of the overband material shall be 60 measured by the skid resistance pendulum method. All material removed from the cracks and joints shall be removed to a licensed waste disposal site. All loose material shall be removed off the Unit to a licensed waste disposal site or recycling centre.
976AR		**Grade H Mastic Asphalt for Bridge Surfacing**
	1	The grade H mastic asphalt shall meet the following requirements: 1.1 Asphaltic Cement The asphaltic cement shall comply with the following requirements: • Penetration point at 25°C: 12 ± 3 • Softening point, °C: 80 ± 10 • Loss on heating for 5h at 163°C, % by mass: max. 2.0 • Solubility in trichloroethylene, % by mass min. 75, max. 79 • Ash (mineral matter), % by mass: min. 16.5, max. 20.0 In all other respects the bitumen used in the manufacture of the asphaltic cement shall comply with British Standard EN 13108-6: 2006, and the lake asphalt and lake asphalt-bitumen mixtures used in the manufacture of the asphaltic cement shall comply with British Standard EN 13108-4: 2006 Annex B. 1.2 Aggregate The total aggregate in the laid material and in material transported hot to the point of laying shall consist of fine aggregate complying with the fine aggregate section below, and coarse aggregate complying with the coarse aggregate section below. Material supplied in block form shall contain only fine aggregate complying with the fine aggregate section below. 1.3 Fine Aggregate The fine aggregate shall consist of naturally occurring limestone ground to a grading as set out in the table below, and shall have a calcium carbonate content of not less than 80% by mass when determined in accordance with British Standard 6463: Part 2. Grading of limestone fine aggregate

Clause No.		Title and Written Text

Grading using test sieves by the wet sieving method described in British Standard 812: Part 103	% by mass	
	Min.	Max.
Retained on 2.36mm	-	3
Passing 2.36 mm retained on 600 µm	5	25
Passing 600 µm retained on 212 µm	10	30
Passing 212 µm retained on 75 µm	10	30
Passing 75 µm	40	55

1.4 Coarse Aggregate

1.4.1 The coarse aggregate shall be material substantially retained on 2.36mm test sieve and shall consist of one of the following:

crushed rock of one of the following types: basalt, gabbro, granite, gritstone, hornfels, limestone, porphyry or quartzite;

gravel of one or more of the groups in (a) or flint.

1.4.2 For material transported hot charge to the point of laying the size and percentage of coarse aggregate incorporated in the mastic asphalt at the time of manufacture shall be in accordance with the limits given below.

The percentage of coarse aggregate shall be such that the total percentage of material retained on a 2.36mm test sieve on analysis of the mastic asphalt as laid, including that portion of the fine aggregate retain on a 2.36mm test sieve, shall fall within the appropriate limits given in below:

Nominal size of coarse aggregate complying with British Standard EN 13043: 10mm

Coarse aggregate content, % by mass of total mix: 45 ± 10

1.5 Manufacture of the mastic asphalt

At this stage the mastic asphalt shall show on analysis a composition within the limits specified in the table below and, if not required for immediate use, shall be cast into blocks.

Composition by analysis of mastic asphalt: (before addition of coarse aggregate)	
Grading of mineral aggregate using test sieves	% by mass of mastic asphalt

Clause No.		Title and Written Text

	Min.	Max.
Retained on 2.36mm	-	2.5
Passing 2.36 mm retained on 600 µm	4	21
Passing 600 µm retained on 212 µm	8	32
Passing 212 µm retained on 75 µm	8	25
Passing 75 µm	40	56
Soluble bitumen	14	17
Note: The composition of the total mix should on analysis comply with this table after due allowance has been made for the presence of the mass of material retained on a 2.36mm test sieve.		

1.6 Mixing

1.6.1 Mastic asphalt cement shall be mixed off-Site and transported to the Site in a lorry mounted hot box system. The % TLA added shall be witnessed by the Supervising Officer at the Plant.

1.6.2 The fine aggregate shall be thoroughly mixed with the asphaltic cement.

1.6.3 Mixing temperature of aggregate with asphaltic cement is to be continuously monitored throughout mixing. Maximum permitted temperature = 230°C.

1.7 Laying

1.7.1 The surface on which the mastic asphalt is to be laid (waterproofing membrane) should be swept clean of debris and standing water and also in a dry condition.

1.7.2 At least 20 No. readings are to be made of the material temperature. Laying temperature is to be between 175°C and 230°C.

1.7.3 Air temperature and pavement temperature is to be recorded at hourly intervals throughout the works.

1.8 Hardness number

The hardness number of the wearing course as laid shall be tested as specified in British Standard 5284, and shall be between 10 and 20 at 35°C. In addition, Marshall mould specimens shall be tested in accordance with British Standard 598-107:2004, except that the stability shall be recorded at a flow of 5mm and 15mm. The required stability range at each flow rate shall be reported after initial testing.

Clause No.		Title and Written Text
1170AR		**Red Chipping Paved Areas**
	1	Red chipping paved areas shall be 14mm nominal size natural red igneous stone in a single layer 80mm thick.
1171AR		**Relaying of Existing Footways**
	1	Relaying of existing footways shall be carried out with materials compatible with the adjacent areas.
1172AR		**Artificial Stone Paving or Natural Stone Paving and Precast Concrete Paving Flags and Blocks**
	1	Before work commences in any individual existing artificial stone paving, York stone paving or precast concrete flag or block paved footway, the Operating Company shall record the dimensions and number of flags or blocks to be replaced and take photographic Records.
	2	The Operating Company shall carefully lift the flags or blocks and set aside.
	3	Flags or blocks not permanently re-laid on the same day as they are lifted shall be stacked in neat piles to a height not exceeding one metre.
1173AR		**Laying of Artificial Stone Paving, Natural Stone Paving and Precast Concrete Paving Flags and Blocks**
	1	Paving of artificial stone paving, York stone paving or precast concrete paving flags shall be reconstructed to match existing as closely as possible and shall be in accordance with British Standard 7533.
1174AR		**Timber Edging to Footways and Paved Areas**
	1	Timber shall be as described in clause 304 and sized to match existing or 75mm x 32mm whichever is the lesser.
	2	Fixing shall be by 50mm x 50mm x 300mm pointed pegs at 600mm centres.
	3	Timber edgings and pegs shall be pressure impregnated with preservative in accordance with clause 311.
1270AR		**Passively Safe Sign Posts**
	1	Passively safe sign posts shall be in accordance with BS EN 12767: 2007 erected in accordance with the manufacturer's instructions.
1271AR		**Snow Poles**
	1	Snow poles shall be 50mm external diameter aluminium poles 20mm gauge 2.5m long with ends capped and 150mm reflective strips at the top of the pole and 500mm above ground level.
	2	On single carriageways the reflective strips are to be red facing the oncoming adjacent traffic with white on reverse side.
	3	In central reserves on dual carriageways the reflective strips are to be orange on both faces.
	4	Pole foundations shall be 400mm x 400mm x 300mm deep in-situ concrete grade ST2 to clause 2602 finished flush with ground level.
	5	Tops of poles shall be 2.2 metres above the adjacent ground level.

Clause No.		Title and Written Text
	6	Poles shall be located 1.2 metres from the carriageway edge.
	7	Poles shall be located at 50 metre intervals on each verge at staggered intervals along opposing verges.
1272AR		**Electroluminescent Signs for Traffic and Gantry Signs**
	1	**Sign Specifications:** (i) Translucent retro-reflective material must be used, (ii) patented Encapsulated Electroluminescent Lamp Pre-wired with 3.5 metre cable for connection to driver, (iii) weatherproof IP66 construction, (iv) electromagnetic compatibility ("EMC") and low voltage directive ("LVD") compliant, (v) acrylic vandal resistant sheet, (vi) operating voltage 50 -150 volts root mean squared, (vii) operating temperature -10 degrees Celsius to +25 degrees Celsius, (viii) CE marked, (ix) conforms to British Standard EN 12899, (x) conforms to British Standard EN60598 (where applicable), and (xi) Class II double insulated construction - no earth connection required. Laminated bonded construction onto standard aluminium 11-Gauge back-plate.
	2	**Driver Specifications:** (i) sealed unit for mounting inside post top, (ii) microprocessor controlled, (iii) integral IP66 photocell (set approx 70 lux), (iv) suitable for EL signs up to 1.5 x 4.5 metres (or equivalent load), (v) EMC & LVD compliant, (vi) output cables for connecting to sign and mains, (vii) CE marked, (viii) operating temperature -10 degrees Celsius to +25 degrees Celsius, (ix) weatherproof construction - IP44, and (x) tamperproof stainless steel fixings supplied.
1370AR		**Lamp Disposal**
	1	The Operating Company shall collect, transport and dispose of waste lamps in accordance with the requirements of the *Waste Electrical and Electronic Equipment Regulations*.

Clause No.		Title and Written Text
1470AR		**Temporary Overhead Feed to Lighting Units**
	1	No temporary overhead cable shall be installed until the lighting columns involved have been assessed as being suitable for the additional mechanical loading placed on them.
	2	Cables used for any temporary overhead feed to lighting units or luminaries shall consist of sheathed or armoured cables supported by a steel catenary wire and shall be installed in accordance with the requirements of British Standard 7671:2008. The minimum height above ground of the span shall, according to the location, be as follows: (i) 10 metres for motorways, and (ii) 5.8 metres for all other roads and road crossings.
1770AR		**Not used**
1771AR		**Additional Requirements for Concrete and Concrete Repairs**
		Storage of Materials
	1	All proprietary materials shall be stored in accordance with the manufacturer's written instructions.
		Records
	2	As repair work proceeds, the Operating Company shall keep Records including digital date stamped photographs.
		High Pressure Water Jetting
	3	High pressure water jetting shall use clean and fresh potable water. The Operating Company shall not add antifreeze agents or any other chemicals to water used for jetting activities.
1772AR		**Removal of Concrete in Areas to be Repaired**
	1	Concrete shall be cut and removed from areas specifically identified following inspection and testing.
	2	Concrete shall be removed from the area until sound concrete is reached. Where reinforcement is exposed, concrete shall be removed for a minimum distance of 25mm beyond the rear face of the reinforcement. Where corroded reinforcement is identified, the area of concrete removed shall be extended to expose 100mm of un-corroded reinforcement.
	3	The position and depth of the reinforcement shall be determined by the Operating Company.
	4	The perimeter of the concrete to be removed shall be saw cut perpendicularly to the face of the concrete to a depth of not less than 15mm or to within 10mm of the reinforcement whichever is the lesser. Cut edges shall be abraded. At the upper limits of repairs to be made using repair concrete, sloping cuts may be used to avoid the entrapment of air when the concrete is poured.

Clause No.		Title and Written Text
	5	Removal of concrete by water jetting shall be carried out by companies registered with the Association of High Pressure Water Jetting Contractors.
	6	Where concrete is removed by high pressure water jetting, final trimming of the area may be broken out using other processes.
	7	Overbreak of concrete shall be made good using a concrete repair system selected from clause 1774AR.
	8	Reinforcement damaged during concrete removal shall be made good. Existing reinforcement which has corroded or is otherwise damaged shall be removed and additional steel reinforcement shall be lapped or welded onto the existing reinforcement. All such welding shall be in accordance with clause 1717. All loose reinforcement shall be securely tied with stainless steel tying wire.
	9	The Site shall be kept free of debris or standing water arising from the high pressure water jetting and other activities.
	10	On completion of removal of concrete, all concrete surfaces and exposed reinforcement which are in contact with repair materials shall be prepared in accordance with clause 1773AR.
1773AR		**Surface Preparation**
		General Requirements
	1	Blast cleaning shall utilise the appropriate grade and particle shape of abrasives. Non-metallic abrasives shall not be recycled.
	2	Only clean potable water shall be used for cleaning and rinsing.
		Preparation of Surfaces of Reinforcement
	3	All detrimental contamination and corrosion products shall be removed from steel reinforcement. The surfaces shall be free of embedded abrasive particles and corrosion products when viewed through a 10 times illuminated magnifying glass.
	4	Dry blast cleaning shall be by a dry air/abrasive system. Wet blast cleaning shall be by a low pressure air/water/abrasive system. The air/water pressure shall be adjustable to a maximum of 14 bar. Within an hour after blast cleaning the treated reinforcement shall be pressure washed with clean water.
		Preparation of Surfaces of Concrete
	5	All cement laitance contaminants and loose friable material shall be removed from concrete surfaces. Concrete surfaces shall be wetted one hour before repair concrete is applied.

Clause No.		Title and Written Text
		Concrete surfaces shall be free from standing water when repair concrete is applied.
	6	The surface profile after cutting out by high pressure water jetting shall be irregular with aggregate particles projecting above the surrounding concrete matrix. All concrete surfaces exposed by percussive methods to receive repair materials, shall be prepared by low vibration processes, such as grit blasting or high pressure water jetting, to remove all fractured aggregate particles and expose a sound substrate.
		Trials
	7	The Operating Company shall remove, cut back and prepare the surface of an area of one square metre of concrete to be repaired as a trial of the methods proposed for carrying out the work and obtain photographic Records.
1774AR		**Concrete Repairs**
		General
	1	Concrete repairs shall be carried out using either, normal-flow concrete proprietary repair mortar, high-flow repair concrete proprietary sprayed concrete or a proprietary repair system proposed by the Operating Company and consented to in writing by the Overseeing Organisation. Where concrete repairs are re required to the top surface of bridge decks the repair material shall be compatible with the waterproofing system. Crack repairs carried out by a resin injection system shall be proposed by the Operating Company and subject to written consent by the Overseeing Organisation.
	2	Proprietary repair materials and systems shall have an Agrément Board Roads and Bridges Certificate registered with the Overseeing Organisation.
	3	Proprietary repair mortars shall be used for repair areas less than $1m^2$ or repair depths less than 30mm deep. Normal flow concrete or high flow concrete or sprayed concrete shall be used for repair areas greater than 1 square metre or greater than 30mm deep or as otherwise proposed by the Operating Company and subject to consent in writing by the Overseeing Organisation.
		Materials for Repairs Using Normal Flow Concrete
	4	(i) Cement shall comply with sub-clause 1702.1, (ii) Repair concrete shall be a designed concrete as defined in sub-clause 1701.2 and clause 1705, (iii) Cement or combination content shall be not less than 360 kg/m^3 in any designed concrete, (iv) Maximum aggregate size shall be 20mm,

Clause No.		Title and Written Text
		(v) The free water/cement ratio shall not be greater than 0.4, (vi) The minimum strength class shall be C32/40, and (vii) Alkali – silica reaction shall be controlled as specified in sub-clause 1704.5.
		Materials for Repairs Using Proprietary Repair Mortar
	5	(i) Pre-batched polymer modified cementitious mortars incorporating a shrinkage reduction agent shall be used, (ii) Mortars for hand screeding of surfaces to be waterproofed shall be sand/cement mortar containing styrene acrylate or styrene butadine polymer bonding admixture, (iii) The maximum aggregate grain size in the mortar shall be suitable for the depths of repair required, (iv) Water required to mix repair mortars shall be clean potable water, (vii) The maximum total chloride content expressed as % of chloride ion by mass of cement of the materials shall not exceed 0.3% and for repairs to prestressed or heat cured concrete shall not exceed 0.1%, Calcium chloride or admixtures containing chloride salts shall not be used, (viii) The minimum 28 day cube strength of the repair mortar shall be 40 N/mm^2, (ix) Alkali-silica reaction shall be controlled as specified in sub-clause 1704.5.
		Delivery and Storage of Material
	6	(i) The Operating Company shall provide and retain for each batch of the material delivered to the Site of the Operations Certificates furnished by the supplier stating: (a) the polymer used, (b) evidence that the total chloride content is less than specified in sub-clause 5 (vii) of this Specification, (c) the content of sodium oxide equivalent in the mortar, (d) maximum shelf life, (e) handling arrangements, (ii) The material shall be stored in a dry environment free from extremes of cold and heat and in accordance with any specific storage requirements of the manufacturer, (iii) The materials shall not be removed from store until immediately prior to mixing.

Clause No.		Title and Written Text
		Placing Repair Mortar
	7	(i) Repair mortar shall be built up in accordance with the manufacturer's written instructions, The surface of each layer except the final layer shall be scored to provide a key for the next layer, (ii) The repair mortar shall be suitable for the purpose intended i.e. for soffits or vertical surfaces as appropriate, (iii) Repair mortar shall not be applied when the temperature of the surface to be repaired falls below 5°C, (iv) The material shall be incorporated within 1 hour of mixing or such lesser period as stated in writing by the manufacturer, and (v) Repair mortar shall be cured in accordance with sub-clause 1710.5 and the manufacturer's written instructions. During the curing period air and surface temperatures shall be maintained at or above 5°C or in accordance with the manufacturers written instructions which may require artificial means if necessary.
		Surface Finish to Repair Mortar
	8	Repair mortar shall be float finished to produce a dense smooth uniform surface free from float marks to the specified line and level.
		Materials for Repairs Using Proprietary High-Flow Repair Concrete
	9	(i) Materials for proprietary high-flow repair concretes shall comply with the specification requirements in BS 8500-1:2006, (ii) Water shall be clean potable water, (iii) Aggregate shall be well graded with the maximum size not exceeding 8mm except when pumping is to be employed when the maximum size shall not exceed 6mm and shall comply with sub-clause 1702.2, (iv) Proprietary material shall be of such composition and grading that when mixed with water a flowable concrete is produced which shall flow freely into the confined spaces to be filled and shall not be prone to segregation bleeding or cracking in either the plastic or hardened stat, and (v) The minimum strength class shall be C32/40.
		Delivery and Storage of Material
	10	(i) Records shall be kept of each batch of material delivered to the Site of the Operations and shall include: (a) formulator's name and address, (b) formulator's agent's name and address where applicable, (c) material identification, (d) batch reference number size of batch and number of containers in the delivery,

Clause No.		Title and Written Text
		(e) date of manufacture, (f) evidence that the chloride contents are less than specified in table 17/1 of clause 1704, (g) details of the significant rock components contained in the aggregates, (h) cement content, (i) combinations and additions used, and (j) the equivalent sodium oxide content. (ii) Containers shall be damp proof and readily emptied of their contents, (iii) Containers shall be marked with the following information: (a) material identification, (b) batch reference number, (c) formulator's name, (d) net weight and lifting arrangements and storage specific requirements, (e) any warnings or precautions concerning the contents. (iv) The material shall be stored in a dry environment free from extremes of cold and heat, (v) Material shall not be older than three months or lesser period specified by the formulator when used in the Operations, (vi) The materials shall not be removed from the store for use in the Operations until immediately prior to mixing.
		Formwork Site Mixing Placing and Curing
	11	(i) Formwork shall be Class F4 to sub-clause 1708.4 with the perimeter of the repair well sealed to prevent grout loss, Release agents shall be compatible with proposed surface treatments, (ii) Mixing in a forced action paddle mixer and placing shall be carried out strictly in accordance with the formulator's written instructions.
		Approval Tests
	12	(i) Before Operations commence all properties of the proposed high-flow repair concrete shall be demonstrated by the Operating Company and the formulator's representative by carrying out the tests specified below in an UKAS accredited laboratory, Records shall be maintained of all tests in accordance with the procedures in the Management System,

Clause No.		Title and Written Text
		(ii) The composition of the high flow concrete including the source of water the mix proportions and the method of mixing shall be the same as that proposed for use in the Operations, The composition shall not be varied throughout the course of the tests and the material shall be obtained from the same batch, (iii) The tests fall into two categories flowability and compressive strength, (iv) The flowability tests shall demonstrate: (a) flow characteristics in a trough at 5°C and 20°C as specified in Note 1 of this sub-clause, (b) flow characteristics in a simulated soffit repair at 5°C and 20°C as specified in Note 2 of this sub-clause.
		Note 1: The flow characteristics of the concrete in a trough shall be assessed by the Operating Company. For each test the concrete and trough shall be at the specified temperature. The funnel of the apparatus shall be fitted with a rubber bung and charged with 6 litres of concrete. On release of the bung, the concrete shall flow along the trough and the length of the flow along the trough shall be measured. A test shall consist of three readings the flow requirements and shall be deemed to be satisfied if none of the readings are below 750mm in 30 seconds without signs of segregation or bleeding. Note 2: The flow characteristics of the concrete in a simulated soffit repair shall be tested in accordance with BD27 of the DMRB. For each test the concrete and apparatus shall be at the specified temperature. The concrete shall be poured in one operation into the supply tube until the level of the concrete has reached 100mm above the underside of the top plate. After the concrete has set, the specimen shall be removed from the apparatus and sawn into two parts and the sawn concrete surfaces shall be examined. The concrete shall be homogeneous free from excessive air holes voids segregation and other Defects and shall completely fill the simulated repair.
		Compressive Strength Tests
	13	(i) Compressive strength tests shall comply with conformity testing requirements in British Standard 8500-2, section 10, (ii) Compressive strength tests shall be carried out by the Operating Company to determine the compressive strength of the concrete at 5°C and 20°C,

Clause No.		Title and Written Text
		(iii) Test cubes shall be made in 100mm metal moulds to British Standard EN 12390, The moulds shall be carefully filled by pouring concrete through a funnel to produce void free specimens, There shall be no compaction, The cubes shall be cured and testing shall be carried out in accordance with the appropriate parts of British Standard EN 12390-2: 2000, (iv) The minimum compressive strength shall be established using a set of three cubes, The requirement shall be satisfied if none of the compressive strengths obtained are lower than the specified value and the difference between the highest and lowest values is not more than 20% of the average, and
		(v) Identity testing where required shall be carried out by the Operating Company in accordance with clause 1707.
		Batch Acceptance Tests
	14	Each batch of material delivered to the Site shall be tested by the Operating Company as follows: (i) the material shall be taken at random from one or more containers from the same batch, (ii) flow through tests shall be carried out as specified in Note 1 of sub-clause 12 of this clause at 20°C, and (iii) compressive strength tests shall be carried out as specified in sub-clause 13 of this clause at 20°C.
		Site Tests
	15	(i) Site tests shall be carried out by the Operating Company to monitor: (a) flowability, and (b) compressive strength. (ii) The flowability of a sample of fresh concrete shall be determined in a trough as specified in sub-clause 12, Note 1, (iii) The gain in strength of the repair concrete shall be monitored by the Operating Company by testing cubes cured alongside the repaired areas at ambient temperature, (iv) For each day's production of repair concrete, six 100mm cubes shall be made by the Operating Company in accordance with sub-clause 13 of this clause, The cubes shall be cured for 24 hours in the moulds with the top surfaces covered by polythene sheets. After 24 hours the cubes shall be stripped and placed in polythene bags which shall be sealed.

