



An agency of  The Scottish Government

# M8 M73 M74 MOTORWAY IMPROVEMENTS

**DBFO AGREEMENT**

**Schedule 4 - O&M Works Requirements**

**Part 5: Specification**

TS/MTRIPS/WKS/2011/04



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## **SCHEDULE 04 - O&M WORKS REQUIREMENTS**

### **PART 5: SPECIFICATION**

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## SCHEDULE 4 - O&M WORKS REQUIREMENTS

### PART 5: SPECIFICATION

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## **Preamble to the Specification**

### **1 Preamble to the Specification**

1.1 The Specification for the O&M Works Requirements shall be the Specification for Highway Works, published by The Stationery Office as Volume 1 of the MCHW current on the Reference Date, as modified and extended by the following:

- i) Appendix 0/1: Additional, Substitute and Cancelled Clauses, Tables and Figures Specific to the Agreement;
- ii) Appendix 0/2: Agreement-Specific Minor Alterations to Existing Clauses, Tables and Figures included in the Agreement;
- iii) The Numbered Appendices listed in Appendix 0/3; and
- iv) Appendix 0/5: Special National Alterations of the Scottish Ministers.

1.2 Appendix 0/4 contains a list of the Drawings.

1.3 The relevant publication date of each page of the Specification for Highway Works is given in the Schedule of Pages and Relevant Publication Dates, contained in this Preamble to the Specification.

1.4 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 Agreement-specific alteration.

1.5 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 Agreement-specific alteration.

1.6 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 Agreement-specific alteration.

1.7 Insofar as any of the Numbered Appendices may conflict or be inconsistent with any provision in 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.

1.8 Any reference in these O&M Works Requirements to a Specification 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.

1.9 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.

1.10 Where a Clause in the Specification relates to work, goods or materials which are not required for the O&M Works it shall be deemed not to apply.

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

1.12 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 Organisations of Scotland, Wales or Northern Ireland.

## **Preamble to the Specification**

- 1.13 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.
- 1.14 The substitute National Clauses are located at the end of the relevant Series together with the additional National Clauses of the Overseeing Organisation.
- 1.15 Other than where references to the Overseeing Organisation are made in the context of the Overseeing Organisation granting statutory or type approvals, the roles and functions of the Overseeing Organisation shall be undertaken by the Scottish Ministers.
- 1.16 Where the Specification requires the provision of documentation to the Overseeing Organisation for statutory or type approval such documentation shall be provided to the Scottish Ministers.
- 1.17 The Specification is used in conjunction with this Agreement and, the delegation of the roles and functions of the Overseeing Organisation as stated in Section 1.15 above shall be amended as follows:
  - (a) If any agreement, consent or approval required to be obtained from the Overseeing Organisation impacts on the health and safety of the general public, the environment or any property or equipment not owned or operated by the Company or the O&M Works Contractor, such agreement, consent, or approval shall be obtained from the Scottish Ministers.
  - (b) Where the Specification provides for the Overseeing Organisation to require a test, waive the requirement for a test or alter testing frequency, the party to whom the Overseeing Organisation's roles and functions have been ascribed by Clause 1.15 above shall exercise such decisions in accordance with the O&M Works Requirements stated in this Agreement.
- 1.18 Where a Clause or Sub-Clause in the Specification is annotated by "05/01" or similar, this indicates the relevant publication date that alteration(s) to the Clause or Sub-Clause were made. The first double digit refers to the month, and the second double digit refers to the year.
- 1.19 The following interpretations shall be applied to words or terms used in documents referred to in this Part 5
  - (a) except where the context requires otherwise, "Engineer" shall be deemed to be a reference to the "Designer" where such an interpretation is necessary for the Company to fulfil its obligations in regard to the Design.
  - (b) where a Numbered Appendix is referred to it shall mean a reference to the Numbered Appendix included in this Part 5
  - (c) all references to the "Site" shall be deemed to be references to lands and other places on, under, in, or through which the O&M Works shall be constructed; and
  - (d) any reference to a "British Standard" shall permit the use of an equivalent European standard.

**Preamble to the Specification**

**Schedule of Pages and Relevant Publication Dates of Specification for Highway Works**

<b>Series/Appendix</b>	<b>Page Number</b>	<b>Publication Date</b>
000	1	March 1998
000	3F	May 2005
000	2	November 2006
100	2	May 2001
100	W1F	May 2005
100	12 to 14, 20F	November 2005
100	1, 3 to 7, N1, N3	May 2006
100	8 to 11, 15 to 19, N2, N4	November 2006
100	N5, N6F	November 2008
200	1, 3F	May 2001
200	2	May 2004
300	1	May 2001
300	4	November 2002
300	2, 3, 5, 6F	May 2008
400	1 to 6, 8, 10 to 13F	November 2007
400	7, 9	November 2008
500	23 to 24, 26	November 2004
500	28F	May 2005
500	3, 22, N1F	May 2006
500	2, 5, 27	November 2006
500	6, 25	November 2007
500	1, 4, 7 to 21	November 2009

**Preamble to the Specification**

Series/Appendix	Page Number	Publication Date
600	33	November 2003
600	2, 27 to 28, 30 to 32, 34 to 36, N1	November 2005
600	25 to 26	November 2006
600	42 to 49, 51 to 68F	November 2007
600	37, 50	November 2008
600	1, 3 to 24, 29, 38 to 41, S1 to S3F, N2 to N4F	November 2009
700	2 to 3, 5 to 6, N1, N3 to N5F	November 2006
700	33 to 34F	November 2007
700	4, N2	August 2008
700	1, 7 to 32F	November 2009
800	1 to 25F	November 2009
900	2 to 5, 9 to 22, 24 to 26, 28 to 67F	August 2008
900	1, 6 to 8, S1F	November 2008
900	23, 27	May 2009
1000	3, 5 to 6	November 2005
1000	1 to 2, 4, 7 to 15, 19 to 33F	May 2006
1000	16 to 18	November 2006
1100	1, 4F	November 2004
1100	2, N1F	November 2006
1100	3	August 2008
1200	5	May 2001
1200	2 to 3, W1F	August 2003

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Series/Appendix	Page Number	Publication Date
1200	1, 14 to 16F	May 2004
1200	4, 9 to 11, 13	May 2005
1200	12	November 2006
1200	6 to 7, N1 to N4F	November 2007
1200	8	May 2008
1300	N2F	November 2003
1300	3 to 4	November 2004
1300	1, 5 to 10, 12F	November 2005
1300	2, 11, N1	May 2006
1400	2, N1F	May 2001
1400	1, 3 to 9F	May 2006
1500	7	May 2001
1500	2	February 2003
1500	3 to 4, 8 to 11, 13	November 2004
1500	1, 5 to 6, 12, 14 to 17F	November 2006
1600	1, 4 to 5, 9, 15, 17 to 18, 24 to 26, 29 to 31, 35, 38, 49F	March 1998
1600	2, 6 to 8, 10 to 14, 16, 19, 27 to 28, 32 to 34, 36 to 37, 39 to 42, 44 to 48	November 2003
1600	3, 20 to 23, 43	November 2005
1700	2 to 7, 10 to 15	May 2004
1700	8 to 9	May 2005
1700	1, 16 to 22F	May 2006
1800	1, 4, 6, 8 to 9	May 2004

**Preamble to the Specification**

<b>Series/Appendix</b>	<b>Page Number</b>	<b>Publication Date</b>
1800	2 to 3, 5, 7, 10 to 12F	November 2005
1900	17	May 2003
1900	1, 5, 8 to 14, 16, 18 to 30F, S1 to S2F	May 2005
1900	6, 7, 15	May 2008
1900	2 to 4	November 2008
2000	1, 3 to 4F	May 2001
2000	2	November 2004
2100	1, 4F	March 1998
2100	2	November 2003
2100	3	November 2005
2300	1	March 1998
2300	2 to 3F	May 2001
2400	1, 4, 7F	May 2005
2400	2	May 2006
2400	3, 5 to 6	May 2008
2500	1	May 2001
2500	2, 8, 11F	November 2003
2500	10	November 2004
2500	6 to 7, 9	May 2005
2500	5	May 2006
2500	3 to 4	November 2006
2600	1	March 1998

**Preamble to the Specification**

<b>Series/Appendix</b>	<b>Page Number</b>	<b>Publication Date</b>
2600	2 to 4	November 2003
2600	5	November 2004
2600	6	May 2005
2600	7F	November 2006
3000	1, 4 to 7, 10, 12 to 17, 19, 22 to 27F	May 2001
3000	20	November 2004
3000	2 to 3	May 2006
3000	8 to 9, 11, 18, 21	May 2008
5000	1, 4 to 19F, S1F	May 2005
5000	2 to 3	November 2008
Appendix A	1 to 32F	May 2008
Appendix B	1	May 2006
Appendix B	2 to 7F	November 2006
Appendix C	1	May 2005
Appendix C	2F	November 2006
# Appendix D	1F	May 2005
Appendix D(NI)	N1F	March 1998
# Appendix E	1F	May 2005
Appendix E(NI)	N1F	May 2005
Appendix F	14	November 2008
Appendix F	1 to 13, 15 to 56F	May 2009

**Preamble to the Specification**

<b>Series/Appendix</b>	<b>Page Number</b>	<b>Publication Date</b>
<b>Appendix G</b>	1F	May 2004
<b>Appendix H</b>	1	May 2004
<b>Appendix H</b>	2	November 2005
<b>Appendix H</b>	3	November 2006
<b>Appendix H</b>	4 to 9F	November 2008

Appendix 0/1: Additional, Substitute and Cancelled Clauses, Tables and Figures Specific to This Agreement

**List of Additional Clauses, Tables and Figures**

Clause Number	Title	Written on Page Number following
070AR	Disability Discrimination Act	
170AR	Licenses Servitudes Wayleaves and Rights of Access	
171AR	Depots	
172AR	Location of Work	
173AR	Cleanliness of O&M Works Site and Use of Land	
174AR	Site Safety	
175 AR	Material Stocks	
178AR	Other Works on the O&M Works Site	
270AR	Tree Felling	
271AR	Existing Vegetation	
273AR	Sign Posts	
370AR	Rabbit, Hare, Deer and Otter Fence Specifications	
371AR	Repair to and Removal of Existing Fencing	
372 AR	Snow Fences	
470AR	Repairs to Road Restraint Systems	
471AR	Repairs to Existing Pedestrian Guardrail	
472AR	Re-tensioning of Safety Barriers	
473AR	Painting of Pedestrian Guardrails and Handrails	

Appendix 0/1: Additional, Substitute and Cancelled Clauses, Tables and Figures Specific to This Agreement

Clause Number	Title	Written on Page Number following
573AR	Renewal of Filter Drains	
575AR	High Pressure Water Jetting	
576AR	High Pressure Water Jetting and Suction	
577AR	Closed Circuit Television Surveys	
971AR	Stone Mastic Asphalt Surface Course	
973AR	Overband Sealing	
976AR	Pavement Cores	
1171AR	Relaying of Existing Footways	
1172AR	Siding Out	
1173AR	Artificial Stone Paving or Natural Stone Paving and Precast Concrete Paving Flags and Blocks	
1174AR	Laying of Artificial Stone Paving Natural Stone Paving and Precast Concrete Paving Flags	
1179AR	Timber Edging to Footways	
1270AR	Electroluminescent Signs for Traffic and Gantry Signs	
1271AR	Solar Powered Units	
1272AR	Chart Node and Section Markers	
1273AR	Night Visibility	
1274AR	Routine Maintenance of Traffic Signs, Hazard Posts, Illuminated Bollards Marker Posts Telephone Hoods Refuge Beacons and ECP Cylinders	
1275 AR	Routine Maintenance of Sign Lighting Units	
1276AR	Routine Maintenance of Traffic Signals	
1277AR	Non Routine Maintenance of Traffic Signals	

Appendix 0/1: Additional, Substitute and Cancelled Clauses, Tables and Figures Specific to This Agreement

Clause Number	Title	Written on Page Number following
1370AR	Routine Maintenance of Road Lighting Units	
1371AR	Cleaning Methods and Materials	
1372AR	Lamp Disposal	
1373AR	Removal of Existing Equipment	
1374AR	Routine Maintenance of High Mast Lighting	
1470AR	Special Tools	
1471AR	Temporary Overhead Feed to Lighting Unit	
1472AR	Non Routine Maintenance	
1670AR	Static Load Testing of Piles	
1671AR	Pile Integrity Tests	
1672AR	Drilling Fluid	
1673AR	Ground Investigation	
1674AR	Geotechnical Reporting	
1675AR	Geotechnical Categorisation	
1770AR	Construction Tolerances in Structural Concrete	
1771AR	Reinforcement Couplers	
1772AR	Concrete Repairs – General Requirements	
1773AR	Removal of Concrete in Areas to be Repaired	
1774AR	Surface Preparation	
1775AR	Concrete Repairs	
1776AR	Foamed Concrete Fill to Structures and Backfilling to Drainage Trenches	

Appendix 0/1: Additional, Substitute and Cancelled Clauses, Tables and Figures Specific to This Agreement

Clause Number	Title	Written on Page Number following
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<b>1778AR</b>	Early Thermal Cracking	
<b>2070AR</b>	Replacement of Bridge Deck Waterproofing	
<b>2071AR</b>	Repairs to Existing Waterproofing	
<b>2170AR</b>	Permanent Works Bolts	
<b>2171AR</b>	Bearing Replacement	
<b>2370AR</b>	Bridge Expansion Joints Used on Bridge Decks	
<b>2371AR</b>	Replacement of Bridge Deck Expansion Joints and Gap Sealants	
<b>2372AR</b>	Asphaltic Plug Joints	
<b>2470AR</b>	Repointing of Brickwork Blockwork and Stonework	
<b>2471AR</b>	Replacement of Precast Concrete Copings	
<b>2472AR</b>	Rebedding Existing Precast Concrete	
<b>2473AR</b>	Replacement Tiling	
<b>2474AR</b>	Rebuilding of Defective Masonry	
<b>2475AR</b>	Lime Putty	
<b>2476AR</b>	Hydraulic Lime Mortars	
<b>2670AR</b>	Anti-Graffiti Coatings	
<b>2671AR</b>	Graffiti Removal	
<b>2674AR</b>	Convex Safety Mirrors in Underpasses and Culverts used by Pedestrians and Cyclists	

Appendix 0/1: Additional, Substitute and Cancelled Clauses, Tables and Figures Specific to This Agreement

Clause Number	Title	Written on Page Number following
<b>2801AR</b>	Winter Maintenance Operation	
<b>2802AR</b>	Basic Facility	
<b>2803AR</b>	Salting and De-Icing Operations	
<b>2804AR</b>	Snow Clearing Operations	
<b>2805AR</b>	Company's Vehicles and Construction Plant	
<b>2806AR</b>	Not Used	
<b>2807AR</b>	Maintenance of Company's Vehicles and other Construction Plant	
<b>2808AR</b>	Not Used	
<b>2809AR</b>	Winter service vehicle data receiving, storing, archiving and web based systems	
<b>2810AR</b>	Winter service vehicle data logging and transmission equipment	
<b>3101AR</b>	Road Cleaning and Clearance	
<b>3102AR</b>	Litter and Debris Clearance	
<b>3103AR</b>	Removal of Dead Animals	
<b>3201AR</b>	Incident Response Operations	
<b>3202AR</b>	Temporary Concrete Road Restraint Systems	
<b>3270AR</b>	Incident Response	
<b>3301AR</b>	Rotary Coring in Carriageways	
<b>3302AR</b>	Rotary Coring in Structures	
<b>3303AR</b>	Structural Investigations	
<b>3304AR</b>	Inspection Patches Within Surfacing on Bridge Structures	
<b>3305AR</b>	Trial Holes in Paved Areas	

Appendix 0/1: Additional, Substitute and Cancelled Clauses, Tables and Figures Specific to This Agreement

Clause Number	Title	Written on Page Number following
<b>3306AR</b>	Falling Weight Deflectometer Tests	
<b>3307AR</b>	Dynamic Cone Penetrometer Tests	
<b>3308AR</b>	Structural Investigation Tests	
<b>6101AR</b>	Maintenance of Road Restraint Systems	
<b>6102AR</b>	Maintenance of Gullies, Piped Grips, Catchpits Soakaways and Oil Separators	
<b>6103AR</b>	Maintenance of Drainage Grips	
<b>6104AR</b>	Maintenance of Linear Drainage Systems	
<b>6105AR</b>	Maintenance of Filter Material	
<b>6106AR</b>	Maintenance of Drainage Structures	
<b>6107AR</b>	Maintenance of Ancillary Drainage Items	
<b>6108AR</b>	Litter and Refuse	
<b>6109AR</b>	Maintenance of Road Studs	
<b>6110AR</b>	Maintenance of Structures – General	
<b>6111AR</b>	Maintenance of Expansion Joints	
<b>6112AR</b>	Maintenance of Bridge Drainage Systems	
<b>6113AR</b>	Maintenance of Parapets and Pedestrian Protection on Structures	
<b>6114AR</b>	Maintenance of Bearings and Bearing Shelves	
<b>6115AR</b>	Maintenance of Structures Over or Conveying Watercourses	
<b>6116AR</b>	Maintenance of Sign or Signal Gantries and High Mast Lighting and Masts	
<b>6117AR</b>	Maintenance of Non-Structural Items	
<b>6118AR</b>	Maintenance of Underpasses, Culverts and Retaining Walls Used by Pedestrians and Cyclists	
<b>6119AR</b>	Maintenance of Road Traffic Signs	

Appendix 0/1: Additional, Substitute and Cancelled Clauses, Tables and Figures Specific to This Agreement

Clause Number	Title	Written on Page Number following
6120AR	Maintenance of Lit Sign Units	
6121AR	Maintenance of Traffic Signals	
6122AR	Maintenance of Roadside Electrical Apparatus, Lighting and Power Supplies	
6123AR	Not Used	
6124AR	Maintenance of High Mast Lighting	
6125AR	Not Used	
6126AR	Not Used	
6127AR	Removal of Graffiti, Posters and Encrusted Deposits	
6128AR	Not Used	
6129AR	Not Used	
6130AR	Maintenance of Geotechnical Assets	

Appendix 0/1: Additional, Substitute and Cancelled Clauses, Tables and Figures Specific to This Agreement

**List of Substitute Clauses, Tables and Figures**

Clause Number, etc	Title	Page Number
110SR	Temporary Information Boards	
113SR	Programme of Operations	
117SR	Traffic Safety and Management	
202SR	Existing Trees, Bushes and Hedges	
1801SR	Structural Steelwork -- General	
1802SR	Amendments to BS EN 1090-2:2008	
1803SR	Amendments to Steel Bridge Group Model Project Specification	
2101SR	Bridge Bearings -- General	

*Appendix 0/1: Additional, Substitute and Cancelled Clauses, Tables and Figures Specific to This Agreement*

**List of Cancelled Clauses, Tables and Figures**

<b>Clause Number, etc.</b>	<b>Title Page Number</b>
<b>1501 to 1534 Inclusive</b>	Motorway Communications

Appendix 0/1: Additional, Substitute and Cancelled Clauses, Tables and Figures Specific to This Agreement

**Additional Clauses, Tables and Figures**

Clause Number	Title and Written Text
070AR	<p><b>1 Disability Discrimination Act</b></p> <p>1.1 The Company shall follow the guidance given in the <i>Disability Discrimination Act: Good Practice Guide for Roads (September 2009)</i> in all Operations.</p> <p>1.2 Where guidance given in the <i>Disability Discrimination Act: Good Practice Guide for Roads (September 2009)</i> conflicts with the Specification for Highway Works, the “good practice guide” shall take precedence.</p> <p>1.3 Compliance with the <i>Disability Discrimination Act: Good Practice Guide for Roads (September 2009)</i> shall not absolve the Company from any liability under the <i>Disability Discrimination Act</i>.</p>
170AR	<p><b>1 Licenses Servitudes Wayleaves and Rights of Access</b></p> <p>1.1 In general the Company shall allow for gaining access to boundary fences and adjacent areas from the O&amp;M Works Site.</p> <p>1.2 If in the opinion of the Company access from the O&amp;M Works Site shall be impractical then the Company shall notify the Scottish Ministers of any licences servitudes wayleaves or rights of access that shall have to be arranged to enable the work to be undertaken.</p> <p>1.3 Under no circumstances shall the Company gain access across private land without the prior written consent by the Scottish Ministers, Relevant Authorities and the landowner and occupier/tenant.</p>
171AR	<p><b>1 Depots</b></p> <p>1.1 The Company shall establish depots and the like from which to carry out its Operations.</p>
172AR	<p><b>1 Location of Works</b></p> <p>1.1 Subject to other provisions of the Agreement the Company shall establish a system whereby the location of the O&amp;M Works carried out under the Agreement is identified by the Routine Maintenance Management System.</p>
173AR	<p><b>1 Cleanliness of O&amp;M Works Site and Use of Land</b></p> <p>1.1 The Company shall take all necessary steps to avoid creating a dust nuisance.</p> <p>1.2 If in the opinion of the Overseeing Organisation the Company shall not be dealing adequately with the control of dust the Overseeing Organisation may require the Company to carry out such additional measures as the Overseeing Organisation considers shall be necessary at the Company's expense.</p> <p>1.3 The Company shall keep all roads, private entrances, verges, paths, footways, drains and ditches that are affected by the Operations or by vehicles of the Company or by any of its sub-contractors or by suppliers of materials or by plant free from mud slurry or other hazardous substance that have been deposited as a consequence of his Operations and in a safe</p>

Appendix 0/1: Additional, Substitute and Cancelled Clauses, Tables and Figures Specific to This Agreement

Clause Number	Title and Written Text
	<p>clean and passable state.</p> <p>1.4 The Company shall promptly remove all waste or superfluous material or any substance deposited by the Company or its sub-contractor.</p> <p>1.5 The Overseeing Organisation shall have the authority to close any crossings and exits if any substance deposited shall not have been promptly removed by the Company.</p> <p>1.6 The Company shall take all necessary precautions to prevent danger nuisance or inconvenience to the owners tenants or occupiers of adjacent properties and to the public generally.</p> <p>1.7 The Company shall make its own arrangements with the owners, tenants and occupiers concerned for the use of any private land for plant and equipment stores working space borrow pits or spoil dumps it requires.</p> <p>1.8 Access to all frontages whether commercial or residential shall be maintained at all times by the Company.</p>
174AR	<p><b>1 Site Safety</b></p> <p>1.1 The Company shall comply with the requirements described in Appendix 1/74 with respect to Health and Safety on the O&amp;M Works Site.</p>
175AR	<p><b>1 Material Stocks</b></p> <p>1.1 The Company shall establish a minimum stock of material as described in Appendix 1/79 which shall be maintained by the Company for the Contract Period.</p>
178AR	<p><b>1 Other Works on the O&amp;M Works Site</b></p> <p>1.1 The Company shall take into account the presence from time to time of other authorised contractors and other bodies executing work which could have or may have an impact on Operations.</p>
270AR	<p><b>1 Tree Felling</b></p> <p>1.1 Works shall be carried out in accordance with:</p> <ul style="list-style-type: none"> <li>i) BS 5837: 2005 Trees in Relation to Construction. Recommendations;</li> <li>ii) BS 3998: 1989 <i>Recommendations for Tree Work</i>; and</li> <li>iii) BS 4428: 1989 Code of Practice for General Landscape Operations (excluding hard surfaces).</li> </ul> <p><b>1.2 Marking of Trees to be Removed</b></p> <p>1.2.1 The Company shall set out the O&amp;M Works prior to the commencement of any tree felling operations and shall indicate with paint those trees the removal of which he considers necessary for the construction of the Permanent Works. No trees, bushes or hedges shall be felled or uprooted without approval from the Overseeing Organisation.</p>

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Clause Number	Title and Written Text
	<p>1.3 <b>Fencing</b></p> <p>1.3.1 Trees, bushes and undergrowth to be preserved shall be fenced off with type CW 120 cleft chestnut pale fencing complying with BS 1722, Part 4 1986, placed in accordance with BS 5837: 2005, and shall be maintained in effective condition until the O&amp;M Works have been fully completed. Fences shall be erected before the O&amp;M Works commence.</p> <p>1.4 <b>Precautions</b></p> <p>1.4.1 Before commencing felling operations warning notices and arrangements shall be made by the Company to prevent public gaining access to the danger zone.</p> <p>1.4.2 When felling of mature trees takes place among trees and vegetation that shall be preserved, near property boundaries, public roads, buildings or other Structures, trees shall be carefully cut down in sections so as to avoid damage to adjacent features and vegetation. To avoid compaction of ground appropriate geotextiles shall be laid down where vehicles / plant have access to the O&amp;M Works Site.</p> <p>1.4.3 Where felling takes place close to Site Roads the Company shall notify the relevant roads authority and the police. The Company shall comply with the Code of Practice for Safety at Street and Road Works in respect of warning signs, direction notices and traffic control.</p> <p>1.4.4 If there is a likelihood of contact with overhead telephone lines, these lines should be disconnected during the O&amp;M Works by British Telecom.</p> <p>1.4.5 Where work is to be carried out within 9 metres of electricity lines suspended from wooden poles or 15 metres of lines suspended from steel towers advice from the Scottish Power Area Manager shall be sought.</p> <p>1.4.6 Position and depth of all pipes, cables and underground Structures shall be verified. The method of work shall take into account such items.</p> <p>1.4.7 Voids left after the removal of stumps and roots shall be filled with suitable material and compacted in compliance with Clause 612 of the Specification.</p> <p>1.4.8 Damage to trees, tree saplings, shrubs or hedges during felling shall be made good as described in BS 3998: 1989 Tree Work, paragraph 7.</p> <p>1.4.9 Any bat roosts identified by the Company shall immediately be reported to the Overseeing Organisation and ecological clerk of works and no works shall be carried out on any tree in which bat roosts are located without further written instructions from the Overseeing Organisation.</p> <p>1.4.10 No trees identified during the ecological surveys as containing confirmed bat roosts or having the potential for bat roosting shall be felled after 31 October unless authorised by the Scottish Government. No trees containing confirmed bat roosts shall be felled without the necessary licences having been obtained from the Scottish Government. Any licences required from the Scottish Government shall be arranged by the Overseeing Organisation once the species of bat and population size has been confirmed by a licensed bat worker.</p>

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Clause Number	Title and Written Text
	<p>1.4.11 The Company shall notify the Overseeing Organisation and ecological clerk of works not less than 7 days in advance of felling any trees as containing confirmed bat roosts or having the potential for bat roosting.</p> <p>1.4.12 The Company shall undertake a pre-felling inspection of all trees identified as containing confirmed bat roosts or having the potential for bat roosting under the supervision of a licensed bat worker. Each tree with bat roosts or potential for bat roosting shall be inspected by safest practicable means and searched for signs of bats, using a torch and endoscope where necessary, as directed by the licensed bat worker. Where no signs of bats and no potential access points are identified the tree may be felled subject to the approval of the licensed bat worker.</p> <p>1.4.13 Where felling of trees containing bat roosts is undertaken under licence and where potential access points for bats are identified, the trees shall be section felled with the feature of interest lowered gently to the ground on a rope in the presence of the licensed bat worker, searched and left on the ground for a period of 24 to 48 hours with the access point exposed to allow any roosting bats to disperse.</p> <p>1.4.14 Should any bats be found to be present in trees during felling the Company shall cease felling works in the area and immediately contact Scottish Natural Heritage ("SNH"), the licensed bat worker and the Overseeing Organisation and seek their instructions. No further works shall be undertaken on trees containing roosting bats without permission from SNH.</p> <p><b>1.5 Weather Conditions for Tree Work</b></p> <p>1.5.1 Work shall cease when trees are very wet, covered in ice or snow, or during storms or high winds except in emergencies, where any work shall be the minimum to make the situation safe.</p> <p><b>1.6 Grubbing up Stumps and Filling Voids</b></p> <p>1.6.1 All stumps and tree roots shall be grubbed up provided this does not damage trees which are being retained. If a stump cannot be removed it shall be cut at least 300 millimetres below ground level, the hole shall be filled with soil, compacted, levelled and seeded. Refer to 270AR(1.10).</p> <p><b>1.7 Chipping of Wood and Bark</b></p> <p>1.7.1 Small timber, twigs, bark and roots not infected by honey fungus may be chipped and left on the Site to compost at agreed locations and shall be turned over at specified intervals. The Company shall remove surplus timber from the O&amp;M Works Site, unless 270AR(1.10) applies.</p> <p><b>1.8 Preliminary Tree Work - BS 3998: 1989</b></p> <p>1.8.1 The Company shall give notice of proposed tree work in conservation areas, and shall seek permission from the relevant authority where trees are protected by a Tree Preservation Order.</p> <p>1.8.2 Pruning works include the removal of dead, diseased or damaged branches, removal of heavy branches, crown lifting, crown thinning, pruning damaged tree saplings, bushes and roots and pruning and shaping of</p>

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	<p>overgrown / neglected hedges.</p> <p>1.8.3 When a branch is to be removed the cut surface should be made at a fork or at the main stem and the final cut should be just outside the branch bark collar, where present. When there is not a collar the angle of the cut shall be the mirror image of the branch bark ridge (BS 3998: 1989: Page 4; 13 and Figure 1). The outline of pruned trees shall be fair and symmetrical.</p> <p>1.8.4 Sealing of the cut surface with a proprietary preparation shall be carried out when there is a high risk of fungal or bacterial infection. Table 1 of Appendix C of BS 3998 lists suitable formulations which may be used. Otherwise heartwood exposed by pruning shall be left untreated so that the surface dries out. A bitumastic or latex based paint shall be applied to the outer edge of the cut to prevent drying and dieback of the cambium. Treatment of the whole wound is for cosmetic reasons only; a thin layer of bitumastic or latex based paint or household emulsion can be applied.</p> <p>1.8.5 Heavy limbs shall be taken down in sections and shall be lowered with ropes to avoid damage to the tree and its surroundings. The method of pruning and sealing of cut surfaces shall be as prescribed.</p> <p>1.8.6 In crown lifting lower branches shall be removed to a given height above ground level in a manner described.</p> <p>1.8.7 Crown thinning involves the removal of a proportion of secondary branch growth throughout the crown to produce an open crown. Thinning shall not be too severe as it may induce fresh growth of epicormic shoots.</p> <p>1.8.8 Damaged tree saplings shall be cut back to sound wood just above a bud. Damaged bushes shall be cut to sound wood or the whole plant shall be cut to base to allow fresh growth to take over.</p> <p>1.9 <b>Timber - Stacking</b></p> <p>1.9.1 Timber shall not be stacked against existing trees and shrubs to be retained. Timber stacks shall not exceed one metre high under any circumstances. Timber stacks shall be constructed in such a way as to prevent the movement or slippage of timber.</p> <p>1.10 <b>Existing Woodland</b></p> <p>1.10.1 The timber from native species to be felled within or adjacent to, existing woodland shall be left within the woodland for habitat enhancement, to the approval of SNH. Stumps within woodland are not to be ground down or removed.</p>
271AR	<p><b>1. Existing Vegetation to be Protected</b></p> <p>1.1 Protection of existing vegetation which is to be retained shall be in accordance with BS 5837: 2005 and as follows:</p> <p>i) The Company shall ensure that all work is safeguarded against damage due to the carrying out of other Site operations. Should any damage or loss be caused to any existing or completed works then the Company shall reinstate and make good such damage or loss all with the acknowledgement in writing of the Overseeing Organisation.</p>

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	<ul style="list-style-type: none"> <li>ii) No existing mature trees, protected or designated landscape areas or other artefact shall be removed or cleaned without the prior written agreement of the Overseeing Organisation. The proposed extent of Site clearance works shall be submitted to the Scottish Ministers prior to the O&amp;M Works starting on the O&amp;M Works Site.</li> <li>iii) No existing trees, shrubs, or other plants shall be removed or cut without specific written instructions from the Designer. Protective fencing in accordance with BS 5837 2005 shall be erected prior to commencement of the O&amp;M Works to protect the areas shown in drawings. No soil, spoil, fuel oil, chemicals, construction materials or rubbish shall be stored or tipped within the spread of existing trees, shrubs or hedges.</li> <li>iv) Should any tree or shrub be mistakenly uprooted, destroyed, or in the opinion of the Overseeing Organisation, be damaged beyond reasonable chance of survival in its original shape due to the Company's negligence, then the Company shall provide and plant suitable replacement trees or shrubs of a similar type and age. If such replacement trees or shrubs are not obtainable, alternative trees or shrubs, acknowledged in writing by the Overseeing Organisation, shall be provided and planted. The Company's liability shall continue until the replacement trees and shrubs have survived the winter following the planting and have completed satisfactorily the following summer's growth.</li> </ul>
<b>2</b>	<b>Existing Vegetation to be Retained</b>
2.1	Existing trees within the O&M Works Site that are not removed as part of Site clearance and are to be protected shall be inspected by a qualified tree surgeon and shall have dead, dying or broken branches pruned back to live wood.
2.2	Dead trees shall be felled and uprooted as required in order to complete the O&M Works, alternatively timber and tree stumps, occurring in areas to be planted may be left in situ to re-grow or provide wildlife habitat, providing the timber is not diseased and with the acknowledgement in writing of the Overseeing Organisation.
2.3	Pruning, shaping, trimming of existing trees shrubs and hedges, and sealing of newly cut surfaces shrubs and hedges shall be carried out in accordance with BS 3998: 1989.
2.4	Existing shrubs shall be cut back or pruned as necessary. The outline of pruned shrubs or groups of shrubs shall be natural. Overgrown hedges shall be cut to shape. Exposed roots shall be cut back to clean wood and covered by soil.
<b>273AR</b>	<b>1</b> <b>Sign Posts</b> <ul style="list-style-type: none"> <li>1.1 Removal of existing sign posts shall include removal of all foundations.</li> <li>1.2 Prior to the removal of sign posts carrying illuminated signs the Company shall arrange to de-energise the electricity supply to the electrical</li> </ul>

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	<p>equipment.</p> <p>1.3 Backfilling of hole to ground level and compaction.</p>
<b>370AR</b>	<p><b>1 Rabbit, Hare, Deer and Otter Fence Specifications</b></p> <p>1.1 The extent of fencing for protected fauna shall meet the requirements of SNH. The Company shall consult and comply with SNH in this respect.</p> <p><b>1.2 Rabbits and Hares</b></p> <p>1.2.1 Fences to protect planting areas from rabbits and hares shall be in accordance with the following specification:</p> <p>i) 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.</p> <p>1.3 <b>Deer</b></p> <p>1.3.1 Fences to protect planting areas from deer shall be in accordance with the following specification:</p> <p>i) 1.80 metres high timber post and 4 wire deer fence with rectangular wire mesh.</p> <p>ii) Fence shall be constructed to the details on HCD Drawing H12 and BS1722 Parts 2 &amp; 3 with the following additions and amendments:-</p> <p>(a) Top rectangular wire mesh to be type C/6/90/30.</p> <p>(b) Bottom rectangular wire mesh to be type C/8/80/15.</p> <p>(c) Timber posts and struts are to be for a 1.8 metres high fence selected from either Table 4 or 5 from BS1722 Part 3. Timber straining posts are to be 2.90 metres length, 178 millimetres minimum diameter.</p> <p>(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.</p> <p>(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.</p>

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	<p>(f) 4 line wires complying with the requirements of Clause 2.1 BS1722 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 BS1722 Part 2.</p> <p>(g) Intermediate posts are to be provided at intervals not exceeding 2.75 metres.</p> <p>(h) Existing ground must be trimmed to maintain the 50 millimetres distance between the ground and the bottom of the fence.</p> <p><b>1.4 Otters</b></p> <p>1.4.1 Fences shall be in accordance with the following specification:</p> <p>i) 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); and</p> <p>ii) Bridges and culverts designed to carry water shall incorporate a ledge or platform as specified in Section 21.7 of Part A1.</p>
371AR	<p><b>1 Repairs to and Removal of Existing Fencing</b></p> <p>1.1 Repairs to and renewal of existing fences shall comply with the appropriate Clauses in Series 300.</p> <p>1.2 If any posts rails or lengths of fencing shall have been removed by the Company to facilitate repairs or renewal of existing fences they shall be reinstated as soon as possible. In the interim the gap in the fencing shall be closed with temporary fencing in accordance with Clause 303 so that no livestock escapes from the adjoining land.</p> <p>1.3 Repairs and renewals of existing fences shall match the existing material and dimensions as far as shall be practicable.</p>
372AR	<p><b>1 Snow Fences</b></p> <p>1.1 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</p>

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	management schemes detailed in Appendix A.	
<b>470AR</b>	<b>1</b>	<b>Repairs to Road Restraint Systems</b>
	1.1	Repairs to safety barrier systems shall comply with the requirements of BS 7669-3 and BS EN 1317-1.
	1.2	Repairs of safety barrier systems shall be carried out in accordance with TD 19/06 and the manufacturers' latest drawings and instructions.
	1.3	All accident damage repairs shall be carried out using the same type of safety barrier system as currently exists at the location.
	1.4	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 BS 7669-3.
<b>471AR</b>	<b>1</b>	<b>Repairs to Existing Pedestrian Guardrail</b>
	1.1	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.
	1.2	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.
	1.3	All Existing bolts nuts and washers shall not be reused.
	1.4	Repairs to pedestrian guardrails shall be carried out using panels and posts which match the original installation as closely as possible.
	1.5	Repaired and renewed pedestrian guardrail shall comply with Clause 411.
	1.6	The Company shall remove damaged sections of guardrail and close the resulting opening using suitable temporary guardrail.
	1.7	The Company shall make permanent repairs using panels to match existing.
	1.8	Permanent repairs shall be carried out in accordance with the requirements of the Agreement and, in any case, no later than 28 days after the removal of the damaged sections.
<b>472AR</b>	<b>1</b>	<b>Re-tensioning of Safety Barriers</b>
		<b>Tensioned Corrugated Beam Safety Barrier</b>
	1.1	Tensioned Corrugated Beam Safety Barrier shall be re-tensioned in accordance with BS 7669: Part 3, Section 2
	1.2	Tensioning between any two limits shall not proceed until each limit is anchored sufficiently securely to resist the load effects due to tensioning.
	1.3	Tensioning shall be undertaken only when the ambient temperature is between 25°C and -5°C.