Clause No.		Title and Written Text	
		The cubes shall continue to be stored alongside the repaired areas throughout the curing period until required for testing. The cubes shall be crushed at times determined by the Operating Company but at least 2 cubes shall be retained to be tested at 28 days.	
		Materials for Repairs Using Proprietary Sprayed Concrete	
	16	(i) The proprietary material shall be pre-weighed and pre-mixed at a location off the Site, (ii) Cement shall comply with sub-clause 1702.1, (iii) Alkali-silica reaction shall be controlled as specified in clause 1704, (iv) The total chloride content of the materials shall be expressed as % of chloride ion by weight of cement and shall not exceed 0.3% except in the case of prestressed or heat cured concrete where the maximum shall not exceed 0.1%,	
		Any additional chloride or admixtures containing chloride salts shall not be used, (v) Aggregate shall be well graded with the maximum size not exceeding 3mm and shall comply with sub-clause 1702.2, (vii) Material shall be capable of being applied to a thickness of 100mm without the requirement for additional mesh reinforcement or fibres, and (vii) Once placed the material shall be capable of being profiled and trowel finished (to the equivalent of formed Class F2) without detrimental effects.	
		Performance Characteristics	
	17	The proprietary material shall have performance characteristics as detailed in Table 17/71 which shall be verified by an independent testing authority employed by the Operating Company.	
		TABLE 17/71: Performance Characteristics	
		TEST	**PERFORMANCE**
		Bond Strength to British Standard EN 1542	greater than 1.0 N/mm^2
		Characteristic strength of cores (28 days) to British Standard EN 12504-1	40 N/mm^2
		Tensile splitting strength (28 days) to British Standard EN 12390-6	greater than 2.4 N/mm^2
		Static Modulus of elasticity to British Standard EN 13412	27000 ± 3000 N/mm^2
		Shrinkage to British Standard EN 12617-4	less than 0.002%
		Coefficient of Thermal Expansion to British Standard EN 1770	8 to 12 x 10-6/°C

Clause No.		Title and Written Text	
		Coefficient of Chloride Ion Diffusion to British Standard EN 13396	To be agreed with the Overseeing Organisation
		Delivery and Storage of Material	
	18	(i) Records shall be kept of each batch of material delivered to the Site and shall include: (a) formulator's name and address, (b) formulator's agent's name and address where applicable, (c) batch reference number size of batch and number of containers in the delivery, (d) date of manufacture, (e) evidence that the chloride contents are less than specified in sub-clause 16 (iv) of this clause, (f) details of the significant rock components contained in the aggregates,	
		(g) cement content, and (h) additives used. (ii) The sodium oxide equivalent content, (iii) Containers shall be damp proof and readily emptied of their contents, (iv) Containers shall be marked with the following information: (a) material identification, (b) batch reference number, (c) formulator's name, (d) net weight, and (e) any warnings or precautions concerning the contents The material shall be stored in a dry environment free from extremes of cold and heat. Material shall not be older than 3 months or lesser period specified by the formulator when incorporated in the Works. The materials shall not be removed from the store for use in the Works until immediately prior to mixing.	
		Trial Mixes	
	19	Practical tests shall be carried out on the Site by constructing test panels to confirm the suitability of the mix for the Works. In these tests the type of equipment used for mixing and placing and the finished face to the panel shall be similar in all respects to those intended for use in the Works.	
		Procedure Trials	

Clause No.		Title and Written Text
	20	(i) Before work commences on the Operations, procedure trials shall be carried out to pre-qualify the nozzlemen proposed for use on the Site, Nozzlemen who have not been pre-qualified shall not be permitted to apply sprayed concrete on the Operations, (ii) Each nozzleman shall carry out procedure trial panels, The procedure trial panels shall have minimum dimensions of 750mm x 750mm x 100mm deep and shall be made of plywood with 45º sloped edge to permit rebound to escape, (iii) One half of each procedure trial panel shall contain reinforcement representative of the size and spacing of the work, The second half of the procedure trial panel shall contain no reinforcement (with the exception of fibre reinforcement) to allow for the extraction of cores for testing in accordance with sub-clause 29(ii) of this clause, (iv) One procedure trial panel shall be carried out by each nozzleman proposed for use on the Site using each proposed mixture proportion at each proposed orientation i.e. horizontally overhead or other such orientations,
		(v) A minimum of three 100mm diameter cores shall be extracted from the location of intersecting reinforcing steel to check the adequacy of consolidation of the sprayed concrete around the reinforcement. A nozzleman shall not be prequalified if the cores from his trial panel show inadequate consolidation, and (vi) No sprayed concrete shall be carried out on the Site until the procedure trial testing requirements shall have been met.
		Surface Preparation for Sprayed Concrete
	21	(i) Sound surfaces which are to receive sprayed concrete shall be thoroughly cleaned and roughened by grit blasting or high pressure water jetting, (ii) All concrete surfaces to receive sprayed concrete, exposed by percussive methods using hand or mechanical tools, shall be prepared by low vibration processes, such as grit blasting or high pressure water jetting, to remove all fractured aggregate particles and expose a sound substrate, (iii) Grit blasted areas shall have sprayed concrete applied within 48 hours or shall be re-blasted, and (iv) Immediately prior to spray concreting all the surfaces to be sprayed shall be thoroughly cleaned and wetted with a strong blast of oil-free air and water.
		Outline Definition
	22	(i) The outline of the finished sprayed concrete shall be defined by screed boards, guide wires or other means proposed by the

Clause No.		Title and Written Text
		Operating Company and consented to in writing by the Overseeing Organisation, and (ii) Guide wires shall be installed tight and true to line and in such a manner that they may be easily tightened.
		Mixing Sprayed Concrete
	23	(i) Sprayed concrete shall be mixed in a batch type mixer complying with the requirements of BS 1305 except that the water shall be delivered direct to the nozzle, The delivery equipment shall be capable of delivering a continuous even stream of uniformly mixed material to the nozzle, Water supply at the nozzle shall be maintained at a uniform pressure sufficient to ensure adequate hydration at all times, The delivery equipment and nozzle shall be thoroughly cleaned and inspected at the end of each day and parts replaced as required, (ii) The temperature of water and cement when added to the mix shall not exceed 60°C and 65°C respectively, and (iii) Water used in sprayed concrete shall be clean potable water.
		Reinforcement
	24	Welded wire mesh fabric reinforcement shall be fixed to prepared surfaces and shall be carefully bent to follow the shape of the members and held in position by anchors spaced at not less than 2 per m^2. The fabric shall be spaced at not less than 25mm from the finished surface of the concrete.
		Transport and Placing Sprayed Concrete
	25	(i) No concrete shall be sprayed in air temperatures less than 5°C or onto a surface temperature less than 5°C, Surfaces shall be free from standing water, (ii) Sprayed concrete shall emerge from the nozzle in a steady uninterrupted flow and an uninterrupted supply of compressed air shall be provided to maintain adequate nozzle velocity, Should the flow become intermittent the nozzle shall be directed away from the work until the flow again becomes uniform, (iii) Sprayed concrete shall be applied under sufficient pressure so as to give a dense and homogeneous covering to the surface in one or more layers of a thickness compatible with the mix design constituents, position of reinforcement and plane of application to ensure the placed concrete does not slump or sag, (iv) Adequate precautions shall be taken to ensure that sprayed concrete rebound shall not be incorporated in the finished work and that any previously deposited hardened rebound which may prevent a proper bond or encasement shall be removed from reinforcement,

Clause No.		Title and Written Text
		(v) Adequate protection shall be given to the nozzle and application surface during high winds, and (vi) The final coat shall be hand screeded to a Class U3 finish in accordance with sub-clause 1708.4.
		Fibre Reinforced Sprayed Concrete
	26	(i) The weight of steel or composite fibres shall not exceed 5% by weight of the combined weight of cement and aggregate, (ii) Fibres shall be added to the mix in such a manner that the fibres shall be evenly distributed and not bent, (iii) Procedure trials shall be undertaken to demonstrate that the proposed methods can achieve the requirements of this sub-clause, (iv) Unless otherwise stated elsewhere in this Contract, a final 15mm thick coat of unreinforced sprayed concrete shall be applied over the whole exposed surface to cover exposed fibres, and (v) The gun and nozzle shall be electrically earthed.
		Construction Joints
	27	(i) Construction joints in sprayed concrete shall be tapered at approximately 30 degrees or cut back square to the reinforcement and then tapered at 30 degrees, and (ii) The construction joint shall be thoroughly cleaned and all laitance and loose material removed and the surface wetted using a strong blast of air and water prior to the placement of adjacent sprayed concrete.
		Curing of Sprayed Concrete
	28	(i) Freshly sprayed concrete shall be protected from rain or water until the surface is sufficiently hard to resist damage, (ii) Immediately after placing and for 14 days thereafter, sprayed concrete shall be protected against harmful effects of weather including rain rapid temperature changes and frost and from drying out, (iii) Curing membranes shall not be used, and (iv) Impregnation in accordance with clause 1709 may be carried out after 14 days.
		Production Testing of Sprayed Concrete
	29	(i) One production test panel shall be carried out for each nozzle orientation for each day of sprayed concrete production or every 15m^3 of sprayed concrete whichever is the lesser, (ii) Sprayed concrete production test panels shall be made with dimensions 450mm x 450mm x 100mm thick with 45º sloped edge forms to permit escape of rebound,

Clause No.		Title and Written Text
		(iii) Production test panels shall contain no reinforcement (other than fibre reinforcement), (iv) The production test panels shall be marked, cured, cored and tested in compression in accordance with the appropriate parts of British Standard EN 12390, (v) They shall be tested in a United Kingdom Accreditation Service (UKAS) accredited laboratory. Records shall be maintained of all tests, and (vi) Routine tests shall be carried out by the Operating Company on the finished sprayed concrete. These routine tests shall consist of taking 25mm or 100mm diameter cores from the finished sprayed concrete, tested in the same manner as cores taken from the test panels or by carrying out non-destructive tests by means of a 'Schmidt' hammer or 'Windsor Probe' or other approved test to determine compressive strength and testing for bond by the use of a hand hammer.
		Resin Injection Repairs
	30	(i) The concrete surface at least 50mm either side of the crack shall be dry blast cleaned to a sound surface free from dirt moss salt staining and loose concrete, The full extent of the crack shall be found and the cleaned area shall extend 50mm beyond the end of the crack or until the crack becomes too narrow to warrant resin injection, and (ii) Where algae or other bacterial growth emanates from the crack it shall be removed by scrubbing with bactericide and rinsing with clean water, Health and safety precautions appropriate to the bactericide cleaning agent used shall be adopted including those recommended in writing by the manufacturers. Measures shall be taken to ensure that any adjacent water course shall not be contaminated and that run-off shall be collected and disposed of in a safe manner.
	31	(i) Where excess moisture is evident in the crack to be resin injected the crack shall be blown through with dry hot air starting at the top of the crack, A temporary crack sealant shall be applied immediately after blowing through and the resin shall be injected into the crack immediately the necessary preparations are complete, (ii) If, for whatever reason, the crack becomes damp before it is resin injected no further work shall be permitted until the temporary crack sealant is removed and the crack blown through again with dry hot air, and (iii) The temperature of the hot air shall be sufficient to dry the full depth of the crack and shall not exceed the maximum temperature specified by the equipment manufacturer.

Clause No.		Title and Written Text
	32	(i) The resin to be used shall be either polyester or epoxy based and shall be mixed and injected in accordance with the manufacturer's written specification, Resin shall not be injected when the air temperature or the surface temperature concrete to be repaired is less than 5°C, (ii) The spacing of the nozzle positions shall be equal to the depth of the crack and shall not, in any case, be less than 250mm, (iii) Injecting shall start at the bottom of the crack and work shall proceed upwards in a continuous operation throughout, Resin shall be seen extruding from the crack at the next nozzle position before the current nozzle location is locked off, (iv) The injected crack shall be left undisturbed for a period of at least 24 hours to allow the resin to harden, and (v) When the resins are sufficiently cured, the cracks and any resin spillages shall be cleaned from the face of the concrete.
	33	When the resin has set, two 20mm diameter proving cores shall be taken to the full depth of the crack. The resulting holes shall be filled with either the resin used for injecting or with a suitable filler of a compatible thixotropic resin.
		Sealing of Cracks in Concrete Bridge Decks
	34	The preparation of surfaces around cracks and the measures to deal with algae or other growth in cracks shall be as described in sub-clause 30 of this clause.
	35	(i) The sealing resin shall be a low viscosity, polyester epoxy or acrylic polymer which shall be compatible with any proposed waterproofing system, (ii) The material shall be applied by pouring through a fine nozzle directly into the crack or into preformed dams, (iii) The injected crack shall be left undisturbed for a period of at least 24 hours to allow the resin to harden, and (iv) When the resins are sufficiently cured the cracks and resin spillages shall be cleaned to the face of the concrete.
1775AR		**Foamed Concrete Fill to Structures and Backfilling to Drainage Trenches**
	1	Foamed concrete fill to arches or bridge decks shall be of density 1400 – 1600 kg/m^3. Minimum cement content shall be 350 kg/m^3. The maximum free-water/cement ratio shall be 0.4. The minimum cube compressive strength shall be 8 N/mm^2.
	2	Foamed concrete fill to drainage trenches shall comply with sub-clause 1 of this clause.

Clause No.		Title and Written Text
1870AR		**Repairs to Existing Steelwork and Welds**
	1	The Operating Company shall develop repair procedures for the repair of all Defects in steel plates and welds. The repair procedures shall be compatible with the grade and properties of the steel plate or sections. Repair procedures shall be submitted to the Overseeing Organisation for consent.
2070AR		**Replacement of Bridge Deck Waterproofing on Concrete Decks**
		Removal of Existing Waterproofing
	1	The existing surfacing shall be removed by cold-milling (planing) in accordance with clause 709 except in the case of small areas which may be removed using other suitable methods.
	2	The existing bridge deck waterproofing or protective layer comprising the last 30mm above the concrete substrate shall be carefully removed by other means to avoid damage to the concrete. Method statements for the removal of existing waterproofing shall be submitted by the Operating Company for the written consent of the Overseeing Organisation before the proposed techniques shall be used.
	3	The final removal of the remaining waterproofing or primer to expose the concrete substrate shall be by recoverable abrasive blast cleaning systems. 'Open' blast cleaning shall not be permitted except on vertical surfaces or intricate details.
		Inspection and Testing
	4	Prior to application of the new waterproofing, the deck concrete shall be examined by the Operating Company to determine the following: (i) if any testing is required (in accordance with the requirements of Appendix 33/1), (ii) if additional deck preparation is required, and (iii) if structural concrete repairs are required (in accordance with the requirements of Series 1700).
		Additional Preparation of Bridge Deck
	5	Additional preparation of bridge decks prior to the application of the new waterproofing shall be the following: (i) removal of surface Defects such as screed marks and footprints, (ii) removal of formwork and falsework anchors from the original construction which have inadequate cover, (iii) sealing of cracks greater than 0.25mm, and (iv) repairs to or forming of fillets and chases to facilitate waterproofing.
	6	Any work required in addition to the items listed above, such as removal of chloride contaminated concrete or delaminated concrete and concrete repairs considered necessary by the Operating Company, shall be deemed to be structural concrete repairs and shall be undertaken in accordance with Series 1700.

Clause No.		Title and Written Text
		Replacement of Bridge Deck Waterproofing
	7	The replacement waterproofing system shall be in accordance with clauses 2008 and shall comply with the requirements of clauses 2002, 2003, 2005 & 2007 and any additional requirements described in Appendix 20/1.
2071AR		**Replacement of Bridge Deck Waterproofing on Steel Decks**
		Removal of Existing Waterproofing
	1	The existing surfacing, waterproofing and any primer shall be removed and the zinc metal coating prepared to 'sound metal coating' by blast cleaning or 'bright metal coating' by abrading in accordance with Clause 5004. The method of removing the existing waterproofing shall avoid damage to the steel deck plate and where necessary procedure trials shall be undertaken to confirm that the proposed method will not result in damage to the deck plate. In areas where the existing zinc coating has broken down the areas of steel shall be prepared to 'clean steel' by blast cleaning or 'bright steel' by abrading in accordance with Clause 5004. To facilitate testing of the deck plate and welds the zinc spray shall be removed and the deck prepared to 'clean steel' by blast cleaning or 'bright steel' by abrading in accordance with Clause 5004.
		Inspection and Testing
	2	Prior to application of the new waterproofing, the deck plate and welds shall be visually examined by the Operating Company and the Operating Company shall carry out non destructive testing of the deck plate and welds using magnetic particle inspection techniques using the methods recommended in British Standard EN ISO 9934.
	3	Where Defects are identified they shall be repaired in accordance with Appendix 18/70.
	4	The steel surface profile required shall be determined by the requirements of the proposed waterproofing system.
		Replacement of Bridge Deck Waterproofing
	5	A zinc rich blast primer shall then be applied to the steel deck. The blast primer shall be either selected from Table 50/1 of Series 5000 or a proprietary zinc rich blast primer developed for use with the proposed waterproofing system. In either case the Operating Company shall ensure that the primer is compatible with waterproofing system and shall prevent any corrosion of the deck plate prior to waterproofing. Adhesion testing shall be undertaken in accordance with the requirements of clause 2007.
	6	The replacement waterproofing system shall be in accordance with clauses 2008 and shall comply with the requirements of clauses 2002, 2003, 2005 & 2007 and any additional requirements described in

Clause No.		Title and Written Text
		Appendix 20/1.
	7	The waterproofing system shall be applied in accordance with the manufacturer's instructions with such primers, bond coats and the like as may be required.
	8	In addition to the waterproofing membrane a 1mm thick 'shear key' membrane of contrasting colour, containing dust free 3mm aggregate (Flintag or equivalent) shall be applied. While the 2nd coat of membrane is still wet and within 5 minutes of its application, the aggregate shall be broadcast onto the membrane in such a manner so as to allow the aggregate to fall vertically, at an application rate of 0.5kg/m^2. When the membrane has cured any aggregate not retained in the membrane shall be removed prior to application of the tack coat.
	9	The waterproofing membrane shall be tested in accordance with clause 2007 and made good as required prior to application of the shear key layer.
	10	Prior to surfacing a separate hot melt tack coat as recommended by the waterproofing manufacturer to be compatible with the surfacing shall be applied.
	11	All components of the waterproofing system shall be suitable for the levels of environmental exposure that will be encountered in permanently exposed locations.
	12	The Operating Company shall have special regard for the limitations of the waterproofing system in terms of its application at low temperatures and ensuring inter-coat adhesion is not compromised by delay between applications of different components of the system. The Operating Company shall strictly follow the requirements of the manufacturer in all aspects of the application of the waterproofing system.
	13	All components of the system shall be provided by one supplier who shall operate a Quality System registered to ISO 9001:2000.
	14	Only persons trained and authorised by the supplier of the waterproofing system may install the waterproofing system.
2072AR		**Repairs to Existing Waterproofing on Concrete Decks**
	1	Repairs shall be carried out to the existing waterproofing only where the existing system has a current British Board of Accreditation -Roads and Bridges Agrément certificate showing compliance with the requirements of BD47 of the DMRB 'Waterproofing and Surfacing of Concrete Bridge Decks' or for other spray applied waterproofing with the written consent of the Overseeing Organisation. Repairs shall be carried out using systems compliant with BD47 of the DMRB and compatible with the system to be repaired.

<table>
<tr><th>Clause No.</th><th></th><th>Title and Written Text</th></tr>
<tr><td></td><td></td><td>The waterproofing shall be applied in accordance with the method statement included with the Agrément certificate for the particular system.

All waterproofing repairs shall be carried out in accordance with Clause 2070AR.

Where the existing waterproofing shall be a spray applied system for repair areas of less than 2m2 at any one location a hand-applied system equivalent to and compatible with the existing may be used subject to the written consent of the Overseeing Organisation.

The repair areas within the carriageway width shall have a protective layer incorporated into the waterproofing system in accordance with sub-Clause 2003.4.</td></tr>
<tr><td>2370AR</td><td></td><td>Bridge Expansion Joints Used on Bridge Decks</td></tr>
<tr><td></td><td>1</td><td>The following types of bridge expansion joints are known to occur on the Trunk Road network.
<table>
<tr><td>Type</td><td>Description</td></tr>
<tr><td>1</td><td>Buried joint under continuous surfacing</td></tr>
<tr><td>2</td><td>Asphaltic plug joint</td></tr>
<tr><td>3</td><td>Nosing joint with poured sealant</td></tr>
<tr><td>4</td><td>Nosing with preformed compression seal</td></tr>
<tr><td>5</td><td>Reinforced Elastomeric</td></tr>
<tr><td>6</td><td>Elastomeric in metal runners</td></tr>
<tr><td>7</td><td>Maurer D80</td></tr>
</table>
This list is not exhaustive and reference shall be made to BA26 and BD33 of the DMRB for all possible types that may be encountered.</td></tr>
<tr><td></td><td></td><td>A description of deck joint types and deck joint manufacturers’ details shall be as provided in the structures management function of the Integrated Roads Information System for individual Structures where these are known.</td></tr>
<tr><td>2371AR</td><td></td><td>Replacement of Bridge Deck Expansion Joints and Gap Sealants</td></tr>
<tr><td></td><td>1</td><td>Replacement repair and alterations to expansion joints shall comply with the requirements of clauses 2301 to 2304 and Standards BD33/94 and BA26/94 of the DMRB.</td></tr>
<tr><td></td><td>2</td><td>Joints shall be installed in accordance with the manufacturer's written instructions.

Work may comprise replacement of a complete joint or maintenance of a joint where complete or partial replacement is not considered necessary.</td></tr>
</table>

Clause No.		Title and Written Text
	3	Existing joints (including transition strips) shall be carefully broken out or unbolted and removed. The adjacent carriageway hardshoulder, hardened verges and central reservations shall be saw cut to provide neat vertical edges. The location of any existing services or ducts shall be determined prior to breaking out or saw cutting and measures shall be taken to protect them.
	4	Existing flashings and sealants shall be removed. Where appropriate, existing intact waterbars may be retained. Existing galvanised plates in buried joints shall be set aside for possible re-use.
	5	The existing surfacing and additional protective layer adjacent to the expansion joint shall be removed to expose the waterproofing membrane. The waterproofing shall be carefully cut back to expose the concrete surface which shall be prepared to receive the expansion joint system.
	6	Continuity of the waterproofing membrane shall be provided by bond or lap between the waterproof membrane and the expansion joint.
	7	Existing holding down bolts and fixings shall be protected, if required, for installation of the proposed replacement joint. If such bolts and fixings are not required they shall be removed or ground flush with the surface of the deck concrete.
	8	The concrete substrate shall be examined by the Operating Company for Defects. Where required, testing shall be carried out and concrete repairs undertaken in accordance with Series 1700 and this Appendix 0/1.
	9	If the joint is not completely replaced, material and components shall form the same system as the existing joint, where possible.
	10	Where required vertical drain holes shall be installed adjacent to expansion joints. The drain holes shall comprise a down pipe fixed into holes cored through the superstructure of minimum internal diameter 40mm and a conical entry funnel with cap to allow water to enter the funnel but prevent blocking of the waterway by the surfacing. The cap and funnel shall be covered with a sheet of permeable membrane prior to surfacing.
	11	Where gap sealant shall be replaced, the existing sealant and deteriorated joint filler shall be raked out to leave clean surfaces. Where possible, new joint filler to replace that removed shall be installed prior to re-sealing the gap. Where it is not possible to replace joint filler the joint shall still be sealed.
2372AR		**Asphaltic Plug Joints**
		Installation

Clause No.		Title and Written Text
	1	All joints shall have a valid approval/registration in accordance with Appendix E of the Specification.
	2	The joints shall be installed in accordance with the manufacturer's written instructions. These written instructions shall comply with the terms of the approval/ registration.
	3	All batches of materials delivered to the Site shall have a Certificate of compliance stating: (i) The binder compound and its properties including Penetration Value Softening Point (Ring and Ball) and Flow Resistance, (ii) The specific type and density of aggregate/stone used in the asphaltic plug matrix, and (iii) The quantities and weights of binder and aggregate used at each joint location.
2470AR		**Repointing of Brickwork Blockwork and Stonework**
	1	Masonry joints in brickwork and blockwork to be repointed shall be ground out to a depth of 25mm to give adequate key. For natural stone masonry and historic structures, power tools shall not be used. All unsound mortar at a greater depth than 25mm shall be removed until sound mortar is encountered. Apparatus used for grinding out shall be fitted with a depth gauge to allow control of rake out depth.
	2	All detritus shall be removed by low pressure water jetting. Repointing shall be carried out by trowel or purpose made repointing keys or by using injection techniques.
	3	Cement mortar designation shall be selected based on clause 2404 and 2417 and Table 24/5. Lime mortar designation shall be selected based on clause 2476AR Table 24/7, Table 24/8 and Table 24/9. Water for mortars shall be clean and free from impurities.
	4	The specification of mortars used in the repair of masonry construction shall be prepared with reference to the existing mortar in the remaining construction and appropriate adjustment shall be made to take account of existing conditions and availability of materials.
	5	For historic brick Structures and all stone masonry Structures, the mortar specification shall be prepared by the Operating Company in conjunction with specialist advice based on mortar analysis and evaluation carried out on the mortar samples from the existing construction.
	6	Lime mortar is extensively used in the construction of masonry road Structures. Mortars used for repairs and repointing shall match the appearance and characteristics of existing materials as closely as possible.

Clause No.		Title and Written Text
	7	The choice of lime mortar to be used shall be influenced by the nature of stone, the nature of any surviving lime based materials and the environmental conditions or exposure of the Site.
	8	Samples of mortar pointing at locations shall be provided for reference and comparison for the duration of the work. Mortar for pointing shall match the standards and details of the samples.
	9	Adequate protection of repair work and pointing from sun, wind, rain and frost shall be provided until cured.
	10	For historic Structures, power tools shall not be used to remove mortars. Damage to stonework shall be avoided.
	11	If any significant voids are present the Operating Company shall where necessary wedge and pin up loose stones.
	12	In deep cavities, work shall be carried out in layers of not more than 35mm allowing the material to dry before placing the next layer. A period of 24 hours shall elapse between each layer.
	13	Deep voids shall be filled to within 35mm or twice the width of the joint back from the finished wall face to allow sufficient depth for pointing.
2471AR		**Replacement of Precast Concrete Copings**
	1	Broken precast concrete copings shall be removed together with the old mortar bed and any loose and friable mortar in the joints below the coping.
	2	New precast concrete copings shall be laid on a mortar designation (i) (refer to clause 2404) bed to a line and level to match existing copings.
2472AR		**Rebedding Existing Precast Concrete or Stone Masonry Copings**
	1	Precast concrete or stone masonry copings shall be removed and stored for re-use.
	2	The existing mortar bed shall be completely removed together with any loose and friable mortar joints below the coping.
	3	Copings shall be relaid on mortar designation (i) (refer to clause 2404) or where wall construction contains lime mortar to clause 2476AR. Rebedding of existing precast concrete or stone masonry copings shall match existing line and level.
2473AR		**Replacement Tiling**
	1	All damaged and defective tiles, adhesive, mortar, loose concrete and grout shall be broken out.
	2	Replacement tiles shall be in accordance with BS 5385-1 for wall and floor tiling.
	3	Any areas of the underlying concrete surface which have been damaged shall be made good as detailed in Series 1700.
	4	Repair materials shall be compatible with the tile adhesive to be used.
	5	The edges of retained existing tiles shall be clean and free of any grout.

Clause No.		Title and Written Text
	6	Unless otherwise determined by the Operating Company in accordance with other provisions of this Contract, replacement tiles shall be glazed ceramic of a colour size and pattern to match existing tiles.
	7	Tiles shall be installed to a line and level to match existing tiling with the joints grouted to match the existing grout colour and pattern.
	8	New tiling shall be cleaned of excess grout when the grout to the joints has hardened.
	9	Where a mural or other new tile pattern is to replace an existing, the Operating Company shall produce drawings for approval by the Overseeing Organisation prior to construction.
2474AR		**Rebuilding of Defective Masonry**
	1	Bricks, concrete blocks and stones designated for reuse in the repairs or reconstruction of existing masonry including bridge parapets shall be taken down and set aside for reuse or removed for storage.
	2	Where parapets have been damaged, the Operating Company shall retrieve displaced bricks, blocks and stones from their position after displacement. This may include recovery from watercourses and rail tracks.
	3	The Operating Company shall consult the appropriate bodies to obtain agreement on access and method of working for retrieval and rebuilding.
	4	For Structures which are scheduled ancient monuments approvals shall be obtained from Historic Scotland.
	5	For Structures which are historic listed approvals shall be obtained from the appropriate local authority.
	6	The Operating Company shall set up lines of communication and processes to enable timescales for rebuilding to be achieved.
	7	The Operating Company shall include in its procedure for approval by Historic Scotland the following steps to ensure early consent: (i) Inform Historic Scotland Ancient Monument Division of damage to a scheduled ancient monument structure and apply for scheduled monument consent for repair work with cost estimates using new stone and sketch drawings of proposed repairs. Record photos of damaged areas shall be submitted to Historic Scotland Ancient Monument Division at this time. (ii) Carry out assessment of retrieval of stones from river beds and the like and notify Historic Scotland of outcome. (iii) Send stone samples to British Geological Survey for best matching replacement stones. Copy report to Historic Scotland. (iv) Meet Historic Scotland on Site with draft proposals for repair. (v) Agree final repair Scheme and submit all information to Historic Scotland for final comment. (vi) Historic Scotland issue Scheduled Monument Consent.

Clause No.		Title and Written Text
	9	The Operating Company shall include in its procedures for the liaison and approval by local authorities any proposals for repairs and any repair work or alterations required due to damage to historic listed Structures other than scheduled ancient monuments which shall be covered by sub-clause 4 of this clause.
	10	All mortar from the faces of the bricks, concrete blocks or stone shall be removed before incorporating them into the reconstructed work.
	11	Recovered bricks, blocks and stones from watercourses and other situations where the surfaces have been discoloured or contaminated shall be cleaned and allowed to dry before incorporating into the reconstructed work.
	12	Where new replacement parapet stones are required for listed / ancient monument Structures, they shall be of matching stone based on British Geological Survey's analysis of stone samples from the relevant Structure.
	13	New materials to be incorporated into existing brick, concrete block or stone masonry construction shall match the remaining construction with regard to appearance and physical characteristics.
2475AR		**Lime Putty**
	1	Lime putty shall be traditional non-hydraulic slaked lime putty to comply with British Standard EN 459-1 with a density of not less than 1.35kg/ltr.
	2	Water for mortars shall be clean and free from impurities which would adversely affect the mortar.
2476AR		**Hydraulic Lime Mortars**
	1	Hydraulic lime for preparation of lime mortars to be used for building, rebuilding, grouting, mechanical pointing and hand pointing shall be Natural Hydraulic Lime NHL5 (eminently hydraulic) or Natural Hydraulic Lime NHL3.5 (moderately hydraulic) or Natural Hydraulic Lime NHL2 (feebly hydraulic) and shall conform to BS EN 459-1. Non-hydraulic lime shall conform to British Standard EN 459-1.
	2	Proportions of hydraulic lime to sand shall be based on Table 24/7 according to the required mortar Durability Designation as defined in British Standard 5628 *Code of Practice for Use of Masonry* and as specified in Appendix 24/1.

Clause No.		Title and Written Text
		TABLE 24/7 Typical Hydraulic Lime Mortar Proportions by Volume

Constituents	Mix Reference/Durability Designation										
	M1 10	M2 9	M3 8	M4 7	M5 6	M6 5	M7 4	M8 3	M9 2	G1* 5-6	G2* 2-4
NHL5 Eminently Hydraulic	1	1	1							3	2
NHL3.5 Moderately Hydraulic				1	1	1					
NHL2 Feebly Hydraulic							1	1	1		
Lime Putty										1	1
Brick Powder (Reactive)/ Pozzolanic additive		½		½		½	½				
Well Graded Sharp Sand	1½	1½	2	1½	2	2½	1½	2	2	10	9
Soft Sand	½	½	½	½	1	1	½		½		
Porous Limestone or Brick Aggregate		½**	½	½**		½**	½**	1	1½		
Lime Mortar Mix Proportions by Volume	1:2	1:2 ½	1:3	1:2 ½	1:3	1:4	1:2 ½	1:3	1:4	3:1 :10	2:1 :9

*Gauged mixes G1 and G2 comprise Natural Hydraulic Lime NHL5: Lime Putty: Sand

** Porous Limestone aggregate may be substituted for equivalent amount of soft sand to achieve the specified lime mix proportions.

	3	Hydraulic lime Mortar shall be mixed as described below unless otherwise described in Appendix 24/1.
	4	Mortar shall be mixed thoroughly by hand or mechanically until its colour and consistency are uniform. The constituent materials shall be accurately measured. Mortar shall be made in small quantities only as and when required for the Operations. Mortar which has begun to set or has been mixed for a period of more than 2 hours shall be discarded.

Clause No.		Title and Written Text
		Hydraulic lime shall be delivered to Site in sealed paper bags stored in dry conditions and used within 24 weeks of manufacture. Brick powder in fine particle (<100 microns) reacts with free lime to form a pozzolan which improves frost resistance. Care is needed as if used at too high a proportion it can increase porosity and reduce flexibility. Introducing porous limestone or brick to the lime mortar mix will assist carbonation and frost resistance. Grading shall be similar to that for sharp sand. Pre-soaking prior to mixing will also help act as a retarder.
		Hydraulic Lime: Sand Mortars
	5	Hydraulic lime mortars may be provided as pre-mixed dry lime/sand mixes - either bagged or silo mixes or they may be site-mixed from bagged hydraulic lime and sand.
	6	Hydraulic lime mortars shall be used for the construction of masonry arch bridges which require a degree of flexibility to function structurally as arches. Hydraulic lime mortars shall be used for repair of masonry arch bridges that were constructed using hydraulic lime mortars.
	7	All hydraulic lime mortars shall be mixed in accordance with the supplier's written instructions.
	8	Hydraulic lime mortar shall be in accordance with the durability classification required (refer to Table 24/8).

Clause No.		Title and Written Text

TABLE 24/8 Durability Class Requirements for Straight Hydraulic Lime Mortars

Mortar Durability Designation (with approximate compressive strengths) for General use building mortar & General use mechanical or hand pointing mortar			
Masonry Type	Parapet & copings Masonry facing roadsides subject to spray & de-icing salts	Other parapets, abutments & spandrel walls Above flood level	Soffit to arch barrel Above flood level
Dense impermeable masonry. Squared or random. Brick, Basalt, Granite etc. (No Suction)	9 – 10 2.2 N/mm^2	7 – 8 1.8 N/mm^2	5 – 6 1.5 N/mm^2
Medium permeability masonry. Squared or random. Brick, Blockwork, Reconstructed stone, Sandstone, Limestone and mixed quality field stone masonry. (Moderate Suction)	7 – 8 1.8 N/mm^2	5 – 6 1.5 N/mm^2	3 – 4 1.34 N/mm^2
High permeability masonry. Squared or random. Brick, Blockwork, Reconstructed stone, Sandstone, Limestone and poor quality mixed field stone masonry. (High Suction)	5 – 6 1.5 N/mm^2	3 – 4 1.34 N/mm^2	2 – 4 1.34 N/mm^2

Clause No.		Title and Written Text
	10	Lime mortars suitable for use below flood level, depending on time required, are mortar designation 9–10 which shall be suitable for immersion within 24 hours or mortar designation 7–8 if a coffer dam shall be provided to allow 72 hours for setting.
	11	Site-mixed hydraulic lime mortars are sufficiently workable for laying and building stone masonry units but shall be generally not initially workable for laying bricks in a modern context without being banked up for several hours and reworked. Site-mixed hydraulic lime mortars shall be generally not suitable for pumping without the use of air entraining additives. Where required for site-mixed mortars, an air entrainer can be used to increase workability and minimise water requirement. Air entrainers shall be used in accordance with the manufacturer's written instructions. Pre-mixed dry bagged or silo mixes generally have a higher entrained air content than site-mixed mortars and shall be suitable for building, pumping and pointing without the need for additional air entrainers. The use of air entraining additives provides mortars of the same Durability Class which shall generally have superior performance characteristics in respect of earlier resistance to freeze/thaw action, faster rate of carbonation, better vapour permeability, and lower capillarity, due to their higher air content and reduced water demand.
		Gauged Hydraulic Lime: Sand Mortars
	12	Gauged hydraulic lime mortars shall only be used where this is necessary to match existing mortars in repointing work. There shall be no requirement for significant structural strength in re-pointing work. Gauged Hydraulic lime mortar shall be in accordance with the durability classification required (Refer to Table 24/9).

Clause No.		Title and Written Text

TABLE 24/9 Durability Class Requirements for Gauged Hydraulic Lime Mortars

Mortar Durability Designation (with approximate compressive strengths) for Non-general use hand pointing mortar			
Masonry Type	Parapet & copings Masonry facing roadsides subject to spray & de-icing salts	Other parapets, abutments & spandrel walls Above flood level	Soffit to arch barrel Above flood level
Dense impermeable masonry. Squared or random. Brick, Basalt and Granite (No Suction)	N/A	N/A	5 – 6 1.5 N/mm^2
Medium permeability masonry. Squared or random. Brick, Blockwork, Reconstructed stone Sandstone, Limestone and mixed quality field stone masonry. (Moderate Suction)	N/A 1.8 N/mm^2	5 – 6 1.5 N/mm^2	2 – 4
High permeability masonry. Squared or random. Brick, Blockwork, Reconstructed stone Sandstone, Limestone and poor quality mixed field stone masonry. (High Suction)	5 – 6 1.5 N/mm^2	3– 4 1.34 N/mm^2	1.34 N/mm^2
When work is planned to continue beyond the autumn raise the durability class by at least 1 where the background masonry permits. Where the background masonry does not permit, plan to commence in the early spring and be complete before the end of summer.			

Clause No.		Title and Written Text
	13	Gauged hydraulic lime mortars exhibit slower rates of carbonation and higher capillarity than straight hydraulic lime mortars and shall not be used in close proximity to wet areas or in areas subject to road spray.
	14	Air entrainers shall not be added to gauged hydraulic lime mortars.
2670AR		**Anti-Graffiti Coatings**
	1	Anti-graffiti coatings shall be of the sacrificial type and shall be capable of being cleaned at least twice before re-coating is necessary.
	2	The coating system shall be applied in accordance with the manufacturer's written instructions.
	3	The application of the coating system shall not change the appearance of the substrate.
	4	Prior to application the surface shall be cleaned of all loose material, oil, grease, dirt and existing graffiti. The surface shall be lightly abraded after cleaning and drying. All loose and flaking paintwork shall be feathered back to a sound edge. A suitable sealer/primer shall be applied to bare areas and areas of graffiti which resist cleaning and may present a problem by showing through the coating system unless sealed.
	5	The cleaning of the coating/removal of graffiti shall not have any detrimental effect on the substrate. Grit-blasting water jetting or chemical cleaning agents likely to have long term effects on the substrate shall not be used.
2671AR		**Graffiti Removal**
		Graffiti posters and encrusted deposits shall be removed by hand high pressure water jetting chemical washing light grit blasting or over-painting of painted surfaces provided the substrate is not damaged. Encrusted deposits may be removed by a light grit blast in accordance with Clause 1772AR provided the substrate is not damaged. The Operating Company shall ensure that all electrical equipment and any other fixtures and fittings are fully protected during graffiti removal. Over-painting shall be in a colour and material to match the existing where necessary and shall be subject to consent in writing by the Overseeing Organisation.
		Series 2800 Winter Service
2801AR		**Winter Service Plant**
	1	Winter Service Plant used for spreading de-icing materials shall: (i) be of proven design and comply with the requirements of British Standard 1622:1989 Spreaders for the Winter Maintenance of Roads,

Clause No.		Title and Written Text
		(ii) be capable of symmetrical and asymmetrical spreading in accordance with the Class A1 requirements of British Standard 1622:1989,
		(iii) be fitted with a de-icing material discharge indicator to inform the operator that treatment has ceased, (iv) have: (a) two rotating amber beacons fitted to the vehicle on the roof of the cab with a visible arc of at least 270° to the front, and (b) one rotating amber beacon at the rear of the vehicle with a visible arc of at least 270° to the rear, that shall be in operation whilst precautionary treatment and snow and ice clearance Operations are being carried out or when the snow plough is attached, (v) have a sign board reading "SPREADING" visible to following vehicles, the lettering of which shall be 160mm in height in black capitals from the 'Transport heavy alphabet' described in the *Traffic Signs Regulations and General Directions* on a yellow Class 1 reflective background in accordance with BS 381C, lemon yellow No 355, (vi) be fitted with a passenger seat, (vii) be painted golden yellow to BS 4800, and (viii) comply with any other relevant requirements relating to Winter Service Plant.
2802AR		**Not used**
2803AR		**Winter Service Vehicle Data Logging and Transmitting Equipment**
	1	The in-vehicle data logger shall be capable of system and data back-up so that the system can be recovered in 12 hours. The data shall be transferred from the vehicle to the data store in near real time (within 30 seconds of collection). In the event of communications failure, the in-vehicle data logger shall be capable of storing one week's worth of data on a robust onboard storage device.
	2	The equipment shall comply with British Standard EN 15430-1:2007 Winter and road service area maintenance equipment-Data acquisition and transmission Part 1: In vehicle data acquisition.
	3	The system shall provide accurate recorded data of the following parameters: (i) location of vehicle, (ii) spreading or not spreading, (iii) rate of spreading, (iv) spreading pattern, width and Lane position, (v) ploughing or not ploughing, (vi) road surface temperature, (vii) air temperature,

Clause No.		Title and Written Text
		(viii) record of weight out of and weight in to the depot, (ix) beacons on or off (including confirmation that they are actually working if on), (x) pre-wet on or off, (xi) flow rates for liquid treatment, (xii) plough orientation, (xiii) driver identification, (xiv) fuel usage, (xv) distance travelled, (xvi) vehicle speed, (xvii) time of leaving depot, (xviii) time of returning to the depot, (xiv) treatment type, (xx) travelling off Route, with driver alert, and (xxi) time. Data shall be referenced to the Ordnance Survey grid.
	4	All Records shall contain a date and time stamp, vehicle identification and the geographical position of the vehicle at the time of record creation and meet the requirements of British Standard EN 15430-1:2007 Winter and road service area maintenance equipment-Data acquisition and transmission Part 1: In vehicle data acquisition.
	5	The data output shall be in accordance with British Standard EN15430-1:2007 Winter and road service area maintenance equipment-Data acquisition and transmission-Part 1: In vehicle data acquisition (DPC:05/30142514DC), to allow data logging information to be easily acquired for transmission.
	6	The accuracy of all data shall be validated by the Operating Company. Calibration of the time and date stamp and Geographical Positioning System location shall be confirmed prior to commissioning and at a frequency not exceeding 12 months thereafter.
	7	The method of calibration and accuracy of the time and date stamp shall be in accordance with British Standard EN15430-1:2007 Winter and road service area maintenance equipment-Data acquisition and transmission-Part 1: In vehicle data acquisition.
2804AR		**Winter Service Vehicle Data Receiving, Storing, Archiving and Web Based Systems**
	1	Data transmitted from the vehicles shall be stored by the Operating Company on a secure server and be accessible by The Director or the Performance Audit Group by means of a web interface, from a commercially available computer.

Clause No.		Title and Written Text
	2	The web interface shall provide access to reports on any of the measured parameters detailed in clause 2803AR. These reports shall be capable of being parameterised to be configured for national, regional and local use.
	3	Reports for the following shall be available: (i) material usage (vehicle weight in and out), (ii) fuel usage, (iii) vehicle mileage, (iv) Route identification and adherence to Route, (v) treatment times, (vi) reports on any/all control functions (plough and spinner/chute settings), (vii) beacons on or off, (viii) driver identification, and (ix) vehicle identification.
	4	The system shall be capable of displaying treatment routes on a map background showing the Trunk Road network in Scotland. The scale of the map shall be user selectable between Unit and national views.
	5	The system shall be capable of displaying due treatment, treated and untreated routes and vehicle position and status in a graphical colour coded format.
	6	The system shall be capable of operating on dial-up type connection when required.
	7	The system shall be capable of alerting the driver if the pre-determined route is not adhered to.
	8	The system shall be capable of generating a remote alert if the vehicle does not follow the prescribed route. The system alert shall be available via user selectable short message service and email.
	9	The system shall display time of last data transmission in order that the viewer can determine if the vehicle is stationary or if there is a break in data transmission.
	10	The Operating Company shall demonstrate how the transmission system will be capable of full operation in poor signal areas or during times of system network overload.
		Series 3300 Site Investigation
3301AR		**Rotary Coring in Carriageways**
	1	Rotary coring in carriageways shall be carried out in accordance with this clause.

Clause No.		Title and Written Text
		Cores shall be 100mm or 150mm nominal diameter and taken in the positions and to the depths proposed by the Operating Company and consented to in writing by the Overseeing Organisation.
	2	Cores shall be cut in accordance with BS 598 using a coring machine that complies with BS 4019.
	3	The walls and base of all holes from which core samples have been cut shall be thoroughly dried and painted with hot bituminous binder immediately prior to reinstatement.
	4	The holes shall be filled to within 50 to 75mm inclusive from the road surface with wet lean concrete and topped off with well compacted bituminous repair material which on completion shall be at the same level as the adjacent surface.
	5	The cores shall be handled carefully to prevent damage and wrapped in polythene to prevent moisture loss. They shall be indelibly marked to indicate the location and date of coring.
	6	Cores shall be packaged to avoid damage, clearly labelled and delivered to the Operating Company's store. At the Operating Company's store, cores shall be handled carefully and stored on purpose built racks or shelves.
	7	Cores shall be stored for periods determined by the Operating Company to enable the necessary recording, testing and data to be obtained or inspected by the Overseeing Organisation.
	8	The Operating Company shall establish if the Overseeing Organisation wishes to inspect the cores prior to disposal.
	9	Core sampling operations testing, referencing, information obtained from data analysis and interpretation shall be recorded by the Operating Company and a copy of data and reports supplied to the Overseeing Organisation.
	10	Any tests required to be carried out on cores shall be subject to an Order.
	11	The Operating Company shall submit evidence, in writing to the Overseeing Organisation for his written consent, that the persons including any sub-contractor proposed to carry out coring testing and reporting Operations have the expertise and resources to carry out any such work.
	12	All coring testing and reporting Operations shall be carried out by a specialist testing firm or laboratory holding accreditation granted in respect of such coring and testing by the United Kingdom Accreditation Service (UKAS) or by the European Co-operation for Accreditation of Laboratories (EAL).
3302AR		**Rotary Coring in Structures**
	1	Rotary coring in Structures shall be carried out in accordance with this clause.
		Cores shall be 50mm 75mm 100mm or 150mm nominal diameter and taken in the positions and to the depths proposed by the Operating Company and consented to in writing by the Overseeing Organisation.

Clause No.		Title and Written Text
	2	The cores shall be cut in accordance with British Standard 598 using a coring machine which complies with British Standard 4019. Cores shall generally be cut through structural concrete with measures taken to avoid encountering reinforcement.
	3	The holes from which core samples have been cut shall be reinstated using repair mortar in accordance with clause 1773AR.
	4	The cores shall be handled carefully to prevent damage and wrapped in polythene to prevent moisture loss. They shall be indelibly marked to indicate the location and date of coring.
	5	Cores shall be packaged to avoid damage, clearly labelled and delivered to the Operating Company's store.
	6	At the Operating Company's [store] cores shall be handled carefully and stored on purpose built racks or shelves.
	7	Cores shall be stored for periods determined by the Operating Company to enable the necessary recording testing and data to be obtained or inspection by the Overseeing Organisation.
	8	The Operating Company shall establish if the Overseeing Organisation wishes to inspect the cores prior to disposal.
	9	Any extended storage periods requested by the Overseeing Organisation shall be subject to an Order.
	10	Core sampling operations, testing, referencing, information obtained from data analysis and interpretation shall be recorded by the Operating Company.
	11	Any tests required to be carried out on cores shall be subject to an Order.
	12	The Operating Company shall submit evidence, in writing to the Overseeing Organisation for his written consent, that the persons including sub-contractors proposed to carry out coring testing and reporting Operations have the expertise and resources to carry out the work.
	13	All coring testing and reporting Operations shall be carried out by a specialist testing firm or laboratory holding accreditation granted in respect of such coring and testing by the United Kingdom Accreditation Service (UKAS) or by the European Co-operation for Accreditation of Laboratories (EAL).
3303AR		**Structural Investigations**
	1	Separate reports upon the findings and testing together with photographic evidence shall be supplied for each Structure as detailed in Appendix 33/1.
	2	The Operating Company shall determine in accordance with the other requirements of this Contract, the need for the reports to contain a section giving an expert interpretation of the results of the investigation, and if so the reports shall contain such a section.
	3	The number of copies for each report shall be as stated in Appendix 33/1.

Clause No.		Title and Written Text
	4	All sampling and testing Operations shall be carried out by a specialist testing firm or laboratory holding appropriate accreditation granted in respect of such sampling and testing.
3304AR		**Inspection Patches within Surfacing on Bridge Structures**
	1	The general requirements for excavation and reinstatement of inspection patches within surfacing on bridges shall be as referred to in the appropriate clauses of Series 600, 700, 900 and 1100.
	2	Details of patch size and location within footways and carriageways shall be determined by the Operating Company.
	3	Such inspection patches shall be excavated through any flexible surfacing asphaltic sand carpet and waterproofing system which may be present.
	4	Following excavation, all residual deposits of surfacing and waterproofing shall be disposed of and the deck cleaned.
	5	Excavation patches shall remain open for testing and inspection and shall only be reinstated after having received the written consent of the Overseeing Organisation.
3305AR		**Trial Pits in Paved Areas**
	1	The Operating Company shall excavate trial pits to permit inspection or sampling of unbound or bound materials.
	2	The size and location of the trial pits shall be determined by the Operating Company.
	3	Trial pits shall be excavated and reinstated in accordance with clause 706 except that trial pits shall remain open for testing and inspection by the Overseeing Organisation.
3306AR		**Falling Weight Deflectometer Tests**
	1	The Operating Company shall undertake falling weight deflectometer tests to assess the structural condition of bituminous and cementitious road pavements.
	2	The location, length to be tested and number of tests to be carried out shall be determined by the Operating Company.
	3	The testing and reporting shall be carried out in accordance with the guidance given in HD 29/08 (DMRB, Volume 7.3.2).
3307AR		**Dynamic Cone Penetrometer Tests**
	1	The Operating Company shall undertake dynamic cone penetrometer tests to assess the structural condition of bituminous and cementitious road pavements.
	2	The testing shall be carried out in accordance with the manufacturer's written instructions.

Clause No.		Title and Written Text
	3	The calculations and reporting shall be carried out in accordance with the guidance given in *Transport and Road Research Laboratory Overseas Road Note 8 – A Users Manual for a Program to Analyse Dynamic Cone Penetrometer Data*.
3308AR		**Structural Investigations Tests**
	1	Structural investigations tests shall be as described in Appendix 33/1.
		Series 6100 Core Operations
6101AR		**Maintenance of Road Restraint Systems**
	1	Safety barriers shall be re-tensioned in accordance with the requirements of clause 472AR.
	2	Re-tensioning required outwith the maintenance cycle shall only be when instructed by the Overseeing Organisation.
6102AR		**Maintenance of Gullies, Catchpits, Interceptors, Soakaways, Manholes and Oil Separators**
	1	Cleaning of gullies, catchpits, interceptors, soakaways, manholes and oil separators shall be carried out in accordance with clauses 520 and clause 521 and the following:
	2	The outlet pipe shall be jetted with clean water to ensure that it is flowing freely. The location of any restrictions in flow and obstruction that cannot be removed shall be recorded. Polluted water shall not be used to jet, surcharge or refill gullies.
	3	Before putting a gully grating or cover back on after cleaning, a spot of paint shall be sprayed onto the underside. The colour of the paint shall differ for each cycle of cleaning.
	4	Details of the Operations including as a minimum the Scheme Identifier, where applicable, Operations Instructions road and number of gullies and chambers emptied and any Defects found in respect to blockages or damages to the drainage system or components together with the location of those Defects shall be recorded.
6103AR		**Maintenance of Drainage Grips**
	1	Drainage grips shall be maintained by cutting and cleaning such that free flow of water shall not be impeded and water does not stand on the carriageway adjacent to the grip.
6104AR		**Maintenance of Linear Drainage Systems,**
	1	Linear drainage systems shall be maintained by cleaning in accordance with clauses 520 and clause 521.
	2	Cleaning may be carried out by drawing through a mandrel with a diameter 20mm less than the nominal diameter of the pipe or nominal minimum area of the "waterway area" of the block.

Clause No.		Title and Written Text
	3	If necessary a root cutter attachment shall be used with the high-pressure water jetter.
	4	Piped grips shall be cleaned by removing all silt and loose obstructions from the pipe such that the free flow of water is not impeded and that the water does not stand on the carriageway adjacent to the piped grip.
	5	Each end of the piped grip shall be maintained free from vegetation or other obstructions including any material expelled from the pipe.
	6	Where the invert of the outlet is below the invert of the ditch the invert of the ditch shall be excavated until the invert of the pipe is exposed.
6105AR		**Maintenance of Filter Material**
	1	Filter material shall be loosened by harrowing to a depth of 200mm over the full width of the drain including contiguous filter material so as to minimise retention of water within this depth.
	2	All weed growth in filter material shall be treated in accordance with clause 3002.
	3	The location of any obstruction that cannot be removed shall be recorded.
	4	Any build up of detritus within the filter material or between the edge of the carriageway and the filter drain shall be removed.
6106AR		**Maintenance of Drainage Structures**
	1	Drainage structures shall be maintained by cleaning in accordance with clauses 520 and clause 521.
	2	Each end of the drainage structure including any ancillary drainage items shall be kept free of vegetation and other obstructions including any material disturbed during cleaning. The drainage structure shall be kept free from debris. Erosion of the banks and bed of a watercourse at the end of a drainage structure shall be repaired and any scour protection re-instated as required.
	3	Where the invert of any drainage structure at intake and outfall points is below the invert of an adjacent watercourse, the watercourse invert shall be excavated to the invert level of the drainage structure to facilitate flow from the drainage structure.
	4	The Operating Company shall maintain a record of any Defects found during maintenance Operations and shall report any hazards immediately to the Overseeing Organisation.
6107AR		**Maintenance of Ancillary Drainage Items**
	1	Ancillary drainage shall be maintained by clearing all vegetation and debris and cleaning to remove all silt, obstructions and other detritus.
	2	Sluices, tidal flaps, penstocks, valves, pumps and other specialist equipment shall be maintained by checking that all mechanisms are functioning as required and lubricating any moving parts in accordance with any manufacturers' instructions.