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	<p>1.4 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 Company as part of the re-tensioning operation.</p> <p>1.5 On completion of tensioning, the centre of each screw securing beams to posts shall not be closer than 25 mm <math>\pm 2</math> mm to the end of the slotted hole in the beam.</p> <p><b>Wire Rope Safety Barrier</b></p> <p>1.6 Wire Rope Safety Barrier shall be re-tensioned in accordance with BS 7669: Part 3, Section 2.5.</p> <p>1.7 Tensioning between any two limits shall not proceed until each limit is anchored sufficiently securely to resist the load effects due to tensioning.</p> <p>1.8 Tensioning shall be undertaken only when the ambient temperature is between 30°C and -10°C.</p> <p>1.9 The ambient temperature shall be recorded by the Operating Company.</p> <p><b>Tensioned Rectangular Hollow Section Beam Safety Barrier</b></p> <p>1.10 Assembly and tensioning shall be carried out in accordance with BS 7669: Part 3, Section 2.4.</p> <p>1.11 Tensioning between any two limits shall not proceed until each limit is anchored sufficiently securely to resist the load effects due to tensioning.</p> <p>1.12 Tensioning shall be undertaken only when the ambient temperature is between 10°C and 20°C</p> <p>1.13 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.</p>
473AR	<p>1 <b>Painting of Pedestrian Guardrails and Handrails</b></p> <p>1.1 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.</p> <p>1.2 All primed surfaces shall be painted with one coat of undercoating of the colour appropriate to the colour of finishing coat</p> <p>1.3 Two finishing coats shall be applied.</p>
573AR	<p>1 <b>Renewal of Filter Drains</b></p> <p>1.1 Filter drain material shall be renewed by replacing the filter media with Type B material in accordance with Table 5/5 of Clause 505.</p> <p>1.2 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</p>

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	<p>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.</p> <p>1.3 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</p> <p>1.4 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.</p> <p>1.5 If required, any geotextile membrane present shall be replaced with new material equivalent to that removed the complete drain shall be replaced.</p> <p>1.6 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.</p> <p>1.7 Where the existing filter drain material is recycled it shall be tested in accordance with Clause 710.</p>
575AR	<p><b>1 High Pressure Water Jetting</b></p> <p>1.1 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<sup>2</sup>. 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.</p>
576AR	<p><b>1 High Pressure Water Jetting and Suction</b></p> <p>1.1 In addition to the jetting requirements which shall be as Clause 575AR the suction facility shall be provided by a liquid ring exhauster and shall have an air flow of at least 70 cubic metre per minute and 380 millimetre Hg vacuum through a 200 millimetre boom mounted pipe with a debris tank capacity of at least 5.5 cubic metre.</p>
577AR	<p><b>1 Closed Circuit Television Surveys</b></p> <p><b>1.1 Definition</b></p> <p>1.1.1 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.</p> <p><b>1.2 Extent of Survey and Method to be Used</b></p> <p>1.2.1 Wherever instructed or ordered to do so, 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.</p> <p>1.2.2 Television cameras shall be drawn by cables and winches self-propelled</p>

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	<p>tractor driven or fixed to rods.</p> <p>1.2.3 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.</p> <p>1.3 <b>Records</b></p> <p>1.3.1 The 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::</p> <ul style="list-style-type: none"> <li>(i) automatic update of the camera's metrage position in the drain line,</li> <li>(ii) date of survey,</li> <li>(iii) direction of survey,</li> <li>(iv) pipe dimensions, and</li> <li>(v) length/location reference.</li> </ul> <p>1.3.2 The DVD recordings shall become the property of the Scottish Ministers..</p> <p>1.4 <b>Photographs</b></p> <p>1.4.1 Photographs shall be taken of Defects and samples of average condition.</p> <p>1.4.2 Where colour in-line photography is used, photographs shall be taken at intervals not exceeding 5 metres</p> <p>1.4.3 Durable half plate prints shall be provided.</p> <p>1.4.4 The photographs shall be identified in relation to the metrage of the place taken and shall show clear definition and accurately reflect what is shown on the monitor.</p> <p>1.4.5 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.</p> <p>1.5 <b>Reports</b></p> <p>1.5.1 The reports shall be presented to the Overseeing Organisation in accordance with the format laid down in the Manual of Sewer Condition Classification – 4<sup>th</sup> Edition, published by the Water Research Council.</p> <p>1.5.2 Each chamber shall be recorded on a separate sheet except for buried chambers which may be included within a length</p> <p>1.5.3 Photographs shall be mounted and shall follow the relevant page of the report.</p> <p>1.5.4 All dimensions shall be in metric units.</p> <p>1.5.5 The report shall include the depth measured from cover level to invert for every drain in each chamber.</p> <p>1.5.6 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</p>

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	the survey.											
970AR	<p><b>1 Repair of Carriageway Category 1 Defects</b></p> <p>1.1 Temporary repairs of carriageway Category 1 Defects shall be undertaken in accordance with these O&amp;M Works Requirements.</p> <p>1.2 The Company may undertake a permanent repair in lieu of a temporary repair in the timescales stated in Part 2 of these O&amp;M Works Requirements for a temporary repair of a Category 1 Defect.</p> <p>1.3 The permanent repair shall be carried out in accordance with the relevant Clauses of Series 600, 700 and 800 using material complying with Series 900.</p>											
971AR	<p><b>1 Stone Mastic Asphalt Surface Course</b></p> <p><b>1.1 General</b></p> <p>1.1.1 Stone mastic asphalt shall comply with the general requirements of BS EN 13108 Bituminous mixtures: Material specifications and MCHW Series 700 and 900 and the specific requirements of this Clause.</p> <p>1.1.2 Stone mastic asphalt shall be produced in plants that shall be registered to the BS EN ISO 9001 'Sector Scheme for the Production of Asphalt Mixes', described in Appendix A.</p> <p>1.1.3 The Design for stone mastic asphalt to Clause 970AR shall be to the general requirements of Clause 942 and shall specifically comply with the requirements for wheel tracking and sensitivity to water.</p> <p>1.1.4 The Company shall declare target aggregate gradings and binder contents prior to commencement of the Operations.</p> <p>1.1.5 The nominal installation depths shall be classified into three categories as given in the table below:</p> <table border="1"> <thead> <tr> <th>Type</th> <th>Type A</th> <th>Type B</th> <th>Type C</th> </tr> </thead> <tbody> <tr> <td>Nominal installation depth (millimeter)</td> <td>&lt;18</td> <td>18 to 25</td> <td>&gt;25</td> </tr> </tbody> </table> <p><b>1.2 Aggregates</b></p> <p>1.2.1 Coarse aggregate shall be crushed rock or crushed slag complying with Clause 901.</p> <p>1.2.2 The shape of the coarse aggregate shall comply with a maximum flakiness index of Category FI25 as defined in BS EN 13043:2002 Aggregates for Bituminous Mixtures and Surface Treatments for Roads, Airfields and Other Trafficked Areas, clause 4.1.6.</p> <p>1.2.3 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.</p> <p>1.2.4 The resistance to polishing of the coarse aggregate shall have a minimum</p>				Type	Type A	Type B	Type C	Nominal installation depth (millimeter)	<18	18 to 25	>25
Type	Type A	Type B	Type C									
Nominal installation depth (millimeter)	<18	18 to 25	>25									

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	<p>declared PSV category specified in Appendix 7/1 in accordance with BS EN 13043:2002 Aggregates for Bituminous Mixtures and Surface Treatments for Roads, Airfields and Other Trafficked Areas, clause 4.2.3.</p> <p>1.2.5 The resistance to abrasion of coarse aggregate shall have a maximum AAV specified in Appendix 7/1 in accordance with BS EN 13043:2002 Aggregates for Bituminous Mixtures and Surface Treatments for Roads, Airfields and Other Trafficked Areas, clause 4.2.</p> <p>1.3 <b>Filler</b></p> <p>1.3.1 Added filler aggregate shall be hydrated lime, crushed limestone or Portland Cement, in accordance with the requirements of BS EN 13108-4, Bituminous mixtures: Material specifications , Part 4: Hot Rolled Asphalt and shall be not less than 2% by mass of total aggregate.</p> <p>1.4 <b>Binder</b></p> <p>1.4.1 Bitumen shall comply with BS EN 12591:2000 Bitumen and Bituminous Binders: Specifications for Paving Grade Bitumens or BS 3690-3:1990 Bitumens for Building and Civil Engineering: Specification for Mixtures of Bitumen with Pitch, Tar and Trinidad Lake Asphalt, and shall be produced in plants that shall be registered to BS EN ISO 9001 'Sector Scheme for the Supply of Paving Grade Binders', described in Appendix A.</p> <p>1.4.2 The said binder shall not be harder than penetration reference 50 (paving grade 40/60).</p> <p>1.4.3 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.</p> <p>1.5 <b>Binder Modifiers</b></p> <p>1.5.1 Binder modifiers pre-blended with bitumen or binder modifiers, including but not limited to natural or man-made fibres, which shall be added or blended with base bitumen complying with BS EN 12591:2000 Bitumen and Bituminous Binders: Specifications for Paving Grade Bitumens of the stated penetration range at the mixing plant shall have a British Board of Agrément HAPAS Roads and Bridges Certificate.</p> <p>1.5.2 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.</p> <p>1.5.3 In the event that no British Board of Agrément HAPAS Roads and Bridges Certificates have been issued, the 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.</p> <p>1.5.4 The Company shall provide the rheological product identification data for pre-blended modified binders in accordance with Clause 956 and cohesion in accordance with Clause 957</p> <p>1.6 <b>Mixture</b></p> <p>1.6.1 The binder drainage of the loose mixture at the target composition at a</p>

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	<p>temperature of 175°C in accordance with BS 594987:2010 shall not be more than 0.3% by total mass of mixture.</p> <p>1.6.2 The agreed binder content for the mixture shall be the target binder content <math>\pm 0.6\%</math>.</p> <p><b>1.7 Job Mixture Approval</b></p> <p>1.7.1 Details of the proposed mixture Design from each asphalt mixing plant shall be submitted to the Overseeing Organisation.</p> <p>1.7.2 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:</p> <ul style="list-style-type: none"> <li>i) bitumen penetration reference;</li> <li>ii) quantities of binder and aggregate;</li> <li>iii) aggregate source and grading;</li> <li>iv) proprietary name and generic type of binder modifier;</li> <li>v) quantity of any binder modifier, including natural or man-made fibres added at the mixer; and</li> <li>vi) modified binder and mixture data requirements specified in Appendix 7/1.</li> </ul> <p>1.7.3 If a modified binder including but not limited to any proportion of the modifier shall not be 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 proposed mixture Design for prior written consent by the Scottish Ministers to implement them.</p> <p>1.7.4 The mixture shall be approved in writing by the Overseeing Organisation as the job standard mixture provided that:</p> <ul style="list-style-type: none"> <li>i) the mixture Design proposed complies with sub-Clauses 1.1.1 and 1.1.3 of this Clause;</li> <li>ii) information has been submitted in accordance with sub-Clauses 1.2.4, 1.2.5 and 1.3.1 of this Clause;</li> <li>iii) information submitted in accordance with sub-Clause 16 of this Clause has been approved in writing by the Overseeing Organisation.</li> </ul> <p>1.7.5 If the mix Design or constituent materials of a job standard mixture shall be changed by the Company, details of the revised mixture shall be submitted for written approval in accordance with sub-Clause 1.7.1 and 1.7.2 of this Clause.</p> <p>1.7.6 Job mixture trials may be carried out on or off the O&amp;M Works Site, however material laid for a job mixture trial on the O&amp;M Works Site which complies with this Specification may form part of the binder/regulating course in the permanent works.</p> <p>1.7.7 If carried out off site, trials may be arranged independently or in conjunction</p>

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	<p>with other works.</p> <p><b>1.8 Mixing</b></p> <p>1.8.1 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 BS EN 13108 Bituminous mixtures: Material specifications &amp; PD 6691, for the penetration reference of the bitumen.</p> <p>1.8.2 This shall be done in such manner that a homogeneous mixture of aggregate, filler, bitumen and additive results.</p> <p>1.8.3 At the time of mixing, the coarse aggregate shall be in a surface dry condition.</p> <p><b>1.9 Transportation</b></p> <p>1.9.1 The transportation of stone mastic asphalt shall be in accordance with sub-Clause 901.3.</p> <p><b>1.10 Permanent Works</b></p> <p>1.10.1 When specified in Appendix 7/1, sampling and testing shall be carried out to establish compliance of material laid in the permanent works.</p> <p><b>1.11 Sampling from the Laid Material</b></p> <p>1.11.1 Samples of uncompacted material shall be taken from the paver as near to where the cores shall be taken as shall be practicable, in accordance with BS EN 12697 Bituminous mixtures: Test methods for hot mix asphalt, Part 27: Sampling.</p> <p>1.11.2 Six 200 millimetre diameter cores shall be cut, where practical from the centre of the Lane out of material from each mixing plant:</p> <ul style="list-style-type: none"> <li>i) from material laid specially in a job mixture approval trial;</li> <li>ii) from the first 1 kilometre length of stone mastic asphalt from a mixing plant laid in the permanent works; or</li> <li>iii) within 3 days of laying stone mastic asphalt from a mixing plant in the permanent works, where less than 1 kilometre length has been laid whichever occurs first.</li> </ul> <p>1.11.3 The 200 millimetre diameter cores shall be cut within 3 days of laying the material unless they have been cut under the requirements of sub-Clause 1.14.1 of this Clause.</p> <p>1.11.4 The cores shall be transported as soon as possible to the laboratory.</p> <p>1.11.5 If the storage period shall be less than 4 days, the storage temperature shall be within the range 0°C to 25°C.</p> <p>1.11.6 For storage beyond 4 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.</p> <p>1.11.7 Site storage of cores where unavoidable and conditions of transportation shall be as close as shall be practicable to the laboratory conditions.</p> <p>1.11.8 The storage temperature and times, including whilst cores are on the O&amp;M</p>

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	<p>Works Site shall be recorded.</p> <p>1.11.9 Three pairs of 150 millimetre diameter cores shall be cut at the same chainages as the 200 millimetre diameter core.</p> <p>1.11.10 One core of each pair shall be taken from the centre of the lane adjacent to the 200 millimetre diameter core and one whose centre shall be between 500 millimetre and 1000 millimetre from the edge of the mat.</p> <p>1.11.11 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.</p> <p>1.11.12 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.</p> <p>1.11.13 Core holes shall be backfilled with materials compacted to refusal with a circular headed vibrating hammer in layers not exceeding 75 millimetre thick.</p> <p>1.11.14 Hot base material shall be similar to existing pavement.</p> <p>1.11.15 In the permanent works, after the first 6 cores and where the required thickness of the material exceeds 25 millimetre for material from each mixing plant not less than one pair of 200 millimetre diameter cores shall be cut from the centre of the Lane every 1 Lane kilometre laid a day's production if less than 1 Lane kilometre shall have been laid.</p> <p><b>1.12 Tests and Calculations</b></p> <p>1.12.1 For each uncompacted sample the compositional analysis shall be carried out in accordance with BS EN 12697 Bituminous mixtures: Test methods for hot mix asphalt, Part 1: Soluble binder content &amp; Part 2: Determination of particle size distribution corrected by any correction factor approved under sub-Clause 16 of this Clause.</p> <p>1.12.2 Each six consecutive 200 millimetre diameter cores of material from the same mixing plant shall form a set of cores on a running basis.</p> <p>1.12.3 For each set the wheeltracking rate and rut depth shall be determined in accordance with the procedure in BS 598-110:1998 Sampling and Examination of Bituminous Mixtures for Roads and Other Paved Areas: Methods of Test For the Determination of Wheel-tracking Rate and Depth, at the test temperature specified in Appendix 7/1.</p> <p>1.12.4 For each 150 millimetre diameter core the bulk density shall be determined in accordance with the procedure in BS EN 12697 Bituminous mixtures: Test methods for hot mix asphalt, Part 6: Determination of bulk density of bituminous specimens.</p> <p>1.12.5 The bulk density at a chainage shall be the mean from the two cores taken at a chainage.</p> <p>1.12.6 Subsequent to determining the bulk density, the maximum density shall be determined from the pair of the cores in accordance with BS EN 12697-</p>

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Clause Number	Title and Written Text
	<p>5:2002 Bituminous Mixtures: Test Methods for Hot Mix Asphalt: Determination of the Maximum Density.</p> <p>1.12.7 The air void content of each pair of 150 millimetre diameter cores shall be calculated to <math>\pm 0.1\%</math> as follows: <math>100\% \times (1 - \frac{\rho}{\rho_{Max}}) \times 100\%</math>  <math>\text{Air voids content} = (1 - \frac{\rho}{\rho_{Max}}) \times 100\%</math>  where: <math>\rho</math> shall be the bulk density in accordance with BS EN 12697 Bituminous mixtures: Test methods for hot mix asphalt, Part 6: Determination of bulk density of bituminous specimens (Mg/m<sup>3</sup>);  and <math>\rho_{Max}</math> shall be the maximum density in accordance with BS EN 12697-5: Bituminous Mixtures: Test Methods for Hot Mix Asphalt: Determination of the Maximum Density (Mg/m<sup>3</sup>).</p> <p><b>1.13 Compliance Requirements</b></p> <p>1.13.1 When determined in accordance with BS EN 12697 Bituminous mixtures: Test methods for hot mix asphalt, Part 1: Soluble binder content &amp; Part 2: Determination of particle size distribution, the compositional analysis shall demonstrate compliance with following</p> <p>1.13.2 the binder content on analysis shall not differ from the target binder content declared by the Company by more than <math>\pm 0.6\%</math>; and</p> <p>1.13.3 the aggregate grading shall not differ from that declared by the Company.</p> <p>1.13.4 Deformation resistance shall be determined in accordance with the requirements of Clause 929, which refers to PD 6691 &amp; BS 594987 and the deformation values specified in Appendix 7/1.</p> <p>1.13.5 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.</p> <p>1.13.6 When the stone mastic asphalt shall be being used as a regulating course at thicknesses below 30 millimetre the appropriate limiting void contents shall be 8% and 6% respectively.</p> <p><b>1.14 Reporting Results</b></p> <p>1.14.1 Where specified in Appendix 1/5 that the Company shall be responsible for testing the individual determinations including location of samples and results from all tests shall be given to the Scottish Ministers in writing within two weeks of the material having been laid.</p> <p><b>1.15 Surface Preparation</b></p> <p>1.15.1 Existing surfaces shall be prepared in accordance with the requirements of BS 594987 Asphalt for roads and other paved areas – Specification for transport, laying, compaction and type testing protocols, and Series 700 Clauses.</p> <p>1.15.2 Bond coats shall be in accordance with Clause 920 except that where the thickness of the stone mastic asphalt shall be less than 20 millimetre, only polymer modified bond coats shall be used.</p>

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Clause Number	Title and Written Text	
	1.16 <b>Laying</b> 1.16.1 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.	1.17 <b>Weather Conditions</b> 1.17.1 The weather conditions specified in Clause 945 shall not apply to stone mastic asphalt laid in accordance with this Clause. 1.17.2 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 Scottish Ministers with details of the modified binder required under sub-Clause 1.2.4 and 1.2.5 of this Clause and shall include information on early trafficking particularly in hot weather.
	1.18 <b>Temporary Trafficking</b> 1.18.1 The Company shall ensure the pavement material has adequately cooled and hardened before it shall be subjected to temporary traffic. 1.18.2 Unless otherwise agreed in writing by the Scottish Ministers 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.	
973AR	1 <b>Overband Sealing</b> 1.1 The 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 1.2 The minimum skid resistance value of the overband material shall be 60 measured by the skid resistance pendulum method. 1.3 All material removed from the cracks and joints shall be removed to a licensed waste disposal site. 1.4 All loose material shall be removed off the Unit to a licensed waste disposal site or recycling centre.	
976 AR	1 <b>Pavement Cores</b> 1.1 Nominal 150 millimetre diameter cores, required for sampling and testing at the frequencies stated in Appendix 1/5, shall be taken using a suitable coring machine in accordance with BS 598:Part100. 1.2 For each core extracted a Roadside Record Sheet (RRS1) as provided in this Appendix 0/1 shall be completed in order to record the site location, coring conditions and condition of the core. 1.3 All cores shall be labelled, protected, transported and stored according to the independent testing organisation's quality procedures. 1.4 In the laboratory each core, prior to any testing, shall be examined, photographed and the information recorded on a Core Record Sheet	

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Clause Number	Title and Written Text
1.5	<p>(CRS1) as provided in this Appendix 0/1. The cores shall be photographed on a white background with the project, location and core number clearly shown together with the units of measurement that will be easily identifiable on the size of photograph produced.</p> <p>The records are to be stored within the Company's quality records and made available to the Overseeing Organisation when required.</p>

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**ROADSIDE RECORD SHEET (RRS1)**

**General**

Project Name			
Coring Date			
Core Number			
Chainage			
Road Name			
Road Type (See Note 1)			
Lane Direction (See Note 2)			
Lane Number (See Note 3)			
Weather Conditions			

**Pavement Coring Description**

Did the core barrel lock / jam whilst cutting pavement?	Yes	No	If Yes, at what depth? Depth (mm):	
Were there difficulties in extracting the core from the barrel?	Yes		No	
Condition of core (Tick as appropriate)	Good	De-bonded	Shattered	Partial recovery
Depth of coring				
Core length				
Any additional information on the core not included above				

Notes:

1. Insert as appropriate i.e. D2AP, S2 etc.
2. Insert eastbound, westbound, northbound, and southbound as appropriate.
3. Insert appropriate descriptor e.g. lane 1 (nearside), lane 2 (offside), hard shoulder.

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**Core Record Sheet (CRS1)**

Project Name		Road type (See Note 1)					
Road Name		Lane Direction (See Note 2)					
Coring Date		Lane Number (See Note 3)					
Core Number		Chainage					
Layer	Layers				Aggregate		Comments
Number	Top (mm)	Bottom (mm)	Thickness (mm)	Material	Maximum size (mm)	Type	
<div style="border: 1px solid black; min-height: 200px; margin-bottom: 10px;"></div> <p style="text-align: center;">Insert picture of core HERE</p>							
<p style="text-align: center;"><i>(The units of measurement should be clearly seen on the photograph)</i></p>							

Notes:

1. Insert as appropriate i.e. D2AP, S2 etc.
2. Insert eastbound, westbound, northbound, and southbound as appropriate.
3. Insert appropriate descriptor e.g. lane 1 (nearside), lane 2 (offside), hard shoulder.

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Clause Number	Title and Written Text	
1171AR	1	<b>Relaying of Existing Footways</b> 1.1 Relaying of existing footways shall be carried out with materials compatible with the adjacent areas.
1172AR	1	<b>Siding Out</b> 1.1 <b>General</b> 1.1.1 Siding out shall normally be carried out at the edge of 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 footway or paved surface. 1.1.2 Footways shall be sided out up to and including any existing footway edging or to a specified width of line. 1.1.3 Where the sided out edges do not generally exceed a height of 75 millimetre above the existing footway surface they may be trimmed with a vertical face. 1.1.4 Where they generally exceed a height of 75 millimetre above the existing footway surface they shall be trimmed to an approximately 45 degree battered face.
1173AR	1	<b>Artificial Stone Paving or Natural Stone Paving and Precast Concrete Paving Flags and Blocks</b> 1.1 Before work in any individual existing artificial stone paving natural stone or precast concrete flag/block paved footway commences the Company shall record the dimensions and number of flags to be replaced and take photographic records. 1.2 These records shall be maintained and made available to the Scottish Ministers at any time when required by other or both. 1.3 The Company shall carefully lift the flags/blocks and set aside. 1.4 If these flags/blocks shall not be permanently relaid on the same day as they shall be lifted the Company shall stack them in neat piles to a height not exceeding one metre.
1174AR	1	<b>Laying of Artificial Stone Paving Natural Stone Paving and Precast Concrete Paving Flags</b> 1.1 Paving of artificial stone, natural stone or precast concrete flags shall be reconstructed to match existing as closely as possible and shall be in accordance with BS 7533 Parts.
1179AR	1	<b>Timber Edging to Footways</b> 1.1 Timber shall be as described in Clause 304 and sized to match existing although the minimum dimensions to be used shall be not less than 75 millimetre x 32 millimetre.

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Clause Number	Title and Written Text
	<p>1.2 Timber shall be pressure impregnated with preservative in accordance with Clause 311.</p> <p>1.3 Fixing shall be by means of 50 millimetre x 50 millimetre x 300 millimetre pointed pegs at 600mm centres.</p>
1270AR	<p><b>1 Electroluminescent Signs for Traffic and Gantry Signs</b></p> <p>1.1 Sign Specifications:</p> <ul style="list-style-type: none"> <li>i) either Avery 6600T or 3M 4090T Translucent retro-reflective material must be used with See@Nite products. Failure to do so may effect the light output of the sign;</li> <li>ii) patented Encapsulated Electroluminescent Lamp Pre-wired with 3.5 metre cable for connection to driver;</li> <li>iii) weatherproof IP66 construction;</li> <li>iv) electromagnetic compatibility and low voltage directive ("LVD") compliant;</li> <li>v) acrylic vandal resistant sheet;</li> <li>vi) operating voltage 50 -150 volts root mean squared;</li> <li>vii) operating temperature -10 degrees Celsius to +25 degrees Celsius;</li> <li>viii) CE marked;</li> <li>ix) conforms to BS EN 12899;</li> <li>x) conforms to BS EN60598 (where applicable); and</li> <li>xi) Class II double insulated construction - no earth connection required. Laminated bonded construction onto standard aluminium 11-Gauge back-plate.</li> </ul> <p>1.2 Driver Specifications:</p> <ul style="list-style-type: none"> <li>i) sealed unit for mounting inside post top;</li> <li>ii) microprocessor controlled;</li> <li>iii) integral IP66 photocell (set approx 70 lux);</li> <li>iv) suitable for EL signs up to 1.5 x 4.5 metres (or equivalent load);</li> <li>v) EMC &amp; LVD compliant;</li> <li>vi) output cables for connecting to sign and mains;</li> <li>vii) CE marked;</li> <li>viii) operating temperature -10 degrees Celsius to +25 degrees Celsius;</li> <li>ix) weatherproof construction - IP44;</li> <li>x) tamperproof stainless steel fixings supplied;</li> <li>xi) integral safety isolating transformer;</li> <li>xii) input 220-240 volt AC 50 hertz 58 milliamps (typical);</li> </ul>

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	<p>xiii) output 150 volt RMS, 200-600 hertz, 100 volt-amp max;</p> <p>xiv) conforms to EN61347-2-11 Part 1;</p>	
1271AR	1	<b>Solar Powered signs</b>
	1.1	To be proposed where a sign is over 100 metres away from the nearest supply point.
	1.2	Sign to be lit using LED lights.
	1.3	The system shall be suitable for illumination of 600 millimetre and 750 millimetre signs to category 1 specification.
	1.4	Vandal resistant.
1272AR	1	<b>Chart Node and Section Markers</b>
	1.1	Cored thermoplastic road markers shall be installed as chart nodes using the following method: <ul style="list-style-type: none"> <li>i) A 100 millimetre diameter x 20 millimetre deep socket shall be formed using a central pilot bit surrounded by an annular bit. The pilot bit permits drilling of an annulus by the annular bit in a precise location by guiding the annular bit.</li> <li>ii) The base of the pocket after breaking out the surface material shall be left jagged. This jagged base assists in the retention of the stud in the pocket.</li> <li>iii) The pocket shall be filled with hot fluid thermoplastic material to the uppermost edge of the pocket projecting slightly above the road surface. This projection depends on the surface tension of the material. The material is then allowed to cool and set to form a stud.</li> <li>iv) The material shall consist of a plastic resin with the white filler and reflective glass particles to BS 3262. This is the same material as is used for white lining purposes.</li> </ul>
	1.2	Notwithstanding any other requirements of the Agreement, record drawings of the chart node locations at a scale of 1:500 shall be provided to the Scottish Ministers within 7 days of the issue of the Taking-Over Certificate for Section B of the O&M Works. The record drawings shall locate the chart nodes as a series of dimensions from carriageway features. The local and national grid co-ordinates of all chart nodes shall be detailed on the record drawings.
1273AR	1	<b>Night Visibility</b>
	1.1	Immediately after application and throughout the Defects Liability Period thereafter, the retro-reflectivity of the road marking line shall be not less than 150 millicandela/lux/square metre when measured in accordance with the method below:
	1.2	<b>Apparatus</b>
	1.2.1	The apparatus for measuring the retro reflectivity (SL value) of material shall

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Clause Number	Title and Written Text
	<p>consist essentially of a light source and a photo detector with a geometry for observation and illumination of 1.37 degrees and 0.74 degrees respectively.</p> <p><b>1.3 Procedure</b></p> <p>1.3.1 Calibrate the instrument in accordance with the manufacturer's instructions.</p> <p>1.3.2 Air temperature shall not be below +10 degrees Celsius nor exceed +30 degrees Celsius.</p> <p>1.3.3 The area to be measured shall be 200 millimetres x 100 millimetres.</p> <p>1.3.4 Measurements shall be made at five positions at approximately 200 millimetre intervals along the marking. This procedure shall be repeated at two further locations along the line and within 50 metres of the first set of measurements. The overall average of the fifteen readings shall be reported as the retro-reflectivity value. The road marking will be tested in a dry condition after removal of any loose dirt or foreign particles. If the retro reflectivity value measured is less than the specified value the line shall be thoroughly wetted and cleaned following BS 3262: Part 2 Clause D2 procedure, then dried and re-measured.</p>
1274AR	<p><b>1 Routine Maintenance of Traffic Signs, Hazard Posts, Illuminated Bollards Marker Posts Telephone Hoods, Refuge Beacons and ECP Cylinders</b></p> <p>1.1 Traffic signs, hazard posts, illuminated bollards and marker posts shall be maintained in compliance with TD25 of the DMRB and the following sub-clauses.</p> <p>1.2 Traffic signs, hazard posts, illuminated bollards and marker posts shall be maintained in a clean condition.</p> <p>1.3 Stiff-bristled brushes or abrasive tools or cleaners shall not be used for cleaning reflectorised sign faces</p> <p>1.4 A wet non-abrasive detergent cleaner shall be used which has generally neutral acidity/alkalinity in the range pH 6.8 to pH 7.2.</p> <p>1.5 Strong aromatic solvents alcohol steam cleaning or high pressure water jets shall not be used.</p> <p>1.6 Approved proprietary sign cleaning products may be used.</p> <p>1.7 All brushes mops detergents and chemicals shall not damage the surface of the item being cleaned.</p> <p>1.8 As part of the cleaning Operations all hazard posts and marker posts shall be straightened and the ground around the base of the post re-compact.</p> <p>1.9 Sign cleaning shall not be carried out when the ambient temperature shall be 2°C or less and falling or when the Operations are likely to result in the formation of ice on the footway or carriageway.</p> <p>1.10 The Company shall ensure that the method used to clean any illuminated unit sign or bollard shall in no way affect the electrical installation to the unit.</p> <p>1.11 Leaning ladders against sign faces shall not be permitted.</p>

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Clause Number	Title and Written Text	
	1.12	Records of cleaning work carried out shall be maintained in accordance with the procedures in the Quality Plan and be available for inspection by the Scottish Ministers at any time.
1275AR	1	<p><b>Routine Maintenance of Sign Lighting Units</b></p> <p>1.1 The Company shall carry out routine maintenance of sign lighting units to ensure their proper and efficient function.</p> <p>1.2 The routine maintenance operation shall include:</p> <ul style="list-style-type: none"> <li>i) A thorough cleaning of all photo electric control units' lantern external and internal surfaces and any other components affecting the optical performance of the lantern.</li> <li>ii) The cleaning methods and materials shall be in accordance with Clause 1371AR.</li> <li>iii) Degreasing lubrication and operation of all toggles wing nuts hinges door locks and lifting gear.</li> <li>iv) The bracket lantern and lantern optical equipment to be correctly aligned in respect of the sign face and to minimise glare to traffic.</li> <li>v) All grub screws locking devices and the like shall be properly tightened in accordance with the manufacturer's written instructions.</li> <li>vi) A report of any damage corrosion or misalignment of posts.</li> <li>vii) A report of any electrical component showing signs of overheating fracture condensation or tracking.</li> <li>viii) The removal of the lamps for lantern cleaning purposes. The lamp to be refitted shall be the existing or new as appropriate.</li> <li>ix) The replacement of lamps.</li> <li>x) All new lamps to be marked with date of installation and this date to be recorded centrally.</li> <li>xi) Spraying of all electrical components with a de-moisturising spray.</li> <li>xii) Visual checking of sign face fixings. Any Defects shall be recorded</li> <li>xiii) Checking of conduits for any corrosion and other Defects. Any Defects shall be recorded.</li> <li>xiv) Checking of all electrical connections. Any Defects shall be recorded</li> <li>xv) Checking of all earthing connections. Any Defects shall be recorded.</li> <li>xvi) Clearing of debris from around the sign post bases for 1 metre radius</li> </ul> <p>1.3 The supply shall be isolated at the cut-out for the removal and fitting of lamps.</p>

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Clause Number	Title and Written Text
	<p>1.4 Any lamp fault shall be disposed off in accordance with Clause 1372AR.</p> <p>1.5 Records of maintenance work carried out shall be held in accordance with the procedures in the Quality Plan and be available for inspection by the Scottish Ministers at any time.</p>
1276AR	<p><b>1 Routine Maintenance of Traffic Signals</b></p> <p>1.1 The Company shall carry out routine maintenance of traffic signals as necessary to ensure their proper and efficient function.</p> <p>1.2 The routine maintenance shall include:</p> <ul style="list-style-type: none"> <li>i) Compliance with Section 3.1 of TD24 of the DMRB;</li> <li>ii) Thorough cleaning of all traffic signal lenses internal and external surfaces and any other components affecting the optical performance of the lenses.</li> <li>iii) The cleaning methods and materials shall be in accordance with Clause 1371AR.</li> <li>iv) Cleaning materials shall not cause harmful effects to the range of materials and surfaces to be cleaned;</li> <li>v) All grub screws locking devices and the like shall be properly tightened in accordance with manufacturer's written instructions;</li> <li>vi) A report of any damage corrosion or misalignment of posts;</li> <li>vii) A report of any electrical component showing signs of overheating fracture condensation or tracking;</li> <li>viii) The removal of the lamps for lantern cleaning purposes.</li> <li>ix) The lamp to be refitted shall be the existing or new as appropriate;</li> <li>x) The replacement of lamps;</li> <li>xi) Identifying faults on any unit and recording;</li> <li>xii) Spraying of all electrical components with a de-moisturising spray;</li> <li>xiii) Visual checking of fixings.</li> <li>xiv) Any Defects shall be recorded;</li> <li>xv) Checking of conduits for any corrosion and other Defects.</li> <li>xvi) Any Defects shall be recorded;</li> <li>xvii) Checking of all electrical connections.</li> <li>xviii) Any Defects shall be recorded;</li> <li>xix) Checking of earthing connections.</li> <li>xx) Any Defects shall be recorded;</li> <li>xxi) Clearing of debris from around the post bases for 1 metre radius.</li> </ul> <p>1.3 The supply shall be isolated at the cut-off for the removal and fitting of lamps.</p>

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Clause Number	Title and Written Text	
	1.4	Any faulty lamp shall be disposed of in accordance with Clause 1372AR.
	1.5	Records of maintenance work carried out shall be in accordance with the procedures in the Quality Plan and be available for inspection by the Scottish Ministers at any time.
1277AR	1	<p><b>Non Routine Maintenance of Traffic Signals</b></p> <p>1.1 The Company shall carry out non routine inspections on or in:</p> <ul style="list-style-type: none"> <li>i) Traffic Signals;</li> <li>ii) Posts;</li> <li>iii) Underground cable systems;</li> <li>iv) Control systems;</li> <li>v) Any other related electrical equipment;</li> </ul> <p>1.2 The Company shall attend to emergency call-outs and provide a report to the Scottish Ministers;</p> <p>1.3 The Company shall repair random failures of traffic signals as follows.</p> <ul style="list-style-type: none"> <li>i) Category 1 repairs - TD24 of the DMRB within 24 hours of the Defect being recorded.</li> <li>ii) Category 2 repairs - TD24 of the DMRB within 6 weeks of the Defect being recorded.</li> </ul> <p>1.4 The Company shall maintain daily records of works progress and details of labour and constructional plant used.</p>
1370AR	1	<p><b>Routine Maintenance of Road Lighting Units</b></p> <p>1.1 The routine maintenance of road lighting units shall be carried out in accordance with TD23 of the DMRB.</p> <p>1.2 The following tasks shall be undertaken:</p> <ul style="list-style-type: none"> <li>i) thorough cleaning of all photo electric control units, Intelligent Lighting Control System (ILCS) components where required luminaire external surfaces internal surfaces where required and any other components affecting the optical performance of the luminaire.</li> <li>ii) The cleaning methods and materials shall be in accordance with Clause 1371AR.</li> <li>iii) The Company shall ensure that the internal surfaces and any other components affecting the optical performance of luminaires with an ingress protection rating of IP65 shall not normally be cleaned.</li> <li>iv) Cleaning materials shall not cause harmful effects to the range of materials and surfaces to be cleaned;</li> <li>v) the degreasing lubrication and operation of all toggles wing nuts hinges door locks and any raising and lowering gear;</li> <li>vi) correct alignment of the bracket luminaire and luminaire optical</li> </ul>

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	<p>equipment with respect to the carriageway;</p> <p>vii) tightening of all grub screws locking devices and the like in accordance with the manufacturer's written instructions;</p> <p>viii) a report of any damage or corrosion;</p> <p>ix) a report of any electrical component showing signs of overheating fracture condensation ingress of moisture or tracking;</p> <p>x) the removal of the lamp(s) during the lantern cleaning process. The lamp(s) to be refitted shall be the existing or new as appropriate;</p> <p>xi) replacement of lamps either by bulk replacement or individually following burn to extinction. (Bulk replacement required on motorways and dual carriageways with a speed limit in excess of 40mph);</p> <p>xii) marking all new lamps indelibly with date of installation;</p> <p>xiii) identifying faults on any lighting unit which fails to operate or undertaking minor repairs or reporting such failure;</p> <p>xiv) spraying of all isolated electrical components with a demoisturising spray;</p> <p>xv) checking of all electrical connections any Defects shall be recorded;</p> <p>xvi) checking of all earthing connections any Defects shall be recorded;</p> <p>xvii) removal of all debris from 1 metre radius of column base or foundation;</p> <p>xviii) cleaning of the column flange;</p> <p>xix) repair of grouting;</p> <p>xx) raising and lowering of columns including provision and operation of all necessary specialist equipment; and</p> <p>xxi) cleaning of all warning and numbering labels.</p> <p>1.3 The electrical supply shall be isolated at the cut-out before lamp removal and fitting and all maintenance Operations.</p> <p>1.4 Disposal of lamps shall be isolated at the cut-out before lamp removal and fitting and all maintenance Operations.</p> <p>1.5 All labour employed on electrical or associated site Operations shall comply with the requirements of these O&amp;M Works Requirements.</p> <p>1.6 The Company shall each day prepare a report that details Operations progress labour employed and Constructional Plant used.</p> <p>1.7 The format of the report shall be in accordance with these O&amp;M Works Requirements.</p> <p>1.8 These records shall be stored in accordance with the procedures in the Quality Plan and made available to the Scottish Ministers at any time.</p>

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	1.9	The Company shall refer to S1.10.3 of Schedule 2 Part 2 of the New Works Requirements for additional requirements concerning the Intelligent Lighting Control System (ILCS).
1371AR	1	<p><b>Cleaning Method and Materials</b></p> <p>1.1 The cleaning of all lighting equipment shall be carried out using an antistatic water based alkaline cleaner/degreaser and cloths complying with the following requirements:</p> <ul style="list-style-type: none"> <li>i) An approved detergent cleaning solution shall be used and shall be non-toxic and cause no handling dangers to personnel;</li> <li>ii) the cleaning solution shall cause no harmful effects to the range of materials and surfaces to be cleaned;</li> <li>iii) the cleaning solution shall be highly effective against greasy surface deposits fast acting and suitable for use in cold water and in hard or soft water areas;</li> <li>iv) the cleaning solution shall not give rise to smearing and it shall not be necessary to carry out rinsing with clean cold water after cleaning;</li> <li>v) the cleaning solution shall not cause persistent foaming in use and shall not promote the formation of static charges on the equipment surfaces;</li> <li>vi) the cleaner/degreaser solution shall be diluted with clean uncontaminated water in accordance with the manufacturer's written instructions and shall be applied by means of soft muslin cloths;</li> </ul> <p>1.2 The cleaning cloths shall be continually cleaned or changed to ensure that no scouring or abrasive action damages the surfaces of the optical components.</p> <p>1.3 The cloths shall not be 'wrung out' or cleaned on the working platform of the lift vehicle and quantities of the cleaning solution in open containers shall not be carried on the working platform on the lift vehicle;</p> <p>1.4 The Company shall ensure that during the Operations dropping of quantities of water or solution onto vehicles passing below or adjacent to the cleaning vehicle shall not occur.</p> <p>1.5 After the use of the cleaning solution all surfaces treated shall be wiped with a clean dry cloth and left reasonably dry.</p>
1372AR	1	<p><b>Lamp Disposal</b></p> <p>1.1 The Company shall collect, transport and dispose of waste lamps in accordance with the requirements of the <i>Waste Electrical and Electronic Equipment Regulations</i>.</p>
1373AR	1	<p><b>Removal of Existing Equipment</b></p> <p>1.1 The Company shall carefully excavate around and dismantle any existing equipment to be removed.</p>

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	1.2	Following removal or any excavation, the excavation shall be reinstated including any pavement, surfacing or landscaping.
	1.3	If the equipment shall not be immediately re-erected the Company shall then transport it to be stored in one of its depots.
	1.4	It shall remain the property of the Scottish Ministers.
<b>1374AR</b>	<b>1</b>	<b>Routine Maintenance of High Mast Lighting</b>
	1.1	Routine maintenance of high mast lighting units shall include all Operations in accordance with Clause 1370 AR and in addition High mast winch and head frame assemblies shall be inspected and maintained in accordance with the manufacturer's requirements and with Section 6 of Technical Report No 7 'High Mast Lighting' published by The Institution of Lighting Engineers. Where applicable, the Company shall ensure that all work undertaken on High Mast winch and head frame assemblies is carried out in accordance with the "Lifting Operations and Lifting Equipment Regulations" (LOLER) and that all personnel working on this Maintained Equipment have satisfactorily completed all necessary training in accordance with the requirements for working with winch mechanisms.
<b>1470AR</b>	<b>1</b>	<b>Special Tools</b>
		Duplicate sets of special tools, keys and handling devices essential for the correct running, operation and maintenance of the equipment shall be made available to the Scottish Ministers and provided to the Scottish Ministers at the end of the Defects Liability Period or Handback as appropriate.
<b>1471AR</b>	<b>1</b>	<b>Temporary Overhead Feed to Lighting Unit</b>
	1.1	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. temporary overhead feed to lighting unit system shall consist of conductor wires supported by a steel catenary wire.
	1.2	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 BS7671:2008.
		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.
<b>1472AR</b>	<b>1</b>	<b>Non Routine Maintenance</b>
	1.1	The Company shall carry out non routine Operations on or in:
	i)	luminaries;
	ii)	columns and brackets;
	iii)	High Mast lighting;

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Clause Number	Title and Written Text
	<p>iv) underground cable systems;</p> <p>v) feeder pillars and associated switchgear;</p> <p>vi) lit sign units;</p> <p>vii) control systems; and</p> <p>viii) any other related electrical and lighting equipment.</p> <p>1.2 When undertaking the replacement of luminaires columns and brackets as non-cyclic maintenance Operations the Company shall have regard to the aesthetic requirements of Clause 1302 and shall ensure that any replaced items match the existing in both physical appearance and lighting levels.</p> <p>1.3 For the purpose of energy efficiency electronic control gear or low loss control gear shall be used in all replacement luminaires.</p> <p>Preference shall always be given to LED based lamps. Other high efficiency devices may be optionally proposed for specific situations.</p> <p>1.4 All luminaires and lighting components shall be, as agreed with the Scottish Ministers, suitable for use with Intelligent Lighting Control System (ILCS) control and communications modules and other similar sub-assemblies. Suitability shall include features for the correct fitting and housing of any such additional components and allow for the ready access to them for maintenance. Suitability shall also cover the interface arrangements of the electronic DALI compatible enabled and accredited ballast or LED driver assembly. Luminaires and lighting components shall be considered as including but not limited to road lighting, illuminated signs and lit bollards and assets covered by Clause 1402TS 2.(iii).</p> <p>1.5 The Company shall attend to Emergency call-outs and prepare a report in a format as Appendix 14/73 as consented to in writing by the Scottish Ministers.</p> <p>1.6 The report shall be stored and made available to the Scottish Ministers at any time.</p> <p>1.7 Isolation Energising of Power Supplies and Making Safe Electricity Cables</p> <ul style="list-style-type: none"> <li>i) All work shall be carried out in accordance with Electricity Council Engineering Recommendation G39.</li> <li>ii) Any person isolating or energising power supplies shall be "competent" in accordance with G39.</li> <li>iii) The Company shall inform the Traffic Scotland Networks Operations Manager prior to isolating or energising power supplies to any equipment its uses or for which it shall be responsible.</li> </ul> <p>1.8 The Company shall refer to S1.10.3 of Schedule 2 Part 2 of the New Works Requirements for additional requirements concerning the Intelligent Lighting Control System (ILCS).</p> <p>1.9 Non routine maintenance of High Mast lighting units shall be undertaken in accordance with the manufacturer's requirements and with Technical Report No 7 "High Mast Lighting" published by the Institution of Lighting Engineers. Where applicable the Company shall ensure that all work undertaken on High Mast winch and head frame assemblies is carried out in accordance with the "Lifting Operations and Lifting Equipment Regulations" (LOLER)</p>

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	<p>and that all personnel working on this Maintained Equipment have satisfactorily completed all necessary training in accordance with the requirements for working with winch mechanisms.</p> <p><b>2 Private Cable Supplies</b></p> <p>2.1 In the event of an Emergency no authorisation shall be required to isolate any cable but the Scottish Ministers shall be notified as soon as possible.</p> <p>2.2 If a communication system supply shall be isolated the Police and the Traffic Scotland Networks Operations Manager shall be informed initially by telephone followed immediately thereafter be a written confirmation.</p> <p>2.3 The isolation or energising of power cable shall be recorded by the Company who shall ensure only one activity shall be being carried out on any cable at this time.</p> <p>2.4 Whenever routine maintenance Operations are being undertaken only the minimum number of feeder pillars shall be de-energised at any one time.</p> <p>2.5 Control circuits shall be returned to normal operation on completion of the Operations.</p> <p>2.6 All cable shall be isolated at the main isolator or switched fuse.</p> <p>2.7 The isolation of individual circuits shall be carried out using the mini circuit breaker or fuses within a distribution board.</p> <p><b>3 Electricity Company Supplies</b></p> <p>3.1 Where electricity companies supplies are required to be isolated above the cut out only competent persons in accordance with G39 and qualified to 'Electrician' status (see Appendix 14/71) may remove the fuse.</p> <p>3.2 Where electricity company's supplies are required to be isolated below the cut out the Company shall then liaise with the electricity authority before Operations commence (see Appendix 14/75).</p> <p><b>4 Special Tools</b></p> <p>4.1 Duplicate sets of special tools keys and handling devices essential for the correct running operation and maintenance of electrical equipment shall be handed to the Scottish Ministers at the Expiry Date.</p> <p><b>5 Fixings for Attachment to Structures</b></p> <p>5.1 Fixings for attachment to Structures shall use a resin fixed replaceable bolt system.</p>
1670AR	<p><b>1 Static Load Testing of Piles</b></p> <p>1.1 Further to Clause 1609:</p> <ul style="list-style-type: none"> <li>i) The Company shall undertake a pile load testing programme that</li> <li>ii) is consistent with section 7.5 of BS EN 1997-1:2004</li> <li>iii) is consistent with the recommendations given in section C15 of the Guidance Notes in Part C of the ICE Specification for Piling and</li> </ul>

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	<p>1.1</p> <p>iv) Embedded Walls 2nd Edition</p> <p>iv) takes due account of the range of ground conditions encountered at the foundation locations</p> <p>v) As a minimum this shall include a maintained load test on at least one full size instrumented preliminary trial pile of the largest diameter proposed to at least the calculated ultimate resistance to validate the design method adopted. The preliminary trial pile(s) shall be constructed using the same equipment and techniques that are adopted for the works piles.</p> <p>1.2 Trial piles shall be instrumented with strain gauges and extensometers with an appropriate degree of redundancy such that the load distribution down the pile during the test can be determined.</p> <p>1.3 Static load testing using the bi-directional method is permitted. If the Company proposes to adopt the bi-directional method full details of the design and construction of the preliminary trial pile(s) and associated instrumentation shall be given in Appendix 16/9. This shall include:</p> <ul style="list-style-type: none"> <li>i) the test procedure and load increments to be adopted;</li> <li>ii) the measurements that will be made during the test; and</li> <li>iii) the method to be used to interpret the results of the test.</li> </ul> <p>1.4 Preliminary trial piles shall be constructed and tested sufficiently in advance of the main works for the results to be evaluated and the design modified if necessary.</p> <p>1.5 A report on the preliminary pile tests shall be submitted which shall include all the information required in sub Clauses 36 and 37 of Clause 1609 together with an interpretation of the results and any implications for the pile design.</p> <p>1.6 Preliminary trial piles are not permitted to be incorporated into the Permanent Works.</p> <p>1.7 The Company shall complete Appendix 16/9 to include:-</p> <ul style="list-style-type: none"> <li>i) the overall pile testing strategy in relation to verification of the pile design and partial resistance factors and model factors to be adopted;</li> <li>ii) the numbers and types of static load tests to be carried out;</li> <li>iii) the proposed locations of preliminary trial piles;</li> <li>iv) whether additional location specific ground investigation is required;</li> <li>v) the programme for installation and testing; and</li> <li>vi) details of the instrumentation to be installed.</li> </ul>	
1671AR	1	<p><b>Pile Integrity Tests</b></p> <p>1.1 Pile Integrity Tests</p> <p>1.1.1 Further to Clause 1608:</p> <ul style="list-style-type: none"> <li>(a) The Company shall carry out a programme of integrity testing of</li> </ul>

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	<p>piles. This shall include:</p> <ul style="list-style-type: none"> <li>i) Cross hole sonic logging in all bored cast in situ piles over the full length of the shaft. The number of logging tubes shall be not less than 2.5 times the pile diameter in metres with a minimum of four.</li> <li>ii) Coring of the lower part of the concrete shaft and contact between the pile base and rock in rock socket piles where end bearing resistance is considered in the design. The coring shall be used to demonstrate the cleanliness of the contact (concrete to rock) and that the rock is undisturbed. Core recovery shall be 100%. Core dimensions shall be at least 0.5 metres of concrete, 1.5 metres of rock both with a diameter of at least 100 millimetres. The resulting bore shall be backfilled with cement grout. This requirement is in addition to that in Clause 1673 AR below.</li> <li>iii) The Company shall complete Appendix 16/8 with detailed scope of integrity testing.</li> </ul> <p>1.2 Dynamic Pile Testing</p> <p>1.2.1 Further to Clause 1608:</p> <ul style="list-style-type: none"> <li>(a) If dynamic pile testing is proposed on driven piles it shall be calibrated against static load tests carried out on comparable piles (i.e. of the same type and similar size constructed in similar ground conditions at the same site using the same installation criteria). Restrike tests shall be carried out unless it has been demonstrated that relaxation following the end of driving is not significant.</li> <li>(b) The limitations of dynamic pile testing set out in section C14 of the Guidance Notes in Part C of the ICE Specification for Piling and Embedded Walls 2nd Edition shall be taken into account.</li> </ul> <p>1.3 Quasi Static (Rapid Loading) Pile Testing</p> <p>1.3.1 If quasi static testing is proposed to be used it shall be calibrated against static load tests carried out on comparable piles (i.e. of the same type and similar size constructed in the same ground conditions at the same site using the same installation criteria).</p> <p>1.3.2 The limitations of quasi static pile testing set out in section C14 of the Guidance Notes in Part C of the ICE Specification for Piling and Embedded Walls 2nd Edition shall be taken into account.</p>	
1672AR	1	<p><b>Drilling Fluid</b></p> <p>1.1 If drilling fluid other than water is proposed for bored piles constructed the Company shall include in Appendix 16/18 details of the methods to be adopted to avoid contamination of the ground. The use of drilling fluid other than water shall only be permitted where the Company has obtained prior approval from the Scottish Environment Protection Agency ("SEPA").</p>

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1673AR	1	<p><b>Ground Investigation</b></p> <p>1.1 If rock socket piles are required to mobilise base resistance under reversible or irreversible serviceability limit state ("SLS") load combinations a borehole shall be made at each pile position prior to pile construction to verify the rock quality at the proposed founding level. Continuous cores shall be recovered from two pile diameters above pile toe level to two pile diameters below pile toe level and appropriate in situ and / or laboratory testing carried out. Core diameter shall be at least 100 millimetres. The resulting bore shall be backfilled with cement grout.</p>
1674AR	1	<p><b>Geotechnical Reporting</b></p> <p>1.1 The Company shall update the preliminary Ground Investigation Report(s) to include additional details providing justification for any changes made when compared to their tender stage Ground Investigation Report(s).</p> <p>1.2 The Company shall update the preliminary Geotechnical Design Reports to "for construction" status with contents as per Clause 2.8 of BS EN 1997-1:2004 along with the following additional requirements:</p> <ul style="list-style-type: none"> <li>(a) The following is added to Clause 2.8(3) of BS EN 1997-1:2004 after "...including actions": <ul style="list-style-type: none"> <li>i) characteristic values of pile resistances, including justification, as appropriate;</li> <li>ii) design values of pile resistances, including justification, as appropriate; and</li> <li>iii) characteristic value of soil and rock properties, including justification, as appropriate.</li> </ul> </li> <li>(b) The modified Clause 2.8(3) of BS EN 1997-1:2004 shall be considered to be a principle in the context of the Eurocodes, i.e. 2.8(3)P.</li> </ul> <p>1.3 Following completion of construction the Company shall provide a full close-out report of the as-built Structures. The contents of the close-out report shall include, but not be limited to, the following:</p> <ul style="list-style-type: none"> <li>(a) As-built location and geometry of all completed O&amp;M Works including any Temporary Works left, with permission of the Scottish Ministers, in-situ;</li> <li>(b) Construction records for all Structures;</li> <li>(c) All integrity test results;</li> <li>(d) All strength measurement test results on materials (concrete cylinder / cube etc) for Permanent Works and, with permission of the Scottish Ministers, Temporary Works left in-situ; and</li> <li>(e) All non-conformance report and completed close out documentation.</li> </ul> <p>1.4 The close out report shall be accompanied by extracts from the geotechnical design reports as per requirements in BS EN 1997- 1:2004</p>

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Clause Number	Title and Written Text																									
	Clause 2.8(6)P.																									
1675AR	1	<p><b>Geotechnical Categorisation</b></p> <p>1.1 The Company shall provide a list of Geotechnical Categories (BS EN 1997-1: 2004, Clause 2.1) for all geotechnical related Structures (cuttings, embankments, retaining walls, foundations) in the project. The default Category shall be taken to be 3 unless justification for a lower category is provided.</p>																								
1770AR	1	<p><b>Construction Tolerances in Structural Concrete</b></p> <p>1.1 <b>General</b></p> <p>1.1.1 Notwithstanding any tolerances stated in the DMRB, British and European Standards the following tolerances shall be adopted in the design, execution and completion of the O&amp;M Works.</p> <p>1.1.2 <b>In-Situ Concrete</b></p> <p>1.1.2.1 The maximum deviation of hardened concrete surfaces prior to the removal of formwork shall not be greater than three millimetres in three metres (which tolerance shall not be cumulative) nor greater than two millimetres in one metre. Of the foregoing deviations, not more than two millimetres shall occur at a formwork joint. The overall standard of workmanship to be achieved shall be such that the lines of the finished surfaces shall be smoothly continuous.</p> <p>1.1.2.2 Where concrete surfaces are not permanently exposed, the maximum deviation of the finished concrete surfaces shall not be greater than six millimetres in three metres (which tolerance shall not be cumulative).</p> <p>1.1.3 <b>Precast Concrete</b></p> <p>1.1.3.1 For members other than pre-stressed pre-tensioned members, the length, cross-section dimensions, straightness, squareness, twist and flatness of precast concrete shall be measured at <math>28 \pm 2</math> days after casting. Unless otherwise stated, the allowable dimensional variations shall not exceed the following:</p> <table> <tr> <td>i)</td> <td>Length</td> <td>Variation</td> </tr> <tr> <td></td> <td>Up to 3 metres</td> <td><math>\pm 6</math> millimetres</td> </tr> <tr> <td></td> <td>3 to 4.5 metres</td> <td><math>\pm 9</math> millimetres</td> </tr> <tr> <td></td> <td>4.5 to 6 metres</td> <td><math>\pm 12</math> millimetres</td> </tr> <tr> <td></td> <td>Additional for every subsequent 6 metres</td> <td><math>\pm 6</math> millimetres</td> </tr> <tr> <td>ii)</td> <td>Cross section (each direction)</td> <td></td> </tr> <tr> <td></td> <td>Up to 500 millimetres</td> <td><math>\pm 6</math> millimetres</td> </tr> <tr> <td></td> <td>500 to 750 millimetres</td> <td><math>\pm 9</math> millimetres</td> </tr> </table>	i)	Length	Variation		Up to 3 metres	$\pm 6$ millimetres		3 to 4.5 metres	$\pm 9$ millimetres		4.5 to 6 metres	$\pm 12$ millimetres		Additional for every subsequent 6 metres	$\pm 6$ millimetres	ii)	Cross section (each direction)			Up to 500 millimetres	$\pm 6$ millimetres		500 to 750 millimetres	$\pm 9$ millimetres
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	<p>Additional for every subsequent 250 millimetres <math>\pm 3</math> millimetres</p> <p>iii) Straightness or bow (deviation from intended line)</p> <table> <tr> <td>Up to three metres</td><td><math>\pm 6</math> millimetres</td></tr> <tr> <td>3 to 6 metres</td><td><math>\pm 9</math> millimetres</td></tr> <tr> <td>6 to 12 metres</td><td><math>\pm 12</math> millimetres</td></tr> <tr> <td>Additional for every subsequent 6 metres</td><td><math>\pm 6</math> millimetres</td></tr> </table> <p>iv) Squareness. When considering the squareness of a corner, the longer of the two adjacent sides being checked shall be taken as the base line. The shorter side shall not vary in its distance from a perpendicular so that the difference between the greatest and shortest dimensions exceeds the following:</p> <table> <tr> <td>i) Length of shorter sides:</td><td></td></tr> <tr> <td>Up to and including 1.2 metres</td><td>6 millimetres</td></tr> <tr> <td>Over 1.2 metres but less than 1.8 metres</td><td>9 millimetres</td></tr> <tr> <td>1.8 metres and over</td><td>12 millimetres</td></tr> </table> <p>When considering squareness, any error due to lack of straightness shall be ignored; squareness shall be measured with respect to the straight lines that are closest to parallel with the features being checked.</p> <p>When the nominal angle is other than 90°, the included angle between check lines shall be varied accordingly.</p> <p>ii) Twist. Any corner shall not be more than the deviation stated from the plane containing the other three corners:</p> <table> <tr> <td>Up to 60 millimetres wide and up to 6 metres in length:</td><td>6 millimetres</td></tr> <tr> <td>Over 600 millimetres wide and for any length:</td><td>12 millimetres</td></tr> </table> <p>iii) Flatness. The maximum deviation from a 1.5 metre straight edge placed in any position on a nominally plane surface shall not exceed 6 millimetres.</p> <p>In addition, for members where accuracy is important, for example those which form bridge deck copes, the allowable dimensional variations and deviations shall not exceed half the values listed above.</p>	Up to three metres	$\pm 6$ millimetres	3 to 6 metres	$\pm 9$ millimetres	6 to 12 metres	$\pm 12$ millimetres	Additional for every subsequent 6 metres	$\pm 6$ millimetres	i) Length of shorter sides:		Up to and including 1.2 metres	6 millimetres	Over 1.2 metres but less than 1.8 metres	9 millimetres	1.8 metres and over	12 millimetres	Up to 60 millimetres wide and up to 6 metres in length:	6 millimetres	Over 600 millimetres wide and for any length:	12 millimetres
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1.2	<b>Assembly and Erection of Precast Concrete Members other than Prestressed Pretensioned Members</b>																				
1.2.1	The vertical alignment of the member shall not depart from the design level along the line by more than $\pm$ five millimetres nor more than three millimetres in a distance of three metres, nor greater than two millimetres in one metre.																				
1.2.2	The horizontal alignment of the new member shall not depart from the																				