Clause No.		Title and Written Text
	3	The Operating Company shall maintain a record of any Defects found during maintenance Operations and shall report any hazards immediately to the Overseeing Organisation.
6108AR		**Litter and Refuse**
	1	Subject to the other provisions of this Contract, the Operating Company shall ensure that all roads and other land within the Unit are maintained to the standards of a Category 6 Zone as set out in the Code of Practice on Litter and Refuse issued under section 89 of the Environmental Protection Act 1990 document no. SE/2006/164 by the Scottish Executive Environment Group in October 2006.
	2	Road cleaning and clearance of channels shall be to such a standard that, on completion of the Operation, there is an unimpeded passage for storm water into the drainage system. Vehicles engaged in sweeping shall only travel in the same direction of flow as the adjacent road traffic. Any growth of grass or other vegetation which may obstruct the flow of water in the channel shall be controlled in accordance with clause 3002.
	3	The term "grassed areas" as referred to in the Code of Practice on Litter and Refuse shall be deemed to cover all areas within the Trunk Road boundary which are not hard surfaced.
	4	Central reservations may be grassed areas or hard surfaced areas.
6109AR		**Maintenance of Road studs**
	1	Any road stud which has become displaced from its socket or is loose or broken shall be removed from the carriageway immediately and the resulting socket shall be filled with bituminous instant repair material.
6110AR		**Maintenance of Structures – General**
	1	Vegetation on or adjacent to a Structure shall be removed using methods which do not damage the structure. Injurious weeds such as Japanese Knotweed and Giant Hogweed shall be removed in accordance with clause 3002 and reported to the Overseeing Organisation.
	2	Debris from any part of a Structure shall be removed using methods which do not damage the Structure.
	3	Bird droppings shall be removed using methods which do not damage the structure.
	5	Bolts shall be checked and tightened to the appropriate torque.
	5	Missing bolts shall be replaced and tightened to the appropriate torque.
	6	Local damage to protective systems shall be made good.
	7	Cleaning shall not be carried out when the ambient temperature is 2°C or less and falling or when the Operations are likely to result in the formation of ice.

Clause No.		Title and Written Text
6111AR		**Maintenance of Expansion Joints**
	1	Debris and vegetation shall be cleaned out from the expansion joint.
	2	Bolts securing the expansion joint, cover plates and nosing joints shall be checked and tightened to the appropriate torque.
	3	Missing bolts shall be replaced and tightened to the appropriate torque.
	4	Securing compounds shall be checked and repaired as necessary.
	5	Neoprene or elastomeric material shall be checked for splitting or detachment from the supporting frame by a visual inspection and the use of appropriate hand tools.
	6	Cover plates and nosing joints shall be checked by visual inspection and the use of appropriate tools.
	7	Debris and sediment from associated drainage below the joint shall be cleared.
6112AR		**Maintenance of Bridge Drainage Systems**
	1	Cleaning of bridge drainage systems shall be carried out in accordance with clauses 520, 6102AR, 6103AR, 6104AR and 6106AR.
	2	Drainage holes in structural components, obstructions, outlet pipes, diffusers, outlet manholes, weep pipes, silt and debris deposits shall be cleaned using appropriate hand tools drainage rods and mechanical means including jetting.
	3	Flap valves shall be checked for operation by hand or using appropriate lifting devices.
	4	Hinges and fixings shall be greased using a corrosion inhibiting lubricant that will not flow below 70^{o}C.
	5	Vegetation and weeds blocking pipes shall be removed.
6113AR		**Maintenance of Parapets and Pedestrian Protection on Structures**
	1	Hollow section drain holes shall be cleaned.
	2	Bolts shall be checked and tightened to the appropriate torque.
	3	Missing bolt assemblies shall be replaced and tightened to the appropriate torque.
	4	Local damage to protective systems shall be made good.
	5	Parapet expansion joints shall be checked for freedom.
	6	Connections with adjoining vehicle restraint barriers shall be checked.
6114AR		**Maintenance of Bearings and Bearing Shelves**
	1	Maintenance shall be in accordance with the manufacturers' requirements.
	2	Local damage to protective systems shall be made good.

Clause No.		Title and Written Text
	3	Bearings shall be checked for freedom of movement and any signs of misalignment, binding, distortion or excessive freedom shall be reported to the Overseeing Organisation.
6115AR		**Maintenance of Structures Over or Conveying Watercourses**
	1	Structures over or conveying watercourses shall be maintained, including clearing of vegetation, debris and encrustations, greasing and lubrication where appropriate.
	2	Maintenance shall be in accordance with manufacturers' requirements or information in the maintenance manual or as-built records.
6116AR		**Maintenance of Sign or Signal Gantries and High Mast Lighting Masts**
	1	Holding down assemblies and fixings, including to cladding, shall be checked and tightened to the designed method or correct torque.
	2	Missing bolts in the holding down assemblies and fixings shall be replaced and tightened to the designed method or correct torque.
	3	Holding down assemblies shall be cleaned and re-greased in accordance with the manufacturer's written specifications, where available.
	4	Cladding shall be cleaned using detergents that will not discolour/degrade cladding finishes.
	5	Seals to box type gantries shall be visually inspected for leaks using torches and tools suitable for use in confined spaces. Any box type gantries that are not wind and waterproof shall be reported to the Overseeing Organisation.
	6	High mast winch and head frame assemblies shall be inspected and maintained in accordance with the manufacturers requirements.
	7	Removal of debris from any part of a Structure shall be undertaken without damage to the Structure and any protective systems.
	8	Local damage to protective systems shall be made good.
6117AR		**Maintenance of Non-structural items**
	1	Moveable parts shall be cleaned and greased and in accordance with the manufacturers' requirements.
	2	Holding down assemblies and fixings, including to cladding, shall be checked and tightened to the designed method or correct torque.
	3	Missing bolts in the holding down assemblies and fixings shall be replaced and tightened to the designed method or correct torque.
	4	Holding down assemblies shall be cleaned and re-greased and in accordance with the manufacturer's written specifications, where available.
	5	Local damage to protective systems shall be made good.
	6	Vegetation shall be removed in accordance with clause 6110AR.
6118AR		**Maintenance of Underpasses and Culverts used by Pedestrians and Cyclists and Retaining Walls**

Clause No.		Title and Written Text
	1	All surfaces, painted finishes and protective systems within culverts and underpasses including ceilings, soffits and handrails shall be cleaned without any detrimental effect to the surface finishes or protective systems.
	2	Cleaning of polycarbonate mirrors shall be undertaken by hand using the appropriate methods as specified in writing by the manufacturer, where available.
6119AR		**Maintenance of Road Traffic Signs**
	1	Road traffic signs shall be maintained by cleaning using methods which do not damage them.
	2	Hazard posts and marker posts shall be straightened and the ground around the base of the post re-compacted.
	3	Cleaning shall not be carried out when the ambient temperature is 2°C or less and falling or when the Operations are likely to result in the formation of ice on the footway or carriageway.
	4	Ladders shall not be leant against sign faces.
6120AR		**Maintenance of Lit Sign Units**
	1	Lit Sign Units shall be maintained by:
		(i) cleaning of all photo electric control units, luminaire external and internal surfaces and any other components affecting the optical performance of the luminaire using methods that do not damage them, (ii) degreasing, lubricating and checking the operation of all toggles, wing nuts, hinges, door locks and lifting gear, (iii) aligning bracket luminaire and luminaire optical equipment in respect of the sign face and to minimise glare to traffic, (iv) checking and tightening screws and locking devices in accordance with the manufacturer's instructions, (v) identifying and recording damage, corrosion or misalignment of posts, (vi) identifying and recording electrical components showing signs of overheating, fracture, condensation or tracking, (vii) inspecting lamps removed for cleaning purposes, and if no longer serviceable replacing the lamp with a new lamp of an equivalent specification. If serviceable, the lamp shall be refitted, (viii) replacing lamps, (ix) marking new lamps with the date of installation and recording this date, (x) identifying and recording faults on any electrical unit, (xi) visually checking fixings and recording any Defects,

Clause No.		Title and Written Text
		(xii) identifying and recording damage, corrosion or other Defects of conduits, (xiii) checking all electrical connections and recording any Defects, (xiv) checking all earthing connections and recording any Defects, and (xv) clearing debris from around sign post bases for 1 metre radius.
	2	The supply shall be isolated at the cut-out for the removal and fitting of lamps.
	3	Any faulty lamp shall be disposed of in accordance with clause 1370AR.
6121AR		**Maintenance of Traffic Signals**
	1	Traffic signals shall be maintained by: (i) cleaning lenses internal and external surfaces and any other components affecting the optical performance of the lenses in accordance with manufacturer's recommendations, (ii) checking and tightening all grub screws and locking devices in accordance with the manufacturer's instructions, (iii) identifying and recording damage, corrosion or misalignment of posts, (iv) identifying and recording electrical components showing signs of overheating fracture condensation or tracking, (v) inspecting lamps removed for cleaning purposes, and if no longer serviceable replacing the lamp with a new lamp of an equivalent specification. If serviceable, the lamp shall be refitted, (vi) identifying and recording faults on any electrical unit, (viii) visually checking fixings and recording any defects, (ix) identifying and recording damage, corrosion or other defects of conduits, (x) checking all electrical connections and recording any defects, (xi) checking of all earthing connections and recording any defects, and (xii) clearing debris from around post bases for 1 metre radius.
	2	The supply shall be isolated at the cut-out for the removal and fitting of lamps.
	3	Any faulty lamp shall be disposed of in accordance with clause 1370AR.
6122AR		**Maintenance of Roadside Electrical Assets and Power Supplies**
	1	Specific requirements for equipment identified in the risk assessment shall be in place prior to electrical maintenance work commencing.
	2	The Operating Company shall obtain the prior agreement of the appropriate third party before carrying out work which will result in loss of service of third party roadside electrical assets.

Clause No.		Title and Written Text
	3	Replacement components shall be either the same as that being replaced or an equivalent.
	4	The Operating Company shall store all faulty columns and lanterns removed from the Unit for four weeks to allow inspection by the Overseeing Organisation.
	5	The Operating Company shall carry out maintenance Operations of luminaires, columns and brackets, underground cable systems, feeder pillars and associated switchgear, control systems, and any other roadside electrical assets and lighting.
	6	When replacing luminaires, columns, brackets and other electrical apparatus as maintenance Operations, the Operating Company shall comply with the aesthetic requirements of clause 1302 and shall ensure that any replaced items match the existing in physical appearance, lighting levels and operational capability.
	7	Unless otherwise agreed with the Director, all replacement lamp control gear shall comply with the following specifications: (i) be of electronic type, (ii) be Digital Addressed Lighting Interface (DALI) compatible, enabled and accredited, (iii) be capable of being controlled via a lighting central management system, (iv) be capable of implementing set dimming/trimming control regimes autonomously, and (v) be ELEXON approved.
	8	The Operating Company shall inform the Traffic Scotland Operations and Infrastructure Services Contractor prior to isolating or energising power supplies to any equipment that Traffic Scotland operates.
	9	All work carried out by the Operating Company, with the exception of inspections and testing on electrical apparatus shall be recorded by: (i) a work report, (ii) a call out report, or (iii) another method approved by the Overseeing Organisation.
	10	The Operating Company, when submitting call out reports and work reports, shall use the format of the model forms below. These reports shall be forwarded to the Overseeing Organisation in accordance with the reporting requirements of Schedule 5 Part 3.
	11	The Operating Company shall comply with *Transport* Scotland guidance document *LDS8020 – Guidance on the preparation of Statement of Intents relating to proposed works on Roadside Electrical Assets and Lighting* when submitting Bids for Works relating to electrical apparatus.

Clause No.		Title and Written Text
	12	The Operating Company shall comply with the recommendations made in Transport Scotland guidance document *LDS8018_Sustain – Guidance on Sustainability in relation to Roadside Electrical Assets and Lighting*.
	13	The Operating Company shall ensure that new items of energy consuming equipment supplied for use on the Unit are provided with an appropriate charge code (ELEXON code) for incorporation into the electrical apparatus inventory in accordance with Transport Scotland guidance document *LDS8012– Guidance Note on MPANS and using ELEXON Consumption Codes for Roadside Electrical Assets and Lighting*.
	14	The Operating Company shall comply with Transport Scotland' guidance document *LDS8016_ScotMCHW – Scottish MCHW Series 1200, 1300 & 1400 and Sample Appendices*
	15	The Operating Company shall comply with Transport Scotland guidance document *LDS8007_Refs – Roadside Electrical Assets and Lighting Recommended Reference Documents Listing*.
	16	The Operating Company shall comply with Transport Scotland guidance document *LDS8021_Festive – Festive Decorations on the Trunk Road Network*.
	17	The Operating Company shall comply with Transport Scotland guidance document *LDS8024_WStns – Weather Stations (Road Sensor) Equipment on Scottish Trunk Roads*.
	18	The Operating Company shall, where applicable make use of the Transport Scotland guidance document *LDS8025_Drwgs – Typical Drawings relating to Roadside Electrical Assets and Lighting*. These are provided for information.
	19	Where modules relating to Transport Scotland's lighting central management system, for the control of roadside electrical assets, lighting and power supplies, are fitted, such items will become part of the maintained equipment. Typically these modules will consist of sealed, readily replaceable subassemblies mounted directly on the asset being controlled, such as a luminaire and similar enclosed roadside equipment. The Operating Company shall replace such modules when necessary as part of their inspection and maintenance of the roadside electrical assets.

Call Out Report Form

DATE WEATHER CONDITIONS

TIME CALLED OUT CALLED OUT BY

TRUNK ROAD/MOTORWAY LOCATION

DESCRIPTION OF WORK

To include: equipment damaged
nature of emergency
registration of any vehicle involved
colour and type of vehicle involved
name and number of Police Officer at scene
photographs glued to reverse side of report
details of any liaison with electricity company
police station reference.

MATERIALS USED

To include stores issue number.

TIME ON SITE

TIME OF LEAVING SITE

ADDITIONAL TEAM TYPES AND DURATION

DESCRIPTION OF PLANT USED AND DURATION

NAME OF APPROVED ELECTRICIAN

SIGNATURE OF APPROVED ELECTRICIAN

NAME OF SUPERVISOR

SIGNATURE OF SUPERVISOR

Works Report Form

ORDER NUMBER DATE OF ISSUE

TODAY'S DATE

WEATHER CONDITIONS

LOCATION TIME OF ARRIVAL ON SITE

DESCRIPTION OF WORK

To include accurate details of all Site operations undertaken in order of the Site operations carried out:

results of tests or protective measures taken by the operatives

any difficulties and further action required

details of clause 1402 times of isolation and energising of power supplies

details of any liaison with electricity companies.

MATERIALS USED

TIME OF LEAVING SITE

TYPE OF CLOSURE USED

DURATION OF CLOSURE

OUTSTANDING WORK

DESCRIPTION OF TEAM TYPES USED AND DURATION

NAME OF SUPERVISOR

SIGNATURE OF SUPERVISOR

Clause No.		Title and Written Text
6123AR		**Not used**
6124AR		**Maintenance of High Mast Lighting**
	1	Maintenance of high mast lighting units shall be in accordance with clause 6122AR and *PLG07 High Masts for Lighting and CCTV. Amended 2003*.
6125AR		**Incident Response**
	1	The response time for attendance of the Operating Company's initial, secondary and back-up Incident Response Resources at the scene of an Incident shall be as stated in Appendix 32/1. During the hours specified in Appendix 32/1, the Operating Company may use the resources identified to respond to requests for assistance on other Operations in connection with this Contract. However they must be able to attend at the Site of any incident on any part of the Unit within the response time stated in Appendix 32/1.
		Resources for Incident Operations
	2	Details of the types of Incident Support Resources that the Operating Company may utilise to respond to incidents are as specified in Appendix 32/1.
6126AR		**Not used**
6127AR		**Removal of Graffiti, Posters and Encrusted Deposits**
	1	Graffiti, posters and encrusted deposits shall be removed by suitable methods which do not damage the substrate.
6128AR		**Not used**
6129AR		**Not used**
6130AR		**Maintenance of Geotechnical Assets**
	1	The removal of stones, rocks and other debris from behind and in contact with the geotechnical assets shall be carried out within or associated with the Unit at sufficient frequency to ensure that damage does not occur to the asset.
		Series 6200 Professional Services Staff
6201AR		**Requirements for Professional Services Staff**
	1	The requirements of role, qualifications, experience, areas of knowledge and key and specific tasks for staff engaged in undertaking Professional Services shall be as stated in Appendix 62/1.

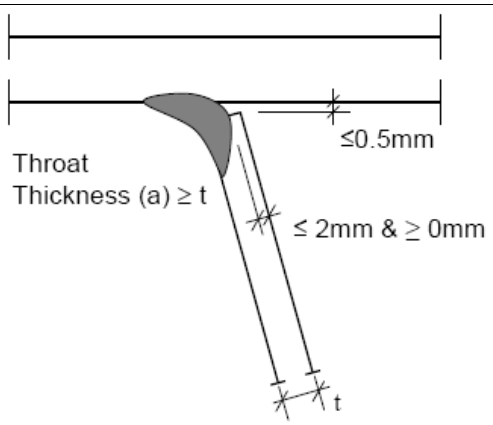
Substitute Clauses, Tables and Figures

Clause No.		Title and Written Text
		Preliminaries
110SR		**Information Boards**
	1	The information boards required are: (i) **Network Customer Information Signs** The Operating Company shall supply and erect network customer information plated signs as detailed in Schedule 3 Part 6. The Operating Company shall remove the sign face not later than the Service End Date. The network customer information signs shall be erected no later than seven days after Commencement of Service Date 1. The Operating Company shall maintain the signs in a clean condition. Signs shall be constructed and assembled in accordance with clause 1207, (ii) **Works Contract Information Signs** Scheme information boards shall comply with the *Traffic Signs Regulations and General Directions (2002)* sign reference 7007.1 and shall be constructed and assembled in accordance with clause 1207, and (iii) **Operations Information Signs** Temporary scheme contact signs, as defined in the *Traffic Signs Regulations and General Directions (2002)*, sign reference 7008, shall be erected at all Sites within the Unit while Operations, including traffic management, are being carried out. In the permitted variants of sign reference 7008, the word "Undertaker's" shall be replaced with the words "Operating Company's". In the description of the sign reference 7008, the word "employer" shall be replaced with the words "Operating Company". The signs shall be erected in a prominent position at either end of the Site so that they may be read easily by users of the Trunk Road. The sign shall display the name and telephone number of the organisation responsible for carrying out such Operations.
	2	The Operating Company shall keep clean and maintain any information boards and shall dismantle and remove them on completion of the Operations.

	3	The Operating Company may erect for its own purpose sign boards at the entrance to each of the compounds which it uses in connection with the maintenance of the Unit. The size of these boards shall be no greater than the boards required for network customer contact signs and shall be subject to the approval of the appropriate planning authority.
	4	Operating Company advertising boards other than the customer information signs set out in Schedule 3 Part 6 will not be allowed on or adjacent to the Unit except at the entrance to compounds.
1202SR		**General Requirements for Permanent Traffic Signs**
	1	Materials for permanent traffic signs and their construction, assembly, location and erection shall comply with this Series, Series 1400 and the requirements of this Contract. The manufacture and installation of traffic signs shall be in accordance with the quality management scheme described in Appendix A.
	2	Each complete traffic sign or part thereof shall be capable of passing the tests in British Standard EN 12899-1:2001. Unless protected by existing safety barriers, signs shall be, designated as passively safe and shall conform to testing in accordance with British Standard EN 12767:2007 and TD89/08, and be installed in compliance with TD19/06 of the DMRB.
	3	Sign panels of internally illuminated signs, transilluminated signs and luminaire face panels shall comply with impact British Standard EN 12889-1:2001.
	4	All lit traffic signs shall comply with Category 1 luminance of British Standard EN 12899-1:2001.
	5	Before the commencement of fabrication of any traffic sign, the Operating Company shall submit for the Overseeing Organisation's consent: (i) fabrication drawings for 'directional informatory' and 'informatory' signs which shall be as required by Appendix 1/4, (ii) the information about 'warning', 'regulatory' and other traffic signs required in Appendix 12/1.
	6	A traffic sign housing shall be provided with vandal and weather resistant locks. Keys shall be provided to the Overseeing Organisation, in the quantities stated in Appendix 12/1. Types of lock shall be kept to a minimum and shall be as described in Appendix 12/1.
	7	The backs of traffic signs shall have a location identifying mark as described in Appendix 12/1. Illuminated traffic signs shall also be labelled in accordance with Transport Scotland (TS) Guidance Note LDS8001_ *Roadside Electrical Asset and Lighting Identification System*. The identifying code shall be provided by the Operating Company responsible for the road. Contact details are provided in Appendix 12/1.
	8	Traffic signs and poles shall at all times be handled, transported and stored in accordance with the manufacturers recommendations and be at all times adequately protected to prevent damage.

1204SR		**Posts for Permanent Traffic Signs**
	1	Posts for permanent traffic signs shall be as described in Appendix 12/1 and shall comply with British Standard EN 12899-1:2001. The surface protection requirements shall similarly comply with British Standard EN 12899-1:2001. Installation shall be in compliance with TD 19/06. Sign posts shall also conform to testing in accordance with British Standard EN 12767:2007 and be constructed as to conform to the following: (i) steel posts shall be tubular or rectangular hollow section complying with British Standard EN 10 210, joists, universal beams or columns complying with British Standard 4-1, and shall be manufactured from steel complying with grade S275 JO or S275 J2, (ii) aluminium posts shall be of tubular or rectangular hollow section, lattice or other construction as agreed with the Overseeing Organisation. Such posts shall not include joints except at the sign head fixing, and (iii) Concrete posts shall only be used for special and specific applications. Such use shall be agreed with the Overseeing Organisation on a Site by Site basis.
	2	Posts shall not protrude above the top of the sign unless supporting an external luminaire, in which case the protrusion shall be kept to no greater than 120mm. Posts shall be fitted with suitable permanently affixed weatherproof cap of a type capable of providing watertight protection for a minimum of 20 years.
	3	Internally illuminated posts for pedestrian crossing beacons shall comply with sub-clause 2 above and where appropriate with British Standard EN 12899-1:2001.
	4	Signs erected on a single post shall be positioned so that the post is in the centre of the sign, unless otherwise described in Appendix 12/1.
	5	Compartments for electrical equipment shall be as described in Appendix 12/1 and, wherever practicable shall be installed such that the door is facing away from the oncoming traffic allowing maintenance personnel to access the door while facing the traffic. The use of other access door orientation shall only be agreed with the Overseeing Organisation at very specific locations. In the case of signs supported by more than one post, such compartment shall be on the post furthest from the carriageway unless otherwise described in Appendix 12/1.
	6	Where flange plates are required they shall have holes or slots as described in Appendix 12/1 to accommodate the installation system.
1801SR		**Structural Steelwork General**
	1	1. All steelwork shall be in accordance with British Standard EN 1090-2:2008 and the *Steel Bridge Group Model Project Specification (SCI Publication P382:2009),* all as amended by Clauses 1802SR and 1803SR. 2. For orthotropic steel decks, the requirements within British Standard EN 1993-2 Annex C Clause C.3 shall apply.

1802SR		**Amendments to British Standard EN 1090-2:2008**
	1	1. Delete section 5.6.10. Hot rivets are not permitted. 2. Delete sections 10.1 and 10.2 and Annex F. Surface treatment to be in accordance with SHW Series 1900.
1803SR		**Amendments to Steel Bridge Group Model Project Specification**
	1	1. Insert in Section 4.101 "British Standard EN 1090-2 Execution of steel Structures and aluminium Structures Company to add further standards to Appendix 18/1" 2. Replace Clause 4.201 with "A quality plan for the execution of the works, in accordance with NHSS 20, shall be provided and maintained." 3. Delete Clause 6.602. Hot rivets are not permitted. 4. Insert in section 7.402 "Pre-production welding tests shall be carried out on complex weld configurations and highly fatigue sensitive details. These shall include but are not restricted to the trough to deck weld and the trough to transverse comb weld." 5. Replace Clause 7.505 with "Permanent backing material may only be used where the Designer has taken it into account including the joint classification for the backing material in the fatigue design and indicated it on the drawings for construction." 6. Replace Clause 8.203 with "The Structure shall not be designed to utilise the shear resistance of the unthreaded shank of bolts." 7. Delete Clause 8.701 and 8.702. Hot rivets are not permitted on this project. 8. Delete Clauses 10.1, 10.2, 10.5, 10.6, 10.8 and 10.9. Surface treatment to be in accordance with SHW Series 1900. 9. Replace 11.302 with, "In addition to the requirements in D.2, the following functional tolerances apply: i) Trough to deck plate weld:

		 10. Delete Clause 12.706. 11. Delete Annex F. Corrosion protection to be in accordance with SHW Series 1900. 12. The Operating Company shall complete the following Clauses by providing details in Appendix 18/1: 5.101, 5.307, 5.606, 6.501, 5.901, 6.604, 6.606, 6.1001, 7.501, 7.506, 7.508, 7.510, 7.602, 7.603, 8.204, 8.901, 8.902, 9.301, 9.302, 9.303, 9.304, 9.401, 12.201, 12.401, 1 .504, 12.704, 12.707
2101SR		**Bridge Bearings – General**
		Unless otherwise described in Appendix 21/1, bearings shall be supplied and installed in compliance with British Standard EN 1337 "Structural bearings" consisting of the following parts: (a) Part 1 - General design rules (b) Part 2 - Sliding elements (c) Part 3 - Elastomeric bearings (d) Part 4 - Roller bearings (e) Part 5 - Pot bearings (f) Part 6 - Rocker bearings (g) Part 7 - Spherical and cylindrical PTFE bearings (h) Part 8 – Guided and restrained bearings (i) Part 9 - Protection (j) Part 10 - Inspection and maintenance (k) Part 11 - Transport, storage and installation excluding subsections relating to corrosion protection which is covered under Series 1900.