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	<p>design alignment along the line where accuracy is important by more than <math>\pm</math> five millimetres nor more than three millimetres in a distance of three metres, nor greater than two millimetres in one metre.</p> <p>1.2.3 At the joints between adjacent members, the difference in level at the point where accuracy is important shall not exceed two millimetres.</p> <p>1.2.4 At the joints between adjacent members, the difference in horizontal alignment at the point where accuracy is important shall not exceed two millimetres.</p> <p>1.2.5 The width of gaps between adjacent members shall be as uniform as possible.</p> <p>1.2.6 The erection procedure shall incorporate means of accurately locating members in their final position. The procedure shall also incorporate means of making fine adjustments to the level and alignment of the units after installation.</p>
1771AR	<p><b>1</b> <b>Couplers</b></p> <p>1.1 The use of threaded mechanical couplers is acceptable subject to:</p> <ul style="list-style-type: none"> <li>i) The Company shall submit the source and suppliers to the Overseeing Organisation for agreement;</li> <li>ii) Manufacturer's and suppliers shall hold a relevant valid CARES certificate of approval unless otherwise agreed by the Overseeing Organisation;</li> <li>iii) All couplers shall be covered by a relevant CARES Technical Approval or other relevant product approval from an appropriate UKAS accredited product certification body; and</li> <li>iv) Concrete cover shall be maintained.</li> </ul> <p>1.2 Tensile Capacity</p> <p>1.2.1 The tensile strength of the coupled bar should exceed 540 newtons per square millimetre for BS4449:2005 grade B500B or Grade B500C hot rolled reinforcement steel.</p> <p>1.3 Slip (permanent elongation test)</p> <p>1.3.1 When a test is made of a representative gauge length assembly comprising reinforcement size, grade and profile to be used and a coupler of the precise type to be used, the permanent elongation after loading to <math>0.6f_y</math> shall not exceed 0.1 millimetres.</p> <p>1.4 Fatigue</p> <p>1.4.1 The Company shall obtain from the coupler manufacturer the fatigue design S-N curve established as defined below, which he shall furnish to the Designer, Checker and Overseeing Organisation with the Design Documentation. Existing fatigue design S-N data may be taken as an acceptable alternative.</p> <p>1.5 Performance testing</p>

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	<p>1.5.1 The material to be used for the performance tests shall be in all respects similar to those which the Company proposes to use in the O&amp;M Works.</p> <p>1.5.2 Mechanical connections shall be qualified for use in the construction on the basis of the following performance tests:</p> <p>1.6 Static tensile strength tests</p> <p>1.6.1 A minimum number of six static tensile strength tests shall be conducted considering the range of all variables. All test samples shall meet the requirements of sub Clause 1.2 above.</p> <p>1.7 Slip testing</p> <p>1.7.1 A minimum number of two slip tests shall be conducted considering the range of variables. All test samples shall meet the requirements of sub-Clause 1.3 above.</p> <p>1.8 Fatigue testing</p> <p>1.8.1 Sampling</p> <p>1.8.1.1 Couplers shall be formed into batches of 20 bars of a single type and size, manufactured at the same time. All couplers of the same diameter should preferably be from the same melt. If not, the melt of each test specimen should be known and there should be a representative number of couplers from each melt.</p> <p>1.8.1.2 Each test specimen shall be selected at random from the batches and shall be representative of the production run.</p> <p>1.8.2 Testing</p> <p>1.8.2.1 The fatigue properties for each coupler size shall be established by a competent testing laboratory complying with the Schedule 4 of the O&amp;M works Requirements.</p> <p>1.8.2.2 Test specimens shall be tested in air under axial tensile loading using tapered grips and a suitable gripping medium.</p> <p>1.8.2.3 Testing shall be carried out under load control and stress shall be calculated using nominal cross-sectional area.</p> <p>1.8.2.4 Tests shall be performed for couplers for reinforcing bar diameters 25 millimetres, 32 millimetres, 40 millimetres on BS4449:2005 grade B500B or grade B500C.</p> <p>1.8.2.5 The number of load cycles per test shall be performed until failure.</p> <p>1.8.2.6 The frequency of testing shall be in the range 5 to 10 hertz.</p> <p>1.8.2.7 The samples of all diameters shall be tested at the following stress ranges (all newtons per square millimetre):</p> <table> <thead> <tr> <th>Stress Range</th> <th>Max Stress</th> <th>Min Stress</th> <th>Mean Stress</th> </tr> </thead> <tbody> <tr> <td>400</td> <td>450</td> <td>50</td> <td>250</td> </tr> <tr> <td>300</td> <td>400</td> <td>100</td> <td>250</td> </tr> <tr> <td>200</td> <td>350</td> <td>150</td> <td>250</td> </tr> </tbody> </table>	Stress Range	Max Stress	Min Stress	Mean Stress	400	450	50	250	300	400	100	250	200	350	150	250
Stress Range	Max Stress	Min Stress	Mean Stress														
400	450	50	250														
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200	350	150	250														

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		160	360	200	280
	1.8.2.8	The S-N curves shall be presented as straight lines, using a log-log scale of stress versus number of cycles to failure. They shall be based upon standard statistical regression analysis methods and give the 97.5 per cent confidence of survival.			
	1.8.3	Frequency of testing			
	1.8.3.1	3 samples shall be tested for each bar / coupler size and stress range; giving a total number of 12 sets of tests per bar / coupler size.			
<b>1772AR</b>	<b>1</b>	<b>Concrete Repairs – General Requirements</b>			
	1.1	<b>Storage of Materials</b>			
	1.1.1	All proprietary materials shall be stored in a dry weatherproof lock up store free from extremes of cold or heat in accordance with the manufacturer's written instructions. The materials shall not be removed from the store for use until immediately prior to mixing.			
	1.2	<b>Records</b>			
	1.1.2	As repair work proceeds the Company shall keep records including date stamped photographs. Records shall be held in accordance with the procedures in the Quality Plan and be available for inspection by the Scottish Ministers.			
	1.3	<b>High Pressure Water Jetting</b>			
	1.1.3	High pressure water jetting shall use clean and fresh potable water which complies with the requirements of BS EN 1008. The Company shall not add antifreeze agents or any other chemicals.			
<b>1773AR</b>	<b>1</b>	<b>Removal of Concrete in Areas to be Repaired</b>			
	1.1	Requirements for the Removal of Concrete			
	1.1.1	The Company shall cut out and remove concrete from areas specifically identified following inspection and testing.			
	1.1.2	Concrete shall be removed from the area until sound concrete is reached. Where reinforcement becomes exposed concrete shall be removed for a minimum distance of 25 millimetres beyond the rear face of the reinforcement. Where corroded reinforcement is identified the area of concrete removed shall be extended to expose 100 millimetres of uncorroded reinforcement in all directions.			
	1.1.3	Before cutting out the Company shall determine the position and depth of the reinforcement. 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 15 millimetres or to within 10 millimetres of the reinforcement, whichever shall be the lesser.			
	1.1.4	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.			
	1.1.5	The saw cut edges shall be abraded by grit blasting or equivalent methods.			

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	<p>1.1.6 The concrete shall be removed by the use of suitable hand or mechanical tools or high pressure water jetting. Removal of concrete by water jetting shall be carried out by firms who are registered members of the Association of High Pressure Water Jetting Companies.</p> <p>1.1.7 Where concrete is removed by high pressure water jetting, final trimming of the area may be broken out using other processes.</p> <p>1.1.8 Overbreak of concrete shall be made good using a concrete repair system selected from Clause 1775AR.</p> <p>1.1.9 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.</p> <p>1.1.10 The Site shall be kept free of debris or standing water arising from the high pressure water jetting activities.</p> <p>1.1.11 On completion of removal of concrete all concrete surfaces and exposed reinforcement which shall be in contact with repair materials shall be prepared in accordance with Clause 1774AR.</p>
1774AR	<p><b>1 Surface Preparation</b></p> <p>1.1 General Requirements</p> <p>1.1.1 Blast cleaning - The Company shall ensure that the grade and particle shape of abrasives is adequate to achieve the appropriate standard of cleanliness. Non-metallic abrasives shall not be recycled</p> <p>1.1.2 Water for cleaning - Only clean cold water which complies with the requirements of BS EN 1008 shall be used for cleaning and rinsing.</p> <p>1.1.3 Preparation of Surfaces of Reinforcement</p> <p>i) Standard - Bright steel: Removal of all detrimental contamination and corrosion products to produce a generally bright appearance overall. The surfaces shall be free of embedded abrasive particles and corrosion products when viewed through a X10 illuminated magnifying glass.</p> <p>1.2 Method</p> <p>1.2.1 Blast cleaning using dry air / abrasive system, or</p> <p>1.2.2 Wet blast cleaning using a low pressure air / water / abrasive system. The equipment shall not allow the air / water pressure to exceed 14 bar and shall incorporate a metering device to allow the abrasive quantity introduced to be adjusted from 0 to 14 bar.</p> <p>1.2.3 Within an hour of cleaning the treated reinforcement shall be pressure washed with clean water.</p> <p>1.3 Preparation of Surfaces of Concrete</p> <p>1.3.1 Standard - Concrete surfaces shall be clean and dry and free of cement</p>

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	<p>laitance contaminants and loose friable material. The surface shall be wetted one hour before repair concrete is applied. There shall be no standing water. The surface shall be such that repair concrete shall flow freely into all voids and be in intimate contact with the existing concrete.</p> <p>1.4 Method</p> <p>1.4.1 High Pressure Water Jet</p> <p>1.4.1.1 The surface profile after cutting out shall be irregular with aggregate particles projecting above the surrounding concrete matrix.</p> <p>1.4.2 Hand or Mechanical Tools</p> <p>1.4.2.1 All concrete surfaces to receive repair materials exposed by percussive methods using hand or mechanical tools shall be prepared by grit blasting or high pressure water jetting to remove all fractured or "bruised" concrete surfaces to expose sound aggregate particles.</p> <p>1.5 Procedure Trials</p> <p>1.5.1 The 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 a photographic record for inspection by the Scottish Ministers.</p>
1775AR	<p><b>1 Concrete Repairs</b></p> <p>1.1 General</p> <p>1.1.1 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 Company and subject to consent in writing by the Scottish Ministers.</p> <p>1.1.1.1 Crack repairs carried out by a resin injection system shall be proposed by the Company and subject to consent in writing by the Scottish Ministers.</p> <p>1.1.2 Proprietary repair materials and systems shall have an Agrément Board Roads and Bridges Certificate registered with the Department for Transport / Highways Agency.</p> <p>1.1.3 Proprietary repair mortars shall be used for repair areas less than or equal to 1 metre squared or repair depths less than or equal to 30 millimetres deep. Normal flow concrete or high flow concrete or sprayed concrete shall be used for repair areas greater than 1 metre squared or greater than 30 millimetres deep or as otherwise proposed by the Company and subject to consent in writing by the Scottish Ministers.</p> <p>1.2 Repairs Using Normal Flow Concrete</p> <p>1.2.1 Repair concrete shall be a designed mix for special structural concrete as defined in Clauses 1701 and 1705 of the Specification.</p> <p>1.2.2 Cement content shall be not less than 400 kilograms per cubic metre or more than 550 kilograms per cubic metre.</p> <p>1.2.3 Maximum aggregate size shall be 10 millimetres.</p>

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	<p>1.2.4 The free water / cement ratio shall not be greater than 0.4.</p> <p>1.2.5 The minimum 28 day compressive strength shall be 40 newtons per square millimetre.</p> <p>1.2.6 Alkali – silica reaction shall be controlled as specified in Clause 1704.5.</p> <p>1.3 Repairs Using Proprietary Repair Mortar</p> <p>1.3.1 Prebatched polymer modified cementitious mortars incorporating a shrinkage reduction agent shall be used.</p> <p>1.3.2 Mortars for hand screeding of surfaces to be waterproofed shall be sand/cement mortar containing styrene acrylate or styrene butadiene polymer bonding mixture.</p> <p>1.3.3 The free water / cement ratio shall be not greater than 0.4.</p> <p>1.3.4 The maximum aggregate grain size in the mortar shall be suitable for the depths of repair required.</p> <p>1.3.5 Water required to mix repair mortars shall comply with the requirements of BS EN 1008.</p> <p>1.3.6 The cement content shall be not less than 400 kilograms per cubic metre or more than 550 kilograms per cubic metre.</p> <p>1.3.7 The total chloride ion content of the materials for repairs to prestressed or heat cured concrete shall not exceed 0.1 per cent of the weight of cement. Calcium chloride or admixtures containing chloride salts shall not be used.</p> <p>1.3.8 The minimum 28 day strength of the mortar shall be 40 newtons per square millimetre. Alkali-silica reaction shall be controlled as specified in Clause 1704.5 of the Specification.</p> <p>1.4 Delivery and Storage of Material</p> <p>1.4.1 The Company shall supply with each batch of the material delivered to the O&amp;M Works Site certificates furnished by the supplier stating:</p> <ul style="list-style-type: none"> <li>i) the polymer used;</li> <li>ii) evidence that the chloride contents are less than specified in sub-Clause 1.3.7 above;</li> <li>iii) the content of sodium oxide equivalent in the mortar;</li> <li>iv) Maximum shelf life; and</li> <li>iv) Handling arrangements.</li> </ul> <p>1.4.2 The material shall be stored in a dry environment free from extremes of cold and heat and any specific storage requirements of the manufacturers; and</p> <p>1.4.3 The materials shall not be removed from the store for use until immediately prior to mixing</p> <p>1.5 Placing Repair Mortar</p> <p>1.5.1 The repair shall be built up in layers in accordance with the repair mortar manufacturer's written instructions. The surface of each layer except the</p>

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	<p>final layer shall be scored to provide a key for the next layer.</p> <p>1.5.2 The repair mortar shall be suitable for the purpose intended i.e. for soffits or vertical surfaces as appropriate.</p> <p>1.5.3 Repair mortar shall not be applied when the temperature of the surface to be repaired falls below five degrees Celsius.</p> <p>1.5.4 The material shall be incorporated within one hour of mixing or such lesser period as stated in writing by the manufacturer.</p> <p>1.5.5 Repair mortar shall be cured in accordance with sub-Clause 1710.5 and the manufacturer's written instructions. During the curing period the temperatures of the repair mortar shall be maintained at or above five degrees Celsius by artificial means if necessary.</p> <p>1.6 Surface Finish to Repair Mortar</p> <p>1.6.1 Repair mortar shall be float finished to produce a dense smooth uniform surface free from float marks to the specified line and level.</p> <p>1.7 Repairs Using High-Flow Repair Concrete</p> <p>1.7.1 Materials</p> <p>1.7.1.1 Cement shall comply with Clause 1702.</p> <p>1.7.1.2 Cement content shall be not less than 400 kilograms per cubic metre or more than 550 kilograms per cubic metre.</p> <p>1.7.1.3 Alkali-silica reaction shall be controlled as specified in Clause 1704.</p> <p>1.7.1.4 The total chloride ion content of the materials shall not exceed 0.1% of the weight of cement. Any chloride or admixtures containing chloride salts shall not be used.</p> <p>1.7.1.5 Aggregate shall be well graded with the maximum size not exceeding eight millimetres except when pumping is to be employed when the maximum size shall not exceed 6 millimetres and shall comply with sub-Clause 1702.2.</p> <p>1.7.1.6 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 state.</p> <p>1.7.1.7 Combinations and additions may comprise pulverised fuel ash ground granulated blast furnace slag microsilica plasticisers aggregate suspension agents and shrinkage reduction agents. Calcium chloride or admixtures containing chloride salts shall not be used.</p> <p>1.7.1.8 Microsilica content shall not exceed five per cent of the mass of the cement. Microsilica shall comply with Table 17/70.</p> <p><b>TABLE 17/70 MICROSILICA CONTENT</b></p> <table border="1"> <thead> <tr> <th>Item</th><th>Limit (by mass)</th></tr> </thead> <tbody> <tr> <td>Silica content (SiO<sub>2</sub>)</td><td>minimum 85%</td></tr> </tbody> </table>	Item	Limit (by mass)	Silica content (SiO <sub>2</sub> )	minimum 85%
Item	Limit (by mass)				
Silica content (SiO <sub>2</sub> )	minimum 85%				

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	Alkali content (NaO2)	maximum 2%
	Carbon	maximum 2%
	Proportion passing 50 micron sieve	minimum 99%
1.7.1.9	Water shall comply with the requirements of BS EN 1008.	
1.7.1.10	The specified minimum 28 day strength of the concrete shall be not less than 40 newtons per square millimetre. The maximum free water / cement ratio shall not exceed 0.4.	
1.7.2	Delivery and Storage of Material	
1.7.2.1	Records shall be kept of each batch of material delivered to the site of the O&M Works in accordance with the procedures in the Quality Plan and shall include:	
	<ul style="list-style-type: none"> <li>i) formulator's name and address;</li> <li>ii) formulator's agent's name and address where applicable;</li> <li>iii) material identification;</li> <li>iv) batch reference number size of batch and number of containers in the delivery;</li> <li>v) date of manufacture;</li> <li>vi) evidence that the chloride contents are less than specified in sub-Clause 1.7.1.4 above;</li> <li>vii) details of the significant rock components contained in the aggregates;</li> <li>viii) cement content;</li> <li>ix) combinations and additions used; and</li> <li>x) The equivalent sodium oxide content.</li> </ul>	
1.7.2.2	Containers shall be damp proof and readily emptied of their contents	
1.7.2.3	Containers shall be marked with the following information:	
	<ul style="list-style-type: none"> <li>i) material identification;</li> <li>ii) batch reference number;</li> <li>iii) formulator's name;</li> <li>iv) net weight; and</li> <li>v) Any warnings or precautions concerning the contents.</li> </ul>	
1.7.2.4	The material shall be stored in a dry environment free from extremes of cold and heat.	
1.7.2.5	Material shall not be older than three months or a lesser period specified by the formulator when used in the O&M Works.	
1.7.2.6	The materials shall not be removed from the store for use in the O&M	

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	<p>Works until immediately prior to mixing.</p> <p>1.7.3 Formwork Site Mixing Placing and Curing</p> <p>1.7.3.1 Formwork shall be Class F3 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.</p> <p>1.7.3.2 Mixing in a forced action paddle mixer and placing shall be carried out strictly in accordance with the formulator's written instructions together with the following additional conditions:</p> <ul style="list-style-type: none"> <li>i) The free water cement ratio shall not exceed 0.4. The water content shall be determined during approval tests and maintained for batch tests works tests and in the O&amp;M Works within <math>\pm</math> 2 per cent of the agreed content.</li> <li>ii) No extra water shall be added after the original mixing.</li> <li>iii) The material shall be incorporated in the O&amp;M Works within 20 minutes of completion of mixing or such lesser period as stated by the formulator. The concrete shall be continuously agitated after the mixing and before placing.</li> <li>iv) The material shall not be mixed or placed in the O&amp;M Works at ambient temperatures lower than five degrees Celsius or where the surface temperature of the concrete in the repair void is less than five degrees Celsius.</li> <li>v) The concrete when placed shall have a temperature of not less than five degrees Celsius and not more than 20 degrees Celsius.</li> <li>vi) The surface temperature of the concrete shall be maintained at not less than five degrees Celsius until the concrete reaches a strength of 10 newtons per square millimetre as determined by tests on cubes cured under similar conditions to the structural concrete. Heat shall not be applied direct to any concrete.</li> <li>vii) Repair concrete shall not be placed against other concrete which has been in position for more than 30 minutes unless a construction joint is formed in accordance with Clause 1710. In addition the joint surface shall be saturated for a minimum of 2 hours before concrete is placed against it. When repair concrete has been in place for four hours no further concrete shall be placed against it for a further 20 hours.</li> <li>viii) Vibration shall not be used. The side shutters shall be tapped lightly with a hammer to expel surface air voids.</li> </ul> <p>1.7.3.3 Immediately after placing and for 14 days thereafter concrete shall be protected against harmful effects of weather including rain, rapid temperature changes and frost and from drying out. Impregnation may be carried out in accordance with the manufacturer's written instructions and not before 14 days as described in Clause 1709. Curing membranes shall not be used.</p> <p>1.7.3.4 When the mix proportions have been determined no variations shall be</p>

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	<p>made in the manufacture supply mix proportions or method of mixing of the material.</p> <p>1.7.4 Approval Tests</p> <p>1.7.4.1 Before O&amp;M Works commence all properties of the proposed high-flow repair concrete shall be demonstrated by the 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 Quality Plan.</p> <p>1.7.4.2 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 O&amp;M Works. The composition shall not be varied throughout the course of the tests and the material shall be obtained from the same batch.</p> <p>1.7.4.3 The tests fall into two categories: flowability and compressive strength.</p> <p>1.7.4.4 The flowability tests shall demonstrate:</p> <ul style="list-style-type: none"> <li>i) flow characteristics in a trough at five degrees Celsius and 20 degrees Celsius as specified in Note 1 below; and</li> <li>ii) flow characteristics in a simulated soffit repair at five degrees Celsius and 20 degrees Celsius as specified in Note 2 below.</li> </ul> <p>Note 1: The flow characteristics of the concrete in a trough shall be assessed. 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 shall be deemed to be satisfied if none of the readings is below 750 millimetres in 30 seconds without signs of segregation or bleeding.</p> <p>Note 2: The flow characteristics of the concrete in a simulated soffit repair shall be tested in accordance with BD27. 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 100 millimetres 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.</p> <p>1.7.5 Compressive Strength Tests</p> <p>1.7.5.1 Compressive strength tests shall be carried out to determine the compressive strength of the concrete at five degrees Celsius and 20 degrees Celsius. These shall conform to the requirements in BS 8500-2:2006.</p> <p>1.7.5.2 Test cubes shall be made in 100 millimetres metal moulds to BS EN 12390-1:2000. The moulds shall be carefully filled by pouring concrete through a funnel to produce void free specimens. There shall be no compaction. The</p>

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	<p>cubes shall be cured and tested in accordance with BS EN 12390-2:2000.</p> <p>1.7.5.3 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 is lower than the specified value and the difference between the highest and lowest values is not more than 20% of the average. Identity testing where required shall be carried out in accordance with Clause 1707.</p> <p>1.7.6 Batch Acceptance Test</p> <p>1.7.6.1 Each batch of material delivered to the Sites shall be tested as follows:</p> <ul style="list-style-type: none"> <li>i) the material shall be taken at random from one or more containers from the same batch;</li> <li>ii) flow trough tests shall be carried out as specified in Note 1 of sub- Clause 1.7.4.4 above at 20 degrees Celsius; and</li> <li>iii) Compressive strength tests shall be carried out as specified in sub- Clause 1.7.5 above at 20 degrees Celsius.</li> </ul> <p>1.7.7 Site Tests</p> <p>1.7.7.1 Site tests shall be carried out to monitor:</p> <ul style="list-style-type: none"> <li>i) flowability; and</li> <li>ii) compressive strength.</li> </ul> <p>1.7.7.2 The flowability of a sample of fresh concrete shall be determined in a trough as specified in sub-Clause 1.7.4.4 Note 1.</p> <p>1.7.7.3 The gain in strength of the repair concrete shall be monitored by testing cubes cured alongside the repaired areas at ambient temperature.</p> <p>1.7.7.4 For each days production of repair concrete six 100 millimetres cubes shall be made in accordance with sub-Clause 1.7.5 above. 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. 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 Company but at least two cubes shall be retained to be tested at 28 days.</p> <p><b>1.8 Repairs Using Proprietary Sprayed Concrete</b></p> <p>1.8.1 Materials</p> <p>1.8.1.1 The proprietary material shall be pre-weighed and pre-mixed at a location off the site of the O&amp;M Works.</p> <p>1.8.1.2 Cement shall comply with Clause 1702.</p> <p>1.8.1.3 Alkali-silica reaction shall be controlled as specified in Clause 1704.</p> <p>1.8.1.4 The total chloride ion content of the materials shall not exceed 0.1% of the weight of cement. Any chloride or admixtures containing chloride salts as defined by sub-Clause 1702.2 shall not be used.</p> <p>1.8.1.5 Aggregate shall be well graded with the maximum size not exceeding</p>

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	<p>3 millimetres and shall comply with sub-Clause 1702.2.</p> <p>1.8.1.6 Combinations and additions may comprise pulverised fuel ash ground granulated blast furnace slag microsilica and plasticisers. Calcium chloride or admixtures containing chloride salts and expansion agents shall not be used.</p> <p>1.8.1.7 The maximum sulphate content shall comply with sub-Clause 1704.6.</p> <p>1.8.1.8 Material shall be capable of being applied to a thickness of 100 millimetres without the requirement for additional mesh reinforcement or fibres. Once placed it shall be capable of being profiled and trowel finished (to the equivalent of formed Class F3) without detrimental effects.</p> <p>1.8.2 Performance Characteristics</p> <p>1.8.2.1 The proprietary material shall have performance characteristics as detailed in Table 17/71 which are to be verified by an independent testing authority.</p> <p><b>TABLE 17/71: Performance Characteristics</b></p> <table border="1"> <thead> <tr> <th>TEST</th><th>PERFORMANCE</th></tr> </thead> <tbody> <tr> <td>Adhesion to concrete substrate</td><td>greater than 2.0 newtons per square millimetre</td></tr> <tr> <td>Characteristic strength of cores (28 days)</td><td>40 newtons per square millimetre</td></tr> <tr> <td>Tensile splitting strength (28 days)</td><td>greater than 2.4 newtons per square millimetre</td></tr> <tr> <td>Static Modulus of elasticity</td><td><math>27000 \pm 3000</math> newtons per square millimetre</td></tr> <tr> <td>Shrinkage</td><td>less than 0.002 per cent</td></tr> <tr> <td>Coefficient of Thermal Expansion</td><td>8 to <math>12 \times 10^{-6}</math> degrees Celsius</td></tr> <tr> <td>Coefficient of Chloride Ion Diffusion</td><td>less than <math>700 \times 10^{-15}</math> square metres per second</td></tr> </tbody> </table> <p>1.8.3 Delivery and Storage of Material</p> <p>1.8.3.1 Records shall be kept of each batch of material delivered to the Site and shall include:</p> <ul style="list-style-type: none"> <li>i) formulator's name and address;</li> <li>ii) formulator's agent's name and address where applicable;</li> <li>iii) batch reference number size of batch and number of containers in the delivery;</li> <li>iv) date of manufacture;</li> <li>v) evidence that the chloride contents are less than specified in sub-Clause 1.8.1.4 above;</li> <li>vi) details of the significant rock components contained in the aggregates;</li> </ul>	TEST	PERFORMANCE	Adhesion to concrete substrate	greater than 2.0 newtons per square millimetre	Characteristic strength of cores (28 days)	40 newtons per square millimetre	Tensile splitting strength (28 days)	greater than 2.4 newtons per square millimetre	Static Modulus of elasticity	$27000 \pm 3000$ newtons per square millimetre	Shrinkage	less than 0.002 per cent	Coefficient of Thermal Expansion	8 to $12 \times 10^{-6}$ degrees Celsius	Coefficient of Chloride Ion Diffusion	less than $700 \times 10^{-15}$ square metres per second
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	<p>vii) cement content;</p> <p>viii) additives used; and</p> <p>ix) the sodium oxide equivalent content.</p> <p>1.8.3.2 Containers shall be damp proof and readily emptied of their contents.</p> <p>1.8.3.3 Containers shall be marked with the following information:</p> <ul style="list-style-type: none"> <li>i) material identification;</li> <li>ii) batch reference number;</li> <li>iii) formulator's name;</li> <li>iv) net weight; and</li> <li>v) any warnings or precautions concerning the contents.</li> </ul> <p>1.8.3.4 The material shall be stored in a dry environment free from extremes of cold and heat.</p> <p>1.8.3.5 Material shall not be older than three months or lesser period specified by the formulator when incorporated in the O&amp;M Works.</p> <p>1.8.3.6 The materials shall not be removed from the store for use in the O&amp;M Works until immediately prior to mixing.</p> <p>1.8.4 Trial Mixes</p> <p>1.8.4.1 Practical tests shall be carried out on the Site by constructing test panels to confirm the suitability of the mix for the O&amp;M Works. In these tests the type of Constructional Plant 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 O&amp;M Works.</p> <p>1.8.5 Procedure Trials</p> <p>1.8.5.1 Before work commences on the site of the O&amp;M Works procedure trials shall be carried out to pre-qualify the nozzlemen proposed for use on the O&amp;M Works. Nozzlemen who have not been pre-qualified shall not be used.</p> <p>1.8.5.2 Each nozzleman shall carry out procedure trial panels. The procedure trial panels shall have minimum dimensions of 750 millimetres x 750 millimetres x 100 millimetres deep and shall be made of plywood with 45 degrees sloped edge to permit rebound to escape.</p> <p>1.8.5.3 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 1.17.2 of this Clause.</p> <p>1.8.5.4 One procedure trial panel shall be O&amp;M Works Operations using each proposed mixture proportion at each proposed orientation i.e. horizontal overhead and the like.</p> <p>1.8.5.5 A minimum of three 100 millimetre diameter cores shall be extracted from the location of intersecting reinforcing steel to check the adequacy of</p>

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	<p>consolidation of the sprayed concrete around the reinforcement.</p> <p>1.8.5.6 No sprayed concrete shall be carried out on the O&amp;M Works until the procedure trial testing requirements have been met.</p> <p><b>1.9 Surface Preparation for Sprayed Concrete</b></p> <p>1.9.1 Sound surfaces which are to receive sprayed concrete shall be thoroughly cleaned and roughened by grit blasting or high pressure water jetting.</p> <p>1.9.2 Grit blasted areas shall have sprayed concrete applied within 48 hours or shall be reblasted.</p> <p>1.9.3 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 to comply with the requirements of BS EN 1008.</p> <p><b>1.10 Outline Definition</b></p> <p>1.10.1 The outline of the finished sprayed concrete shall be defined by screed boards guide wires or other means proposed by the Company and consented to in writing by the Scottish Ministers.</p> <p>1.10.2 Guide wires shall be installed tight and true to line and in such a manner that they may be easily tightened.</p> <p><b>1.11 Mixing Sprayed Concrete</b></p> <p>1.11.1 Sprayed concrete shall be mixed in a batch type mixer complying with the requirements of BS1305 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.</p> <p>1.11.2 The temperature of water and cement when added to the mix shall not exceed 60 degrees Celsius and 65 degrees Celsius respectively.</p> <p>1.11.3 Water used in sprayed concrete shall comply with the requirements of BS EN 1008.</p> <p><b>1.12 Reinforcement</b></p> <p>1.12.1 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 two per square metre. The fabric shall be spaced at not less than 25 millimetres from the finished surface of the concrete.</p> <p><b>1.13 Transport and Placing Sprayed Concrete</b></p> <p>1.13.1 No concrete shall be sprayed in air temperatures less than five degrees Celsius or onto a surface temperature less than five degrees Celsius. Surfaces shall be free from standing water.</p> <p>1.13.2 Sprayed concrete shall emerge from the nozzle in a steady uninterrupted flow and an uninterrupted supply of compressed air shall be provided to</p>

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	<p>maintain adequate nozzle velocity. Should the flow become intermittent the nozzle shall be directed away from the work until the flow again becomes uniform.</p> <p>1.13.3 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.</p> <p>1.13.4 Adequate precautions shall be taken to ensure that sprayed concrete rebound is not incorporated in the finished work and that any previously deposited hardened rebound which may prevent a proper bond or encasement is removed from reinforcement.</p> <p>1.13.5 Adequate protection shall be given to the nozzle and application surface during high winds.</p> <p>1.13.6 The final coat shall be hand screeded to a Class U3 finish in accordance with sub-Clause 1708.4</p> <p><b>1.14 Fibre Reinforced Sprayed Concrete</b></p> <p>1.14.1 The weight of steel and / or composite fibres shall not exceed five per cent by weight of the combined weight of cement and aggregate. Fibres shall be added to the mix in such a manner that the fibres are evenly distributed and not bent. Procedure trials shall be undertaken to demonstrate that the proposed methods can achieve the requirements of this sub-Clause.</p> <p>1.14.2 Unless otherwise stated elsewhere in this Agreement a final 15 millimetres thick coat of unreinforced sprayed concrete shall be applied over the whole exposed surface to cover exposed fibres.</p> <p>1.14.3 The gun and nozzle shall be electrically earthed.</p> <p><b>1.15 Construction Joints</b></p> <p>1.15.1 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. 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.</p> <p><b>1.16 Curing of Sprayed Concrete</b></p> <p>1.16.1 Freshly sprayed concrete shall be protected from rain or water until the surface is sufficiently hard to resist damage.</p> <p>1.16.2 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. Curing membranes shall not be used.</p> <p>1.16.3 Impregnation in accordance with Clause 1709 may be carried out after 14 days.</p> <p><b>1.17 Production Testing of Sprayed Concrete</b></p>

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	<p>1.17.1 One production test panel shall be carried out for each nozzle orientation for each day of sprayed concrete production or every 1five cubic metres of sprayed concrete whichever is the lesser.</p> <p>1.17.2 Sprayed concrete production test panels shall be made with dimensions 450 millimetres x 450 millimetres x 100 millimetres thick with 45 degrees sloped edge forms to permit escape of rebound. Production test panels shall contain no reinforcement (other than fibre reinforcement). The production test panels shall be marked cured cored and tested in compression in accordance with the appropriate parts of BS1881 and BS EN 12390. They shall be tested in a UKAS accredited laboratory. Records shall be maintained of all tests and stored at a suitable location.</p> <p>1.17.3 Routine tests shall be carried out by the Company on the finished sprayed concrete. These shall consist of taking 25 millimetres or 100 millimetres dia. cores from the finished sprayed concrete and testing them 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' to determine compressive strength and testing for bond by the use of a hand hammer.</p> <p>1.18 <b>Resin Injection Repairs</b></p> <p>1.18.1 Preparation of Surfaces Around Cracks</p> <p>1.18.1.1 The concrete surface at least 50 millimetres 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 50 millimetres beyond the end of the crack or until the crack becomes too narrow to warrant resin injection.</p> <p>1.18.1.2 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 is not contaminated and that run-off is collected and disposed of in a safe manner.</p> <p>1.18.2 Moisture in Cracks</p> <p>1.18.2.1 Where the moisture level in the crack to be resin injected is unacceptably high 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.</p> <p>1.18.2.2 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</p> <p>1.18.2.3 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.</p> <p>1.18.3 Resin Injection</p>