Appendix F AR		Appendix F is extended by the addition of the publications listed below.	
	1	**British Standards**	Specification Clause/Table
	BS 2874	Specification for copper and copper alloy rods and sections (other than forging stock)	1423
	BS 4019	Rotary core drilling equipment. Specification for System A	3301AR, 3302AR
	BS 7609	Code of practice for installation and inspection of uninsulated compression and mechanical connectors for power cables with copper or aluminium conductors	1420
	BS 7973	Spacers and chairs for steel reinforcement and their specification. Product performance requirements	1714
	BS EN 1542	Products and systems for the protection and repair of concrete structures. Test methods. Measurement of bond strength by pull-off	1774AR
	BS EN 1770	Products and systems for the protection and repair of concrete structures. Test methods. Determination of the coefficient of thermal expansion	1774AR
	BS EN 12390	Testing hardened concrete. Making and curing specimens for strength tests	1774AR
	BS EN 12504	Testing concrete in structures. Cored specimens. Taking, examining and testing in compression	Table 17/71
	BS EN 12617	Products and systems for the protection and repair of concrete structures. Test methods. Shrinkage of crack injection products based on polymer binder: volumetric shrinkage	Table 17/71
	BS EN 12767	Passive safety of support structures for road equipment. Requirements, classification and test methods	1202SR; 1204SR; 1301.
	BS EN 12889	Fixed, vertical road traffic signs. Delineator posts and retroreflectors	1202SR
	BS EN 13396	Products and systems for the protection and repair of concrete structures. Test methods. Measurement of chloride ion ingress	Table 17/71
	BS EN 13412	Products and systems for the protection and repair of concrete structures. Test methods. Determination of modulus of elasticity in compression	Table 17/71
	BS EN 50081	Electromagnetic compatibility. Generic emission standard. Residential, commercial and light industry	1409

	BS EN 50082	Electromagnetic compatibility. Generic immunity standard. Residential, commercial and light industry	1409
	BS EN 62305	Protection against lightning. General principles	1420
	BS EN 60068	Environmental testing. Tests. Test Fc. Vibration (sinusoidal)	1409

TABLE 50/2SR: Requirements for Bridges, Parapets, Bearings, CCTV Masts, Cantilever Masts, Steel Lighting Columns and Bracket Arms and other Highway Structures: Protective Systems

I (M) – High Build Epoxy (2 pack)/ Polyurethane (2 pack) finish				
Substrate Type	1 Steel	2 Aluminium metal spray, zinc metal spray	3 Existing paint coats	4 Existing paint coats
Surfaces prepared to	Clean, bright Sa2 or St3 quality steel	Bright or sound metal coating	Sound finishing coat or last undercoat	Other sound paint coats
1st Coat Item No. Minimum dry film thickness (μm)	 Item 115 100	 Item 115 100	 Nil –	 Nil –
2nd Coat Item No. Minimum dry film thickness (μm)	 Item 116 –	 Item 116 or 112 –	 Nil –	 Item 116 or 112 100
3rd Coat Item No. Minimum dry film thickness (μm)	 Item 168 50	 Item 168 50	 Item 168 50	 Item 168 50
Minimum total dft of the paint system to be obtained (μm)	300μm	300μm	50μm	175μm
STRIPE COATS	Item 112, 80 μm mdft. Brush or airless spray. One stripe coat in area prepared to clean steel or sound metal coating. Applied over 1st coat.			
PATCH COATS	Nil			

TABLE 50/2SR: Requirements for Bridges, Parapets, Bearings, CCTV Masts, Cantilever Masts, Steel Lighting Columns and Bracket Arms and other Highway Structures: Protective Systems (Continued)

NOTES:

1. When a light tint gloss finish is required an extra coat of Item 168 shall be applied. Item 169 Polyurethane Finish, may be used in lieu of Item 168 to provide a semi-gloss finish, alternatively Item 164 (Moisture Cure Polyurethane finish) can provide a semi-gloss finish and is tolerant of surface moisture (but not running water) and low temperatures during application and curing.
2. Types I (M) and II (M) can be combined to allow paint maintenance to proceed when temperature falls and relative humidity increases and for night work.

HEALTH & SAFETY

Polyurethane (two pack) and Moisture Cured Polyurethane paints contain isocyanate and can be injurious to health if not used correctly.

An assessment of the risks and controls for their safe use shall be carried out before use.

TABLE 50/2SR: Requirements for Bridges, Parapets, Bearings, CCTV Masts, Cantilever Masts, Steel Lighting Columns and Bracket Arms and other Highway Structures: Protective Systems (continued)

II (M) – MC/Polyurethanes				
Substrate Type	1 Steel	2 Aluminium metal spray, zinc metal spray	3 Existing paint coats	4 Existing paint coats
Surfaces prepared to	Clean or bright steel	Bright or sound metal coating	Sound finishing coat or last undercoat	Other sound paint coats
1st Coat Item No. Minimum dry film thickness (μm)	 Item 160 40	 Item 160 40	 _ _	 _ _
2nd Coat Item No. Minimum dry film thickness (μm)	 Item 162 _	 Item 162 _	 _ _	 Item 162 70
3rd Coat Item No. Minimum dry film thickness (μm)	 Item 162 70	 Item 162 70	 _ _	 Item 162 70
4th Coat Item No. Minimum dry film thickness (μm)	 Item 164/169 40/50	 Item 164/169 40/50	 Item 164/169 40/50	 Item 164/169 40/50
Minimum total dft of the paint system to be obtained (μm)	275/325μm	275/325μm	50/100μm	225/275μm
STRIPE COATS	Item 162, 50 μm mdft. Brush or airless spray. Two stripe coats, the first applied over 1st coat, the second coat applied over the 2nd coat.			
PATCH COATS	Nil			

TABLE 50/2SR: Requirements for Bridges, Parapets, Bearings, CCTV Masts, Cantilever Masts, Steel Lighting Columns and Bracket Arms and other Highway Structures: Protective Systems (continued)

NOTES:

1. Item 168, Polyurethane (two pack) gloss finish may be used in lieu of Item 164 MC Polyurethane semi-gloss finish (two pack Polyurethane gloss finishes shall be less tolerant of moisture and low temperatures during application and curing than MC Polyurethanes and shall therefore only be specified when conditions preclude the formation of moisture on surfaces and when the ambient temperature is likely to be above 5^{o}C during application and the curing period).
2. Types I (M) and II (M) can be combined to allow paint maintenance to proceed when temperature falls and relative humidity increases and for night work.

HEALTH & SAFETY

Polyurethane (two pack) and Moisture Cured Polyurethane paints contain isocyanate and can be injurious to health if not used correctly.

An assessment of the risks and controls for their safe use shall be carried out before use.

TABLE 50/2SR: Requirements for Bridges, Parapets, Bearings, CCTV Masts, Cantilever Masts, Steel Lighting Columns and Bracket Arms and other Highway Structures: Protective Systems (continued)

	III (M) – Extended Cure Epoxy/Polyurethanes	III (M) (alternative) – Extended Cure Epoxy/Polyurethanes
Substrate Type	1 Hot dip galvanizing	2 Hot dip galvanizing
Surfaces prepared to	Bright or sound metal coating	Bright or sound metal coating
1st Coat Item No. Minimum dry film thickness (μm)	 Item 155 or other adhesion promoter –	 Item 121 100
2nd Coat Item No. Minimum dry film thickness (μm)	 Item 121 100	 Item 164,168 or 169 50
3rd Coat Item No. Minimum dry film thickness (μm)	 Item 164,168 or 169 40/50/50	 _ _
Minimum total dft of the paint system to be obtained (μm)	175/250μm	175μm
STRIPE COATS	Item 121, 80 μm mdft. Brush or airless spray. One stripe coat in area prepared to clean steel or sound metal coating Applied over 1st coat	
PATCH COATS	Nil	

TABLE 50/2SR: Requirements for Bridges, Parapets, Bearings, CCTV Masts, Cantilever Masts, Steel Lighting Columns and Bracket Arms and other Highway Structures: Protective Systems (continued)

NOTES:

1. Some Item 121 formulations have been developed for direct application to hot dipped galvanised surfaces with excellent adhesion without the need for an adhesion promoter (to be checked with and guaranteed by paint manufacturer).

2. When a light tint gloss is required an extra coat of Item 168 shall be applied. Item 164, Moisture Cured Polyurethane Finish, may be used in lieu of Item 168 to provide a semi-gloss finish tolerant of surface moisture (but not running water) and low temperatures during application and curing.

TABLE 50/2SR: Requirements for Bridges, Parapets, Bearings, CCTV Masts, Cantilever Masts, Steel Lighting Columns and Bracket Arms and other Highway Structures: Protective Systems (continued)

HEALTH & SAFETY

Polyurethane (two pack) and Moisture Cured Polyurethane paints contain isocyanate and can be injurious to health if not used correctly. An assessment of the risks and controls for their safe use shall be carried out before use.

IV (M) – MC/Epoxy/Polyurethane	
Substrate Type	1 Steel
Surfaces prepared to	Clean, bright or Sa2 or St3 quality steel
1st Coat Item No. Minimum dry film thickness (μm)	 Item 160 50
2nd Coat Item No. Minimum dry film thickness (μm)	 Item 116 or 112 –
3rd Coat Item No. Minimum dry film thickness (μm)	 Item 164 or 168 50
Minimum total dft of the paint system to be obtained (microns)	250μm
STRIPE COATS	Item 112, 80μm mdft. Brush or airless spray. One stripe coat in area prepared to clean steel or sound metal coating Applied over 1st coat
PATCH COATS	Nil

NOTES:

1. When a light tint gloss finish shall be required an extra coat of Item 168 shall be applied. Item 164, Moisture Cured Polyurethane Finish may be used in lieu of Item 168 to provide a semi-gloss finish tolerant of surface moisture (but not running water) and low temperatures during application and curing.

HEALTH & SAFETY

Polyurethane (two pack) and Moisture Cured Polyurethane paints contain isocyanate and can be injurious to health if not used correctly.

An assessment of the risks and controls for their safe use shall be carried out before use.

TABLE 50/2SR: Requirements for Bridges, Parapets, Bearings, CCTV Masts, Cantilever Masts, Steel Lighting Columns and Bracket Arms and other Highway Structures: Protective Systems (continued)

Grease paint system for maintenance of an Oleo-resinous system on a zinc metal sprayed coating where there has been extensive breakdown of the paint system over areas where corrosion of the zinc metal coating has started.

Also may be used, subject to the written approval of the Overseeing Organisation as a temporary measure over steel strengthening (additional stiffeners, welding or other measures) on the insides of boxes and to external bridge bearings where loose surface paint has been removed.

V (M) – Grease Paint			
Substrate Type	1 Steel	2 Aluminium metal spray, zinc metal spray or hot dip galvanizing	3 Existing paint coats
Surfaces prepared to	Clean, bright or Sa2 or St3 quality steel	Bright or sound metal coating	Sound finishing coat or last undercoat or other sound paint coats
1st Coat: Grease Paint Penetrating Primer Item No. Minimum dry film thickness (μm)	 Item 200 Nominal	 Item 200 Nominal	 Item 200 Nil
2nd Coat: Grease Paint Undercoat, yellow Item No. Minimum dry film thickness (μm)	 Item 201 150	 Item 201 150	 Item 201 Nil
3rd Coat: Grease Paint Finish, black Item No. Minimum dry film thickness (μm)	 Item 201 150	 Item 201 150	 Item 201 150
Minimum total dft of the paint system to be obtained (μm)	330μm	350μm	160μm
STRIPE COATS	Item 201, 150μm mdft. Brush. One stripe coat in all areas over 2nd coat		
PATCH COATS	Item 201. Brush, over 2nd coat		

TABLE 50/2SR: Requirements for Bridges, Parapets, Bearings, CCTV Masts, Cantilever Masts, Steel Lighting Columns and Bracket Arms and other Highway Structures: Protective Systems (continued)

NOTE:

The total dft of existing coats plus new coats, including patch coats, shall not be less than 400 μm.

Number of patch coats to suit.

Cancelled Clauses Tables And Figures	
Clause No	**Title and Written Text**
	None

APPENDIX 0/2 - CONTRACT-SPECIFIC MINOR ALTERATIONS TO EXISTING CLAUSES, TABLES AND FIGURES INCLUDED IN THIS CONTRACT

Clause No.		Alterations to be made
		Preliminaries
104		**Standards Quality Assurance Agreement Certificates and Other Approvals**
	2	In sub-Clause 2, line 3 Delete "BS EN ISO 9002" and insert "British Standard EN ISO 9001 or British Standard EN ISO 9002 where appropriate and British Standard EN ISO 14001:1996 (Environmental Management Systems)".
	4	In sub-clause 4, after “Appendix B,” insert “apart from the exceptions at the end of this sub-clause,” In sub-clause 4, add new sentences at the end as follows: "All quality management schemes listed in Appendix A shall be applicable to this Contract. For Bridge Refurbishment works undertaken directly by the Operating Company up to a value of £50,000 the Operating Company need not be listed in the Bridgeworks Scheme of the Register of Qualified Steelwork Contractors. In all other respects the Operating Company shall comply with Sector Scheme 20 and shall instigate a quality management system for the execution of steel structures in accordance with BS EN ISO 9001 and the requirements of Schedule 5: Part 1 and shall describe this in a quality plan. All Bridge Refurbishment works undertaken directly by the Operating Company shall be supervised by a Welding Coordinator according to BS EN ISO 14731 who shall be experienced in the type of work being undertaken. For the corrosion protection of the Forth Road Bridge undertaken directly by the Operating Company, the Operating Company need not be registered to National Highways Sector Scheme 19A. In all other respects the Operating Company shall comply with Sector Scheme 19A and shall instigate a quality management system for the corrosion protection of steel bridges in accordance with BS EN ISO 9001 and the requirements of Schedule 5: Part 1 and shall describe this in a quality plan.”
	7	In sub-Clause 7, line 3 Delete "BS EN ISO 9002" and insert "British Standard EN ISO 9001 or British Standard EN ISO 9002 where appropriate and British Standard EN ISO 14001:1996 (Environmental Management Systems)".
120		**Recovery Vehicles For Breakdowns**
	9	Insert in sub-clause 9, after "A copy of each Certificate shall be provided to the Overseeing Organisation not less than 14 days before the commencement of the recovery Operations", the following: "and a copy of each Certificate shall be kept by the Operating Company".

Clause No.		Alterations to be made
	17	Insert in sub-clause 17 new paragraph as follows: "The Operating Company shall assist, when required by the Overseeing Organisation or the Police, in the removal of loads or parts thereof deposited within the Site".
	18	Delete sub-clause 18, and insert the following: "The recovery service shall be provided in accordance with Appendix 32/1,"
	19	Insert in sub-clause 19 new paragraph as follows: "When moving broken down or damaged vehicles, the Operating Company shall take all reasonable measures to prevent further damage to the vehicles."
	23	Insert in sub-clause 23 new paragraph as follows: "Drivers shall be informed that they must make their own arrangements for further assistance."
	26	In sub-clause 26 delete: "The Contractor shall submit weekly to the Overseeing Organisation:" and replace with: "The Operating Company shall maintain at the Central Office:"
	32	Insert in sub-clause 32: After "Vehicle and Operator Services Agency (VOSA) approved testing station,…", the following: "or the Freight Transport Association, conducted not less than 14 days nor more than 28 days before the vehicles are required," Delete "annually on the due anniversary of the inspection" and replace with: "at intervals not exceeding six months, …" Add a new paragraph as follows: "A copy of each inspection report shall be kept in: (i) the Operating Company Central Office, (ii) the recovery vehicle."
	36	Insert in sub-clause 36: After "The vehicle and all retroreflective markings shall be maintained in a good and clean condition." The following "Where the recovery vehicle forms part of the Operating Companies fleet the livery shall be in accordance with Appendix 1/75."

Clause No.		Alterations to be made
	37	In sub-clause 37: After "FREE RECOVERY TO END OF ROADWORKS" insert " OR BRIDGE"
	52	Insert in sub-clause 52, after "The contractor shall …", the following: "provide suitable mess and other welfare arrangements for the recovery operatives which shall: (i) be in the form of temporary accommodation, (ii) be located at the recovery vehicle station, and shall …"
		SITE CLEARANCE
201		**Clearing**
	3	Delete Sub-Clause 3 and replace with: "Disused chambers located under the road pavement, verge or central reserve shall be demolished to a depth of 0.5 metres below formation, properly cleaned out, and filled or capped to meet the requirements of the relevant roads authority. To permit free drainage holes of 76 millimetre diameter (minimum) shall be made at 500 millimetre centres over the whole areas or over 10 per cent of the whole area (whichever is more onerous), of slabs basements etc., which are not removed and which are liable to hold water."
	6	In sub-clause 6, after paragraph 2, add new paragraph as follows: "In the case of items such as stone, copes, granite setts, kerbs and concrete paving, stacking and protection shall be achieved by palletising."
	7	Delete sub-clause 7 and replace with: "7. Topsoil excavated for any purpose shall be reserved and protected for re-use. Multiple handling of topsoil shall be kept to a minimum. After completion of the work the topsoil shall be spread over the disturbed ground, any surplus being disposed of as described in clause 602".
204		**Hazardous Materials**
	1	In sub-clause 1, after "…in Site clearance", insert "or any other work on the Unit including Incident Response".
		DRAINAGE AND SERVICE DUCTS
507		**Chambers**
	19	Add the following new sub-clauses 19-23: The frame shall be haunched with mortar to within 40mm of its top. The remaining 40mm shall be painted with joint bitumen.

Clause No.		Alterations to be made
	20	The remainder of the void around the frame shall be filled with either bitumen macadam or rolled asphalt surfacing material to match the surrounding surface. The surface course shall be laid in a uniform layer of the specified thickness and shall include any surface treatment necessary to match the surrounding surface. Such treatment shall comply with the relevant clauses in this Specification.
	21	Covers and frames shall be broken-out, adjusted, reinstated and able to be trafficked in the course of one day.
	22	In certain circumstances, for example if the Site is to be overlaid, the Operating Company may adjust covers and frames to levels above the adjacent surface. The covers and frames shall be surrounded by a temporary ramp in bituminous material to a gradient not steeper than 1:10. The Operating Company shall provide warning signs in accordance with clause 117.
	23	Draw pit chambers for electrical supply cables shall be as referred to in Appendix 5/2.
521		**Water Jetting and Suction**
	9	In sub-clause 9, after (vi), insert (vii): "(vii) the suction facility shall be provided by a liquid ring exhauster and shall have an air flow of at least 70 cu m per minute and 380mm Hg vacuum through a 200mm boom mounted pipe with a debris tank capacity of at least 5.5 cu m."
606		**Watercourses**
	1	In sub-clause 1, after "ditches," insert "drainage grips".
	5	Add new sub-clause 5: "The cutting of new drainage grips shall be to the profiles required to deal with the discharge of surface water from the carriageway. All arisings from the cutting of new drainage grips shall be removed to a licensed disposal facility unless it is appropriate to spread and level the arisings on the verge. The grass shall be trimmed for a distance of 1 metre on either side of the grip."
610		**Fill to Structures**
	1	In sub-clause 1(iv): delete "unless otherwise required in Appendix 6/6".
	2	In sub-clause 2 line 2 delete: " 6P, 7A and 7B".

Clause No.		Alterations to be made
		In sub-clause 2 lines 3 and 4 delete: ", in the locations described in Appendix 6/6".
	3	In sub-clause 3 lines 2 and 3 delete: "6P, 7A and 7B".
	6	In sub-clause 6 lines 1 and 2: delete: "6P and 7B"
611		**Fill Above Structural Concrete Foundations**
	1	In sub-clause 1 (i): delete "6P, 7A or 7B". In sub-clause 1 (ii) delete whole sub-clause.
920		**Bond Coats, Tack Coats and other Bituminous Sprays**
	1	In sub-clause 1: Delete last sentence and replace with "In the event that no British Board of Agrément HAPAS Certificates have been issued in respect of any proprietary bond coats, tack coats, or other bituminous sprays that comply with Sub-Clauses 2 to 12 of this Clause and the requirements specified in Appendix 7/4, detailed proposals accompanied by quality plans and method statements appropriate to the project shall be submitted to the Overseeing Organisation for consent."
930		**EME2 Base and Binder Course Asphalt Concrete**
	6	Add to end of sub-clause 6: "EME2 shall be laid with uniform compaction over the whole Lane width by a paver fitted with a high density, pre-compaction screed."
	8	Delete existing sub-clause 8 and replace with: "Compaction shall be substantially completed before the temperature falls below 125 °C. Limited rolling without vibration may be carried out below this temperature to improve the finish. If EME2 starts to shove or tear during compaction, compaction must be stopped. Compaction can recommence if material temperature drops and no material movement is observed."
	14	Delete existing sub-clause 14 and replace with: "For the material from each mixing plant, a pair of cores shall be taken from the wheel-tracks every 250 metres laid, or part thereof, per paver, and the void content shall be determined in accordance with BS 594987, clause 9.5.1.3."
	16	Delete existing sub-clause 16 and replace with: "For the material from each mixing plant, a pair of cores shall be taken every 250 metres laid, or part thereof, centered 100mm from the final joint position or at any open longitudinal joint and the air void shall be determined in accordance with BS 594987, clause 9.5.1.3."

Clause No.		Alterations to be made
	20	Add to end of sub-clause 20: "Two copies of the final in situ core air void results shall be passed to the Overseeing Organisation within 7 Days."
942		**Thin Wearing Course Systems**
	14	In sub-clause 14 delete "for a period of two years" and insert "for a period of five years".
		Kerbs Footways And Paved Areas
1101		**Precast Concrete Kerbs Channels Edgings and Quadrants**
	3	In sub-clause 3 lines 13 and 14: delete "At expansion joints in bridge decks the kerb joints shall be as described in Appendix 11/1."
1102		**In Situ Asphalt Kerbs**
	2	Delete sub-clause 2.
1103		**Freestanding In Situ Concrete Kerbs Channels and Edge Details**
	1	In sub-clause 1, line 8: delete all text after "dragging" and add: "The longitudinal surface regularity shall not deviate by more than 5mm in 3 metres when checked with a 3 metre straight edge."
1104		**Footways and Paved Areas (Precast Concrete Flags and Natural Stone Slabs)**
	2	In sub-clause 2, lines 3 and 4: delete "with a bond as described in Appendix 11/1".
1106		**Footpaths and Paved Areas (In Situ Concrete)**
	4	Add new sub-clause 4: "Synthetic fibres shall be added to the concrete at the concrete mixing plant at a rate of 0.9kg per cubic metre of concrete as and when specified by the Overseeing Organisation."
1107		**Footways and Paved Areas (Concrete Block Paving)**
	4	Add new sub-clause 4: "When replacing an existing area of block paving the type and colour of the blocks and the pattern used shall match existing."
1108		**Footways and Paved Areas (Clay Pavers)**
	4	Add new sub-clause 4: "When replacing an existing area of paving the type and colour of the blocks and the pattern used shall match existing."