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	<p>1.18.3.1 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 five degrees Celsius.</p> <p>1.18.3.2 The spacing of the nozzle positions shall be equal to the depth of the crack and shall not in any case be less than 250 millimetres.</p> <p>1.18.3.3 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.</p> <p>1.18.3.4 The injected crack shall be left undisturbed for a period of at least 24 hours to allow the resin to harden.</p> <p>1.18.3.5 When the resins are sufficiently cured the cracks and any resin spillages shall be cleaned from the face of the concrete.</p> <p>1.18.4 Proving Tests</p> <p>1.18.4.1 When the resin has set, two 20 millimetres diameter proving cores shall be taken to the full depth of the crack. These shall be filled with either the resin used for injecting or with a suitable filler of a compatible thixotropic resin.</p> <p>1.19 <b>Sealing of Cracks in Concrete Bridge Decks</b></p> <p>1.19.1 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 1.18 above.</p> <p>1.19.2 Application of Sealer</p> <p>1.19.2.1 The sealing resin shall be a low viscosity polyester epoxy or acrylic polymer which shall be compatible with any proposed waterproofing system.</p> <p>1.19.2.2 The material shall be applied by pouring through a fine nozzle directly into the crack or into pre-formed dams.</p> <p>1.19.2.3 The injected crack shall be left undisturbed for a period of at least 24 hours to allow the resin to harden.</p> <p>1.19.2.4 When the resins are sufficiently cured the cracks and resin spillages shall be cleaned to the face of the concrete.</p>	
1776AR	1	<p><b>Foamed Concrete Fill to Structures and Backfilling to Drainage Trenches</b></p> <p>1.1 Foamed concrete fill to arches or bridge decks shall be of density 1400 – 1600 kilograms per cubic metre. Minimum cement content shall be 350 kilograms per cubic metre. The maximum free water cement ratio shall be 0.4. The minimum compressive strength shall be eight newtons per square millimetre.</p> <p>1.2 Foamed concrete fill to drainage trenches shall comply with sub-Clause 1.1 above.</p>

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1777AR	<p><b>1 Installation of Resin Anchored Reinforcement</b></p> <p>1.1 General</p> <p>1.1.1 Installation of resin anchored reinforcement into existing reinforced concrete shall utilise proprietary products, materials and methods suitable for highway works and for the conditions set out below.</p> <p>1.1.2 The Company shall consult and comply with the requirements of Transport Scotland (Contact: [REDACTED], Telephone: [REDACTED]) with regard to all resin anchor systems. The Company shall provide the Scottish Ministers with completed Consultation Certificates in accordance with Part 6 of the O&amp;M Works Requirements in respect of this requirement.</p> <p>1.1.3 The resin anchor system proposed shall be checked against the anchorage design to ensure that it is capable of resisting the design loads by means of testing. For the purposes of testing the test loading shall be the load calculated allowing for a 30 per cent increase above ULS design load and adjusted to allow group effects to be ignored.</p> <p>1.1.4 Site testing to verify the above loads is required and is specified in sub-Clause 1.2 below.</p> <p>1.1.5</p> <p>1.1.5.1 Materials</p> <p>Resin adhesive grout for anchoring reinforcement shall be polyester or epoxy based and non-expansive. Grout shall be stable over the temperature range of -20 degrees Celsius to +40 degrees Celsius and be resistant to mechanical and chemical degradation under normal service conditions.</p> <p>1.1.6</p> <p>1.1.6.1 Workmanship</p> <p>Installation shall strictly follow the methods and working procedures specified by the proprietary product manufacturer. Adequate preparations shall be made to work involving resin grouting to avoid inconsistent results.</p> <p>1.1.6.3 Locations for the drilling of holes shall be determined by the design of the O&amp;M Works. The design of the O&amp;M Works shall ensure that locations can be adjusted within tolerances specified in the design of the O&amp;M Works to avoid existing reinforcement. It shall be ensured that holes do not clash with existing buried reinforcement by using non-destructive test methods (e.g. cover meter) prior to commencement of drilling.</p> <p>1.1.6.4 Before and after drilling holes it shall be ensured that the existing concrete is sound, and that any significant defects such as loose fractures and voids are repaired. Any defective holes shall be repaired and not used. Alternative holes shall be re-drilled in new locations without affecting the design of the O&amp;M Works.</p> <p>1.1.6.5 Holes shall be formed using rotary percussion drilling. The diameter and minimum depth shall be as required by the design of the O&amp;M Works.</p> <p>After drilling, holes shall be free of all contaminants including dust and water before injecting grout. It shall be ensured that grout fills the hole entirely without air voids following insertion of the reinforcement, and that the reinforcement is fully coated by the grout. Excess grout shall be removed</p>

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	<p>immediately.</p> <p>1.1.6.6 Reinforcement shall not be inserted or grout used after the gel time, and the completed installation shall not be disturbed until the grout is fully cured. Gel times and curing times as stated by the product manufacturer will depend on concrete temperature, therefore temperature shall be recorded during installation.</p> <p>1.2 Testing of Resin Anchored Reinforcement</p> <p>1.2.1 The adequacy of resin fixed reinforcement shall be verified by site testing. For each combination of bar size and embedment depth, 1 No. test shall be carried out for every 20 bars, subject to a minimum of 3 No. tests.</p> <p>1.2.2 A test rig equivalent to that shown in BS 5080 Part 1: 1993, Figure 3 shall be used. The test rig shall be capable of testing the anchor bars in situ.</p> <p>1.2.3 If, due to the shape code or spacings of the bars to be resin grouted into the deck, it is not possible to apply the test rig to a bar, the following procedure should be followed: A straight bar of the same type, diameter and embedment depth shall be tested as close to the scheduled test bar as is practical.</p> <p>1.2.4 The bars shall be capable of resisting the test loads given in sub-Clause 1.1.3 above.</p> <p>1.2.5 A force sufficient to take up any slack in the apparatus, attachment and seating should be initially applied in accordance with BS 5080 Part 1: 1993. Readings taken at this stage will constitute the base from which subsequent relative movement shall be measured.</p> <p>1.2.6 Each tested anchor shall be loaded incrementally in tension in accordance with BS 5080 Part 1: 1993 up to the test load.</p> <p>1.2.7 Incremental loads shall be held for not less than half a minute and the test load for not less than five minutes.</p> <p>1.2.8 Readings shall be taken immediately after applying load and at the ends of the time intervals stated above.</p> <p>1.2.9 There should be no movement of the anchorage during the test and total movement should be no greater than the load / extension characteristics of the reinforcement bar being tested and the testing apparatus being used.</p> <p>1.2.10 Any evidence of slip during loading up to the test load, as demonstrated by a significant change in the slope of the load / extension curve, shall constitute a failure.</p> <p>1.2.11 Testing records shall be retained at the end of each testing day.</p>	
1778AR	1	<p><b>Early Thermal cracking</b></p> <p>1.1 The Company shall develop suitable concrete mix designs and safe curing methods to ensure that any cracking due to early thermal effects does not exceed appropriate permissible crack widths in BS EN 1992-2 and to ensure compliance with the following criteria.</p> <p>i) Peak temperature: 65 degrees Celsius</p>

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	<ul style="list-style-type: none"> <li>ii) Maximum temperature differential within a single pour: in accordance with Table 7.1 of CIRIA C660 for internal restraint, <math>R = 0.42</math>, for the appropriate coarse aggregate type. If limestone coarse aggregate is to be used, the assumed value for coefficient of linear thermal expansion shall be demonstrated by measurements on concrete specimens.</li> <li>iii) The demonstration shall include the results of early thermal cracking trial pours, as scheduled in Appendix 1/5 of the specification. The temperature rise recorded in the trial pours may be used to establish the temperature rise for the concrete and to enable more reliable predictions of temperature rise using CIRIA C660.</li> <li>iv) The relationship established from the trial pours between temperature and strain change may be used to determine the coefficient of thermal expansion and contraction as the temperature in the block rises and falls. This performance data can then be used to demonstrate compliance with the Agreement requirements to restrict early thermal cracking.</li> </ul>
2	<h2>Early Thermal Cracking Trial Pours</h2>
2.1	<p>Early thermal cracking trial pours shall be performed in advance of construction for each proposed concrete mix subject to these considerations. Further testing shall be performed in advance of any changes to materials or mix composition that might have a significant effect on these properties including, but not limited to, changes in type, source or content of cement, ground granulated blast furnace cement or fly ash.</p>
2.2	<p>Insulated 'hot-blocks' (one cubic metre) shall be used to simulate the temperature conditions in large sections. The base, sides and top should be contained in 18 millimetre plywood with 50 millimetres of polystyrene insulation. The temperature in the block should be measured using thermocouples (at the centre and at the surface). 100 millimetres cores shall be taken at 28 days for testing compressive strength and checking for internal cracks.</p>
2.3	<p>The test blocks should be instrumented using thermocouples and Vibrating Wire strain gauges (VWG) to provide a measure of the temperature rise and the associated strain.</p>
2.4	<p>The following test data shall be recorded on the test certificate:</p> <ul style="list-style-type: none"> <li>i) Name and address of the test laboratory;</li> <li>ii) Date and identification number of the test report;</li> <li>iii) Name and address of the organisation responsible for the testing;</li> <li>iv) Name and address of the concrete supplier;</li> <li>v) Date of arrival of the concrete;</li> <li>vi) Composition of the concrete tested, including sources of materials;</li> <li>vii) Purpose of the test;</li> </ul>

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	<ul style="list-style-type: none"> <li>viii) Test method;</li> <li>ix) Any deviation from the test method;</li> <li>x) Name of the person who performed the test;</li> <li>xi) Date of the test;</li> <li>xii) Test results, including: <ul style="list-style-type: none"> <li>i) Compressive strength of cores taken and tested in accordance with BS EN 12504-1 and BS EN 13791 at an age of 28 days;</li> <li>ii) The temperature rise; and</li> </ul> </li> <li>xiii) Date and signature.</li> </ul>
2070AR	<p><b>1 Replacement of Bridge Deck Waterproofing</b></p> <p><b>1.1 Removal of Existing Waterproofing</b></p> <p>1.1.1 The existing surfacing shall generally be removed by cold-milling (planing) in accordance with Clause 709.</p> <p>1.1.2 Small areas may be removed using other suitable methods.</p> <p>1.1.3 The existing bridge deck waterproofing or protective layer comprising the last 30 millimetre above the concrete substrate shall be carefully removed to avoid damage to the concrete.</p> <p>1.1.4 In exceptional cases for particularly difficult materials method statements shall be submitted for written consent of the Scottish Ministers before these techniques shall be used.</p> <p>1.1.5 The final removal of the remaining waterproofing or primer to expose the concrete substrate shall be by recoverable abrasive blast cleaning systems.</p> <p>1.1.6 'Open' blast cleaning shall not be permitted except on vertical surfaces or intricate details.</p> <p><b>1.2 Inspection and Testing</b></p> <p>1.2.1 Prior to application of the new waterproofing the deck concrete shall be examined by the Company to determine the following:</p> <ul style="list-style-type: none"> <li>i) if any testing is required (in accordance with the requirements of Series 3300);</li> <li>ii) if additional deck preparation is required; and</li> <li>iii) if structural concrete repairs are required (in accordance with the requirements of Series 1700).</li> </ul> <p><b>1.3 Additional Preparation of Bridge Deck</b></p> <p>1.3.1 Additional work required in the preparation of the bridge deck prior to the application of the new waterproofing shall include but shall not be limited to the following:</p> <ul style="list-style-type: none"> <li>i) removal of surface Defects such as screed marks and footprints;</li> <li>ii) removal of formwork/falsework anchors from the original</li> </ul>

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	<p>construction which have inadequate cover;</p> <p>iii) sealing of cracks greater than 0.25 millimetre;</p> <p>iv) repairs to or forming of fillets and chases to facilitate waterproofing; and</p> <p>v) additional preparation of the surface of concrete deck to an acceptable standard for the application of the waterproofing membrane.</p> <p>1.3.2 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 Company shall be deemed to be structural concrete repairs and shall be undertaken in accordance with Series 1700.</p> <p><b>1.4 Replacement of Bridge Deck Waterproofing</b></p> <p>1.4.1 The replacement waterproofing system shall be in accordance with Clauses 2001 to 2003 and be installed in accordance with Clause 2005.</p>
<b>2071AR</b>	<p><b>1 Repairs to Existing Waterproofing</b></p> <p>1.1 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 Scottish Ministers.</p> <p>1.2 Repairs shall be carried out using systems compliant with BD47 of the DMRB and compatible with the system to be repaired.</p> <p>1.3 The waterproofing shall be applied in accordance with the method statement included with the Agrément certificate for the particular system.</p> <p>1.4 All waterproofing repairs shall be carried out in accordance with Clause 2070AR.</p> <p>1.5 Where the existing waterproofing shall be a spray applied system for repair areas of less than 2m<sup>2</sup> 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 Scottish Ministers.</p> <p>1.6 The repair areas within the carriageway width shall have a protective layer incorporated into the waterproofing system in accordance with sub-Clause 2003.4.</p> <p>1.7 Details of current forms of waterproofing systems in use on the trunk road network shall be provided in Appendix B of the TRBDB User Manual (Table 46, 47 and 48).</p> <p>1.8 Manufacturer's details for deck waterproofing shall be held for individual Structures within the TRBDB where records shall be known.</p>
<b>2170AR</b>	<p><b>1 Permanent Works Bolts</b></p>

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Clause Number	Title and Written Text																	
	1.1 All Permanent Works bolts shall be vibration resistant.																	
2171AR	1	<b>Bearing Replacement</b> 1.1 The design for the O&M Works shall allow for bearing replacement under the specified load conditions as indicated in the Structures Design Basis (Road Connections).																
2370AR	1	<b>Bridge Expansion Joints Used on Bridge Decks</b> 1.1 The following types of bridge expansion joints are known to occur on the Trunk Road Network. <table border="1"> <thead> <tr> <th>Type</th><th>Description</th></tr> </thead> <tbody> <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> </tbody> </table>	Type	Description	1	Buried joint under continuous surfacing	2	Asphaltic plug joint	3	Nosing joint with poured sealant	4	Nosing with preformed compression seal	5	Reinforced Elastomeric	6	Elastomeric in metal runners	7	Maurer D80
Type	Description																	
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6	Elastomeric in metal runners																	
7	Maurer D80																	
	<p>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.</p> <p>A description of deck joint types and deck joint manufacturers' details shall be as provided in Transport Scotland's structures management function of the Integrated Roads Information System for individual Structures where these shall be known.</p>																	
2371AR	1	<b>Replacement of Bridge Deck Expansion Joints and Gap Sealants</b> 1.1 Replacement repair and alterations to expansion joints shall be subject to consent in writing by the Scottish Ministers. 1.2 Such work shall comply with the requirements of Clauses 2301 to 2304 and BD33 and BA26 of the DMRB. 1.3 It may comprise replacement of a complete joint or essential maintenance of a joint where complete or partial replacement is not considered necessary. 1.4 Joints shall be installed in accordance with the manufacturer's written instructions. 1.5 Existing joints (including transition strips) shall be carefully broken out or unbolted and removed. 1.6 The adjacent carriageway hardshoulder hardened verges and central reservations shall be saw cut to provide neat vertical edges.																

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	1.7	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.
	1.8	Existing flashings and sealants shall be removed.
	1.9	Where appropriate, existing intact waterbars may be retained.
	1.10	Existing galvanised plates in buried joints shall be set aside for possible re-use.
	1.11	The existing surfacing and additional protective layer adjacent to the expansion joint shall be removed to expose the waterproofing membrane.
	1.12	The waterproofing shall be carefully cut back to expose the concrete surface which shall be prepared to receive the expansion joint system.
	1.13	Continuity of the waterproofing membrane shall be provided by bond or lap between the waterproof membrane and the expansion joint.
	1.14	Existing holding down bolts and fixings shall be protected if required for installation of the proposed replacement joint.
	1.15	If they shall not be required they shall be removed or ground flush with the surface of the deck concrete.
	1.16	The concrete substrate shall be examined by the Company for Defects.
	1.17	Where required testing shall be carried out and concrete repairs undertaken in accordance with Series 1700 and this Appendix 0/1.
	1.18	If the joint shall not be completely replaced material and components shall form the same system as the existing joint where possible.
	1.19	Where considered necessary by the Company and subject to approval of the Scottish Ministers vertical drain holes shall be installed adjacent to expansion joints.
	1.20	The drain holes shall comprise a down pipe fixed into holes cored through the superstructure of minimum internal diameter 40 millimetre and a conical entry funnel with cap to allow water to enter the funnel but prevent blocking of the waterway by the surfacing.
	1.21	The cap and funnel shall be covered with a sheet of permeable membrane prior to surfacing.
	1.22	Where gap sealant shall be replaced the existing sealant and deteriorated joint filler shall be raked out to leave clean surfaces.
	1.23	Where possible, new joint filler, replacing that removed, shall be installed prior to re-sealing the gap.
	1.24	Where it shall not be possible to replace joint filler the joint shall still be sealed.
	1.25	All debris arising from Operations shall be removed off the Site.
2372AR	1	<b>Asphaltic Plug Joints</b>
	1.1	<b>Installation</b>
	1.1.1	All joints shall have a valid Approval/Registration in accordance with

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	<p>Appendix E of this Specification.</p> <p>1.1.2 The joints shall be installed in accordance with the manufacturer's written instructions which shall comply with the terms of the certification.</p> <p>1.1.3 All batches of materials delivered to the Site shall have a certificate of compliance stating:</p> <ul style="list-style-type: none"> <li>i) The binder compound and its properties including Penetration Value Softening Point (Ring and Ball) and Flow Resistance;</li> <li>ii) The specific type and density of aggregate/stone used in the asphaltic plug matrix;</li> <li>iii) The quantities and weights of binder and aggregate used at each joint location.</li> </ul>
2470AR	<p><b>1 Repointing of Brickwork Blockwork and Stonework</b></p> <p>1.1 Masonry joints in brickwork and blockwork to be repointed shall be ground out to a depth of 25 millimetre to give adequate key. For natural stone masonry and historic structures power tools shall not be used.</p> <p>1.2 All unsound mortar at a greater depth than this shall be removed until sound mortar shall be encountered.</p> <p>1.3 Apparatus used for grinding out shall be fitted with a depth gauge to allow control of rake out depth.</p> <p>1.4 All detritus shall be removed by low pressure water jetting.</p> <p>1.5 Repointing shall be carried out by trowel or purpose made repointing keys or by using injection techniques.</p> <p>1.6 Cement mortar designation shall be selected based on Clause 2404 and 2417 and Table 24/5.</p> <p>1.7 Lime mortar designation shall be selected based on Clause 2476AR Table 24/7, Table 24/8 and Table 24/9.</p> <p>1.8 Water for mortars shall be clean and free from impurities.</p> <p>1.9 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 Site conditions and availability of materials.</p> <p>1.10 For historic brick Structures and all stone masonry Structures, the mortar specification shall be prepared by the Company in conjunction with specialist advice based on mortar analysis and evaluation carried out on the mortar samples from the existing construction.</p> <p>1.11 Lime mortar is extensively used in the construction of masonry road Structures.</p> <p>1.12 Mortars used for repairs and repointing shall match the appearance and characteristics of existing materials as closely as possible.</p> <p>1.13 The choice of lime mortar to be used shall generally be influenced by the nature of stone the nature of any surviving lime based materials and the</p>

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	environmental conditions or exposure of the Site.	
	1.14 Samples of mortar pointing at locations shall be provided for reference and comparison for the duration of the work.	
	1.15 Mortar for pointing shall be required to match the standards and details of the samples.	
	1.16 Adequate protection of repair works and pointing from sun wind rain and frost shall be provided until cured.	
	1.17 For historic Structures, power tools shall not be used to remove mortars. Damage to stone work shall be avoided.	
	1.18 If any significant voids are present the Company shall where necessary wedge and pin up loose stones.	
	1.19 In deep cavities, work shall be carried out in layers of not more than 35 millimetre allowing the material to dry before placing the next layer and allow 24 hours between layers.	
	1.20 Deep voids shall be filled to within 35 millimetre or twice the width of the joint back from the finished wall face to allow sufficient depth for pointing.	
<b>2471AR</b>	<b>1</b>	<b>Replacement of Precast Concrete Copings</b>
	1.1	Broken precast concrete copings shall be removed together with the old mortar bed and any loose and friable mortar in the joints of the brickwork below the coping.
	1.2	All debris shall be removed off the O&M Works Site.
	1.3	New precast concrete copings shall be laid on a mortar designation (i) (see Clause 2404) bed to a line and level to match existing copings.
<b>2472AR</b>	<b>1</b>	<b>Rebedding Existing Precast Concrete or Stone Masonry Copings</b>
	1.1	Precast concrete or stone masonry copings shall be removed and stored for re-use.
	1.2	The existing mortar bed shall be completely removed together with any loose and friable mortar in brickwork joints below the coping.
	1.3	All debris shall be removed off the O&M Works Site.
	1.4	Copings shall be relaid on a mortar designation (i) (see Clause 2404) or where wall construction contains lime mortar to Clause 2476AR.
	1.5	Rebedding or existing precast concrete or stone masonry copings shall match existing line and level.
<b>2473AR</b>	<b>1</b>	<b>Replacement Tiling</b>
	1.1	All damaged or defective tiles adhesive mortar loose concrete grout and the like shall be broken out and removed off the O&M Works Site.
	1.2	Replacement tiles shall be in accordance with BS5385 Part 1 1995 Wall and Floor Tiling: Code of Practice for the Design and Installation of Internal Ceramic and Natural Stone Wall Tiling and Mosaics in Normal Conditions,

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Clause Number	Title and Written Text
	<p>Wall and Floor Tiling.</p> <p>1.3 Any areas of the underlying concrete surface which have been damaged shall be made good as detailed in Series 1700 of the Specification.</p> <p>1.4 Repair materials shall be compatible with the tile adhesive to be used.</p> <p>1.5 The edges of retained existing tiles shall be clean and free of any grout.</p> <p>1.6 Replacement tiles shall be glazed ceramic of a colour size and pattern to match existing tiles.</p> <p>1.7 They shall be installed to a line and level to match existing tiling with the joints grouted to match the existing grout colour and pattern.</p> <p>1.8 New tiling shall be cleaned of excess grout when the grout to the joints has hardened.</p> <p>1.9 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.</p>
2474AR	<p><b>1 Rebuilding of Defective Masonry</b></p> <p>1.1 Bricks concrete blocks and stones designated for reuse in the repairs or reconstruction of existing masonry including bridge road restraint systems shall be taken down and set aside for reuse or removed for storage.</p> <p>1.2 Where road restraint systems have been damaged the Company shall include for retrieval of displaced bricks, blocks and stones from their position after displacement.</p> <p>1.3 This may include recovery from watercourses and rail tracks.</p> <p>1.4 The Company shall include for consultation with the appropriate bodies to obtain agreement on access and method of working for rebuilding.</p> <p>1.5 For scheduled ancient monument Structures consultation and appropriate approvals shall be obtained from Historic Scotland.</p> <p>1.6 For repairs to listed Structures consultation and appropriate approvals shall be obtained from the local planning department.</p> <p>1.7 The Company shall set up lines of communication and processes to enable timescales for rebuilding to be achieved.</p> <p>1.8 The Company shall include in its procedure for approval by Historic Scotland the following steps to ensure early consent:</p> <ul style="list-style-type: none"> <li>(i) Inform Historic Scotland - Ancient Monument Division of damage to a scheduled ancient monument Structure and apply for Scheduled Monument Consent for repair works with cost estimates using new stone and sketch drawings of proposed repairs.</li> <li>(ii) Record photos of damaged areas shall be submitted at this point.</li> <li>(ii) Carry out assessment of retrieval of stones from river beds and otherwise and notify Historic Scotland of outcome.</li> <li>(iii) Send stone samples to British Geological Survey's for best</li> </ul>

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	<p>matching replacement stones. Copy report to Historic Scotland.</p> <p>(iv) Meet Historic Scotland on site with draft proposals for repair.</p> <p>(v) Agree final repair scheme and submit all information to Historic Scotland for final comment.</p> <p>(vi) Historic Scotland issue Scheduled Monument Consent.</p> <p>1.9 The Company shall include in its procedures for the liaison and approval by local planning departments any proposals for repairs and any repair works or alterations required due to damage to listed historic Structures other than scheduled ancient monuments which shall be covered by sub-Clause 1.5 of this Clause.</p> <p>1.10 All mortar from the faces of the bricks concrete blocks or stone shall be removed before incorporating into the works.</p> <p>1.11 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 reconstruction works.</p> <p>1.12 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 structure.</p> <p>1.13 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 subject to the current O&amp;M Works Site conditions and availability of materials.</p>
2475AR	<p>1 <b>Lime Putty</b></p> <p>1.1 Lime putty shall be traditional non-hydraulic slaked lime putty to comply with BS 890:1972 Specification for Building Limes, with a density of not less than 1.35kg/ltr.</p> <p>1.2 Portland or other modern cements shall not be used. Water from mortars shall be clean and free from impurities which would adversely affect the mortar.</p> <p>1.3 The Company shall ensure that personnel responsible for the supervision of the production of mortars and the like shall be suitably experienced in the techniques of preparing and using traditional lime mortars. Where ready made mortars are being purchased the Company shall obtain evidence that the supplier shall be suitably experienced in the techniques of production of traditional lime mortars. The Company shall comply with BS8000:2001 Part 3 Workmanship on Building Sites: Code of Practice for Masonry, in terms of standards of workmanship and Site practice.</p>
2476AR	<p>1 <b>Hydraulic Lime Mortars</b></p> <p>1.1 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 NHL 3.5 (moderately hydraulic) or Natural Hydraulic Lime NHL2 (feeblely hydraulic)</p>

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	and shall conform to BS EN 459-1:2001 Building Lime: Definitions, Specifications and Conformity Criteria.											
1.2	Non-hydraulic lime shall conform to BS EN 459-1:2001 Building Lime: Definitions, Specifications and Conformity Criteria.											
1.3	Proportions of hydraulic lime to sand shall be based on Table 24/7 according to the required mortar durability designation defined in BS 5628 'Code of Practice for Use of Masonry' and as specified in Appendix 24/1.											
TABLE 24/7 Typical Hydraulic Lime Mortar /Durability Designation												
Constituents			Mix Reference/Durability Designation									
			M1	M2	M3	M4	M5	M6	M7	M8	M9	G1
			10	9	8	7	6	5	4	3	2	5-6
NHL5 Eminently Hydraulic			1	1	1							3
NHL3.5 Moderately Hydraulic						1	1	1				
NHL2 Feebly Hydraulic									1	1	1	
Lime Putty												1
Brick Powder (Reactive)/ Pozzolanic additive				1/2		1/2		1/2	1/2			
Well Graded Sharp Sand			1 1/2	1 1/2	2	1 1/2	2	2 1/2	1 1/2	2	2	10
Soft Sand			1/2	1/2	1/2	1/2	1	1	1/2		1/2	
Porous Limestone or Brick aggregate				1/2	1/2	1/2		1/2	1/2	1	1 1/2	
Lime Mortar Mix by Volume			1:2	1:2 1/2	1:3	1:2 1/2	1:3	1:4	1:2 1/2	1:3	1:4	3:1: 20
												2:1: 9
1.4	Hydraulic lime mortar shall be mixed as described below unless otherwise described in Appendix 24/1.											
1.5	Mortar shall be mixed thoroughly by hand or mechanical until its colour and consistency are uniform.											
1.6	The constituent materials shall be accurately measured.											
1.7	Mortar shall be made in small quantities only as and when required											
1.8	Mortar which has begun to set or has been mixed for a period of more than 2 hours shall be discarded.											
1.9	Hydraulic lime shall be delivered to the O&M Works Site in sealed paper bags stored in dry conditions and used within 24 weekend of manufacture.											
1.10	Brick powder in fine particles (<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.											

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	<p>1.11 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.</p> <p>1.12 Hydraulic Lime : Sand Mortar</p> <p>1.13 Hydraulic lime mortars may be provided as pre mixed dry lime/sand mixes - either bagged or, for larger projects, silo mixes may be appropriate - or they may be Site mixed from bagged hydraulic lime and sand.</p> <p>1.14 Hydraulic lime mortars have good working qualities but develop strength more slowly than cement mortars.</p> <p>1.15 They can develop appropriate strength and durability and have a higher flexural strength in proportion to compressive strength than do cement mortars.</p> <p>1.16 They shall be eminently suitable for the construction of masonry arch bridges which require a degree of flexibility to function structurally as arches.</p> <p>1.17 Hydraulic lime mortars shall always be used for repair of masonry arch bridges that were constructed using hydraulic lime mortars (i.e. all historic masonry arch bridges).</p> <p>1.18 All hydraulic lime mortars shall be mixed in accordance with the supplier's written instructions.</p> <p>1.19 <b>Hydraulic lime mortar should be specified in accordance with the durability classification required. (refer to Table 24/8).</b></p>

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

Mortar durability designation (with approximate compressive strengths) for general use building mortar and general use mechanical or hand pointing mortar

Masonry Type	Parapet and copings masonry facing roadsides subject to spray and de-icing salts	Other parapets, abutments and spandrel walls above flood levels	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 <sup>2</sup>	7-8 1.8 N / mm <sup>2</sup>	5-6 1.5 N/mm <sup>2</sup>
Medium permeability masonry. Squared or random. Brick, Blockwork, Reconstructed	7-8 1.8 N / mm <sup>2</sup>	5-6 1.5 N/mm <sup>2</sup>	3-4 1.34 N/mm <sup>2</sup>

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	stone, Sandstone, Limestone and mixed quality field stone masonry. (Moderate Suction)			
	High permeability masonry. Squared or random Brick, Blockwork, Reconstructed stone, Sandstone, Limestone and mixed quality field stone masonry. (High Suction)	5-6 1.5 N/mm <sup>2</sup>	3-4 1.34 N/mm <sup>2</sup>	2-4 1.34 N/mm <sup>2</sup>
	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.			
1.20	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 d) setting.			
1.21	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.			
1.22	Site mixed hydraulic lime mortars shall be generally not suitable for pumping without the use of air entraining additives.			
1.23	Where required for site mixed mortars, an air entrainer can be used to increase workability and minimise water requirement.			
1.24	Air entrainers shall be used in accordance with the manufacturer's written instructions.			
1.25	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.			
1.26	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.			
2	<b>Gauged Hydraulic Lime : Sand Mortars (i.e. mortars containing</b>			

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	<p><b>hydraulic lime, non-hydraulic lime putty or hydrate and sand)</b></p> <p>2.1 Gauged hydraulic lime mortars shall generally only be specified where this shall be necessary to match existing mortars in repointing work.</p> <p>2.2 There shall normally be no requirement for significant structural strength in re-pointing work.</p> <p>2.3 Gauged Hydraulic lime mortar should be specified in accordance with the durability classification required. (refer to Table 24/9).</p>																				
	<p><b>TABLE 24/9 Durability Class Requirements for Gauged Hydraulic Lime Mortars</b></p> <p>Mortar durability designation (with approximate compressive strengths) for general use building mortar and general use mechanical or hand pointing mortar</p>																				
	<table border="1"> <thead> <tr> <th>Masonry Type</th> <th>Parapet and copings masonry facing roadsides subject to spray and de-icing salts</th> <th>Other parapets, abutments and spandrel walls above flood levels</th> <th>Soffit to arch barrel above flood level</th> </tr> </thead> <tbody> <tr> <td>Dense impermeable masonry. Squared or random. Brick, Basalt, Granite etc. (No Suction)</td> <td>N/A</td> <td>N/A</td> <td>5-6 1.5 N/mm<sup>2</sup></td> </tr> <tr> <td>Medium permeability masonry. Squared or random. Brick, Blockwork, Reconstructed stone, Sandstone, Limestone and mixed quality field stone masonry. (Moderate Suction)</td> <td>N/A 1.8 N / mm<sup>2</sup></td> <td>5-6 1.5 N/mm<sup>2</sup></td> <td>2-4</td> </tr> <tr> <td>High permeability masonry. Squared or random Brick, Blockwork, Reconstructed stone, Sandstone, Limestone and mixed quality field stone masonry. (High Suction)</td> <td>5-6 1.5 N/mm<sup>2</sup></td> <td>3-4 1.34 N/mm<sup>2</sup></td> <td>1.34 N/mm<sup>2</sup></td> </tr> <tr> <td colspan="4"> <p>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.</p> </td></tr></tbody></table>	Masonry Type	Parapet and copings masonry facing roadsides subject to spray and de-icing salts	Other parapets, abutments and spandrel walls above flood levels	Soffit to arch barrel above flood level	Dense impermeable masonry. Squared or random. Brick, Basalt, Granite etc. (No Suction)	N/A	N/A	5-6 1.5 N/mm <sup>2</sup>	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 <sup>2</sup>	5-6 1.5 N/mm <sup>2</sup>	2-4	High permeability masonry. Squared or random Brick, Blockwork, Reconstructed stone, Sandstone, Limestone and mixed quality field stone masonry. (High Suction)	5-6 1.5 N/mm <sup>2</sup>	3-4 1.34 N/mm <sup>2</sup>	1.34 N/mm <sup>2</sup>	<p>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.</p>			
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2.4	Gauged hydraulic lime mortars exhibit slower rates of carbonation and																				