Clause No.		Alterations to be made
		TRAFFIC SIGNS
1209		**Covering of Permanent Traffic Signs**
	7	Add new sentence to sub-clause 7 as follows: "Any damage caused as a result of the temporary covering of permanent traffic signs shall be rectified at the Operating Company's expense."
1213		**Road Studs**
	9	Add new sub-clause 9: "New or replacement thermoplastic road studs shall be installed as CHART node points as and when directed by the Overseeing Organisation. Existing metal CHART node points shall be removed with minimum damage to the carriageway which shall be reinstated using filled bitumen or bituminous instant repair material."
1301		**General**
	1	Delete existing sub-clause 1 and replaced with: "This Series shall apply to the design, supply and installation of lighting columns and brackets and CCTV masts and cantilever masts for traffic signals and/or speed cameras (hereafter called cantilever masts) within the following dimensional limitations: (i) For aluminium lighting columns: (a) aluminium columns shall not exceed 15 metres nominal height, and (b) columns shall be tapered with an integral bracket. The maximum bracket outreach shall be no greater than 0.5 metres. (ii) For steel columns: (a) post top columns not exceeding 20 metres nominal height, these columns shall be of continuously tapered folded steel construction, and (b) columns with brackets not exceeding 18 metres nominal will have a maximum bracket outreach of 0.5 metres. NOTE: Only where individual columns are being replaced within an existing lighting scheme will outreaches greater than 0.5 metres be accepted. Generally, only to maintain consistency in such installations can columns other than tapered folded sheet steel be used. In these situations columns of a similar design to those in the existing lighting scheme can be used. (iii) For glass fibre reinforced plastic lighting columns: (a) unless specified otherwise by the Overseeing Organisation columns not exceeding 10 metres nominal height, and (b) bracket projections shall not exceed 0.5 metres. (iv) For steel CCTV masts:

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		(a) post top masts not exceeding 25 metres nominal height. (v) For steel cantilever masts: (a) nominal height not exceeding 8.5 metres, (b) cantilever projection not exceeding 8.5 metres, and
		(c) bracket projections for cantilever masts not exceeding 0.25 x nominal height or 3 metres whichever is the lesser. (vi) For Hinged Columns: (a) nominal height shall not exceed 12 metres, (b) bracket projections shall not exceed 0.5m, and (c) where hinged columns greater than 8 metres high are installed these shall incorporate a suitable raising and lowering mechanism. For all new installations it is a requirement of the Overseeing Organisation that lighting columns shall be continuous taper, be manufactured from aluminium, the column root to be protected by an inner and outer polymer thermally bonded sheath to a height of 250mm from the bottom of the column, the columns to have an integral 0.5m outreach and flush access doors. Sign support posts shall be of tubular aluminium or aluminium lattice construction. The nominal height of a flange column or mast is taken as the distance between the underside of the flange plate and the highest point of the mast. See Fig. 1. of BD88 (DMRB 2.2.13)."
	8	Insert additional sub-clause 8: "Unless protected by an existing Vehicle Restraint System (VRS), columns shall be, designated Passively Safe or otherwise located so as to require no protection in accordance with TD19/06. Where passively safe columns are used they shall conform to testing as set out in British Standard EN 12767:2007. Installation shall always be in compliance with TD19/06."
	9	Insert additional sub-clause 9: "Non-hygroscopic base compartment back-board not less than 15mm thick and of a sufficient size to accept the selected cut-out shall be positioned internally opposite the access door. The baseboard shall be securely fixed to the inside of the column. All screws and fixings used for the attachment of equipment and components to this wooden back-board shall be of stainless steel."
	10	Insert additional sub-clause 10: "Lighting columns shall be manufactured with a flush mounted access door correctly positioned relative to the integral bracket. This position ensures that access through the door can only take place when the operative is facing the oncoming traffic."
	11	Insert additional sub-clause 11: "The column cable entry slot, which shall be positioned on the face to the right of the column access door opening, shall have minimum dimensions

Clause No.		Alterations to be made
		of 150mm x 75mm with the lower edge of the slot 600mm below ground level. The cable entry slot shall be free from irregularities and burrs."
	12	Insert additional sub-clause 12: "Each column shall be fitted with an 8 mm (minimum) diameter earth terminal complete with two plain washers and one full nut and one locking nut. These items shall be corrosion resistant and compatible with the column material. Earth terminals shall be readily accessible through the door opening and located such as to minimise the risk of injury to persons accessing them while undertaking installation and maintenance."
	13	Insert additional sub-clause 13: "All electrical and similar joints made onto the column structural aluminium and column access door shall be such as to eliminate or protect against corrosion resulting from contact between dissimilar metals. The Operating Company is required to adhere to such aspects of the guidance provided in PD 6484 as it relates to dissimilar metals in contact with aluminium. The selection of electrical earthing components shall also comply in this respect and other respects with the requirements of BS 7430. All access doors shall be fitted with a bonding earth conductor marginally longer than the retaining chain or wire. Termination of the bonding earth conductor shall use components manufactured from compatible material."
	14	Insert additional sub-clause 14: "The flush fitting weatherproof single access door shall provide protection no less than IP33 and shall be free from any irregularities, burrs or sharp edges likely to cause injury. Unless specifically required by this Contract each column access door shall have at least one lock. All locks shall use a triangular type key. The number of column door keys shall be supplied shall be 10% of the number of columns erected subject to a minimum of three keys. All column access door keys shall be manufactured from metal and be of an adequate handling size."
	15	Insert additional sub-clause 15: "On completion of the installation, all door locking components shall be coated with suitable corrosion inhibitor grease providing lubrication and protection from seizure and general deterioration."
	16	Insert additional sub-clause 16: "Lighting column access doors shall be retained by stainless steel chain or braided stainless steel wire. Such retaining chain or wire shall be compatible with the column material and be held captive by fixings similarly manufactured from compatible material. Chains shall be a minimum gauge of 4mm and be long enough to allow the column access door to be rested completely on the ground whilst removed. All removable access doors shall be interchangeable with access doors of similar columns without the need for adjustment."
	17	Insert additional sub-clause 17: "Where columns are mounted on structures and behind parapets, the access doors shall be positioned such that the access opening is fully

Clause No.		Alterations to be made
		accessible above the upper height of the protective parapet and facing the maintenance personnel."
	18	Insert additional sub-clause 18: "Flange plate columns shall be set vertical on the foundation bases prepared for them. To ensure the column is set vertical compatible metal shims shall be used for adjustment. The nuts and exposed bolts shall be made suitably tight and then coated with protective paste and suitable protective tape. All fixings shall be compatible with the column material."
	19	Insert additional sub-clause 19: "Where the column flange is not in accordance with BS EN 40-2 the Operating Company shall liaise with the Contractor responsible and agree details of the flange sizes and fixing centres. The Operating Company shall implement a design based upon the agreed flange fixing and provide the design to the column manufacturer."
	20	Insert additional sub-clause 20: "Where separate bracket arms are used such bracket arms shall be of the same material as the column and fixed in accordance with the manufacturer's written instructions to prevent rotation using an anti-rotational device."
	21	Insert additional sub-clause 21: "Road lighting columns and brackets shall be manufactured, located and erected in compliance with this Series, the 1400 Series and all relevant requirements."
	22	Insert additional sub-clause 22: "Where wall brackets and associated service boxes are installed they shall, where applicable, match existing items."
1302		**Design of Lighting Columns, Brackets, CCTV Masts, Cantilever Masts, Foundations, Anchorages and Attachment Systems**
	1	Delete existing sub-clause 1 and replace with: "Lighting columns, brackets, CCTV masts, cantilever masts, the foundations of both planted columns and columns and masts with flange plates, and the anchorages and attachment systems for columns and masts with flange plates shall be designed to comply with the requirements of BD 94/07 of the DMRB and the technical approval scheme adopted by the Overseeing Organisation. The Operating Company shall similarly comply with British Standard PD 6547:2004+A1:2009 and the referenced standards within it. The Operating Company shall use the soil type information as described in Appendices 13/1. The Operating Company shall design foundations for all columns and masts detailed in this Contract. The Operating Company shall submit to the Overseeing Organisation a copy of all design calculations, variations, certification and supporting information at least two weeks prior to delivery and shall include with such Records confirmation that such Records have been checked in accordance with the requirements of BD 97 and BD 2 to ensure compliance with the required standards and check Certificates issued for lighting

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		columns, brackets, CCTV masts, cantilever masts and foundations. The Design of the foundations shall be appropriate to the soil types encountered on Site, as identified in Appendices 13/1, 13/4 and 13/7. The Operating Company shall establish the soil types on Site and submit, to the Overseeing Organisation for its acceptance, lighting column foundation details appropriate to the conditions found and in accordance with the requirements of British Standard EN 40.
		The excavation to accommodate planted root columns shall not exceed a diameter greater than twice the diameter of the column root. Where a separate bracket is used for compatibility with existing columns the column shall be erected without the bracket in place and placed centrally in the excavation. Where separate brackets are used these shall not be erected on the column until such a time as the foundations have cured. Alternative foundations can be used with the prior agreement of the Overseeing Organisation."
	2	Aesthetic Requirements Delete existing sub-clause 2 and replaced with: "The aesthetic design of lighting columns, including those with bracket arms, shall be submitted by the Operating Company to the Overseeing Organisation for consideration and approval. The design of lighting columns and luminaires including those with bracket arms shall comply with the general advice given in BS 5489-1 relating to the appearance of lighting installations both by day and by night from the viewpoint of both the road and the surrounding neighbourhood. Where required to be incorporated into an existing scheme the lighting column silhouette must use the same or near similar bracket angle and generally be compatible with existing equipment."
1303		**Data Sheets**
	3	Insert additional sub-clause 3: "The Operating Company shall within one month of the commencement of the work and prior to placement of any orders for materials, submit to the Overseeing Organisation for approval, triplicate copies of completed Appendix 13/2 Data sheets for each type lighting column."
1304		**Identification and Location Markings**
	1	Delete existing sub-clause 1 and replace with: "All lighting columns and brackets, CCTV masts and cantilever masts shall carry unique identification marks indicating the name of the manufacturer, year of manufacture, the unique product code and other relevant information to enable details of the lighting column and bracket, CCTV masts and cantilever masts to be determined by reference to the appropriate Lighting Column and Bracket, CCTV masts and cantilever masts Data Sheets. All such masts, columns and brackets shall be correctly labelled confirming conformance with the appropriate directive(s) and or Legislation."

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	2	Delete existing sub-clause 2 and replace with: "The column and mast identification marks shall be permanent and legible and be made clearly visible in one of the following ways: (i) on a permanent fixed label, or (ii) hard stamped, or (iii) formed into the material of the column/mast external face only. For hard stamped identifiers, the mark shall be located immediately above the access door and for label identification this shall be placed immediately inside the base compartment: it shall not be located on the door. All hard stamping shall be carried out in a manner that will not induce any stresses into the material of the column/mast."
	3	Delete existing sub-clause 3 and replaced with: "Where separate brackets are approved for use by the Overseeing Organisation the bracket identification mark shall also be permanent and legible and be either: (i) hard stamped, or (ii) formed into the material of the bracket arm and on either the luminaire spigot or the underside of the bracket arm adjacent to the column shaft or the wall or pole mounting plate. The mark will be on an external face only."
	4	Delete existing sub-clause 4:
	5	Delete existing sub-clause and replaced with: "In addition, location/identification labels for compliance with DMRB requirements and electrical regulatory inspection and maintenance purposes shall be applied to each lighting column as described in the Overseeing Organisation guidance document LDS8001_A.2 *Roadside Electrical Asset and Lighting Identification System*. The identifying code for use on the labels shall be provided by the Operating Company and agreed with the Overseeing Organisation. The Operating Company shall provide the Overseeing Organisation with Site design layout drawings and electrical schematics. All Records relating to the lighting columns shall include the identifying code."
1308		**Handling, Transport and Erection**
	4	Delete existing sub-clause 4 and replace with: "Columns and masts shall be installed in accordance with the manufacturer's instructions and all requirements of the Specification."
	6	Insert additional sub-clause 6: "All verge located lighting columns shall be installed such that the door is facing away from the oncoming traffic. Alternative access door orientation must be consented to by the Overseeing Organisation. Where consent for such alternative orientations is to be sought this must form part of the initially proposed project design."

Clause No.		Alterations to be made
	7	Insert additional sub-clause 7: "All proprietary materials shall be stored in accordance with the manufacturer's written instructions."
1401		**General**
	1	Insert additional new first paragraph to sub-clause 1: "The lighting installation shall not be operationally energised until the Operating Company has complied with the Electricity at Work Regulation 1989 and provided to the Overseeing Organisation all completed British Standard 7671 Inspection and Testing Certificates. In addition to the provision of the British Standard 7671 Inspection and Testing Certificates the Operating Company shall provide a written record to the Overseeing Organisation stating that these Certificates have been audited for correct and full completion by a resource competent to undertake such audits." Delete existing first paragraph of sub-clause 1 and replaced with: "Materials equipment and workmanship required under this Contract shall comply with British Standard 7671 Regulations for Electrical Installations (the IEE Wiring Regulations) and the applicable regulations of the "distribution network operator (DNO)" providing the supply. The installation and maintenance of electrical apparatus and cabling for road lighting and illuminated traffic signs shall comply with the quality management scheme detailed in Appendix A Volume 1 of this Specification. The Operating Company shall incorporate into work procedures the contents of Engineering Recommendation G39/1 `Model Code of Practice covering Electrical Safety in the Planning, Installation, Commissioning and Maintenance of Public Lighting and Other Street Furniture'." Delete existing third paragraph of sub-clause 1 and replaced with: "In addition to the requirements of sub-clauses 10.2 and 10.3 of G.39/1, each Competent Person as defined in G.39/1, clause 2, shall be provided by the Operating Company with not less than one copy of the above Certificate, duly completed and signed as Approved. Such Certificate(s) shall be retained and be available at all times for inspection on the Works on request by the Overseeing Organisation. A formal Work Allocation record shall be kept by the Operating Company to enable work carried out by individual operatives and the responsible supervisor to be identified. All operatives and supervisors shall hold a valid Electrotechnical Certification Scheme (ECS) identity card. Notification of the details of all such cards shall be submitted to the Overseeing Organisation 14 days prior to commencement of the work."

Clause No.		Alterations to be made
		Insert additional final paragraph to sub-clause 1: "The Operating Company shall ensure that only competent persons as defined in the guidance note *LDS8014_Competency – Competency requirements relating to work on Transport Scotland's Roadside Electrical Assets and Lighting* shall be employed on work that falls within the scope of this series. All competent persons shall be registered with the Highway Electrical Registration Scheme (HERS). In addition Authorised Persons shall be registered as specified in the "Highway Electrical Registration Scheme (HERS) Handbook."
	2	Delete existing sub-clause 2(iv) and replaced with: "Electrical Equipment for Lighting Units shall consist of the following as described in this Contract: luminaires, photo-electric control units (PECUs), shorting plugs, lamps, time switches, ballasts, ignitors, starters, capacitors, cut-outs, fuses, fuse holders, miniature circuit breakers (MCBs) and Light Emitting Diode (LED) drivers." Delete existing sub-clause 2(v) and replaced with: "In this Series the "network" is the electrical distribution network from the DNO cut-out to the Lighting Units. This includes feeder pillars, cabinets, housings and similar enclosures that form part of the installed electrical distribution network."
	3	Delete existing sub-clause 3 and replaced with: "Each network shall operate on a nominal single phase 230V ac, - 6% to +10% or three phase 400V - 6% to +10% at a frequency of 50Hz ±1%. It will be the Operating Company's responsibility to ensure that the equipment supplied will operate correctly at the voltage and frequency available at the point of use and ensure that the voltage at the point of use is within the requirements of the BS 7671 Regulations. The Operating Company's designer shall obtain a declaration from the DNO, provided in accordance with the Electricity Safety, Quality and Continuity Regulations in which the nominal voltage and frequency of the supply shall be specified along with the permitted tolerances. Further guidance on requesting electricity supplies is contained within *LDS8006Supply – Electricity Supplies to Roadside Electrical Assets and Lighting*. TN-C distribution shall not be used for any part of any new road lighting electrical distribution network. Only where a 3-phase supply is used to energise high mast lighting and similar loads shall a 3-phase supply be distributed within the lighting installation as 3-phase. Where a 3-phase supply has been provided by the DNO for circuits other than high mast lighting and similar the 3-phase supply shall, unless otherwise consented to by the Overseeing Organisation, not be distributed as a 3-phase supply but only as three separate single phase supplies. Such single phase supplies derived from a 3-phase supply shall not be considered as being an 'individual' or 'separate' single phase supplies.

Clause No.		Alterations to be made
		Unless specifically consented to by the Overseeing Organisation lighting supplies shall not be used to supply equipment other than road lighting and related circuits. Road lighting circuit electricity consumption shall be considered as including maintenance sockets and similar items housed within lighting pillars. Unless specifically consented to by the Overseeing Organisation anti-condensation heaters shall not be fitted within pillars and distribution cabinets."
	4	Delete existing sub-clause 4 and replace with: "The Operating Company's Designer shall provide sufficient access and area within electrical equipment to allow the electricity supplier to install their service connection and associated cut-out. This shall be considered as the origin of the installation as defined in British Standard 7671."
	5	Delete existing sub-clause 5 and replaced with: "This dedicated feeder pillar shall be provided for the Overseeing Organisation's lighting network. Distribution feeder pillars shall be also provided as required. Unless otherwise consented to by the Overseeing Organisation supplies provided to electrical equipment for third parties, internal and external to the Overseeing Organisation, shall not be connected to the Overseeing Organisation's lighting network. Any such supplies so provided shall conform to the Overseeing Organisation's specific instructions as specified in the Overseeing Organisation guidance document *LDS8006_ - Electricity Supplies to Roadside Electrical Assets and Lighting*. Before making any form of electrical connection into any part of the Overseeing Organisation's lighting network consent shall be obtained from the Overseeing Organisation 21 days prior to the connection being made."
	6	Insert additional sub-clause 6: "The Operating Company shall fit ID labels and conspicuity bands in accordance with the Overseeing Organisation guidance document *LDS8001_ Roadside Electrical Asset and Lighting Identification System*."
1402		**Site Records**
	1	Delete existing sub-clause 1 and replace with: "In accordance with the requirements of the Electricity at Work Regulations the Operating Company shall, on the completion of the electrical work, provide a set of as-installed drawings or transparencies showing as a minimum the position and identification mark (including luminaire type, modification status, lamp setting, lamp type and serial numbers) of equipment requiring electrical connections, ducts, underground cables and joints and the type and depth of cables. The Operating Company shall also supply test Certificates and operation and maintenance manuals. The general requirement for information to be included within the lighting section of the health and safety file is contained within *LDS8004–*

Clause No.		Alterations to be made
		Roadside Electrical Assets and Lighting Health & Safety File Requirements with Model Forms.
	2	Delete existing sub-clause 2 and replace with: "The Operating Company shall amend drawings provided by the Overseeing Organisation whenever any part of the installation shall be amended or extended. Test Certificates pertaining to the part of the installation that has been modified shall be completed and passed to the Overseeing Organisation for consent. Locations of Constructional Plant and equipment shall be referenced in accordance with the Trunk Road network referencing system."
	3	Delete existing sub-clause 3 and replace with: "As-built drawings shall be produced by the Operating Company showing the network and all lighting units in accordance with this clause. The Operating Company shall complete the as-built drawings in AutoCAD ™ format and provide the drawings in AutoCAD. As-built drawings shall include both geographical and schematic drawings: (i) a schematic distribution layout drawing indicating the distribution arrangement of each private cable network, (ii) a schedule of abandoned cables including location, (iii) duct and cable location offsets taken at 20m intervals where cables maintain a steady line, and at 5m intervals where the line of the cable varies. Cable records shall be determined from kerb lines or fence lines, and (iv) the geographical and schematic drawing shall detail the ID label attached to pillars and lighting units. The geographical drawing shall detail the accurate location of all lighting units, duct location (including size and number), cable runs (including cable size), pillars, all chambers and the electricity supply location. The DNO 'supply point ID No.' must be obtained from the electricity supplier and included on the drawing. Column height, material lantern type, lamp wattage, Lit Sign Units TRGD ref. No, type and wattage of sign lighting unit shall be included on the drawing."
	4	Delete existing sub-clause 4 and replace with: "Operational Records shall include: (i) maintenance or operating manuals for installed equipment, (ii) inspection and test Certificates in accordance with British Standard 7671, and (iii) Data required for inventory purposes in the format stipulated in the Trunk Road Inventory Manual and the Scottish Ministers' Requirements."

Clause No.		Alterations to be made
1403		**Location of Lighting Units and Feeder Pillars**
	1	Delete existing sub-clause 1 and replace with: "The location of feeder pillars shall be in accordance with the Operating Company's submitted Design. The Operating Company's Design shall fully consider all relevant requirements including inter alia such arrangements as to ensure safe maintenance access to the pillar. The exact location will be agreed on Site before commencement of any related ground work. The Operating Company shall be responsible for recording and documenting all aspects of the final Site layout and the as-installed equipment."
	3	Insert additional sub-clause 3: "The location of cabinets or pillars provided to house the electricity supplier's equipment shall be consented to by the Overseeing Organisation prior to its installation."
1407		**Luminaires**
	1	Delete existing sub-clause 1 and replace with: "Luminaires fitted with integral control gear shall have a fuse holder incorporating direct touch protection adjacent to the terminal block with a cartridge fuse protecting each set of control gear."
	2	Delete existing sub-clause 2 and replace with: "Luminaires for road lighting shall comply with British Standard EN 60598-2-3 and the following: (i) the mounting arrangement shall provide for a close fitting between the luminaire and the column, making use of a two or more bolt, fixing arrangement, (ii) tilt angle adjustment shall be integral to the luminaire and shall apply to both top and side fixing arrangements. The adjustment shall allow for a minimum of three tilt angles including 0deg. +5deg. and +10 degrees, (iii) the internal arrangement of the luminaire shall consist of separate control gear and lamp compartments. These compartments shall be arranged to provide for the separate sealing of the optical system (lamp housing) and control gear compartment. Both compartments shall have a degree of external sealing and sealing between each other no less than IP66, (iv) luminaire to be used for group control shall be fitted with a NEMA socket and this shall be located in the canopy. The control column shall be sited immediately adjacent to the control pillar and a PECU fitted into the NEMA socket, (v) meet the structural design and aesthetic approval requirements of clause 1302. The external finish shall be to BS 4800 RAL9007 Silver,

Clause No.		Alterations to be made
		(vi) a range of luminaires of varying rating shall be available in a common style/design, (vii) curved glass shall be manufactured from toughened safety glass. Flat glass shall only be used in the vicinity of railways, airfields and navigable waterways or with the consent of the Overseeing Organisation. Luminaires shall be of the full-cut-off/low-threshold increment type as consented to by the Overseeing Organisation, (viii) Electronic ballast units shall be provided in luminaires rated up to and including 400W and shall be suitable for operation over the input voltage range of 210-250 Volts. Electronic ballasts shall incorporate over-temperature protection and have a power factor of 0.95 (lagging/leading) or greater. Unless otherwise consented to by the Overseeing Organisation, all replacement lamp control gear shall be of electronic type, DALI compatible, enabled and accredited, capable of being controlled via a lighting central management system, capable of implementing set dimming/trimming control regimes autonomously, and be ELEXON approved. Prior to delivery of any luminaire using electronic control gear the Overseeing Organisation shall be provided, by the supplier, with a 'statement of compatibility'. This statement shall detail and confirm that the electronic control gear being supplied is capable of operating over the temperatures range to which it will be exposed in use within the luminaire housing and that the lamp and control gear are fully compatible. The 'statement of compatibility' shall indicate that the testing regime to which the equipment has been exposed, (ix) ballast units shall have a power factor no less than 0.85, (x) luminaires shall incorporate some form of anti-condensation vent or similar measures to minimise moisture build-up within the luminaire, (xi) all luminaires shall operate correctly over the temperature range of -25deg. C to +35deg. C, (xii) luminaires may be Class I where the luminaire has an integral earth terminal linked to all exposed metalwork or Class II where there is no earth terminal provided for connection of the luminaire's exposed metalwork to the circuit protective conductor. Fortuitous earth connection provided by connection to mechanical fixings shall not be relied upon, (xiii) safe access to the lamp and control gear enclosures for maintenance purposes shall require a tool. Doors shall be hinged and include a safety catch, (xiv) luminaire housings shall be manufactured from corrosion resistant die-cast aluminium suitable for use in their intended environments including locations directly adjacent to the sea, and similar salt-laden locations,

Clause No.		Alterations to be made
		(xv) any electrical wiring that could be subjected to heat shall be fitted with additional heat insulating sleeving, (xvi) luminaires with remote control gear shall not be used unless previously agreed with the Overseeing Organisation, and (xvii) luminaires shall conform to the requirements of the appropriate sections of the Restriction of the Use of certain Hazardous Substances in Electrical and Electronic Equipment Directive and the Waste Electrical and Electronic Equipment Regulations 2006."
	3	Delete existing sub-clause 3 and replace with: "Traffic sign luminaires shall comply with BS 873-5 and the following: (i) luminaires shall use low energy, high efficiency lamps with electronic control gear, (ii) traffic sign luminaires shall be manufactured from cast aluminium unless otherwise specified, (iii) the external finish shall be to British Standard 4800 RAL7000. External sealing shall be to no less than IP54. The construction shall be suitable for use in all environments including directly adjacent to the sea at ferry terminals and in similar salt-laden locations, (iv) for overhung illumination of a sign:

Clause No.		Alterations to be made
		(a) the mounting arrangement of the luminaire(s) shall incorporate a vandal and wind loading resistant anti-rotational support fixing capable of accommodating all commonly used post diameters, (b) the sign lighting luminaire(s) shall provide efficient illumination of the sign, (c) all luminaires shall include integral control gear which shall be mounted on a single readily removable tray, (d) suitable arrangements must be incorporated to prevent un-necessary light spillage, (v) for up-lighter illumination of a sign: (a) the mounting arrangement of the luminaire(s) shall incorporate a vandal and wind loading resistant anti-rotational support, (b) the sign lighting luminaire(s) shall provide efficient illumination of the sign, (c) all luminaires shall include integral control gear, (d) suitable arrangements must be incorporated to prevent un-necessary light spillage, (vi) for internally illuminated 'light box' and electroluminescence signs, the signs shall conform to all applicable standards in relation to their use including background light intensity, (vii) access doors into lamp and control gear compartments on all luminaire types shall be hinged and tamperproof, (viii) the mean sign luminance shall be Category l of British Standard 873-5 and use high efficiency lamp(s), (ix) the impact strength shall be Category 1 of British Standard 873-5, sign lighting luminaires shall conform to the requirements of the appropriate sections of the Restriction of the Use of certain Hazardous Substances in Electrical and Electronic Equipment Directive and the Waste Electrical and Electronic Equipment Regulations 2006."
1409		**Photo-electric Control Units (PECUs)**
	1	Delete existing sub-clause 1 and replace with: "Photo-electric control units (PECUs) shall comply with British Standard 5972:1980 and British Standard EN 60068 for vibration and certified to EN 50081-1 EMC Emissions and to EN 50082-1. The PECU shall incorporate synchronous switching technology and be of one-part construction."
	2	Delete sub-clause 2(i) and replace with: "be factory fitted in NEMA socket and secured as appropriate to the road lighting luminaire canopy." Insert additional sub-clauses in sub-clause 2: (i) be protected against mains borne surges and spikes,