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	<p>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.</p> <p>2.5 Gauged hydraulic lime mortars do not require the addition of air entrainers as 2. Good workability is ensured by the inclusion of lime putty.</p>
2670AR	<p><b>1 Anti-Graffiti Coatings</b></p> <p>1.1 Anti-graffiti coatings shall be of the sacrificial type and shall be capable of being cleaned at least twice before re-coating is necessary</p> <p>1.2 The coating system shall be applied strictly in accordance with the manufacturer's written instructions.</p> <p>1.3 The application of the coating system shall not change the appearance of the substrate.</p> <p>1.4 Prior to application the surface shall be cleaned of all loose material oil grease dirt and existing graffiti. The surface shall be clean and dry before lightly abrading. 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.</p> <p>1.5 The cleaning of the coating / removal of graffiti shall not have any detrimental effect on the substrate. Grit-blasting water jetting or the use of chemical cleaning agents likely to have long term effects on the substrate shall not be acceptable.</p> <p>1.6 Where an existing anti-graffiti coating system is of the type that requires grit-blasting water jetting or the use of chemical cleaning agents likely to affect the substrate then the Company shall consult and comply with the requirements of Transport Scotland (Contact: [REDACTED], Telephone: [REDACTED]) with regard to the methods proposed. The Company shall provide the Scottish Ministers with completed Consultation Certificates in accordance with Part 6 of the O&amp;M Works Requirements in respect of this requirement.</p>
2671AR	<p><b>1 Graffiti Removal</b></p> <p>1.1 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.</p> <p>1.2 Encrusted deposits may be removed by a light grit blast in accordance with Clause 1774AR provided the substrate is not damaged.</p> <p>1.3 The Company shall ensure that all electrical equipment and any other fixtures and fittings are fully protected during graffiti removal.</p> <p>1.4 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 Scottish Ministers.</p>

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2674AR	1	<b>Convex Safety Mirrors in Underpasses and Culverts Used by Pedestrians and Cyclists</b>  1.1 Convex safety mirrors in underpasses and culverts used by pedestrians and cyclists shall be polycarbonate external type. They shall be fixed in accordance with the manufacturer's written instructions. 1.2 Cleaning of polycarbonate safety mirrors shall be carried out using a non hazardous de-greaser/cleaning agent. 1.3 Repetitive use of the de-greaser/cleaning agent shall not have a detrimental effect on the safety mirrors.
2801AR	1	<b>Winter Maintenance Operations</b>  1.1 <b>General</b> 1.1.1 Subject to the other provisions of the Agreement the Company shall provide all resources including but not limited to depots materials labour and Constructional Plant required to fulfil its obligations under the Agreement. Such resources shall include the provision of all labour Constructional Plant and the like to ensure all necessary measures are taken to keep all roads open to road Users and free from ice and snow at all times. 1.1.2 For the avoidance of doubt the resources identified in Tables 1 to 4 inclusive of Appendix 28/2 shall be deemed to be the minimum provision and shall not be construed as being all resources required by the Company to fulfil its obligations for winter maintenance Operations. All necessary measures shall include the provision of labour and hiring leasing and the like of Constructional Plant. 1.1.3 Salt shall be stored in accordance with current planning and environmental regulations at the locations and in the quantities as stated in Appendix 28/1 Table 1. All salt storage locations shall be designated as loading points. 1.1.4 The Company shall provide adequate and sufficient salt loading facilities at each salt storage location to load vehicles. 1.1.5 With 24 hours of completing each precautionary salting operation or other snow or ice removal or other Operations a report shall be completed by the Company held electronically in accordance with the procedures in the Quality Management System and Quality Plan and be available for inspection by the Scottish Ministers at any time. The report shall state the times of commencement and completion of each route the rate of spread and the quantity and size of salt used on each route. 1.1.6 A log of hours for each operative spent on "call out" or "standby" shall be kept in accordance with the procedures in the Quality Plan.
2802AR	1	<b>Basic Facility</b>  1.1 Drivers of all winter maintenance vehicles shall hold appropriate skill qualifications and experience. 1.2 The Company shall ensure that at least one month prior to the commencement of the operational winter maintenance period sufficient

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	<p>drivers and operatives shall be available to provide the winter service Operations.</p> <p>1.3 The Company shall ensure that throughout the entire operational winter maintenance period there shall be available at least 3 trained drivers for each operational vehicle and other items of Construction Plant. Additionally every driver based at a vehicle loading point shall have a basic knowledge of every salting route emanating from that point and be capable of undertaking that route if necessary.</p> <p>1.4 A two-way radio or hands free mobile phone shall be fitted in each vehicle used for winter service Operations.</p> <p>1.5 The Company shall be responsible for all arrangements necessary to ensure the availability of operatives to meet the response time detailed in sub-Clause 1.3 of this Clause. Prior to 1 October each year the Company shall prepare rosters detailing the availability of supervisors salting vehicle drivers and loading machine drivers for the operational winter service period. This roster shall also include names addresses and telephone numbers of the personnel listed.</p> <p>1.6 The Company shall satisfy itself that arrangements for handling and loading salt at the vehicle loading points shall be adequate to achieve the specified response times.</p> <p>1.7 When on continuous night shift the Company's personnel shall be stationed at the appropriate vehicle loading point to provide immediate response. When on continuous day shift the Company's personnel shall be either:</p> <p>1.8 stationed at all or some of the vehicle loading points to provide an immediate response; or</p> <p>1.9 engaged elsewhere on the O&amp;M Works Site but be capable of providing a one hour response.</p> <p>1.10 Prior to 1 October each year the Company shall carry out a 'dry' run of each route and fit and remove the plough to every vehicle so equipped. Records including details of time taken to traverse the route fit the plough and any problems encountered shall be held in accordance with the procedures in the Quality Plan and be available for inspection by the Scottish Ministers at any time.</p>
2803AR	<p><b>1 Salting and De-icing Operations</b></p> <p>1.1 Salting and de-icing Operations shall commence at the time and be carried out at the spread rates instructed by the winter service duty officer.</p> <p>1.2 Salt spreading shall be carried out in such a manner as to avoid damage to other vehicles and pedestrians or other users of the road network. Spreading width shall be adjusted to suit the carriageway width.</p> <p>1.3 No vehicle shall be driven above the legal speed limit at any time and at a speed greater than 40mph whilst salting on de-restricted dual carriageways and motorways. Unless otherwise consented to in writing by the Scottish Ministers precautionary salting shall be carried out from the left hand lane of 2 lane dual carriageways from the centre lane of 3 lane dual carriageways</p>

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	<p>and from the left hand centre lane of 4 lane dual carriageways. Spread patterns shall be adjusted to suit the travel lane and carriageway width.</p> <p>1.4 On single carriageway roads salt shall be spread across the full width of the road in a single pass with the spreading vehicle travelling at a speed no greater than 30mph.</p> <p>1.5 Operations on Project Roads requiring temporary traffic management involving contra-flow running may occasion an amendment to a route. Salt spreading shall be carried out from the offside lane of the contra-flow and the spread pattern adjusted to ensure that salt shall be spread behind and to the nearside and shall not be thrown into the path of oncoming traffic. Particular care shall be taken to ensure that all open lanes at contra-flow crossovers shall be adequately treated.</p> <p>1.6 In the event of a breakdown of one or more of the Company's spreading vehicles details shall be recorded. The Company shall make immediate arrangements for a reserve vehicle to be made available in order to comply with the requirements of the Agreement.</p> <p>1.7 The Company shall clear ice from footways footbridges and cycle facilities in accordance with the requirements of Section 3 to Part 2 of these O&amp;M Works Requirements.</p>
2804AR	<p><b>1 Snow Clearing Operations</b></p> <p><b>1.1 Ploughing</b></p> <p>1.1.1 The Company shall ensure sufficient resources are mobilised to prevent snow or ice from remaining on the trunk roads and Motorways. The Company shall put in place specific arrangements to ensure that these resources shall be mobilised to keep the trunk roads free of snow and ice subject to Appendix 0/1 Series 2800 of this Specification and Section 3 of Part 2 of these O&amp;M Works Requirements.</p> <p>1.1.2 All vehicles engaged in snow clearing Operations shall be manned taking cognisance of the Company's obligations under health and safety legislation.</p> <p>1.1.3 Subject to the other provisions of the Agreement spreading of salt during ploughing shall be at the rate of spread instructed by the winter maintenance manager. During prolonged periods of snow ploughing shall be continuous from the onset of snow to prevent a build-up of snow and compaction by traffic. Ploughing shall continue until the roads shall be clear of ice and snow.</p> <p>1.1.4 The plough blade shall be set as close to the road surface as shall be consistent with removal of the maximum amount of snow whilst avoiding damage to the road surface other equipment in the road surface and plough blade.</p> <p><b>1.2 Single Carriageway Roads</b></p> <p>1.2.1 When clearing single carriageway roads particularly those having more than two lanes snow clearance Operations shall avoid the build up of snow in the</p>

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	<p>centre of the road.</p> <p><b>1.3 Dual Carriageway Roads</b></p> <p>1.3.1 The clearance procedure shall be dependent on the number of lanes on each carriageway. In the event only the right hand lane shall be ploughed towards the central reservation. When conditions and resources permit the winter maintenance manager may instruct echelon ploughing (2 or more vehicles moving in the same direction one behind each other on different lanes).</p> <p>1.3.2 When ploughing to the nearside other vehicles (unless stationary or on the hardshoulder) shall never be overtaken snow shall never be thrown over bridge parapets onto the road beneath and when ploughing to the central reservation the speed shall be such as not to throw snow into the path of traffic on the opposing carriageway.</p> <p><b>1.4 Machine Snow Clearance other than by Salting Vehicles</b></p> <p>1.4.1 In the event of significant snow falls where snow ploughing being carried out by the salting vehicles shall not be sufficient the Company's Winter Maintenance Manager shall deploy additional equipment for snow clearance to ensure delays caused by the weather conditions shall be kept to a minimum.</p> <p><b>1.5 Hand Snow Clearance</b></p> <p>1.5.1 When machine snow clearance shall not be suitable (including clearance around carriageway obstructions) hand snow clearance and salting shall be carried out.</p> <p>1.5.2 Snow clearance shall take place on the footways footbridges and cycle facilities specified in accordance with the requirements of Section 3 to Part 2 of these O&amp;M Works Requirements and de-icing material spread to restore the original surface free from ice and snow.</p>
2805AR	<p><b>1 Company's Vehicles and Constructional Plant</b></p> <p>1.1 The Company shall ensure that the winter Constructional Plant listed in Appendix 28/2 and Annex C to Part 2 of these O&amp;M Works Requirements shall be available as necessary for the winter service.</p> <p>1.2 The Company's winter Constructional Plant shall as a minimum meet the specification set out in this Clause 2805AR.</p> <p>1.3 The Company shall state where required in Annex C to Part 2 of these O&amp;M Works Requirements details of the winter Constructional Plant to be used in connection with the winter service. Such details shall be incorporated into this Agreement.</p> <p>1.4 When used on the trunk road and Motorway for operator training and maintenance runs, the spinner disc at the rear of the Company's winter Constructional Plant shall be covered in such a way that damage by sharp edges in the event of an accident shall be reduced to a minimum.</p> <p>1.5 Front line and reserve winter Constructional Plant shall be fitted with</p>

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	<p>onboard electronic data loggers which shall provide an accurate record of:</p> <ul style="list-style-type: none"> <li>i) driver time;</li> <li>ii) distance travelled;</li> <li>iii) times when de-icing materials shall have been spread;</li> <li>iv) rate of spread; and</li> <li>v) width of spread;</li> </ul> <p>1.6 In the event of an on-board electronic data logger malfunction the Company shall within 12 hours prepare a similar written record.</p> <p>1.7 The Company shall provide apparatus to measure and record the quantity of de-icing material spread on each occasion on each precautionary treatment route. Such apparatus can be fitted to winter Constructional Plant or can be located at depots. Such apparatus shall be additional to the data loggers.</p> <p>1.8 The Company shall provide and operate a global positioning system (GPS) for all carriageway de-icing vehicles that shall record an accurate real time location for all front line and reserve winter Constructional Plant. The GPS system shall be capable of downloading to personal computer to allow the displaying of real time information.</p> <p>1.9 As a minimum requirement, in September and January of each Contract Year the Company shall calibrate all de-icing material spreading equipment. In September and January the calibration for de-icing material spreading equipment shall comply with the requirements of BS1622:1989 Specification for Spreaders for Winter Maintenance. September testing shall comply with the requirements of tests 'A' and 'B' and January testing the requirements of test 'B' of BS1622:1989 Specification for Spreaders for Winter Maintenance. All calibrations shall be independently carried out and certificated. Re-calibration and testing shall be carried out after repairs to the spreading equipment and at other times when necessary to ensure the accuracy of de-icing material spreading. Calibration certificates shall be held in accordance with the requirements of the Winter Service Plan and the Company's Quality Management System and Quality Plan shall be available for inspection by the Scottish Ministers at any time.</p> <p>1.10 The Company shall provide winter Constructional Plant and other Constructional Plant in accordance with the specifications referred to in sub-clause 2 of this Clause 2805AR.</p> <p><b>2 General</b></p> <p>2.1 The winter Construction Plant which shall be used for spreading rock salt on the Project Roads shall consist of a truck chassis/cab upon which shall be mounted a salt spreading machine of sufficient capacity to enable the Company to fulfil its obligations for winter service Operations.</p> <p>2.2 Where alternative de-icing materials shall be specified the Company shall provide Winter Constructional Plant to spread these in accordance with the manufacturer's written recommendations.</p> <p>2.3 Winter Constructional Plant Specification for Plant used for Spreading Rock</p>

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	<p><b>Salt</b></p> <p>2.4 The chassis/cab shall:</p> <ul style="list-style-type: none"> <li>i) be of robust construction and shall comply fully with the requirements of the Motor Vehicle Construction and Use Regulations;</li> <li>ii) have a suitable wheelbase to accommodate the appropriate salt spreader body without excessive overhang behind the rear spring suspension brackets; and</li> <li>iii) be fitted with a diesel engine which develops sufficient horsepower to cater for snow clearing and winter service.</li> </ul> <p>2.5 <b>Operations</b></p> <p>2.5.1 The salt spreading equipment shall:</p> <ul style="list-style-type: none"> <li>i) be of proven design and comply fully with the requirements of BS.1622:1989 Specification for Spreaders for Winter Maintenance;</li> <li>ii) be capable of spreading dry salt to BS 3247:1991 Specification for Salt for Spreading on Highways for Winter Maintenance;</li> <li>iii) be capable of symmetrical and asymmetrical spreading in accordance with the Class A1 requirements of BS 1622:1989 Specification for Spreaders for Winter Maintenance;</li> <li>iv) be fitted with a hopper that itself shall be fitted with removable salt screens;</li> <li>v) be fitted with a spreading mechanism at the rear of the machine designed to minimise damage to passing vehicles when the machine shall be operating. The level of the spreader shall be not greater than 350 millimetre above the road surface. The spreader shall be capable of even distribution of salt over the full width of spread at rates between 10g/sq. m and 40g/sq. m and the trajectory of the salt leaving the spreader shall at no time be higher than 150 millimetre above the point of distribution;</li> <li>vi) be fitted with a salt discharge indicator connected to the salt spreading machine so as to inform the operator that spreading has ceased;</li> <li>vii) be fitted with an electronic data logger in accordance with Clause 2810AR; and</li> <li>viii) be fitted with an on board global positioning system.</li> </ul> <p>2.5.2 The Company shall provide a range of snowploughs which shall be capable of clearing all snow conditions in the O&amp;M Works Site.</p> <p>2.5.3 Snow blowers utilised shall:</p> <ul style="list-style-type: none"> <li>i) be capable of blowing up to 600 tonnes of snow per hour;</li> <li>ii) have a width of cutter head to be at least 1.8 metres; and</li> <li>iii) be capable of operating in up to 4 metres depth of snow.</li> </ul> <p>2.5.4 All winter Constructional Plant used for de-icing and snow and ice clearance</p>

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	<p>Operations shall:</p> <ul style="list-style-type: none"> <li>i) be painted golden yellow to BS 4800:1989 Schedule of Paint Colours for Building Purposes;</li> <li>ii) have 2 additional headlamps shall be fitted to permit forward visibility when the snow plough shall be fitted;</li> <li>iii) have 3 rotating amber beacons shall be fitted to the vehicle 2 on the roof of the cab and 1 beacon at the rear of the salt hopper;</li> <li>iv) be fitted with a sign board reading "SPREADING" fitted to the back of the salt hopper. The lettering shall be 160 millimetre 'x' 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:1996 Specification for colours for identification, coding and special purposes lemon yellow No 355; and</li> <li>v) The vehicle shall be fitted with a passenger seat.</li> </ul>	
2807AR	1	<b>Maintenance of Company's Vehicles and other Constructional Plant</b>
	1.1	The Company shall be responsible for ensuring that its vehicles and other Constructional Plant shall be mechanically maintained to a standard in order to comply with the other provisions of the Agreement.
	1.2	The Company shall arrange for sufficient qualified motor fitters to be on standby at all times during the operational winter maintenance period. In the event of mechanical breakdown or other mechanical failure with the Company's vehicles and other Constructional Plant the Company shall arrange for the necessary repairs to be carried out without delays so that the response and treatment times can be met.
2808AR	1.1.1	Not used
2809AR	1	<b>Winter Service Vehicle Data Receiving, Storing, Archiving and Web Based Systems</b>
	1.1	Data transmitted from the vehicles shall be stored by the Company on a secure server and be accessible by Transport Scotland or the Performance Audit Group by means of a web interface, from a commercially available computer.
	1.2	The web interface shall provide access to reports on any of the measured parameters detailed in Clause 2810AR. These reports shall be capable of being parameterised to be configured for national, regional and local use.
	1.3	Reports for the following shall be available: <ul style="list-style-type: none"> <li>(i) material usage (vehicle weight in and out)</li> <li>(ii) fuel usage</li> <li>(iii) vehicle mileage</li> <li>(iv) route identification and adherence to route</li> </ul>

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	<ul style="list-style-type: none"> <li>(v) treatment times</li> <li>(vi) reports on any / all control functions (Plough and spinner / chute settings)</li> <li>(vii) beacons on and off</li> <li>(viii) driver identification</li> <li>(ix) vehicle identification</li> </ul> <p>1.4 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 national and Project Network views.</p> <p>1.5 The system shall be capable of displaying due treatment, treated and untreated routes and vehicle position and status in a graphical colour coded format.</p> <p>1.6 The system shall be capable of operating on dial up type connection when required.</p> <p>1.7 The system shall be capable of alerting the driver if the pre-determined route is not adhered to.</p> <p>1.8 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 e-mail.</p> <p>1.9 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.</p> <p>1.10 The Company shall demonstrate how the transmission system will be capable of full operation in poor signal areas or during times of system network overload.</p>
2810AR	<p><b>1 Winter Service Vehicle Data Logging and Transmitting Equipment</b></p> <p>1.1 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.</p> <p>1.2 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.</p> <p>1.3 The system shall provide accurate recorded data of the following parameters:</p> <ul style="list-style-type: none"> <li>(i) location of vehicle</li> <li>(ii) spreading or not spreading</li> <li>(iii) rate of spreading</li> <li>(iv) spreading pattern, width and lane position</li> </ul>

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	<ul style="list-style-type: none"> <li>(v) ploughing or not ploughing</li> <li>(vi) road surface temperature</li> <li>(vii) record of weight out of and weight in to the depot</li> <li>(viii) beacons on or off (including that they are actually working if on)</li> <li>(ix) pre-wet on or off</li> <li>(x) flow rates for liquid treatment</li> <li>(xi) plough orientation</li> <li>(xii) driver identification</li> <li>(xiii) fuel usage</li> <li>(xiv) distance travelled</li> <li>(xv) vehicle speed</li> <li>(xvi) time of leaving depot</li> <li>(xvii) time of returning to the depot</li> <li>(xviii) treatment type</li> <li>(xix) travelling off route, with driver alert</li> <li>(xx) time</li> </ul> <p>Data shall be referenced to the Ordnance Survey Grid.</p>
1.4	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.
1.5	The data output shall be in accordance with British Standard EN 15430-1:2007 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
1.6	The accuracy of all data shall be validated by the 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.
1.7	The method of calibration and accuracy of the time and date stamp shall be in accordance with British Standard EN 15430-1:2007 Winter and Road Service Area Maintenance Equipment – Data Acquisition and Transmission Part 1: In Vehicle Data Acquisition.
3101AR	<p><b>1 Road Cleaning and Clearance</b></p> <p><b>1.1 Sweeping</b></p> <p>1.1.1 Subject to the other provisions of the Agreement the Company shall provide all the necessary labour Constructional Plant materials and equipment</p>

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	<p>required to maintain to the standards of cleanliness set out in the Environmental Protection Act 1990 Code of Practice on Litter and Refuse (Category 6 Zone) the carriageways, channels, hardshoulders, central reserves, footways, cycle facilities and footbridges on the O&amp;M Works Site.</p> <p>1.1.2 Sweeping of channels shall be to such a standard that on completion of the work there shall be an unimpeded passage for storm water into the drainage system. Channels shall be swept at least once annually in the spring. Vehicles engaged in sweeping shall only travel in the same direction of flow as the adjacent road traffic.</p> <p>1.1.3 Sweeping shall also take place when required to remove material which constitutes an immediate or imminent hazard (Category 1 Defect) to road Users.</p> <p>1.1.4 Sweeping shall also be required on all paved areas and all roads within the O&amp;M Works Site to ensure that detritus and vegetation do not obscure any carriageway markings or otherwise cause a road safety hazard (such as loose material in hatched areas).</p> <p>1.1.5 The Company shall identify all mechanical sweeping equipment to be provided for use in the O&amp;M Works Site in its Quality Plan. Records of cleansing work carried out shall be maintained within its Quality System and be available for inspection by the Scottish Ministers at any time.</p>
3102AR	<p><b>1 Litter and Debris Clearance</b></p> <p>1.1 Subject to the other provisions of the Agreement the Company shall maintain all road verges and central reservations to meet the standards for motorways and strategic routes set out in the Environmental Protection Act 1990 Code of Practice on Litter and Refuse (Category 6 Zone).</p> <p>1.2 The term "verges" includes all grassed and planted areas between the road boundary fences which are not surfaced with bituminous materials or classified as central reservations.</p> <p>1.3 Central reservations shall be both grassed and paved areas and no distinctions shall be made between either type.</p> <p>1.4 The Company shall carry out safety inspections and safety patrols on the Roads to the standards identified in Part 2 of these O&amp;M Works Requirements. The inspectors and patrollers shall collect from the carriageway, hardshoulder, central reserve and verges all objects of any material size or form weighting less than 25kg which might be a hazard of distraction to road Users.</p> <p>1.5 Records of litter and debris clearance shall be held in accordance with the procedures in the Quality Plan and be available for inspection by the Scottish Ministers at any time.</p>
3103AR	<p><b>1 Removal of Dead Animals</b></p> <p>1.1 The carcass of a dead animal found on the O&amp;M Works Site that needs to be removed for safety or environmental reasons shall be collected and disposed of in accordance with the requirements of the Local Authority</p>

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	Environmental Health Officer.	
<b>3201AR</b>	<b>1</b>	<b>Incident Response Operations</b>
	<b>1.1</b>	<b>General</b>
	<b>1.1.1</b>	Notwithstanding the provisions of Section 17 of Part 1 of these O&M Works Requirements this clause specifies the requirements for incident response Operations.
	<b>1.2</b>	<b>Incident Operations</b>
	<b>1.2.1</b>	The Company shall provide incident standby/response Operations as described in Appendix 32/1.
	<b>1.2.2</b>	At all times the Company shall have available competent and trained operatives and suitably equipped vehicles and to be on the site of the incident within the time period stated in Appendix 32/1.
	<b>1.2.3</b>	Eight weeks prior to the commencement of the Agreement and at least two weeks prior to 1 April and 1 October in each Annual Period thereafter the Company shall prepare rosters detailing the availability of supervisors and emergency crews for each 6 month period of each Contract Year commencing 1 April. The roster shall include names and addresses and telephone and message pager numbers of the personnel listed. The roster shall be updated at such times when the personnel identified on the roster cease to be available or changes are proposed to the personnel by the Company.
	<b>1.2.4</b>	The Company's arrangements for training and supervision shall ensure that all operatives are familiar with the types of incident that can be expected including any special procedures necessary during the hours of darkness.
	<b>1.2.5</b>	Section 17 of Part 1 of these O&M Works Requirements specifies the customer contact system to be provided by the Company to which emergency calls shall be transmitted. It also describes the role of the emergency liaison officer.
	<b>1.2.6</b>	During the hours of 07.00 to 19.00 Monday to Friday the Company may use the personnel identified to respond to Incident requests for assistance on other Operations in connection with the Agreement. They shall however be able to attend at the site of any Incident on any part of the O&M Works Site within the response time stated in Appendix 32/1. The Company's stock of material as specified in Appendix 1/79 shall include all materials necessary to respond without delay to an Incident on the O&M Works Site.
	<b>1.2.7</b>	For the avoidance of doubt the resources identified in Table 1 of Appendix 32/1 shall be deemed to be the minimum provision and shall not be construed as being all resources required by the Company to fulfil its obligations for Incident response Operations.
<b>3202AR</b>	<b>1</b>	<b>Temporary Concrete Road Restraint Systems</b>
	<b>1.1</b>	<b>General</b>
	<b>1.1.1</b>	When necessary, to ensure the safety of the Users of the O&M Works Site

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	<p>and Company operatives, the installation of temporary vertical concrete road restraint systems shall be carried out in accordance with Series 400. The Company shall have immediate access to at least 90 metres of temporary vertical concrete road restrain system and shall ensure that the necessary Constructional Plant and personnel shall be available to commence erection of the road restraint system as soon as practicable but within 24 hours. Records of such use shall be held within the Company's Quality System and be available for inspection by the Scottish Ministers at any time.</p>
3270AR	<p><b>1 Incident Response</b></p> <p><b>1.1 Response Time</b></p> <p>1.1.1 The response time for attendance of the Company's initial and secondary incident response resources at the scene of an emergency shall be as stated in Table 1 of Appendix 32/1.</p> <p>1.1.2 During the hours of 07.00 to 19.00 Monday to Friday the Company may use the personnel identified to respond to emergency requests for assistance on other operations or parts of the O&amp;M Works in connection with this Agreement.</p> <p>1.1.3 The incident response personnel shall however be able to attend at the site of any incident on any part of the Land Made Available within the response time stated in Appendix 32/1</p> <p><b>1.2 Resources for incident response operations</b></p> <p>1.2.1 Details of the types of resources that shall be made available by the Company to respond to incidents shall be as specified in Table 2 of Appendix 32/1.</p>
3301AR	<p><b>1 Rotary Coring in carriageways</b></p> <p>1.1 Rotary coring in carriageways shall be carried out in accordance with this Clause.</p> <p>1.2 Cores shall be 100 millimetre or 150 millimetre nominal diameter and taken in the positions and to the depths proposed by the Company and consented to in writing by the Scottish Ministers.</p> <p>1.3 Cores shall be cut in accordance with BS 598 using a coring machine, which complies with BS 4019.</p> <p>1.4 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.</p> <p>1.5 The holes shall be filled to within 50 millimetre to 75 millimetre 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.</p>

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	<p>1.6 The cores shall be handled carefully to prevent damage wrapped in polythene to prevent moisture loss.</p> <p>1.7 They shall be indelibly marked to indicate the location and date of coring.</p> <p>1.8 Cores shall be packaged to avoid damage, clearly labelled and delivered to the Company's store.</p> <p>1.9 At the Company's store, cores shall be handled carefully and stored on purpose built racks or shelves.</p> <p>1.10 Cores shall be stored for periods determined by the Company to enable the necessary recording testing and data to be obtained or inspected by the Scottish Ministers.</p> <p>1.11 The Company shall establish if the Scottish Ministers wish to inspect the cores prior to disposal.</p> <p>1.12 Core sampling operations testing, referencing, information obtained from data analysis and interpretation shall be recorded by the Company and a copy of data and reports supplied to the Scottish Ministers.</p> <p>1.13 The Company shall submit evidence in writing to the Scottish Ministers for written consent that the persons including any subcontractor proposed to carry out coring testing and reporting Operations have the expertise and resources to carry out any such work.</p> <p>1.14 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).</p>
3302AR	<p><b>1 Rotary Coring in Structures</b></p> <p>1.1. Rotary coring in Structures shall be carried out in accordance with this Clause.</p> <p>1.2. Cores shall be 50 millimetre, 75 millimetre or 100 millimetre nominal diameter and taken in the positions and to the depths proposed by the Company and consented to in writing by the Scottish Ministers.</p> <p>1.3. The cores shall be cut in accordance with BS 598 using a coring machine which complies with BS 4019.</p> <p>1.4. Cores shall generally be cut through structural concrete with measures taken to avoid encountering reinforcement.</p> <p>1.5. The holes from which core samples have been cut shall be reinstated using repair mortar in accordance with Clause 1775AR.</p> <p>1.6. The cores shall be handled carefully to prevent damage wrapped in polythene to prevent moisture loss. They shall be indelibly marked to indicate the location and date of coring.</p> <p>1.7. Cores shall be packaged to avoid damage, clearly labelled and delivered to the Company's store.</p> <p>1.8. At the Company's store cores shall be handled carefully and stored on</p>

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		<p>purpose built racks or shelves.</p> <p>1.9. Cores shall be stored for periods determined by the Company to enable the necessary recording testing and data to be obtained or inspection by the Scottish Ministers.</p> <p>1.10. The Company shall establish if the Scottish Ministers wish to inspect the cores prior to disposal.</p> <p>1.11. Core sampling operations testing referencing information obtained from data analysis and interpretation shall be recorded by the Company and copies of data and reports supplied to the Scottish Ministers.</p> <p>1.12. The Company shall submit evidence in writing to the Scottish Ministers for 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.</p> <p>1.13. 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).</p>
3303AR	1	<p><b>Structural Investigations</b></p> <p>1.1 Separate reports upon the findings testing and the like together photographic evidence shall be supplied for each Structure as detailed in Appendix 33/1.</p> <p>1.2 The Company shall determine in accordance with the other requirements of this Agreement, the need for the reports to contain a section giving an expert interpretation of the results of the investigation the reports shall contain such a section.</p> <p>1.3 The number of copies for each report shall be described in Appendix 33/1.</p> <p>1.4 The Company shall submit evidence to the Scottish Ministers that the persons including sub-contractors proposed to carry out investigation testing and reporting Operations have the expertise and resources to carry out the work.</p> <p>1.5 All sampling and testing Operations shall be carried out by a specialist testing firm or laboratory holding accreditation Service (UKAS) or by the European Co-operation for Accreditation of Laboratories (EAL).</p>
3304AR	1	<p><b>Inspection Patches Within Surfacing on Bridge Structures</b></p> <p>1.1 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 700 900 and 1100.</p> <p>1.2 Details of patch size and location within footways and carriageways shall be agreed in advance by the Scottish Ministers.</p> <p>1.3 Such inspection patches shall be excavated through any flexible surfacing asphaltic sand carpet and waterproofing system which may be present.</p>

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	1.4	Following excavation all residual deposits of surfacing and waterproofing shall be disposed of off the O&M Works Site and the deck cleaned.
	1.5	Excavation patches shall remain open for testing and inspection and shall only be reinstated after having received the written consent of the Scottish Ministers.
3305AR	1	<b>Trial Holes in Paved Areas</b> 1.1 The Company shall excavate trial holes by hand or machine to permit inspection or sampling of unbound or bitumen bound materials. 1.2 The size and location of the trial holes shall be determined by the Company in accordance with the other provisions of this Agreement. 1.3 Trial holes shall be excavated and reinstated in accordance with Clause 706 except that trial holes shall remain open for testing and inspection and shall only be reinstated after having received the written consent of the Scottish Ministers.
3306AR	1	<b>Falling Weight Deflectometer Tests</b> 1.1 The Company shall undertake falling weight deflectometer tests to assess the structural condition of bituminous and cementitious road pavements. 1.2 The location, length to be tested and number of tests to be carried out shall be determined by the Company in accordance with the other provisions of this Agreement. 1.3 The testing and reporting shall be carried out in accordance with the guidance given in HD 29 of the DMRB.
3307AR	1	<b>Dynamic Cone Penetrometer Tests</b> 1.1 The Company shall undertake dynamic cone penetrometer tests to assess the structural condition of bituminous and cementitious road pavements. 1.2 The testing shall be carried out in accordance with the Manufacturer's written instructions. 1.3 The calculations and reporting shall be carried out in accordance with the guidance given in <i>Transport and Road Research Laboratory Overseas Road Note 8 – A Users Manual for a Program to Analyse Dynamic Cone Penetrometer Data..</i>
3308AR	1	<b>Structural Investigations Tests</b> 1.1 Structural investigations tests shall be as described in Appendix 33/1
6101AR	1	<b>Maintenance of Road Restraint Systems</b> 1.1 Safety barriers shall be re-tensioned in accordance with the requirements of Clause 472AR within the periods specified in Part 2 of Schedule 4. 1.2 Re-tensioning required outwith the maintenance cycle shall only be when instructed by the Scottish Ministers.