Clause No.		Alterations to be made
		(ii) be of an electronic type with a switching level of 70 Lux with switching differential ratio of 1:0.5 negative. The photoelectric sensor shall have zero sensor shift over a five year period, (iii) have a power consumption of no more than 0.25Watts with a uniform operating temperature range of –25deg. C to +50deg. C, (iv) be able to switch a continuously rectified circuit of less than 20Watts where used to control contactors, (v) date stamped and have a manufacturer's guarantee of at least 6 years, (vi) be designed so that in the event of a fault occurring in the unit they fail in the ON position.
	3	Delete existing sub-clause 3 and replace with: "Single and multi-bracket lighting circuits shall be group switched under the control of the group PECU. Such control shall include provision for remotely switched or time switched lighting control."
1412		**Ballasts**
	1	Delete existing sub-clause 1 and replace with: "Ballasts and other lamp control gear, including LED lamp drivers shall be electronic and comply with Clause 1407. Ballasts shall comply with British Standard EN 61347-1, British Standard EN 61347-2-1, British Standard EN 61347-2-8, British Standard EN 61347-2-9 and British Standard EN 60921 or British Standard EN 60923 as appropriate and be tap selected to the specified operating voltage of the network. Lantern control gear shall be rated at 300volts and thermally protected with super imposed pulse ignitor. Electronic ballasts and LED Driver circuits shall be capable of operating over a range of input voltages 210-250 Volts without any form of tap selection. The terminals shall be indelibly marked to indicate all wiring connections and operating voltages."
1416		**Cut-outs, Fuse Holders, Fuses and Miniature Circuit Breakers (MCBs)**
	1	Delete existing sub-clause 1 and replace with: "Cut-outs, fuse holders and MCBs shall have moulded plastic drip-proof housing to IP34 or above. This requirement applies to the device when installed in a normal operational orientation and fully assembled."
	2	Delete existing sub-clause 2 and replace with: "All single phase road lighting cut-outs shall be BS 7654 and double-pole ensuring both phase and neutral is broken by the removal of the fuse carrier. An earth terminal shall be provided within the cut-out enclosure. The continuity of any earth path shall not be broken by the removal of the cut-out fuse carrier."
	3	Delete existing sub-clause 3 and replace with:

Clause No.		Alterations to be made
		"Terminals shall be sufficient for the conductors. They shall be clearly labelled to differentiate circuits and phases."
	4	Delete existing sub-clause 4 and replace with: "When fuses are intended to be used as isolating devices, no special tools shall be necessary to extract the fuse from its carrier to achieve disconnection. However some method of then securing the device in the disconnected (OFF) condition must be provided. To achieve full isolation the fuse carrier shall incorporate the means of neutral disconnection."
	5	Delete existing sub-clause 5 and replace with: "Fuse links shall comply with the requirements of British Standard EN 60269-1, British Standard 88-2, British Standard 646/BS 2950, or British Standard 88-3. They shall be of high rupture capacity (HRC) type and be of a rating as specified in sub-clause 11 below."
	6	Delete existing sub-clause 6 and replace with: "Miniature circuit breakers shall be in accordance with British Standard EN 60898 and unless consented to by the Overseeing Organisation shall be the preferred method of circuit protection. Miniature circuit breakers shall be suitable for use on the specified operating voltage of the network at single or three phase as appropriate. Their short circuit current rating shall be no less than 10KA. The Operating Company shall ensure by enquiry of the DNO that the prospective short circuit current rating, of the supply is no greater than 16KA. Thermal or magnetic overcurrent tripping devices shall be provided with a mechanism to ensure that the contact cannot be held closed against a fault. Circuits shall be designed such that devices are operated within the ratings specified by the manufacturer."
	8	Insert additional sub-clause 8: "The cut-out gland plates shall be an integral part of the cut-out and be capable of terminating XLPE/PVC SWA cables up to 25 mm^2 and have the capacity for looping in-out. The gland plate shall typically accommodate up to 3 cables however additional armoured cable termination and cut-out capacity shall be provided at multi-headed columns, at columns where the group PECU is fitted and at locations where spur supplies are provided."
	9	Insert additional sub-clause 9: "At columns fitted with more than one luminaire, each luminaire shall be wired and fused separately, however all cut-out fuse carriers shall be arranged to be withdrawn as one. Where a PECU is fitted to any of the luminaires, the cut-out for that luminaire shall also carry the fuse for the PECU and provide simultaneous isolation of both PECU and luminaire. Each cut-out fuse carrier shall be clearly marked indicating the luminaire or device that it protects."
	10	Insert additional sub-clause 10: "The design of the cut-out shall be such that it is possible to incorporate facilities, integral within the unit, to feed additional spur(s) to sundry equipment such as lit bollards and signs. The supply to each spur shall have its own dedicated circuit protection and be individually isolated by a separate fused cut-out. Spur supplies will be protected using a dedicated

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		fuse carrier allowing the supply to be individually isolated. Where spurs are required for supplies to third parties then reference should also be made to Cl. 1401SR.6."
	11	Insert additional sub-clause 11: "The design of the cut-out shall be such that, when the fuse carrier/neutral link is removed, no live parts are accessible, i.e. have a minimum rating of IP2X. Any protective cover exposed by the removal of the fuse link shall be designed so it cannot be separated from the main housing without the use of a key or tool."
	12	Insert additional sub-clause 12: "Circuit protection on lamp circuits shall be provided by high rupturing capacity (HRC) fused links complying with British Standard 88 category of duty 300 AC 16 rating Q1 and shall be rated to suit the lamp circuit type. Typical fuse rating for High pressure sodium and Metal Halide lamp types are 6A for 70-150 Watts, 10A for 151 to 250 Watts and 16A for 251 to 400 Watts."
1417		**Base Compartment Fixing Arrangements**
	1	Delete existing sub-clause 1 and replace with: "Electrical equipment described in clauses 1411 to 1416 installed within the base compartment of columns or posts shall be fixed in accordance with manufacturers' instructions with corrosion resistant fixing screws."
1418		**Feeder Pillars**
	1	Delete existing sub-clause 1 and replace with: "Feeder pillars, forming part of a road lighting installation, are required to: (i) house the DNO service connection facilities, (ii) provide the electrical distribution to individual circuits and their associated circuit protection, (iii) provide circuit energisation under the control of PECUs or time-clocks. Where time-clocks are used these shall be housed within the feeder pillars. PECUs shall be mounted on an immediately adjacent column or post. Lighting feeder pillars shall be used for the energising of the lighting equipment and associated electrical circuits only. All equipment fitted within the feeder pillars shall be securely fixed to the back board. The enclosure shall be adequately ventilated by a suitable method preventing the ingress of water, snow or foreign bodies. The feeder pillars shall carry a nameplate showing the manufacturer's name or trade mark and the type designation or identification number of the product.

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		Feeder pillars shall comply with IP 34 to British Standard EN 60529. They shall include a full size back board of varnished marine plywood at least 15 mm thick or other suitable non-hygroscopic material. Alternatively, a purpose-designed equipment mounting system may be used. The entry for cables shall be via the root."
	2	Insert the following additional sentence at end of sub-clause 2: "All MCBs, fuses, isolators, switches, contactors, bus-bars and similar parts shall be clearly identified by correctly fitted permanent labels."
	3	Delete existing sub-clause 3 and replace with: "The feeder pillar shall be fitted with a suitably rated single or 3-phase and neutral switch disconnector/isolator and the circuit fused in accordance with British Standard 7671 using fuses to British Standard 88 rated as appropriate for the consumer circuits."
	4	Delete existing sub-clause 4 and replace with: "The external pillar door locking shall be by means of tamperproof wedge type locks, with the actuator protected by plastic sealing plugs. Two sets of keys are to be provided per feeder pillar. The locks shall be fitted with triangular actuators operated by a single key. All hinges and locks shall be of stainless steel unless otherwise consented to by the Overseeing Organisation. Door locks on the wedge side should have a generous application of suitable inhibitor grease applied when installed to inhibit the effects of moisture and corrosion/rust. Access to the external enclosure shall be by means of close fitting hinged door(s) opening to a full 180 degrees at the front. Hinges shall be of stainless steel construction or similar approved materials. Means shall be provided to secure the door(s) in the open condition during maintenance visits. The door frame shall be fitted with a heavy duty non-perishable gasket to provide a minimum rating of protection against ingress of foreign materials of IP54."
	5	Delete existing sub-clause 5 and replace with: "Feeder pillar distribution boards shall be provided with an external earth, be phase barriered and correctly colour coded. They shall be fitted with the same number of live and neutral bus-bar terminals as there are outgoing circuits plus at least one spare way. The main earthing terminal in each feeder pillar shall be connected to earth in accordance with British Standard 7671 and British Standard 7430. The main earth terminal size M8 x 32 mm long shall be provided at a readily accessible location within the cabinet section of the pillar. The earth terminal shall be supplied complete with one full nut, two half nuts and two washers all manufactured in material compatible with the pillar material."

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	6	Delete existing sub-clause 6 and replace with: "Circuit details and labelling shall be provided in each feeder pillar. The details/diagram shall be laminated or similarly protected from moisture and held in a purpose made pocket attached to the inner face of the pillar door. The electrical details must include a circuit schematic."
	7	Delete existing sub-clause 7 and replace with: "The main earthing terminal in each feeder pillar shall be connected to earth."
	8	Delete existing sub-clause 8 and replace with: "Feeder pillars shall be mounted on a 150 mm thick foundation of ST2 concrete in compliance with clause 2602. However, where special ground conditions exist the foundations shall be adjusted to accommodate such conditions. Foundations for pillars considered as 'Passively Safe' shall be constructed in accordance with all specific guidance for such pillars. Such pillars will typically have larger foundations than normally required. After completion of the cabling the feeder pillar base shall be filled to 25 mm below the door with pea gravel conforming with Table 2 of British Standard EN 12620, 4/14 aggregate with a grading category of GC90/15. Prior to the addition of pea gravel all duct ends entering the pillar shall be cut back no greater than 25mm above the finished level of the infill. Under no circumstances shall sharp gravel be used. Prior to the addition of the pea gravel the duct ends shall be completely sealed with expanded foam."
	9	Delete existing sub-clause 9 and replace with: "A durable warning sign indication 'Danger 400 Volts' or 'Danger 230 Volts' shall be fixed to the front of the feeder pillar door and the inner panel door where applicable to comply with the *Health and Safety (Safety Signs & Signals) Regulations* and the *Electricity at Work Regulations*. In compliance with these regulations these warning labels shall be triangular and no less than 75mm high."
	10	Insert additional sub-clause 10: "Where a feeder pillar is erected on a grass verge, an area of hard standing of minimum size 900x600mm shall be provided. The hard standing shall be set into the ground at a level such as to allow grass cutting to be readily undertaken."
	11	Insert additional sub-clause 11: "All ducts leaving the root of the pillar shall extend beyond the immediate concrete foundation of the pillar. A separate black duct shall be provided for the supply authority's incoming cable."
	12	Insert additional sub-clause 12: "The bonding conductor cross-sectional area for all lighting feeder pillars shall be not less than 10 mm^2 Tri-rated."

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	13	Insert additional sub-clause 13: "The inner enclosure should contain the following equipment, (i) A single phase double pole / 3 phase & neutral isolator to British Standard 5419, (ii) A single phase single pole/3-phase contactor rated at British Standard 5424, (iii) A push button operated test switch accessible from within the outer enclosure and providing a timed over-ride of the photocell, (iv) A DIN rail fitted with British Standard EN 60898 miniature circuit breakers/ Modular fuse holders fitted with fuses to British Standard 88-2.1. The control circuit fuse shall normally be rated at 6 Amp with any spare output circuit fuses rated at 20 Amp, unless agreed with the Overseeing Organisation, and (v) A neutral rail and an earth rail to accept the installed wiring with at least one spare termination provided on each rail. Note: within the inner enclosure all electrical apparatus shall be shrouded to a minimum of IP2X including the neutral rail and all neutral connections/terminals."
1419		**Wiring**
	1	Delete existing sub-clause 1 and replace with: "All wiring and installation of components within the column, post, lit sign unit, bollard or pillar shall be as described in this Contract."
	2	Delete existing sub-clause 2 and replace with: "The wiring between the luminaire and the components in the base of the column or sign unit shall be PVC insulated 'arctic grade', 3-core 2.5 mm^2 flexible cable with blue sheath. This cable shall generally be to British Standard 6500 and be suitable for use over the temperature range –20 to +70 deg. C. The circuit protective conductor within this cable shall connect the earth terminal on the luminaire to the main earth terminal associated with the column cut-out in the base compartment. Under no circumstances shall domestic grade flat 'Twin and earth' cable be used for any purpose within lighting installations."
	5	Delete existing sub-clause 5 and replace with: "All wiring/cables shall be correctly colour coded throughout their length and labelled appropriately at all points of termination. The Operating Company shall comply with British Standard 7671:2008 with regard to harmonized wiring colours and the warning notices required should 'old' and 'harmonized' wiring colours form part of a single installation."
	6	Insert the following additional sentence at the end of sub-clause 6: "Correctly selected and fitted plastic glands shall protect and seal all cable penetrations."

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	7	Delete existing sub-clause 7 and replace with: "Under no circumstances shall wiring, cables and cable tails come into direct contact with the inner surfaces of access doors or be located adjacent to hinges, sharp metal edges, fixing screws or similar items. Installers shall, at all times ensure that conductor insulation is protected from being penetrated, cut, abraded, or crushed or in any other way physically damaged as a result of contact with such items."
	8	Delete existing sub-clause 8 and replace with: "Wiring shall, wherever possible, be housed inside columns, wall brackets and posts or stiffening members. Where it is external it shall be secured using appropriate methods and in accordance with British Standard 7671. Connections between conduit and sign housings, switchboxes and other components shall be sealed to no less than IP66. Internal surfaces in contact with such cables shall be smooth. Only plastic conduit, rigid or flexible, shall be used."
	9	Delete existing sub-clause 9 and replace with: "All unused cores shall be cut to a suitable length for safe, unobtrusive stowage and the ends sealed and insulated."
1420		**Earthing**
	1	Delete existing sub-clause 1 and replace with: "Circuit protective and equipotential bonding conductors shall be installed in accordance with British Standard 7671 and British Standard 7430 and shall be green/yellow PVC or XLPE insulated or sleeved. Where bolted connections are required, these shall be terminated in accordance with manufacturers' instructions in correctly sized purpose made lugs. Such connections shall be made using brass or stainless steel or other compatible non-ferrous nuts, bolts and washers."
	3	Delete existing sub-clause 3 and replace with: "A separate circuit bonding conductor not less than 10 mm^2 cross-sectional area shall connect the earth terminal of the luminaire to the adjacent earth stud of the column/bracket."
	4	Delete existing sub-clause 4 and replace with: "All extraneous conductive parts, as described in British Standard 7671, and including doors to feeder pillars, lighting columns and lit sign units, shall be bonded to the main earth terminal using an equipotential bonding conductor of 10 mm^2 cross-sectional area. When the earth conductor forms part of a 3-core cable the equipotential bonding conductor can be reduced to a size equal to the other cores but not less than 2.5 mm^2 cross-sectional area. Earthing of lighting equipment in general and the design and installation of earth electrodes in particular shall all be in accordance with British Standard 7674 and British Standard 7430."
	6	Insert the following additional sub-clause 6: "Where lighting pillars, columns, signs are adjacent to the same or separately supplied electrical equipment i.e. equipment fed from different

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		electrical supply pillar and these are located within 3 metres of each other, then they shall be bonded together in accordance with British Standard 7671 Reg. 411.3.1. However in accordance with British Standard 7671 Reg. 559.10.3.1(v) bonding is not required to adjacent metallic structures such as safety fences, handrails and similar except that where lightning protection is to be provided the bonding shall satisfy British Standard EN 62305. No lighting infrastructure equipment shall be located within 5 metres of metallic conductive parts forming part of a separately supplied electrical equipment, such as Traffic Scotland Equipment and similar equipment. Bonding between the metal parts of such equipment is specifically excluded by this note in accordance with British Standard 7671 Reg. 542.1.3-8. Where an electrical supply is required to permanently power third party equipment located at the same Site then this shall be accommodated through the provision of a separate feeder pillar housing, with its own electricity suppliers cut-out. If this second housing is located within 3 metres of a road lighting pillar then the two pillars shall be bonded together in accordance with British Standard 7671 Reg. 411.3.1."
	7	Insert the following additional sub-clause 7: "The main earthing conductor within the feeder pillar shall be of copper and be of a size no less than the supplier's phase conductor. Where the supplier's phase conductor is greater than 16 mm^2 the main earth conductor is 16 mm^2 The main earth conductor shall connect the main earthing terminal to the incoming supply earth. Under no circumstances shall fortuitous contact via mechanical fixings be relied upon as a conductive path in place of a specific, correctly selected, rated, terminated and installed earthing conductor. Crimp connections for earth conductors shall meet the performance criteria suggested in British Standard 7609 using a matching tool, die set and connector, i.e. the first and second barrels shall crimp the conductor, the third set shall crimp the insulating, and facilitating stress relief and allowing for increased movement of the conductor. All bolted earth connection shall be made between two plain washers manufactured using material compatible with the equipment metalwork."

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	8	Insert the following additional sub-clause 8: "Earth electrodes shall be fitted to all lighting electrical installations both adjacent to the electricity supply pillar and at the end of each circuit. The acceptable resistance to earth of these electrodes shall be selected in accordance with the requirements of British Standard 7671 and British Standard 7430. Unless lightning protection is required typical values are likely to be no greater than 20 ohm for each individual electrode used as part of a TN-S circuit. For circuits energised by TN-C-S type electricity supply the typical electrode resistance to earth shall be as specified in Table 9.3 of British Standard 7671 Guidance Note 5 where the circuit wattage sets the maximum resistance allowed. Lightning protection typically requires electrode resistances below 10 ohms. For the avoidance of doubt the electrode resistance values referred to above are provided for guidance only and must be confirmed by the designer before use."
	9	Insert following additional sub-clause 9: "Where there are exposed metal casings of capacitors/ignitors these shall be directly connected to earth. Reliance on the earthing of security clips shall not be acceptable. All bonding conductors shall terminate at a common point."
1421		**Underground and Ducted Cable**
	1	In sub-clause 1 insert "purple" prior to "XLPE" in first sentence.
	2	In sub-clause 2 insert "purple" following "self coloured" in first sentence.
	3	Delete existing sub-clause 3 and replace with: "Cable covers for protection of underground cables shall comply with British Standard 2484 and shall be installed as described in Appendix 14/4. When cable covers are installed, marker tapes are not required."
	4	Delete existing sub-clause 4 and replace with: "Cable trenches shall be excavated to the lines described and in accordance with clause 602. The depth of excavation shall be such that cables laid under verges, footways or open ground shall have a minimum cover of 500 mm and under carriageways of 750 mm or 300 mm below formation whichever is the greater depth."
	5	Delete existing sub-clause 5 and replace with: "Cables shall be laid without sharp bends and kinks. If required, additional protection and support shall be provided as required."
	8	Delete existing sub-clause 8 and replace with: "Electrical supply cables shall not be installed within 500 mm of signal, communication or telecommunication cables or within 300 mm of HV cables."
	9	In sub-clause 9 insert "on a rising thermometer" following "0°C" in first sentence.
	11	Delete existing sub-clause 11 and replace with:

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		"Sufficient length of cable shall be allowed for its termination. When termination does not proceed immediately following the installation of the cable, its end shall be sealed against the ingress of moisture. If such cable ends are buried, their positions shall be marked with a permanent marker block consisting of a 300 mm square x 225 mm deep precast concrete block having a mark indented into its top surface and recorded on the Site Records."
	14	Delete existing sub-clause 14 and replace with: "Metallic trace marker tape shall be laid above the duct or cable to permit cable detection by electronic route tracing equipment, this shall be purple self-coloured PVC or polythene plastic tape for cable marking and shall be laid approximately 250 mm above any electrical supply/distribution cable. The tape shall be not less than 0.1 mm thick and 150 mm wide with the wording "Street Lighting Cables Below" printed in black along the full length so as to occupy not less than 75% of its available length and occurring at least at 1 m intervals. Where several cables are laid in one trench, only one line of marker tape need be installed."
	20	Insert the following additional sub-clause 20: "Cable laid in troughs shall not be used."
	21	Insert the following additional sub-clause 21: "Only steel wire armour cabling shall be used underground for lighting supply distribution. All cabling shall be purple in colour and installed within continuous purple self-coloured ducts in accordance with Cl. 1421.15. Straight or split-concentric cable shall not be used as part of any lighting installation. Direct buried cables shall not be installed."
	22	Insert the following additional sub-clause 22: "Under no circumstances shall cables enter a column, post, bollard or pillar base without the protection of ducting typically 60mm diameter. Such ducts, shall continue into the base and terminate at a suitable height to allow a seal to be formed using expanded foam sealant or similar."
	23	Insert the following additional sub-clause 23: "When laid in carriageways, road lighting service ducts shall be twin walled high density polypropylene with smooth bore of 150mm in internal diameter to British Standard EN 50086-2-4, purple in colour and printed with "STREET LIGHTING" lettering at intervals of not more than one metre throughout its length. A minimum cover of 450mm shall be provided."
	24	Insert the following additional sub-clause 24: "Cable duct laid under carriageways shall consist of 2 No. 150mm ducts and having a minimum cover of 750mm and shall be protected by concrete surround of mix ST2 concrete or similar as directed by the Overseeing Organisation. The ducts shall be twin walled high density polypropylene with smooth bore of 150mm in internal diameter to British Standard EN 50086-2-4, purple in colour and printed with "STREET LIGHTING" lettering at intervals of not more than one metre throughout its length and shall

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		terminate in an underground draw-in chamber at each side of the carriageway."
	25	Insert the following additional sub-clause 25: "When laid in verges and footways, road lighting service ducts shall be twin walled high density polypropylene with smooth bore of 100mm in internal diameter to British Standard EN 50086-2-4, purple in colour and printed with "STREET LIGHTING" lettering at intervals of not more than one metre throughout its length. A minimum cover of 650mm shall be provided."
	26	Insert the following additional sub-clause 26: "Ducts shall be impervious to water, capable of being laid in temperatures down to -10 degrees C and be sufficiently flexible to follow undulation in a trench bottom."
	27	Insert the following additional sub-clause 27: "At least 75mm clearance shall be provided between the cable duct and the sides of the trench and between ducts sharing the same trench."
	28	Insert the following additional sub-clause 28: "At least 150mm clearance shall be provided between cable ducts and services pipes belonging to other Undertakers."
	29	Insert the following additional sub-clause 29: "At least 500 mm shall be provided between lighting electrical cable ducts and communications cable ducts."
1422		**Cable Joints**
	1	Delete existing sub-clause 1 and replace with: "Cable joints, other than for short term remedial work, shall not be permitted for underground cables supplying road lighting. Lighting installations shall be designed to employ a loop in - out arrangement without joints. When joints are installed these shall be made using jointing kits complying with British Standard 6910-1 which shall be installed in compliance with British Standard 6910-2. The Operating Company shall repair damaged cables by replacing the full length of the damaged cable."
	2	Delete existing sub-clause 2 and replace with: "Consent is required from the Overseeing Organisation for any remedial jointing during new work. A record shall be kept to enable cable joints to be identified with the jointer responsible for the work."
	3	Delete existing sub-clause 3 and replace with: "Cable joints shall be made where described. Additional joints shall not be provided on cables in duct or trough. Consent is required from the Overseeing Organisation for additional joints using other fixing methods."

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1423		**Armoured Cable Terminations**
	1	Delete existing sub-clause 1 and replace with: "Cables shall be individually terminated and existing cables re-terminated, and secured at switches, cut-outs and other electrical apparatus by means of a compression type gland and, where not provided as part of the apparatus, a gland plate compatible with the equipment material and complying with ' British Standard 6121-1, British Standard EN 50262'. Cable glands shall be manufactured in brass to British Standard 2874."
	2	Delete existing sub-clause 2 and replace with: "Earth connection to the cable armouring shall be made to the gland plate. At least one non ferrous earthing terminal compatible with the equipment shall be provided on the gland plate."
	3	Delete existing sub-clause 3.
1424		**Inspection and Testing to be Carried Out by the Contractor**
	2	Delete existing sub-clause 2 and replace with: "Not less than 3 months prior to commencing testing the Operating Company shall submit an Inspection and Testing Method Statement, Risk assessments, and the Extent and Limitations statement, forming part of the British Standard 7671 Electrical Installation Certificate, initial verification to the Overseeing Organisation for consent. The Extent and Limitations shall include:

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		(i) a description of the electrical aspects of the lighting units including the Class of the luminaires to be used i.e. Class I or Class II together a statement of the testing regime to be adopted for these items, (ii) the extent of the network fixed wiring covered by BS 7671 including the point of termination within the lighting units and the point of supply (origin) for the installation, and (iii) any specific issues relating to the inspection and testing of the particular electrical installation. The Inspection and Testing Method Statement shall detail all tests and items of inspection to be undertaken, the sequence of tests, how each test will be undertaken and what Records will be recorded and what values for each test will prove compliance with British Standard 7671. The Method Statement shall include the Lighting Installation design drawings and schematics. The schematic shall be suitable for inclusion within the pillars and cabinets forming part of the circuit described. Such included schematics shall be laminated or otherwise protected against damage by moisture or handling during use. The Operating Company shall ensure that all required aspects of the electrical installation are sufficiently and correctly inspected and tested as required by British Standard 7671 Part 6 and as further described in *IEE Guidance Note 3 'Inspection and Testing'*. Without reduction to the importance of any other aspect of British Standard 7671 Inspection and Testing the attention of persons undertaking this work is particularly drawn to the following: (i) A cable over-sheath insulation test shall be carried out prior to any other testing of the network cables, (ii) Continuity testing of protective conductors within the network circuits, including main and supplementary equipotential bonding conductors, shall be carried out and the values of R1+R2 with respect to the circuit origin recorded. These measurements shall be carried out in a way that excludes any 'parallel paths', (iii) The resistance of all earth electrodes shall be measured and recorded, (iv) For Periodic Testing Class I luminaires a 500V insulation test shall be carried out between the phase and neutral cores connected together relative to the earth core and metalwork of the lighting unit. The initial commissioning testing being carried out on each individual core. Insulation resistance shall not be less than 1 Mohm in either case, (v) For Periodic Testing Class II luminaires a 500V insulation test shall be carried out between the phase and neutral cores connected together relative to the metalwork of the lighting unit. The initial commissioning testing being carried out on each individual core. Insulation resistance shall not be less than 2 Mohm in either case, (vi) For the periodic testing of network cables a 500V insulation test shall be carried out, with the phase and neutral cores connected together, relative to the earth core and the metalwork of the lighting column.