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<b>6102AR</b>	<b>1</b>	<b>Maintenance of Gullies, Piped Grips, Catchpits Soakaways and Oil Separators</b>  1.1 Cleaning of gullies, catchpits, soakaways and oil separators shall be carried out in accordance with Clauses 520, 521 and the following  1.2 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.  1.3 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.  1.4 Details of the Operations including the Scheme Identifier, 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.
<b>6103AR</b>	<b>1</b>	<b>Maintenance of Drainage Grips</b>  1.1 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.
<b>6104AR</b>	<b>1</b>	<b>Maintenance of Linear Drainage Systems</b>  1.1 Linear drainage systems shall be maintained by cleaning in accordance with Clauses 520, 521.  1.2 Cleaning may be carried out by drawing through a mandrel with a diameter 20 millimetre less than the nominal diameter of the pipe or nominal minimum area of the "waterway area" of the block.  1.3 Where necessary a root cutter attachment shall be used with the high pressure water jetter.  1.4 Piped grips shall be cleaned as necessary such that all silt and loose obstructions shall be removed from the pipe such that the free flow of water shall not be impeded and that the water does not stand on the carriageway adjacent to the piped grip.  1.5 Each end of the piped grip shall be maintained free from vegetation or other obstructions including any material expelled from the pipe.  1.6 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.
<b>6105AR</b>	<b>1</b>	<b>Maintenance of Filter Material</b>  1.1 The 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.

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	1.2	All weed growth in filter material shall be treated in accordance with clause 3002
	1.3	The location of any obstruction that cannot be removed shall be recorded
	1.4	Any build up of detritus between the edge of the carriageway and the filter drain shall be removed at the same time.
<b>6106AR</b>	<b>1</b>	<b>Maintenance of Drainage Structures</b>
	1.1	Drainage structures shall be maintained by cleaning in accordance with Clauses 520 and Clause 521.
	1.2	Each end of the drainage structure including any ancillary drainage items is shall be kept free of vegetation and other obstructions including any material disturbed during cleaning.
	1.3	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.
	1.4	The Company shall maintain a record of any defects found during maintenance Operations and shall report any hazards immediately to the Scottish Ministers.
<b>6107AR</b>	<b>1</b>	<b>Maintenance of Ancillary Drainage Items</b>
	1.1	Ancillary drainage shall be maintained by cleaning all vegetation and debris and cleaning to remove all silt loose obstructions and other detritus.
	1.2	Sluices, tidal flaps, penstocks, valves, pumps and other specialist equipment shall be maintained by checking that all mechanisms shall be functioning as required and lubricating any moving parts in accordance with any manufacturers' instructions.
	1.3	The Company shall maintain a record of any defects found during maintenance operations and shall report any hazards immediately to the Scottish Ministers.
	1.4	Where Ancillary Drainage Items are electrically energised they shall be Inspected, tested and certificated in accordance with the requirements of BS7671. The interval between this certification shall be no greater than 5 years.
<b>6108AR</b>	<b>1</b>	<b>Litter and Refuse</b>
	1.1	Subject to the other provisions of this Agreement the Company shall ensure that all roads and other land within the Site shall be maintained to the standards of a Category 6 Zone as set out in the Environmental Protection Act 1990 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.
	1.2	Road cleaning and clearance of channels shall be to such a standard that on completion of the Operation there shall be an unimpeded passage for

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	1.3	storm water into the drainage system.
	1.4	Vehicles engaged in sweeping shall only travel in the same direction of flow as the adjacent road traffic.
	1.5	Any growth of grass or other vegetation which shall be likely to obstruct the flow of water in the channel shall be controlled in accordance with Clause 3002.
	1.6	The term "grassed areas" as referred to in the Code of Practice shall include all areas that shall be either grassed planted granular or the like between the road boundary fences which shall not be hard surfaced.
	1.6	Central reservations may be grassed or hard surfaced areas.
<b>6109AR</b>	<b>1</b>	<b>Maintenance of Road Studs</b>
	1.1	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.
<b>6110AR</b>	<b>1</b>	<b>Maintenance of Structures - General</b>
	1.1	Vegetation on or adjacent to the Structure shall be removed using hand tools or appropriate mechanical means which preserve the integrity and do not damage the Structure.
	1.2	Injurious weed such as Japanese Knotweed and Giant Hogweed shall be removed in accordance with Clause 3002 and reported to the Scottish Ministers.
	1.3	Debris from any part of the Structure shall be removed by methods which do not damage the Structure.
	1.4	Bird droppings shall be removed by methods which do not damage the structure.
	1.5	Bolts shall be checked and tightened to the appropriate torque.
	1.6	Missing bolts shall be replaced and tightened to the appropriate torque.
	1.7	Local damage to protective systems shall be made good.
	1.8	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.
<b>6111AR</b>	<b>1</b>	<b>Maintenance of Expansion Joints</b>
	1.1	Debris and vegetation shall be cleaned out from the expansion joint.
	1.2	Bolts securing the expansion joint, cover plates and nosing joints shall be checked and tightened to the appropriate torque.
	1.3	Missing bolts shall be replaced and tightened to the appropriate torque.
	1.4	Securing compounds shall be checked and repaired as necessary.
	1.5	Neoprene or elastomeric material shall be checked for splitting or detachment from the supporting frame by a visual inspection and the use of

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	<p>appropriate hand tools.</p> <p>1.6 Cover plates and nosing joints shall be checked by visual inspection and the use of appropriate tools.</p> <p>1.7 Debris and sediment from associated drainage below the joint shall be cleared.</p>
<b>6112AR</b>	<p><b>1 Maintenance of Bridge Drainage Systems</b></p> <p>1.1 Cleaning of bridge drainage systems shall be carried out in accordance with Clauses 520, 6102AR and 6104AR.</p> <p>1.2 Drainage holes in structural components obstructions outlet pipes outlet manholes weep pipes silt and debris deposits shall be cleaned using appropriate hand tools drainage rods and mechanical means including jetting.</p> <p>1.3 Flap valves shall be checked for operation by hand or using appropriate lifting devices.</p> <p>1.4 Hinges and fixings shall be greased using a corrosion inhibiting lubricant that will not flow below 70°C.</p> <p>1.5 Vegetation and weeds blocking pipes shall be removed.</p>
<b>6113AR</b>	<p><b>1 Maintenance of Parapets and Pedestrian Protection on Structures</b></p> <p>1.1 Hollow section drain holes shall be cleaned.</p> <p>1.2 Bolts shall be checked and tightened to the appropriate torque.</p> <p>1.3 Missing bolts shall be replaced and tightened to the appropriate torque.</p> <p>1.4 Local damage to protective systems shall be made good.</p> <p>1.5 Parapet expansion joints shall be checked for freedom.</p> <p>1.6 Connections with adjoining vehicle restraint barriers shall be checked..</p>
<b>6114AR</b>	<p><b>1 Maintenance of Bearings and Bearing Shelves</b></p> <p>1.1 Maintenance shall be in accordance with the manufacturers' requirements.</p> <p>1.2 Local damage to protective systems shall be made good.</p> <p>1.3 Bearings shall be checked for freedom of movement and any signs of misalignment, binding, distortion or excessive freedom shall be reported to the Scottish Ministers.</p>
<b>6115AR</b>	<p><b>1 Maintenance of Structures Over or Conveying Watercourses</b></p> <p>1.1 Structures over or conveying watercourses shall be maintained, including clearing of vegetation, debris and encrustations, greasing and lubrication where appropriate.</p> <p>1.2 Maintenance shall be in accordance with manufacturer's requirements or information in the maintenance manual or as-built records.</p>

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<b>6116AR</b>	<b>1</b>	<b>Maintenance of Sign or Signal Gantry and High Mast Lighting Masts</b>
	1.1	Holding down assemblies and fixings including to cladding shall be checked and tightened employing calibrated hand or mechanical wrenches to achieve the torque.
	1.2	Missing bolts in the holding down assemblies and fixings shall be replaced and tightened to the appropriate torque.
	1.3	Holding down assemblies shall be cleaned and re-greased and where available in accordance with the manufacturer's written specifications, where available.
	1.4	Cladding shall be cleaned using detergents that will not discolour/ degrade cladding finishes.
	1.5	Seals to box type gantries shall be visually inspected for leaks using torches and tools suitable for use in confined spaces.
	1.6	Any box type gantries that shall not be wind and waterproof shall be reported to the Scottish Ministers.
	1.7	High mast winch and head frame assemblies shall be inspected and maintained in accordance with the manufacturers requirements.
	1.8	Local damage to protective systems shall be made good.
<b>6117AR</b>	<b>1</b>	<b>Maintenance of Non-Structural Items</b>
	1.1	Moveable parts shall be cleaned and greased and where available in accordance with the manufacturer's requirements.
	1.2	Holding down assemblies and fixings including to cladding shall be checked and tightened to the appropriate torque.
	1.3	Missing bolts in the holding down assemblies and fixings shall be replaced and tightened to the appropriate.
	1.4	Holding down assemblies shall be cleaned and re-greased and where available in accordance with the manufacturer's written specifications, where available.
	1.5	Vegetation shall be removed in accordance with Clause 6110AR.
<b>6118AR</b>	<b>1</b>	<b>Maintenance of Underpasses, Culverts and Retaining Walls Used by Pedestrians and Cyclists .</b>
	1.1	All surfaces, painted finishes and protective systems within culverts and underpasses including ceilings, soffits and handrails shall be cleaned without ant detrimental effect to the surface finishes or protective systems..
	1.2	Cleaning of polycarbonate mirrors shall be by hand using the appropriate methods as specified in writing by the manufacturer, where available.
<b>6119AR</b>	<b>1</b>	<b>Maintenance of Road Traffic Signs</b>
	1.1	Road traffic signs shall be maintained by cleaning using methods which do not damage them.

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Clause Number	Title and Written Text
	<p>1.2 Hazard posts and marker posts shall be straightened and the ground around the base of the post re-compacted.</p> <p>1.3 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.</p> <p>1.4 Ladders shall not be leant against sign faces.</p>
<b>6120AR</b>	<p><b>1 Maintenance of lit Sign Units</b></p> <p>1.1 Lit Sign Units Shall be maintained by</p> <ul style="list-style-type: none"> <li>(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 which do not damage them,</li> <li>(ii) degreasing, lubricating and checking the operation of all toggles, wing nuts, hinges, door locks and lifting gear,</li> <li>(iii) aligning bracket luminaire and luminaire optical equipment in respect of the sign face and to minimise glare to traffic,</li> <li>(iv) checking and tightening screws and locking devices in accordance with the manufacturer's instructions,</li> <li>(v) identifying and recording damage, corrosion or misalignment of posts,</li> <li>(vi) identifying and recording electrical component showing signs of overheating fracture condensation or tracking,</li> <li>(vii) refitting lamps removed for cleaning purposes shall be or, if no longer serviceable, replacing with a new lamp of an equivalent specification,</li> <li>(viii) replacing lamps,</li> <li>(ix) marking new lamps with the date of installation and recording this date,</li> <li>(x) identifying and recording faults on any electrical unit,</li> <li>(xi) visually checking fixings and recording any defects,</li> <li>(xii) identifying and recording damage, corrosion or other defects of conduits,</li> <li>(xiii) checking all electrical connections and recording any defects,</li> <li>(xiv) checking all earthing connections and recording any defects,</li> <li>(xv) clearing debris from around sign post bases for 1 metre radius.</li> </ul> <p>1.2 The supply shall be isolated at the cut-out for the removal and fitting of lamps.</p> <p>1.3 Any faulty lamp shall be disposed of in accordance with Clause 1370AR.</p>
<b>6121AR</b>	<p><b>1 Maintenance of Traffic Signals</b></p> <p>1.1 Traffic signals shall be maintained by</p>

Appendix 0/1: Additional, Substitute and Cancelled Clauses, Tables and Figures Specific to This Agreement

Clause Number	Title and Written Text
	<ul style="list-style-type: none"> <li>(i) cleaning lenses internal and external surfaces and any other components affecting the optical performance of the lenses in accordance with manufacturer's recommendations,</li> <li>(ii) checking and tightening all grub screws and locking devices in accordance with the manufacturer's instructions,</li> <li>(iii) identifying and recording damage, corrosion or misalignment of posts,</li> <li>(iv) identifying and recording electrical component showing signs of overheating fracture condensation or tracking,</li> <li>(v) refitting lamps removed for cleaning purposes shall be or, if no longer serviceable, replacing with a new lamp of an equivalent specification,</li> <li>(vi) identifying and recording faults on any electrical unit,</li> <li>(vii) visually checking fixings and recording any defects,</li> <li>(viii) identifying and recording damage, corrosion or other defects of conduits,</li> <li>(ix) checking all electrical connections and recording any defects,</li> <li>(x) checking of all earthing connections and recording any defects,</li> <li>(xi) clearing debris from around post bases for 1 metre radius</li> </ul> <p>1.2 The supply shall be isolated at the cut-out for the removal and fitting of lamps.</p> <p>1.3 Any faulty lamp shall be disposed of in accordance with Clause 1370AR.</p>
6122AR	<p><b>1 Maintenance of Roadside Electrical Apparatus, Lighting and Power Supplies</b></p> <p>1.1 Special requirements for equipment identified in the risk assessment shall be in place prior to electrical maintenance work commencing.</p> <p>1.2 The 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 apparatus.</p> <p>1.3 Replacement components shall be either the same as that being replaced or an equivalent.</p> <p>1.4 The Company shall store all faulty columns and lanterns removed from the Unit for four weeks to allow inspection by the Scottish Ministers.</p> <p>1.5 The Company shall carry out non-cyclic maintenance Operations of luminaires, columns and brackets, underground cable systems, feeder pillars and associated switchgear, control systems, and any other roadside electrical apparatus and lighting.</p> <p>1.6 When replacing luminaires, columns, brackets and other electrical apparatus as non-cyclic maintenance Operations, the 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.</p>

Appendix 0/1: Additional, Substitute and Cancelled Clauses, Tables and Figures Specific to This Agreement

Clause Number	Title and Written Text
	<p>1.7 Electronic control gear or low loss control gear shall be used in all replacement luminaires.</p> <p>1.8 The Company shall inform Traffic Scotland Operator and Traffic Scotland maintenance contractor prior to isolating or energising power supplies to any equipment that Traffic Scotland operates.</p> <p>1.9 All works carried out by the Company, with the exception of inspections and testing on electrical apparatus shall be recorded by:</p> <ul style="list-style-type: none"> <li>(i) a works report,</li> <li>(ii) a call out report, or</li> <li>(iii) another method approved by the Scottish Ministers.</li> </ul> <p>1.10 The Company when submitting Call Out Reports and Works 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.</p> <p>1.11 The Company shall comply with <i>Transport Scotland guidance document LDS8020_09 – Guidance on the preparation of statement of intents relating to proposed works on Road Lighting and other Electrically Energised Apparatus</i> when submitting bids for Works relating to electrical apparatus.</p> <p>1.12 The Company shall comply with the recommendations made in Transport Scotland guidance document <i>LDS8018_09 – Guidance on Sustainability in relation to Roadside Electrical Equipment and Lighting</i>.</p> <p>1.13 The 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 <i>LDS8012_09 – Guidance Note on MPANS and using ELEXON Consumption Codes for Roadside Electrical Equipment and Lighting</i>.</p>

Appendix 0/1: Additional, Substitute and Cancelled Clauses, Tables and Figures Specific to This Agreement

<b>Call Out Report Form</b>	
DATE	WEATHER CONDITIONS
TIME CALLED OUT	CALLED OUT BY
TRUNK ROAD/MOTORWAY	LOCATION
<b>DESCRIPTION OF WORK</b>	
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.	
<b>MATERIALS USED</b>	
To include stores issue number.	
<b>TIME ON SITE</b>	
<b>TIME OF LEAVING SITE</b>	
<b>ADDITIONAL TEAM TYPES AND DURATION</b>	
<b>DESCRIPTION OF PLANT USED AND DURATION</b>	
<b>NAME OF APPROVED ELECTRICIAN</b>	
<b>SIGNATURE OF APPROVED ELECTRICIAN</b>	
<b>NAME OF SUPERVISOR</b>	
<b>SIGNATURE OF SUPERVISOR</b>	

*Appendix 0/1: Additional, Substitute and Cancelled Clauses, Tables and Figures Specific to This Agreement*

<b>Works Report Form</b>	
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 as 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	

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**Substitute Clauses, Tables and Figures**

Clause Number	Title and Written Text
6123 AR	Not Used
6124 AR	<p><b>1 Maintenance of High Mast Lighting</b></p> <p>1.1 Maintenance of high mast lighting units shall be in accordance with Clause 6122AR and Technical Report No. 7 High Masts for Lighting and CCTV, published by The Institution of Lighting Engineers.</p>
6125 AR	Not Used
6126AR	Not Used
6127 AR	<p><b>1 Removal of Graffiti, Posters and Encrusted Deposits</b></p> <p>1.1 Graffiti, posters and encrusted deposits shall be removed by suitable methods which do not damage the substrate.</p>
6128AR	Not Used
6129AR	Not Used
6130AR	<p><b>1 Maintenance of Geotechnical Assets</b></p> <p>1.1 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.</p>
110SR	<p><b>1 Temporary Information Boards</b></p> <p>1.1 The Company shall clean and maintain the advertising signs set out in Appendix 1/21 and all temporary information boards required by Scottish Office Industry Department Circular 1/1994. It shall also clean and maintain any information boards provided by it for its own use and shall dismantle and remove them on completion of the Operations. Company advertising boards other than those set out in Appendix 1/21 shall not be allowed on or adjacent to the O&amp;M Works Site. It shall however be allowed at the entrance to compounds subject to the restriction specified in these O&amp;M Works Requirements.</p>
113SR	<p><b>1 Programme of Operations</b></p> <p>1.1 The Company shall establish and maintain a high level of co-operation with the Traffic Scotland Networks Operations Manager, TSCC, Police, adjacent operating companies and Relevant Authorities to ensure that road Users shall be provided with the best possible service and that disruptions to traffic flows are kept to a minimum.</p>
117SR	<p><b>1 Traffic Safety and Management</b></p> <p>1.1 Traffic management measures shall be determined by the Company and may comprise lane closures, Lane Occupations, mobile and short</p>

Appendix 0/1: Additional, Substitute and Cancelled Clauses, Tables and Figures Specific to This Agreement

Clause Number	Title and Written Text
	<p>duration static lane closures and diversions all as detailed in Appendix 1/17 or other such measures as may be necessary for the Operations. The duration and scope of the traffic management measures shall vary according to the nature and extent of the Operations being carried out by other contractors and outside bodies.</p> <p>1.2 The Company shall ensure that to minimise disruption to traffic optimum use shall always be made of traffic management provided as part of the Operations.</p> <p>1.3 The Company shall provide erect maintain reposition cover and uncover and finally remove traffic signs as required. In so doing such other measures shall be taken by the Company as may be necessitated by the Operations in accordance with any special requirements in Appendix 1/17 recommendations in Chapter 8 of the Traffic Signs Manual or any amendments thereto or other requirements of the Scottish Ministers as detailed in Appendix 1/17.</p> <p>1.4 Traffic signs shall comply with the appropriate Clauses in Series 1200 of the Specification. The Company shall keep traffic signs clean secure and legible. It shall ensure that all signs required to be lit by external or internal lighting are illuminated during periods when road vehicles are required to display lights.</p> <p>1.5 All traffic safety and management measures necessitated by the Operations shall be fully operational before the Company commences any Operations which affect the road network.</p> <p>1.6 Any area of the road network which had previously been closed because of the Operations shall not be opened to traffic until it had been swept and cleared of all personnel items of constructional plant material and debris and until any appropriate traffic safety and management measures have been completed and the road is in a suitable condition for public use.</p> <p>1.7 When Operations shall be carried out on or adjacent to a road open to vehicles the Company shall ensure vehicles and mobile Constructional Plant under its control operating on or adjacent to such road in the execution of the Operations shall be painted in a conspicuous colour.</p> <p>1.8 All vehicles used in mobile lane closures as defined in Section 6 "Type C Works" in Chapter 8 of the Traffic Signs Manual shall be non-reflectorised yellow (Colour No. 355 to BS 381C:1996 Specification for Colours for Identification, Coding and Special Purpose).</p> <p>1.9 All other vehicles under the Company's control shall be generally light in colour preferably but not necessarily non-reflectorised yellow and/or provide over the full width and height of the vehicle which is exposed to approaching vehicles conspicuous marking and signs to clearly define that the vehicle is a roadworks vehicle.</p> <p>1.10 Vehicles shall have a sign board reading 'Motorway Maintenance' or 'Road Maintenance' (to Diagram 7404 of Schedule 12 Part V of The Traffic Signs Regulations and General Directions) fixed at the rear. The lettering shall be the largest 'x height' that can be accommodated</p>

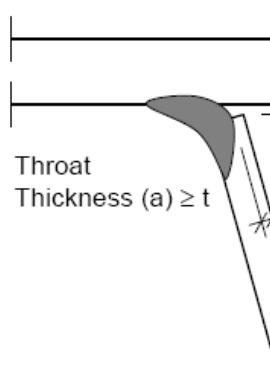
Appendix 0/1: Additional, Substitute and Cancelled Clauses, Tables and Figures Specific to This Agreement

Clause Number	Title and Written Text
	<p>out of the following heights 37.5 millimetre, 50 millimetre, 62.5 millimetre or 100 millimetre. The lettering shall be black capital letters from the alphabet described in The Traffic Signs Regulations and General Directions: Schedule 13: Part II on a yellow non-reflectorised background in accordance with BS 381C:1996 Specification for Colours for Identification, Coding and Special Purpose, colour number.355. In addition the Company's all purpose vehicles and Constructional Plant shall each be provided with either roof mounted light bars or at least two amber flashing beacons and the Company's light vans and cars shall each be provided with a roof mounted amber flashing distinctive lamp.</p> <p>1.11 The lamps shall be switched on:</p> <ul style="list-style-type: none"> <li>i) when the vehicle or Constructional Plant is manoeuvring into or out of the O&amp;M Works Site or operating at low speed on a carriageway or hardshoulder open to vehicles; and</li> <li>ii) when the vehicle or Constructional Plant is standing on a carriageway or hardshoulder open to vehicles.</li> </ul> <p>1.12 Temporary lighting shall be provided in accordance with Clause 1405 where it shall be required in the execution of the Operations.</p> <p>1.13 Unless otherwise stated in Appendix 1/17 the Company shall provide and suitably sign points of entry and exit from the Operations for vehicles and Constructional Plant engaged on the Operations. The Company shall ensure that when any vehicle or item of Constructional Plant shall be reversing within the O&amp;M Works Site on or adjacent to a road open to vehicles it does so only under the supervision of a person designated for the purpose of regulating traffic within the O&amp;M Works Site who shall be readily distinguishable from the remainder of the work force.</p> <p>1.14 Where Operations are carried out on or adjacent to a road open to vehicles the Company shall ensure that the work force and supervisory staff at all times wear jackets complying with Class A in BS 6629:1985 Specification for Optical Performance of High-visibility Garments and Accessories for Use on the Highway, incorporating the recommendations of Appendix G of BS 6629:1985 Specification for Optical Performance of High-visibility Garments and Accessories for Use on the Highway, except that where protected by a safety zone they may wear jackets complying with either Class A or Class B in BS 6629:1985 Specification for Optical Performance of High-visibility Garments and Accessories for Use on the Highway.</p> <p>1.15 All vehicles and Constructional Plant operating within the O&amp;M Works Site between sunset and sunrise and during periods of poor visibility and fog shall have mandatory lights illuminated and shall travel in the same direction of flow as the adjacent traffic. Vehicles travelling within the O&amp;M Works Site against the adjacent traffic flow shall not have headlights on or be similarly illuminated and shall keep as far away as possible from the lanes open to vehicles.</p>

Appendix 0/1: Additional, Substitute and Cancelled Clauses, Tables and Figures Specific to This Agreement

Clause Number	Title and Written Text	
	1.16	The Company shall be restricted to entering and leaving the site of the Operations and erecting and removing traffic management measures during the time periods quoted in Appendix 1/17.
	1.17	If an accident or breakdown occurs on a carriageway or hardshoulder open to vehicles within or in the vicinity of the Operations, the Company and operators of recovery vehicles provided in accordance with Clause 120 shall act as requested by the Police.
	1.18	The Company shall produce for each and every site of the Operations a safety plan which amongst other safety issues shall identify the traffic management measures to be utilised and the surveillance and maintenance standards.
	1.19	Traffic management measures shall be monitored and modified by the Company to ensure traffic delays are minimised. When traffic signals are in use, queue lengths shall be monitored to ensure that the phase settings result in equal queue lengths and are adjusted appropriately to accommodate the varying flows throughout the whole day.
	1.20	The Company shall make good any damage or disturbance to temporary signs or other traffic management measures which shall be reported to it within 30 days.
202SR	1	<b>Existing Trees, Bushes and Hedges</b>
	1.1	Existing trees, bushes, hedges and shrubs shall be retained and protected wherever possible.
	1.2	When removal shall be unavoidable they shall be cut down in accordance with the requirements of Specification Series 3000.
1801SR	1	<b>General</b>
	1.1	All steelwork shall be in accordance with BS EN 1090-2:2008 and the Steel Bridge Group Model Project Specification (SCI Publication P382:2009), all as amended by Clauses 1802SR and 1803SR.
1802SR	1	<b>Amendments to BS EN 1090-2:2008</b>
	1.1	Delete section 5.6.10. Hot rivets are not permitted.
	1.2	Delete sections 10.1 and 10.2 and Annex F. Surface treatment to be in accordance with SHW Series 1900.
1803SR	1	<b>Amendments to Steel Bridge Group Model Project Specification</b>
	1.1	Insert in Section 4.101 "BS EN 1090-2 Execution of steel Structures and aluminium Structures Company to add further standards to Appendix 18/1"
	1.2	Replace Clause 4.201 with "A quality plan for the execution of the works, in accordance with

Appendix 0/1: Additional, Substitute and Cancelled Clauses, Tables and Figures Specific to This Agreement

Clause Number	Title and Written Text
	<p>NHSS 20, shall be provided and maintained.”</p> <p>1.3 Delete Clause 6.602. Hot rivets are not permitted.</p> <p>1.4 Insert in section 7.402</p> <p>“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.”</p> <p>1.5 Replace Clause 7.505 with</p> <p>“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.”</p> <p>1.6 Replace Clause 8.203 with</p> <p>“The Structure shall not be designed to utilise the shear resistance of the unthreaded shank of bolts.”</p> <p>1.7 Delete Clause 8.701 and 8.702. Hot rivets are not permitted on this project.</p> <p>1.8 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.</p> <p>1.9 Replace 11.302 with,</p> <p>“In addition to the requirements in D.2, the following functional tolerances apply:</p> <p>i) Trough to deck plate weld:</p>  <p>The overall depth of a box section shall be within +/-5 millimetres of that shown on the drawings and within +/-3 millimetres of that of the adjacent section to which it will be joined.</p> <p>The overall width of a longitudinal girder box section shall be within +/-10 millimetres of that shown on the drawings and within +/-5 millimetres of that of the adjacent section to which it</p>

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Clause Number	Title and Written Text
	<p>will be joined.</p> <p>1.10 Replace Clause 12.701 with, “Trial assembly</p> <p>i) Prior to the approval of fabricated steelwork sections trial assembly shall verify correct geometry once erected. Prior to commencement of the trial assembly the Company shall submit a plan describing the methods and procedures for measuring, recording, and controlling the geometry of the bridge deck. The procedure shall include methods for combining the survey results of each individual trial assembly to calculate and check the cumulative geometry of the complete bridge deck as trial assembly proceeds. Procedures for trial assembly shall be included in the Test plan for this part of the O&amp;M Works.</p> <p>Trial assembly of bridge deck erection sections</p> <p>ii) Each complete bridge deck erection section shall be trial assembled with its adjacent completed erection sections. The trial assembly may be a running trial assembly, in which at least two adjacent erection sections are aligned and temporarily held together, new erection sections being successively built on to one end of the assembly and complete welded-up erection sections removed from the other end. The assembly of a new erection section can be started before two adjacent completed erection sections are temporary held together.</p> <p>iii) Each erection section shall be assembled by tack welding the components together while temporarily held to the adjacent erection section. When tack welding two components within one erection section the temperature difference between the two components shall not exceed two degrees Celsius. The components shall be adjusted until, with the erection sections in correct alignment, a correct fit-up is obtained at the longitudinal butt welds within the section and at the peripheral erection weld with the adjacent erection section. Accurate alignment of the stiffeners around the erection welds shall also be obtained.</p> <p>iv) Trial assembly shall only take place during temperature conditions where the temperature difference between the deck and bottom panels is less than +/- 2 degrees Celsius. Correlation to the reference temperature shall be made if the temperature during trial assembly deviates from the reference temperature. Precautions shall be taken to overcome the effects of differential temperature during assembly, so that the required tolerances are satisfied.</p> <p>v) During trial assembly the support conditions of the erection sections shall resemble the support conditions for the erection</p>

Appendix 0/1: Additional, Substitute and Cancelled Clauses, Tables and Figures Specific to This Agreement

Clause Number	Title and Written Text
	<p>sections during erection. Thereby the deformed shape of the erection sections will resemble each other in the two situations. Hence a match between adjacent erection sections is established during trial assembly that later can be re-established on the bridge site. The centre of gravity shall be determined for all deck erection sections and the support reactions shall be measured for all deck erection sections. The Company shall survey and record the geometry of each trial assembly and thereby determine deviations in geometry on single sections and accumulated deviations. The survey shall be carried out using the same survey points. The survey results of each individual trial assembly shall be combined to calculate and check the cumulative geometry of the completed bridge deck assembly relative to the design vertical alignment as trial assembly proceeds.</p> <p>v) The level and profile of deck plates, which form the roadway deck, shall be checked and adjusted if necessary to bring them within tolerances.</p> <p>vi) Before completed erection sections are separated, all necessary temporary connections shall be carefully positioned and welded to each section in order to ensure accurate alignment after erection. These connections shall be designed to withstand all forces which are liable to occur during erection.</p> <p>1.11 Delete Clause 12.706.</p> <p>1.12 Delete Annex F. Corrosion protection to be in accordance with SHW Series 1900.</p> <p>1.13 The Company shall complete the following Clauses by providing details in Appendix 18/1:</p> <p>i) 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</p>
2101SR	<p><b>1 Bridge Bearings – General</b></p> <p>1.1 Unless otherwise described in Appendix 21/1, bearings shall be supplied and installed in compliance with BS EN 1337 "Structural bearings" consisting of the following parts:</p> <p>(a) Part 1 - General design rules</p> <p>(b) Part 2 - Sliding elements</p> <p>(c) Part 3 - Elastomeric bearings</p> <p>(d) Part 4 - Roller bearings</p> <p>(e) Part 5 - Pot bearings</p> <p>(f) Part 6 - Rocker bearings</p>

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<b>Clause Number</b>	<b>Title and Written Text</b>
	<p>(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</p> <p>excluding subsections relating to corrosion protection which is covered under Series 1900.</p>

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**PART B: VOLUME 2 NOTES FOR GUIDANCE ON THE SPECIFICATION FOR HIGHWAY WORKS**

**List of SUBSTITUTE Clauses, Tables and Figures**

Clause Number	Title	Written on Page Number following
None		

**List of CANCELLED Clauses, Tables and Figures**

Clause Number	Title
<b>Series NG 1800</b>	Structural Steelwork
<b>Series NG 2100</b>	Bridge Bearings
<b>Series NG 2200</b>	Parapets

**Appendix 0/2: Minor Alterations to Existing Clauses, Tables and Figures Specific to This Agreement**

**Minor Alterations to Existing Clauses**

Clause Number	Title and Written Text	Page Number
104	Standards, Quality Assurance, Agrément Certificates and Other Approvals	
121	Tidal, Flowing and Standing Water	
201	Clearing	
306	Fencing and Environmental Barriers	
920	Bond Coats, Tack Coats and other Bituminous Sprays	
942	Thin Wearing Course Systems	
1404	Change of Lighting Arrangements	
1416	Cut Outs, Fuse Holders, Fuses and Miniature Circuit Breakers	
1601	General requirements for Piling and Embedded Retaining Walls	
1702.2	Concrete – Constituent Materials	
1711	Concrete – Grouting and Duct Systems for Post-tensioned Tendons	
1714	Reinforcement – Fixing	
<b>Table 19/1</b>	BD 35 Quality Assurance Scheme for Paints and Similar Protective Coatings Annex A Manual of Paints for Structural Steelwork Current Paint Item Numbers	
<b>Table 19/2A</b>	Requirements for Bridges, Parapets and Other Highway Structures Except Bearings, CCTV Masts, Cantilever Masts and Steel Lighting Columns and Bracket Arms Surface Preparation and Protective Systems.	