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		The initial commissioning and testing being carried out on each individual core. Insulation shall not be less than 6 Mohm regardless of cable length. This test shall be carried out with cables in place and connected to the supply side of the lighting units cut-outs. During the testing all luminaires shall be isolated on the consumer side of the cut-out, (vii) The Operating Company shall record the earth fault loop impedance at the suppliers cut-out at every lighting unit with all earth conductors and earth electrodes in place in accordance with Guidance Note 3 para. 2.7.14. Values of Zs measured for any circuit shall not exceed those given in British Standard 7671 Tables 41.2 and 41.3 for 0.4 second disconnection, and (viii) The Operating Company shall ensure that inspection and testing undertaken shall be sufficient to fulfil the requirements of the Electricity at Work Regulations 1989, Regulation 4(1) and other relevant Legislation. On conclusion of the Inspection and Testing, submission of the results to the Overseeing Organisation shall take place within 7 days of the completion of each circuit inspection and testing. If, in the opinion of the Overseeing Organisation, the Inspection and Testing is not considered adequate or the installation is not considered correct then all such necessary remedial work and repeated inspection and testing shall be undertaken by the Operating Company and all corrected results submitted to the Overseeing Organisation."
	4	Delete existing sub-clause 4 and replace with: "The Operating Company shall ensure that a voltage reading is taken at each feeder pillar and at the terminals of the last current-using equipment on each circuit, with all equipment energised. Where a spur is created from the main circuit to energise a bollard, sign or similar the voltage at all such spurs shall also be recorded. The voltage measured at the last current consuming piece of equipment on a given circuit shall not be below 223.1V (3% of 230V, British Standard 7671:2008) at full load."
	5	Delete existing sub-clause 5 and replace with: "The Operating Company shall provide and maintain an installation, inspection and testing programme. The programme shall be provided to the Overseeing Organisation at least 14 days prior to any installation work being undertaken and shall be updated and provided to the Overseeing Organisation when the programme changes from that previously provided to the Overseeing Organisation. The programme shall detail duct laying, cable pulling, column erection, inspection and testing. The programme will include dates when Records will be provided."

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	6	Delete existing sub-clause 6 and replace with: "The Operating Company shall furnish the Overseeing Organisation with two copies of a Certificate verifying compliance with British Standard 7671 upon satisfactory completion of the inspection and tests. The layout of the British Standard 7671 Certificate shall conform to the sample Certificates as provided in the *LDS8005 – Electrical Inspection and Testing of Lighting and Associated Electrical Assets and Installations with Model Forms*. The separate Certificate covering the testing of the luminaires and similar items considered outside of the scope of British Standard 7671 shall also be submitted."
	8	Insert the following additional sub-clause 8: "The value of Ze provided by the electricity supplier at the electrical origin shall be no greater than 0.35 ohm for TN-C-S supplies and 0.8 ohm for TN-S supplies. The Overseeing Organisation shall not accept values that exceed these Ze maximum values. The Operating Company shall ensure the Ze values are achieved by the DNO prior to acceptance of the supply on behalf of the Overseeing Organisation."
1714		**Structural Concrete**
	1	Add the following additional paragraph to sub-clause 1: "Concrete spacers or distance tubes shall conform to British Standard 7973 and be manufactured in accordance with British Standard EN ISO 9001:2008. Plastic spacers shall not be used."
2007		Delete **Integrity Testing of Concrete Bridge Deck Waterproofing** and replace with **Integrity Testing of Bridge Deck Waterproofing**
	1	At end of sub-clause 1 add the following: The Operating Company shall provide with all batches of material delivered to the Site a Certificate of Compliance with the Specification and Annex A and in particular confirming that the material complies with the BBA Roads and Bridges Agreement Certificate. The Operating Company shall provide 2 No free film samples, sprayed on to open moulds (at least 200 millimetres x 200 millimetres in area and minimum thickness two millimetres), for tensile strength, elongation at break to British Standard ISO 37:2011and tear strength to British Standard ISO 34 Part 1:2012 Method C. The Operating Company shall supply copies of the test results with the samples. A membrane can be applied to the surface of concrete slabs between 14 to 17 days after casting provided no water was added to the surface of the concrete during cure. The Operating Company shall continuously monitor the coverage rate of the material applied to the deck and shall provide sheets on a daily basis showing the start / finish weights and area covered for each period of spray operation.

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		The Operating Company shall continuously monitor the wet film thickness using a gauge pin or a standard comb type thickness gauge. The Operating Company shall provide sheets on a daily basis indicating the wet film thickness measured and location. The Operating Company shall measure the adhesion of the fully cured membrane to the deck using Elcometer Adhesion Tester Model 106 or similar. The Operating Company shall provide test values and location of test before these areas are covered. Minimum adhesion values shall be as follows: for Primer: 2.0 N/mm² on steel 1.0 N/m² on concrete Suggested rates of testing: 1 adhesion test (dolly) per 20m² of deck plate or the nearest equivalent depending on panel areas. for Waterproofing: 2.0 N/mm² on steel 1.0 N/mm² on concrete Three tests shall be required per 500 square metres of sprayed membrane. The Operating Company shall reinstate the test areas including primer if necessary. Test values below the minimum values specified above shall require spraying operations to be suspended while further investigation is undertaken. The Operating Company shall at its own expense remove and re-spray areas that do not meet the required figures.
		The finished waterproof membrane surface shall be 'Holiday Tested' or tested by an equivalent method consented to in writing by the Overseeing Organisation and any imperfections detected shall be rectified by the Operating Company at its own expense. The Operating Company shall make allowance in his programme of Works for such testing. **High Voltage Pinhole / Holiday Detection for Bridge Deck Membranes Equipment** Pinhole detection shall be carried out using suitable equipment and the results made available to the Overseeing Organisation. The equipment shall have the following facilities: a. variable DC test voltage (1 - 20 kilovolts DC), b. audible and visual alarm signals, c. sensitivity adjustment, d. phosphor bronze or silicon rubber electrode, e. earth lead connection with clip, and f. test voltage. The output voltage of the pinhole detector shall be adjusted in accordance with the following table. **COATING THICKNESS** **TEST VOLTAGE** 2 millimetres to 2.5 millimetres 12.5 kilovolts

Clause No.		Alterations to be made
		2.5 millimetres to 3 millimetres 13.5 kilovolts The coating thickness is the maximum expected not the average. **Procedure** (a) Identify a site on the bridge deck to which the earth lead connection from the pinhole detector can be fixed, i.e. a metal object imbedded in the bridge deck, (b) Connect the leads from the pinhole detector in accordance with the manufacturer's written instructions, (c) Fix the earth lead from the pinhole detector to the substrate and ensure that a good electrical contact is made, (d) Adjust the pinhole detector to the required test voltage in accordance with Sub-Clause (a) above, (e) With the pinhole detector turned OFF, connect any extension rods that may be required to the test probe handle. Connect the electrode to the end of the extension rods if fitted. A damaged electrode that does not make 100 per cent contact along its length shall not be used, (f) Pass the electrode over the coated surface at a maximum rate of 100 millimetres / second, paying particular attention to edges, holes and visible irregularities in the coating. The test voltage will have to be reduced if testing edges as the coating will be thin, (g) To check the pinhole detector is working correctly, touch the electrode onto the exposed substrate. The pinhole detectors alarm signal should be activated. If not, check the lead connections to the equipment and the earth lead to the substrate, also it may be necessary to adjust the sensitivity control on the equipment, (h) When a fault has been identified by the detector, the electrode shall be moved sideways in order to identify its precise location. Subsequently the fault should be ringed with a suitable marker. Such markings shall be made sufficiently distant from the coating Defect to allow the repair procedure to be carried out without detriment to the adhesion of the repair material, and (i) Continue testing and marking defects until all the coating has been tested, changing the electrode size as necessary. All repaired areas shall be re-tested.

<table>
<tr><td>Clause No.</td><td></td><td>Alterations to be made</td></tr>
<tr><td></td><td></td><td>Brickwork, Blockwork And Stonework</td></tr>
<tr><td>2404</td><td></td><td>Mortar</td></tr>
<tr><td></td><td>3</td><td>In sub-clause 3, add cement designation (iv) to Table 24/1 as follows:
<table>
<tr><td>Mortar Designation</td><td>Cement: Lime: Stone dust</td><td>Masonry Cement: Stone dust</td></tr>
<tr><td>(iv)</td><td>1:1:5 to 6</td><td>1:4½</td></tr>
</table></td></tr>
<tr><td></td><td>7</td><td>Insert the following additional sub-clause 7:

"Where joints less than 2 mm wide in natural stone ashlar stonework shall be required a cement mortar designation (iv) containing natural stone dust of the same colour as the adjacent masonry shall be used. However, for sandstones and similar weaker masonry, a suitable lime mortar mix shall be selected based on clause 2476AR and Appendix 24/1."</td></tr>
<tr><td>2412</td><td></td><td>Brickwork and Blockwork</td></tr>
<tr><td></td><td>5</td><td>Delete existing sub-clause 5 and replace with:

"Not used."</td></tr>
<tr><td>2417</td><td></td><td>Unreinforced Masonry Arch Bridges</td></tr>
<tr><td></td><td></td><td>In sub-clause 8 delete the Table and replace with the following table:
<table>
<tr><td colspan="2" rowspan="2">Location / Element</td><td colspan="4">Masonry Unit Type</td></tr>
<tr><td>Class A Eng Brickwork</td><td>Class B Eng Brickwork</td><td>Common Brickwork/ blockwork/ stonework with joints more than 2mm wide</td><td>Natural stone ashlar stonework with joints less than 2mm wide</td></tr>
<tr><td colspan="2">Below a level of 150mm above finished ground level</td><td>(i)</td><td>(ii)</td><td>(ii)</td><td>(iv)</td></tr>
<tr><td rowspan="2">Above a level of 150mm above finished ground level</td><td>Abutments, spandrel/ wing walls, piers and parapets</td><td>(i)</td><td>(ii)</td><td>(iii)</td><td>(iv)</td></tr>
<tr><td>Arch rings</td><td>(ii)</td><td>(ii) or (iii)</td><td>(iii)</td><td>(iv)</td></tr>
</table></td></tr>
<tr><td>3006</td><td></td><td>Planting</td></tr>
<tr><td></td><td>14</td><td>Insert the following additional sentence at end of sub-clause 14:

"Compost produced to PAS 100:2005 may be used."</td></tr>
</table>

Clause No.		Alterations to be made
3007		**Grass, Bulbs and Wildflower Maintenance**
	1	For the purposes of this Clause, Appendix 30/7 of Schedule 9 Part 2 and paragraph 4.15 of Schedule 7 Part 1, grass shall mean the sward including any type of vegetative growth therein. Delete existing sub-clause 1 and replace with: "The grass and wildflower areas to be maintained are scheduled in Appendix 30/7. Prior to any cutting operation all stones or other harmful material from whatever source which may damage grass cutting plant or create a possible hazard to persons or property shall be removed off Site. Not more than 48 hours prior to grass cutting the area to be cut shall be cleansed of litter to Grade B standard as stated in the Code of Practice on Litter and Refuse and any litter susceptible to shredding shall be removed. Any movable obstructions such as seats and litterbins shall be removed to facilitate cutting and replaced prior to leaving the Site. The use of weed killer or other chemical substances shall not be used in order to restrict the growth of grass. Where the areas contain injurious weeds as listed in sub-Clause 3002.1, the first cut of any year shall be undertaken prior to the weeds flowering and additional selective cuts shall be undertaken within these areas as required in Appendix 30/7 or instructed by the Overseeing Organisation. No grass cutting shall be carried out within 250 mm of unprotected trees and shrubs. Strimmers shall not be used for cutting grass within unprotected planted areas without the written consent of the Overseeing Organisation."
	2	Delete existing sub-clause 2 and replace with: "Tractors mounted with grass cutting equipment shall comply with manufacturer's recommendations regarding the fitting and operation of attachments. Grass cutting equipment fitted to tractors shall comply with manufacturer's recommendations regarding the fitting and operation of such attachments. All dedicated grass-cutting machines shall have an effective silencer of the type originally fitted on manufacture. All grass cutting equipment, whether self-propelled or attached to a tractor, shall comply with the following: (i) All cutters and blades shall be sharpened and set according to the manufacturer's recommendations to ensure a consistent cleanly mown sward and the height of cut determined as the height above ground level to the cutting blade measured with the machine standing on a hard level surface, (ii) All guards shall be in place and in good condition and all safety devices shall be operational and of a type originally fitted on manufacture, and (iii) For grass and vegetation cutting on slopes, the grass-cutting equipment manufacturer's recommendations relating to safe gradients for cutting shall be observed.

Clause No.		Alterations to be made
		All vehicles involved in verge and visibility area cutting shall comply with the requirements of clause 117."
	3	Delete existing sub-clause 3 and replace with: "Grass shall be cut cleanly and evenly to achieve the outcomes specified in this clause, without damage to the existing surface. Soft vegetative growth such as clover and other broad-leaved vegetation shall be deemed to be part of the cutting operation where it falls within areas of grass."
	5	Delete existing sub-clause 5 and replace with: "The grass cutting operation shall include cutting around all obstacles such as trees, posts and signs. Strimmers may be used where appropriate. Areas around obstacles shall be cut to the same height as specified for the surrounding grassed areas. Strimming shall be carried out within two days of grass cutting of surrounding areas, such that cut grass and strimmed grass shall have a similar appearance."
	6	Delete existing sub-clause 6 and replace with: "Mowing operations shall avoid spillage of debris such as stones onto carriageways or footways. Grass clippings and arisings shall be dispersed evenly over the sward except as set out below under which circumstances they shall be removed from Site: (i) for the first cut of the year in areas of high amenity, amenity or general grass, (ii) for grassed central reservations, (iii) when cutting is carried out in high winds, or when high winds are forecast, which could lead to arisings being blown around, (iv) clippings and arisings lying on roads, footpaths, car parks and other hard surfaces, (v) arisings that could lead to the blockage of ditches or drains, and (vi) where clippings or arising are sufficiently thick as to be detrimental to the underlying sward."
	7	Delete existing sub-clause 7 and replace with: "During periods when ground conditions are so wet as to prevent grass cutting without causing damage to the surface or producing divots, Operations shall cease and shall recommence only when ground and weather conditions are suitable. The Operating Company shall record and report all such conditions."
	9	Delete existing sub-clause 9 and replace with: **"Grass Cutting – High Frequency** In the locations stated in Appendix 30/7, for high amenity grass, grass shall be cut to maintain a height of between 25mm and 75mm."

Clause No.		Alterations to be made
	10	Delete existing sub-clause 10 and replace with: **"Grass Cutting: Medium Frequency** In the locations stated in Appendix 30/7, for amenity grass, grass shall be cut to maintain a height of between 50mm and 150mm **Grass Cutting: Low Frequency** In the locations stated in Appendix 30/7, for general grass, grass shall be cut as follows: (i) Grass shall be cut to maintain a height of between 80mm and 300mm, and (ii) Grass shall be cut to prevent an obstruction of a sight line or the visibility of a sign or other item. **Grass Cutting: Minimal Frequency** In the locations stated in Appendix 30/7, for rough grass, grass shall be subject to minimal frequency cutting as follows: (i) to remove a hazard, (ii) to promote biodiversity, and (iii) as a minimum cut in alternate years.**"**
	11	Delete existing sub-clause 11 and replace with: "Not used."
	12	Delete existing sub-clause 12 and replace with: "Not used."
	13	Delete existing sub-clause 13 and replace with: "**Maintenance of Edges** The edges of planted areas adjoining kerbs, hard surfaces and structures shall be cut in order to maintain the original shape of the grass area. Herbicide treatment in lieu of edging will not be permitted."
	14	Delete existing sub-clause 14 and replace with: "The edges of planted areas adjoining kerbs, hard surfaces and structures shall be re-formed as necessary in order to maintain the original shape and dimension of the grass area. Where edges abut planted areas, re-forming shall include drawing back the soil from the edges so that edging shears can be used."
	15	Delete existing sub-clause 15 and replace with: "Where edges abut hard surfaces, re-forming shall include the removal of any soil or vegetation growing on or through the hard surface."
	17	Delete existing sub-clause 17 and replace with: "Not used."

Clause No.		Alterations to be made
	18	Delete existing sub-clause 18 and replace with: "In the locations in the landscape inventory not covered by any of the high, medium or low frequency regimes, a single cut shall be undertaken once in the second Annual Period and subsequently every two years. The cut shall be to a height not exceeding 150 mm and the cuttings evenly dispersed to leave a neat and uniform appearance."
	19	Delete existing sub-clause 19 and replace with: "Not used."
	20	Delete existing sub-clause 20 and replace with: "Where there is a possibility of the sign being obscured by grass, visibility splays in front of road signs shall be cut in accordance with requirements for Grass Cutting – Minimal Frequency for general grassed areas. The cut shall extend from the edge of the carriageway, at a point 50 m from the sign and be splayed to meet the full width of the sign. This will only be required where there is a low level sign or on a slope."
	25	Delete existing sub-clause 25 and replace with: "Where it is stated in the landscape inventory that grass and herbaceous plants shall be cut in planted areas/plantations, the Operating Company shall cut between the woody plants over the whole area up to the boundaries of the planted area/plantation, whilst avoiding damage to the trees and shrubs, leaving no areas uncut and producing an even sward height across the whole area."
	26	Delete existing sub-clause 26 and replace with: "Where cutting of wildflowers or areas of other floral interest in rough grass is required, one or more of the following operations, shall be carried out, as identified in the landscape inventory: (i) Annual Spring/Summer Cut Areas shall be cut to a height of between 50 and 60 mm after the seeding of desirable species, in late spring/early summer. Arisings shall be raked off and removed off Site, avoiding any pulling, tearing or causing other damage to the soil surface and retained vegetation, (ii) Annual Summer/Autumn Cut Areas shall be cut to a height of between 50 and 60 mm after the seeding of desirable species, in late summer/early autumn. Arisings shall be raked off and removed off Site, by such means that avoids pulling, tearing or causing other damage to the soil surface and retained vegetation, (iii) Topping Cut Areas shall be cut to a height of between 80 and 100 mm after the seeding of desirable species, in late autumn, with the cuttings being finely chopped and evenly dispersed over the area, and (iv) Biennial Cut Areas shall be cut to a height of between 50 and 60 mm, after the seeding of desirable species, every alternate year. Arisings shall be raked off and removed off Site.

Clause No.		Alterations to be made
		If no specific requirements are identified in the landscape inventory then wildflower areas and areas of other floral interest in rough grass shall receive a topping cut in accordance with paragraph (iii) above. The Operating Company shall seek the Overseeing Organisation's consent to alter the requirement to a Biennial Cut in accordance with sub-clause 3007.26 paragraph (iv) if it believes it would be in the best nature conservation interest."
	27	Delete existing sub-clause 27 and replace with: "Within the wildflower areas or areas of other floral interest stated in the landscape inventory, the cutting shall include areas of bramble, tree and shrub saplings of less than 20 mm diameter. Cutting shall be timed to allow for prior seeding of desirable species."
	29	Delete existing sub-clause 29 and replace with: "Where directed and subject to an Order, weed control in wildflower areas shall be carried out using spot treatment with a translocated herbicide applied in accordance with sub-clause 3002.7, at the appropriate frequency."
	31	Delete existing sub-clause 31 and replace with: "In high amenity, amenity and general grass areas, molehills shall be removed before grass-cutting and the soil distributed on nearby cultivated areas."
	32	Delete existing sub-clause 32 and replace with: "Bulb foliage within ornamental planting areas shall be cut down when leaves have died back naturally, not earlier than six weeks after flowering and normally early June for Narcissus species. Bluebell stands shall not be cut. Arisings shall be raked up and removed off Site."
3009		**Establishment Maintenance for Planting**
	4	Delete existing sub-clause 4 and replace with: "Stakes, tubes, guards and ties shall be removed from plants where they are no longer required and either disposed of off Site or reused if suitable."
3010		**Maintenance of Established Trees and Shrubs**
	1	Delete existing sub-clause 1 and replace with: "All areas of established planting/vegetation to be maintained each year until the Service End Date shall be as shown within the landscape inventory. Established tree and shrub planting shall be maintained in the locations and over the times stated below.

Clause No.		Alterations to be made
	1.1	Hedges which are distinct linear planting strips within the road corridor are intended to be formally shaped and maintained. Maintenance requirements and frequency are: (a) Trimming/pruning: Once per year – arisings shall be removed, (b) Laying: When subject to an Order, (c) Gapping up: When subject to an Order, (d) Checking/topping-up mulch: Once per year if required, and (e) Weeding: Hedges under 5 years old shall be kept weed free.

Clause No.		Alterations to be made
	1.2	Shrubs which are sub divided into: (i) Ornamental shrubs – planted as a visual element of the road corridor – usually associated with settlements and urban roundabouts, and (ii) Informal shrubs – generally native major and minor shrub species (excluding gorse and broom) informally planted or developing along the road corridor up to a maximum height of approximately 3.5m. The level and frequency of maintenance for shrubs is adjusted according to the level of maintenance required (high, medium and low). The category of maintenance and frequency relates to the category of the adjacent grass cutting i.e. high maintenance shrub treatment is undertaken in areas of high amenity/high frequency grass cutting, medium maintenance shrub treatment is undertaken in areas of amenity grass/medium frequency grass cutting and low maintenance shrub treatment is undertaken in areas of general grass/low frequency grass cutting, as follows: (i) High Maintenance: (a) Weeding: Monthly during growing season, (b) Pruning/cutting back/ removal/ disposal of arisings: Once per year, (c) Checking/topping-up mulch: Once per year if required, and (d) Gapping-up: When subject to an Order. (ii) Medium Maintenance: (a) Weeding: Three times during growing season, (b) Pruning/cutting back/ removal/disposal of arisings. Once per year, (c) Checking/topping up mulch. Once per year if required, and (d) Gapping up. When subject to an Order. (iii) Low Maintenance: (a) Weeding. Twice during growing season, (b) Pruning/cutting back/removal/disposal of arisings. Once every two years, and (c) Cutting back. When subject to an Order.
	1.3	Woodland which is sub divided into: (i) New woodland, under 5 years old, a newly planted or self-seeded area of predominantly tree species with the potential of developing into a mature wooded area. Any new planting undertaken through

Clause No.		Alterations to be made
		this Contract will be subject to establishment maintenance for three years in accordance with sub-clause 3002.7, (ii) Establishing Woodland, between 5 and 10 years old, a developing area of tree species with or without woodland shrubs and with the potential of developing into a mature wooded area, and (iii) Maturing Woodland, over 10 years old, an established area of dense tree cover, whether single or mixed species/ varieties and with or without a woodland shrub layer. Maintenance requirements and frequency are as follows: (i) New Woodland: (a) Weeding. Twice during growing season when subject to an Order, (b) Pruning/cutting back/removal/disposal of arisings. When subject to an Order, (c) Checking and adjusting any stakes/shelters, ties. When subject to an Order, (d) Removing any stakes/shelters/ties. When subject to an Order, (e) Re-firming plants. Once per year, and (f) Replacement planting. When subject to an Order. (ii) Establishing Woodland: (a) Weeding. Once per year when subject to an Order, (b) Pruning/cutting back/removal/disposal of arisings. When subject to an Order, (c) Thinning/coppicing. When subject to an Order, and (d) Clearing/felling. When subject to an Order. (iii) Maturing Woodland: (a) Pruning/cutting back/removal/disposal of arisings. When subject to an Order, (b) Thinning/coppicing. When subject to an Order, and (c) Clearing/felling. When subject to an Order.

Clause No.		Alterations to be made
	1.4	Scrub which is areas of self-seeded vegetation, predominantly (but not exclusively) gorse, broom, birch and /or bramble, up to a height of approx. 2.5m. Maintenance requirements and frequency are as follows: (a) Cutting back. When subject to an Order except where scrub growth is impacting on (or has the potential to impact on) a sightline area when scrub shall be cut back as required, (b) Clearing. When subject to an Order except where scrub growth is impacting on (or has the potential to impact on) a sightline area when scrub shall be cut back as required, and
		(c) Removal/disposal of arisings. When subject to an Order unless scrub cut is undertaken due to impact on a sightline, when arisings shall be removed from Site as part of the maintenance Operations.
	1.5	Individual trees which are lone trees, or trees with no interlocking canopy with the nearest neighbours, and sporadic trees where there is a loose arrangement of established trees with occasional interlocking canopies. Maintenance and frequency are as follows: (a) Pruning/cutting back. When subject to an Order except where tree growth is impacting on (or has the potential to impact on) a sightline area when the vegetation shall be cut back as required, (b) Removal/treatment of arisings. When subject to an Order unless vegetation removal is undertaken due to impact on a sightline, when arisings shall be removed from Site as part of the maintenance operation, (c) Checking and adjusting any stakes/shelters/ties. Once per year, (d) Removing any stakes/shelters/ties. When subject to an Order, (e) Re-firming plants. Once per year, and (f) Replacement planting. When subject to an Order."
3011		**Management of Waterbodies**
		Reedbeds and Marginal Plants
	9	Delete existing sub-clause 9 and replace with:
		"Reedbeds and marginal plants as described in Appendix 30/11 shall be inspected twice per year in early February and October or at other times stated in Appendix 30/11, and their condition reported to the Overseeing Organisation."