**Appendix 0/2: Minor Alterations to Existing Clauses, Tables and Figures Specific to This Agreement**

**Minor Alterations to Existing Clauses**

Clause Number	Title and Written Text	Page Number
<b>Table 19/2B</b>	Requirements for Bridges, Parapets and Other Highway Structures Except Bearings, CCTV Masts, Cantilever Masts and Steel Lighting Columns and Bracket Arms Protective Systems	
<b>Table 19/3B</b>	Requirements for Steel in Bridge Bearings (and Metal Coated Fasteners) Protective System Type V	
<b>2001</b>	General	
<b>2006</b>	Workmanship for Waterproofing Below Ground Concrete Surfaces	
<b>2007</b>	Integrity Testing of Concrete Bridge Deck Waterproofing	
<b>2606</b>	Cored Thermoplastic Node Markers	
<b>3009</b>	Establishment Maintenance for Planting	

Clause Number	Title and Written Text
<b>104</b>	<p><b>1 Standards, Quality Assurance, Agrément Certificates and Other Approvals</b></p> <p>1.1 Sub-Clause 2, line 3 Delete “BS EN ISO 9002” and insert “BS EN ISO 9001 or BS EN ISO 9002 where appropriate and BS EN ISO 14001:1996 (Environmental Management Systems)”.</p> <p>1.2 Sub-Clause 7, line 3 Delete “BS EN ISO 9002” and insert “BS EN ISO 9001 or BS EN ISO 9002 where appropriate and BS EN ISO 14001:1996 (Environmental Management Systems)”.</p>
<b>121</b>	<p><b>1 Tidal, Flowing and Standing Water</b></p> <p>1.1 Add at end of Clause: Notwithstanding any other provisions of this Agreement, the Company shall take adequate precautions to prevent the damage and pollution of streams, waterways and water courses and shall indemnify the Scottish Minister against all claims arising from any such pollution caused by virtue</p>

**Appendix 0/2: Minor Alterations to Existing Clauses, Tables and Figures Specific to This Agreement**

**Minor Alterations to Existing Clauses**

Clause Number	Title and Written Text
	of the operation during the currency of this Agreement. The Company shall make good any unnecessary damage to streams, waterways and watercourse at his own expense.
201	<p><b>1 Clearing</b></p> <p>1.1 Delete Sub-Clause 3 and insert new Sub-Clause 3: 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.</p>
306	<p><b>1 Fencing and Environmental Barriers</b></p> <p>1.1 Sub-Clause 2, second line: Delete "four" and replace it with "five".</p>
920	<p><b>1 Bond Coats, Tack Coats and other Bituminous Sprays</b></p> <p>1.1 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 Scottish Ministers for approval."</p>
942	<p><b>1 Thin Wearing Course Systems</b></p> <p>1.1 Sub-Clause 14: Delete "for a period of two years" and insert "for a period of five years".</p>
1404	<p><b>1 Change of Lighting Arrangements</b></p> <p>1.1 Insert "written" between "prior" and "approval".</p>
1416	<p><b>1 Cut Outs, Fuse Holders, Fuses and Miniature Circuit Breakers</b></p> <p>1.1 At end of the Clause and following the additions to the Clause in Appendix 0/5 add the following: (16) Design, execution and completion of the O&amp;M Works shall ensure that in normal use the unit shall function in a reliable manner and cause no</p>

**Appendix 0/2: Minor Alterations to Existing Clauses, Tables and Figures Specific to This Agreement**

**Minor Alterations to Existing Clauses**

Clause Number	Title and Written Text
	<p>danger to persons or surroundings. Construction shall be such that the unit shall resist mechanical damage when used under specified service conditions.</p> <p>The unit shall be impact resistant and shall be constructed such that it cannot readily be deformed allowing contact with live parts.</p> <p>The unit shall provide ease of access to allow electrical termination works to be carried out and also provide a positive location arrangement between separable parts.</p> <p>Any separable parts which allow access to live terminations shall be held together by slot headed bolts or screws, with lock washer.</p> <p>A removable insulating shroud shall be installed with the unit, covering all line conductors.</p> <p>(17) Creepage distances and Clearances: Shall be not less than the values given in Table 1, Clause 9, Section 2 of BS 5733.</p>
1601	<p><b>1 General Requirements for Piling and Embedded Retaining Walls</b></p> <p>1.1 Add to end of item 27.</p> <p>In addition to the records required by Table 16/1 in Series 1600 of the MCHW an ultrasonic survey (1 reading per 5 centimetres) shall be carried out of rock socket excavations to record the socket diameter and verticality in 2 orthogonal directions.</p>
1702.2	<p><b>1 Concrete – Constituent Materials</b></p> <p>1.1 Add at the end of Clause</p> <p>The minimum testing frequency for drying shrinkage testing, as required by 4.3 of BS8500-2: 2006 shall be in accordance with table 3 of BS812: Part 120: 1989.</p>
1711	<p><b>1 Concrete – Grouting and Duct Systems for Post-tensioned Tendons</b></p> <p>1.1 Add at end of Section 9</p> <p>The tests indicated in BS EN 446:2007 and TR447:2007 for Inspection Class 3 may be carried in place of those described in TR 47. However a sedimentation test shall be provided for initial type testing of grout.</p> <p>1.2 Add at end of Section 10</p> <p>11. Post tensioning systems</p> <p>In addition to the requirements above, the recommendations according to ETAG 013 must be adopted.</p>

**Appendix 0/2: Minor Alterations to Existing Clauses, Tables and Figures Specific to This Agreement**

**Minor Alterations to Existing Clauses**

Clause Number	Title and Written Text				
1714	<p><b>1 Reinforcement – Fixing</b></p> <p>1.1 At the end of sub-Clause 1 add the following: The cover survey shall be carried out by the use of an electronic covermeter with a facility for downloading to a computer. The results shall be included in the bridge maintenance manual.</p> <p>1.2 Delete the first paragraph of Sub-Clause 1714.1 and replace with the following: Reinforcement shall be secured against displacement. Unless specified otherwise, the actual concrete achieved cover shall be not less than the required minimum cover derived from the exposure class Tables in BS 8500-1, and including any allowance for longer durability required under Clause A5 of BS 8500-1. The maximum achieved cover shall not be more than the nominal cover as defined in BS 8500-1, including the stated fixing tolerance <math>\Delta c</math> plus an additional tolerance away from the concrete surface <math>\Delta(\text{plus})</math> the value of which shall be as described below:</p> <p style="text-align: center;"> <math>\Delta c_{\text{dev}}</math> = Allow  <math>c_{\text{nom}}</math> = <math>c_{\text{min}}</math>  <math>\Delta(\text{plus})</math> = Perm  <math>h</math> = Heig </p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="background-color: #005a99; color: white; text-align: center;"><b>Cross-section</b></td> </tr> <tr> <td><math>h \leq 150</math></td> </tr> <tr> <td><math>150 &lt; h &lt; 2500</math></td> </tr> <tr> <td><math>h \geq 2500</math></td> </tr> </table>	<b>Cross-section</b>	$h \leq 150$	$150 < h < 2500$	$h \geq 2500$
<b>Cross-section</b>					
$h \leq 150$					
$150 < h < 2500$					
$h \geq 2500$					

**Appendix 0/2: Minor Alterations to Existing Clauses, Tables and Figures Specific to This Agreement**

**Minor Alterations to Existing Clauses**

Clause Number	Title and Written Text																																																	
Table 19/1	<p><b>1 BD 35 Quality Assurance Scheme for Paints and Similar Protective Coatings Annex A Manual of Paints for Structural Steelwork Current Paint Item Numbers</b></p> <p>1.1 Add the following to Table 19/1</p> <table border="1"> <thead> <tr> <th>Item</th><th>Description</th><th>Coat Type</th><th>Build</th><th>Applied By</th></tr> </thead> <tbody> <tr> <td>09</td><td>Zinc-rich epoxy</td><td>Blast Primer</td><td>NB</td><td>B or AS (B to small areas only)</td></tr> </tbody> </table>					Item	Description	Coat Type	Build	Applied By	09	Zinc-rich epoxy	Blast Primer	NB	B or AS (B to small areas only)																																			
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09	Zinc-rich epoxy	Blast Primer	NB	B or AS (B to small areas only)																																														
Table 19/2A	<p><b>1 Requirements for Bridges, Parapets and Other Highway Structures Except Bearings, CCTV Masts, Cantilever Masts and Steel Lighting Columns and Bracket Arms Surface Preparation and Protective Systems</b></p> <p>1.1 Remove references to "I for Ready Access" and replace "II for difficult access" with "IIa or IIb for difficult access".</p> <p>1.2 Replace aluminium metal spray protective system required for Area C with Item 109 or 110.</p>																																																	
Table 19/2B	<p><b>1 Requirements for Bridges, Parapets and Other Highway Structures Except Bearings, CCTV Masts, Cantilever Masts and Steel Lighting Columns and Bracket Arms Protective Systems</b></p> <p>1.1 Replace the standard Type II system with:</p> <table border="1"> <thead> <tr> <th>Type</th><th></th><th>Metal Coating</th><th>1st Coat</th><th>2nd Coat</th><th>3rd Coat</th><th>4th Coat</th><th>5th Coat</th><th>Minimum total dry film thickness of the paint system (microns)</th></tr> </thead> <tbody> <tr> <td>IIa</td><td>Item No</td><td></td><td>109</td><td>112 or 162</td><td>112 or 162</td><td>169</td><td>169 or 164*</td><td>400 or 390</td></tr> <tr> <td></td><td>Minimum dry film thickness (µm)</td><td></td><td>50</td><td>125</td><td>125</td><td>50</td><td>50 or 40</td><td></td></tr> <tr> <td>IIb</td><td>Item No</td><td></td><td>110</td><td>123</td><td>169 or 164</td><td>169 or 164*</td><td></td><td>525 or 515</td></tr> <tr> <td></td><td>Minimum dry film thickness (µm)</td><td></td><td></td><td></td><td>50 or 40</td><td>50 or 40</td><td></td><td></td></tr> </tbody> </table>					Type		Metal Coating	1st Coat	2nd Coat	3rd Coat	4th Coat	5th Coat	Minimum total dry film thickness of the paint system (microns)	IIa	Item No		109	112 or 162	112 or 162	169	169 or 164*	400 or 390		Minimum dry film thickness (µm)		50	125	125	50	50 or 40		IIb	Item No		110	123	169 or 164	169 or 164*		525 or 515		Minimum dry film thickness (µm)				50 or 40	50 or 40		
Type		Metal Coating	1st Coat	2nd Coat	3rd Coat	4th Coat	5th Coat	Minimum total dry film thickness of the paint system (microns)																																										
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	Minimum dry film thickness (µm)		50	125	125	50	50 or 40																																											
IIb	Item No		110	123	169 or 164	169 or 164*		525 or 515																																										
	Minimum dry film thickness (µm)				50 or 40	50 or 40																																												
	<p>* On all externally exposed surfaces on the steel bridge deck the final finish coat of 50 (item number 169) or 40 (item number 164) microns shall be applied on site to ensure colour continuity. The final finish coat shall be applied using a minimum number of paint manufacturing batches applied in a controlled pattern.</p>																																																	

**Appendix 0/2: Minor Alterations to Existing Clauses, Tables and Figures Specific to This Agreement**

**Minor Alterations to Existing Clauses**

Clause Number	Title and Written Text																																															
	** Applicable only for Area E and painted areas damaged during erection.																																															
<b>Table 19/3B</b>	<b>1 Requirements for Steel in Bridge Bearings (and Metal Coated Fasteners) Protective System Type V</b> 1.1 Replace Areas A, B, C and D with: <table border="1"> <thead> <tr> <th>Applied over</th><th></th><th>Metal Coating</th><th>1st Coat</th><th>2nd Coat</th><th>3rd Coat</th><th>4th Coat</th><th>Minimum total dry film thickness of the paint system (microns)</th></tr> </thead> <tbody> <tr> <td>Area A and D</td><td>Item No</td><td></td><td>109</td><td>112</td><td>112</td><td>168</td><td>350</td></tr> <tr> <td></td><td>Minimum dry film thickness (µm)</td><td></td><td>50</td><td>125</td><td>125</td><td>50</td><td></td></tr> <tr> <td>Area C</td><td>Item No</td><td></td><td>109</td><td>112</td><td>112</td><td>168</td><td>350</td></tr> <tr> <td></td><td>Minimum dry film thickness (µm)</td><td></td><td>50</td><td>125</td><td>125</td><td>50</td><td></td></tr> </tbody> </table>								Applied over		Metal Coating	1st Coat	2nd Coat	3rd Coat	4th Coat	Minimum total dry film thickness of the paint system (microns)	Area A and D	Item No		109	112	112	168	350		Minimum dry film thickness (µm)		50	125	125	50		Area C	Item No		109	112	112	168	350		Minimum dry film thickness (µm)		50	125	125	50	
Applied over		Metal Coating	1st Coat	2nd Coat	3rd Coat	4th Coat	Minimum total dry film thickness of the paint system (microns)																																									
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	Minimum dry film thickness (µm)		50	125	125	50																																										
<b>2001</b>	<b>1 General</b> 1.1 At end of Sub-Clause 1 add the following: Surfaces to receive bridge deck waterproofing shall be prepared as recommended in writing by the particular manufacturer and, in addition, shall be given a light grit blast to produce an open texture surface free from laitance and other deleterious materials.																																															
<b>2006</b>	<b>1 Workmanship for Waterproofing Below Ground Concrete Surfaces</b> 1.1 At end of Sub-Clause 3 add the following: The waterproofing shall be applied strictly in accordance with the manufacturer's written instructions at the recommended rate of application. 1.2 At end of Sub-Clause 4 add the following: Details of the proprietary system shall be submitted for the approval of the Scottish Ministers prior to the inclusion in the O&M Works.																																															
<b>2007</b>	<b>1 Integrity Testing of Concrete Bridge Deck Waterproofing</b> 1.1 Testing of Waterproofing Membrane At end of Sub-Clause 1 add the following: The Company shall provide with all batches of material delivered to the Site a Certificate of Compliance with the Specification and Annex A. The Company shall provide 2 No free film samples, sprayed on to open																																															

**Appendix 0/2: Minor Alterations to Existing Clauses, Tables and Figures Specific to This Agreement**

**Minor Alterations to Existing Clauses**

Clause Number	Title and Written Text
	<p>moulds (at least 200 millimetres x 200 millimetres in area and minimum thickness two millimetres), for tensile strength, elongation at break to BS 903, Part A2 and tear strength to BS 903, Part 3A, Method C. The Company shall supply the Scottish Ministers with copies of the test results with the samples.</p> <p>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.</p> <p>The Company shall continuously monitor the coverage rate of the material applied to the deck and shall provide the Scottish Ministers with sheets on a daily basis showing the start / finish weights and area covered for each period of spray operation.</p> <p>The Company shall continuously monitor the wet film thickness using a gauge pin or a standard comb type thickness gauge. The Company shall provide the Scottish Ministers with sheets on a daily basis indicating the wet film thickness measured and location.</p> <p>The Company shall measure the adhesion of the fully cured membrane to the deck using Elcometer Adhesion Tester Model 106 or similar. Three tests shall be required per 500 square metres of sprayed membrane. The Company shall provide the Scottish Ministers with the test values and location of test before these areas are covered. The Company shall reinstate the test areas including primer if necessary. Test values below 0.7 newton / square millimetre shall require spraying operations to be suspended while further investigation is undertaken. The Company shall at his own expense remove and respray areas that do not meet this figure.</p> <p>The finished waterproof membrane surface shall be 'Holiday Tested' or tested by an equivalent method approved in writing by the Overseeing Organisation and any imperfections detected shall be rectified by the Company at his own expense. The Company shall make allowance in his programme of Works for such testing.</p> <p><b>High Voltage Pinhole / Holiday Detection for Bridge Deck Membranes Equipment</b></p> <p>Pinhole detection shall be carried out using suitable equipment and the results made available to the Scottish Ministers. The equipment shall have the following facilities:</p> <ol style="list-style-type: none"><li>variable DC test voltage (1 - 20 kilovolts DC);</li><li>audible and visual alarm signals;</li><li>sensitivity adjustment;</li><li>phosphor bronze or silicon rubber electrode;</li><li>earth lead connection with clip; and</li></ol>

**Appendix 0/2: Minor Alterations to Existing Clauses, Tables and Figures Specific to This Agreement**

**Minor Alterations to Existing Clauses**

Clause Number	Title and Written Text						
	<p>f. test voltage.</p> <p>The output voltage of the pinhole detector shall be adjusted in accordance with the following table.</p> <table><thead><tr><th>COATING THICKNESS</th><th>TEST VOLTAGE</th></tr></thead><tbody><tr><td>2 millimetres to 2.5 millimetres</td><td>12.5 kilovolts</td></tr><tr><td>2.5 millimetres to 3 millimetres</td><td>13.5 kilovolts</td></tr></tbody></table> <p>The coating thickness is the maximum expected not the average.</p> <p><b>Procedure</b></p> <ul style="list-style-type: none"><li>(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.</li><li>(b) Connect the leads from the pinhole detector in accordance with the manufacturer's written instructions.</li><li>(c) Fix the earth lead from the pinhole detector to the substrate and ensure that a good electrical contact is made.</li><li>(d) Adjust the pinhole detector to the required test voltage in accordance with Sub-Clause (a) above.</li><li>(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.</li><li>(f) 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.</li><li>(g) 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.</li><li>(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.</li><li>(i) Continue testing and marking defects until all the coating has been tested, changing the electrode size as necessary.</li></ul>	COATING THICKNESS	TEST VOLTAGE	2 millimetres to 2.5 millimetres	12.5 kilovolts	2.5 millimetres to 3 millimetres	13.5 kilovolts
COATING THICKNESS	TEST VOLTAGE						
2 millimetres to 2.5 millimetres	12.5 kilovolts						
2.5 millimetres to 3 millimetres	13.5 kilovolts						

**Appendix 0/2: Minor Alterations to Existing Clauses, Tables and Figures Specific to This Agreement**

**Minor Alterations to Existing Clauses**

Clause Number	Title and Written Text
	All repaired areas shall be re-tested.
2606	<p><b>1 Cored Thermoplastic Node Markers</b></p> <p>1.1 Sub-Clause 2(i), Line 1: Delete “10 millimetres <math>\pm 5</math> millimetres” and replace with “20 millimetres”</p> <p>1.2 At end of Clause add the following: Notwithstanding any other requirements of this Agreement, record drawings of the chart node locations at a scale of 1:500 shall be provided to the Scottish Ministers within seven days of the completion date stated within the Taking-Over Certificate for Section B issued by the Scottish Ministers pursuant to Sub Clause 10.1 of the Conditions. The record drawings shall locate the chart nodes as a series of dimensions from carriageway features. The local and national grid co-ordinates of all chart nodes shall be detailed on the record drawings.</p>
3009	<p><b>1 Establishment Maintenance for Planting</b></p> <p>1.1 Delete Sub-Clause 9 and insert: 9. Plant circles shall be defined as the area within 250 millimetre radius of an individual tree or shrub, within which weed control operations are carried out.</p>

**Appendix 0/2: Minor Alterations to Existing Clauses, Tables and Figures Specific to This Agreement**

**Minor Alterations to Existing Clauses**

**PART B: VOLUME 2 NOTES FOR GUIDANCE ON THE SPECIFICATION FOR HIGHWAY WORKS**

**LIST OF MINOR ALTERATIONS TO EXISTING CLAUSES**

Clause Number	Alteration to be made	Written on Page Number
None		

**MINOR ALTERATIONS TO EXISTING CLAUSES**

Clause Number	Alteration to be made
None	

**Appendix 0/3: List of Numbered Appendices Referred to in the Specification and Included in This Agreement**

**1 Appendix 0/3**

1.1 Appendix 0/3 is comprised of two lists, A and B, of numbered Appendices as follows:

1.2 List A is a complete list of the numbered Appendices referred to in the Specification with those not adopted marked "Not Used".

1.3 The responsibility for compiling/completing the numbered Appendices is indicated by the following symbols:

E	The Scottish Ministers compiles
E/C	The Scottish Ministers partially compiles and the Company completes and returns to the Scottish Ministers.
C	The Company compiles, completes and returns to the Scottish Ministers.
I	For Company's information only
(P)	This indicates the Appendix is a national proforma and the format shall not be altered.
T	The Participant compiles, completes and returns with Tender.

1.4 The Company shall compile/complete the numbered Appendices in accordance with the Notes for Guidance on the Specification for Highway Works (Volume 2 of the MCHW), and provide as a minimum the information described in the sample appendices.

**List A**

Compiled/ Completed by	Appendix Number	Title
<b>Introduction</b>		
E	0/1	Additional, Substitute and Cancelled Clauses, Tables and Figures specific to this Agreement
E	0/2	Minor Alterations to Existing Clauses, Tables and Figures specific to this Agreement
E	0/3	List of Numbered Appendices Referred to in the Specification and Included in this Agreement
E	0/4	List of Drawings for the O&M Works
E	0/5	Special National Alterations of the Scottish Ministers
<b>Preliminaries</b>		
Not Used	1/1	Temporary Accommodation and Equipment for the Scottish Ministers
Not Used	1/2	Vehicles for the Scottish Ministers
Not Used	1/3	Communication System for the Scottish Ministers
Not Used	1/4	Working and Fabrication Drawings
E/C	1/5	Testing to be Carried out by the Company
<b>Preliminaries continued</b>		

**Appendix 0/3: List of Numbered Appendices Referred to in the Specification and Included in This Agreement**

Compiled/ Completed by	Appendix Number	Title
Not Used	1/6	Supply and Delivery of Samples to the Scottish Ministers
E	1/7	O&M Site Extent and Limitations on Use
Not Used	1/8	Operatives for the Scottish Ministers
E	1/9	Control of Noise and Vibration
Not Used	1/10	Structures to be Designed by the Company
Not Used	1/11	Structural Elements and Other Features to be Designed by the Company
C	1/12	Setting Out and Existing Ground Levels
C	1/13	Programme of Works
Not Used	1/14	Monthly Statements
C	1/15	Accommodation Works
C	1/16	Privately and Publicly Owned Services and Supplies
E/C	1/17	Traffic Safety and Management
E	1/18	Temporary Diversion for Traffic
E	1/19	Routeing of Vehicles
E	1/20	Recovery Vehicles for Breakdowns
E/C	1/21	Information Boards
C	1/22	Progress Photographs
E/C	1/23	Substances Hazardous to Health
E/C	1/24	Quality Management System
C	1/25	Temporary Closed Circuit Television (CCTV) System for the Monitoring of Traffic
C	1/26	Temporary Automatic Speed Camera System for the Enforcement of Mandatory Speed Limits at Road Works (TASCAR)
C	1/27	Temporary Automatic Speed Camera System for the Enforcement of Mandatory Speed Limits at Road Works (TASCAR) – Particular Requirements
<b>Site Clearance</b>		
C	2/1	List of Buildings, etc. to be Demolished
C	2/2	Filling of Trenches and Pipes
C	2/3	Retention of Material Arising from Site Clearance

**Appendix 0/3: List of Numbered Appendices Referred to in the Specification and Included in This Agreement**

<b>Site Clearances continued</b>		
C	2/4	Explosives and Blasting
C	2/5	Hazardous Materials
<b>Fencing and Environmental Barriers</b>		
C	3/1	Fencing, Gates and Stiles
<b>Road Restraint Systems (Vehicle and Pedestrian)</b>		
C	4/1	Road Restraint Systems (Vehicle and Pedestrian)
E/C	4/2	Information Required to Demonstrate Compliance of Road Restraint Systems to BS EN 1317-1, BS EN 1317-3 and DD ENV 1317-4: 2002
<b>Drainage and Service Ducts</b>		
C	5/1	Drainage Requirements
C	5/2	Service Duct Requirements
C	5/3	Surface Water Channels and Drainage Channel Blocks
C	5/4	Fin Drains and Narrow Filter Drains
C	5/5	Combined Drainage and Kerb Systems
C	5/6	Linear Drainage Channel Systems
C	5/7	Thermoplastics Structural Wall Pipes and Fittings
<b>Earthworks</b>		
C	6/1	Requirements for Acceptability and Testing etc. of Earthworks Materials
C	6/2	Requirements for Dealing with Class U1B and Class U2 Unacceptable Material
C	6/3	Requirements for Excavation, Deposition, Compaction (Other than Dynamic Compaction)
C	6/4	Requirements for Class 3 Material
C	6/5	Geotextiles Used to Separate Earthworks Materials
C	6/6	Fill to Structures and Fill Above Structural Foundations
C	6/7	Sub-formation and Capping and Preparation and Surface Treatment of Formation
C	6/8	Topsoiling
C	6/9	Earthworks Environmental Bunds, Landscape Areas, Strengthened Embankments

**Appendix 0/3: List of Numbered Appendices Referred to in the Specification and Included in This Agreement**

<b>Earthworks continued</b>		
E/C	6/10	Ground Anchorages, Crib Walling and Gabions
E/C	6/11	Swallow Holes and Other Naturally Occurring Cavities and Disused Mine Workings
C	6/12	Instrumentation and Monitoring
C	6/13	Ground Improvement
C	6/14	Limiting Values for Pollution of Controlled Waters
C	6/15	Limiting Values for Harm to Human Health and the Environment
<b>Road Pavements - General</b>		
T/C	7/1	Permitted Pavement Options
C	7/2	Excavation, Trimming and Reinstatement of Existing Surfaces
C	7/3	Surface Dressing – Performance Specification
C	7/4	Bond Coats, Tack Coats and Other Bituminous Sprays
C	7/5	In Situ Recycling: The Remix and Repave Processes
C	7/6	Breaking Up or Perforation of Existing Pavement
C	7/7	Slurry Surfacing Incorporating Microsurfacing
Not Used	7/8	Not Used
C	7/9	Cold Milling (Planing) of Bituminous of Bound Flexible Pavement
C	7/10	Worksheet Pro Forma for Results of Testing for Constituent Materials in Recycled Coarse Aggregate and Recycled Concrete Aggregate
C	7/11	Overbanding and Inlaid Crack Sealing Systems
C	7/12	Arrester Beds
C	7/13	Saw-Cut and Seal Bituminous Overlays on Existing Jointed Concrete Pavements
C	7/14	Preparation of Jointed Concrete Pavements Prior to Overlaying and Saw-Cut and Seal of the Bituminous Overlay
C	7/15	Not Used
C	7/16	Cracking and Sealing of Existing Jointed Unreinforced Concrete Pavements and CBM Bases
C	7/17	Cracking Plant and Equipment Progress Record
C	7/18	Site Specific Details and Requirements for Cold Recycled Bitumen Bound Material

**Appendix 0/3: List of Numbered Appendices Referred to in the Specification and Included in This Agreement**

<b>Road Pavements General continued</b>		
C	7/19	Site Specific Details and Requirements for Recycled Cement Bound Material
C	7/20	Site Specific Details and Requirements for Inducing Cracks
C	7/21	Surface Dressing – Recipe Specification
C	7/22	Repair to Potholes
<b>Road Pavements – Concrete and Cement Bound Materials</b>		
C	10/1	Plant and Equipment for the Construction of Exposed Aggregate Concrete Surface
<b>Kerbs, Footways and Paved Areas</b>		
C	11/1	Kerbs, Footways and Paved Areas
C	11/2	Access Steps
<b>Traffic Signs</b>		
E/C	12/1	Traffic Signs: General
E/C	12/2	Traffic Signs: Marker Posts
E/C	12/3	Traffic Signs: Road Markings and Studs
C	12/4	Traffic Signs: Cones, Cylinders, FTDs and Other Traffic Delineators
E/C	12/5	Traffic Signs: Traffic Signals
C	12/6	Traffic Signs: Special Sign Requirements on Gantry
<b>Road Lighting Columns and Brackets</b>		
C	13/1	Information to be Provided When Specifying Lighting Columns and Brackets
C/P	13/2	(Specification for Highway Works) Typical Lighting Column and Bracket Data Sheets 1 and 2
C/P	13/3	Instructions for Completion of Column and Bracket Data Sheets
C	13/4	Information to be Provided When Specifying CCTV Masts
C	13/5	(Specification for Highway Works) Typical CCTV Mast Data Sheet
C/P	13/6	Instructions for Completion of CCTV Mast Sheets
C	13/7	Information to be Provided When Specifying Cantilever Masts
C/P	13/8	(Specification for Highway Works) Typical Cantilever Masts Data Sheets 1 and 2
C/P	13/9	Instructions for Completion of Cantilever Masts Data Sheets

**Appendix 0/3: List of Numbered Appendices Referred to in the Specification and Included in This Agreement**

<b>Electrical Work for Road Lighting and Traffic Signs</b>		
C	14/1	Site Records
C	14/2	Location of Lighting Units & Feeder Pillars
C	14/3	Temporary Lighting
C	14/4	Electrical Equipment for Road Lighting
C	14/5	Electrical Equipment for Traffic Signs
<b>Motorway Communications</b>		
C	15/1	Motorway Communications
C	15/2	Cable Duct Requirements
<b>Piling and Embedded Retaining Walls</b>		
C	16/1	General Requirements for Piling and Embedded Retaining Walls
C	16/2	Precast Reinforced and Pre-stressed Concrete Piles and Precast Reinforced Concrete Segmental Piles
C	16/3	Bored Cast in Place Piles
C	16/4	Bored Piles Constructed Using Continuous Flight Augers and Concrete or Grout Injection Through Hollow Auger Stems
C	16/5	Driven Cast-in-Place Piles
C	16/6	Steel Bearing Piles
C	16/7	Reduction of Friction on Piles
C	16/8	Non-Destructive Methods for Testing Piles
C	16/9	Static Load Testing of Piles
C	16/10	Diaphragm Walls
C	16/11	Hard/Hard Secant Pile Walls
C	16/12	Hard/Soft Secant Pile Walls
C	16/13	Contiguous Bored Pile Walls
C	16/14	King Post Walls
C	16/15	Steel Sheet Piles
C	16/16	Integrity Testing of Wall Elements
C	16/17	Instrumentation for Piles and Embedded Walls
C	16/18	Support Fluid

**Appendix 0/3: List of Numbered Appendices Referred to in the Specification and Included in This Agreement**

<b>Structural Concrete</b>		
C	17/1	Concrete - Classification of Mixes
C	17/2	Concrete - Impregnation Schedule
C	17/3	Concrete - Surface Finishes
C	17/4	Concrete - General
C	17/5	Buried Concrete
C	17/6	Grouting and Duct Systems for Post-Tensioned Tendons
<b>Structural Steelwork</b>		
C	18/1	Requirements for Structural Steelwork
<b>Protection of Steelwork Against Corrosion</b>		
C	19/1	(Specification for Highway Works) Form HA/P1 Paint System Sheet
C	19/2	(Specification for Highway Works) Requirements for Other Works
C	19/3	(Specification for Highway Works) Form HA/P2 Paint Data Sheet
C	19/4	(Specification for Highway Works) Form SEDD/P3 Paint Sample Despatch List, Sheets 1 and 2
C	19/5	General Requirements
<b>Waterproofing for Structures</b>		
C	20/1	Waterproofing for Concrete Structures
<b>Bridge Bearings</b>		
C	21/1	Bridge Bearing Schedule
<b>Bridge Expansion Joints and Sealing of Gaps</b>		
C	23/1	Bridge Deck Expansion Joint Schedule
C	23/2	Sealing of Gaps Schedule (Other than in Bridge Deck Expansion Joints)
<b>Brickwork, Blockwork and Stonework</b>		
C	24/1	Brickwork, Blockwork and Stonework

**Appendix 0/3: List of Numbered Appendices Referred to in the Specification and Included in This Agreement**

<b>Special Structures</b>		
C	25/1	Requirements for Corrugated Steel Buried Structures
C	25/2	Requirements for Reinforced Soil and Anchored Earth Structures
C	25/3	Requirements for Pocket-Type and Grouted-Cavity Reinforced Brickwork Retaining Wall Structures
C	25/4	Environmental Barriers
C	25/5	Requirements for Buried Rigid Pipes for Drainage Structures
<b>Miscellaneous</b>		
C	26/1	Ancillary Concrete
C	26/2	Bedding Mortar
C	26/3	Cored Thermoplastic Node Markers
<b>Landscape and Ecology</b>		
E/C	30/1	General
E	30/2	Weed Control
E	30/3	Control of Rabbits and Deer
E	30/4	Ground Preparation
E	30/5	Grass Seeding, Wildflower Seeding and Turfing
E	30/6	Planting Sheets 1 and 2
E/C	30/7	Grass, Bulbs and Wildflower Maintenance
E	30/8	Watering
E	30/9	Establishment Maintenance for Planting
E	30/10	Maintenance of Established Trees and Shrubs
E	30/11	Management of Waterbodies
E	30/12	Special Ecological Measures
<b>Maintenance Painting of Steelwork</b>		
C		(Specification for Highway Works) Form (HA/P1 (Maintenance) Paint System Sheet
C		Requirements for Other Work
C		(Specification for Highway Works) Form HA/P2 Paint Data Sheet
C		Form SEDD/P3 Paint Sample Despatch List
C		General Requirements

**Appendix 0/3: List of Numbered Appendices Referred to in the Specification and Included in This Agreement**

Amendment to the Specification for Highway Works

<b>List "B" List of numbered Appendices Devised for this Agreement</b>		
<b>Compiled/ Completed by</b>	<b>Appendix Number</b>	<b>Title</b>
<b>Preliminaries</b>		
E/C	1/74	Safety of Operations
E/C	1/75	TRISS Vehicle Liveries
E/C	1/76	TRISS Operatives Uniform
E/C	1/77	Specification for TRISS Vehicle Mobile CCTV System
E/C	1/78	Specification for Vehicle Mounted Variable Message Signs
E/C	1/79	Material Stocks
<b>Road Restraint Systems (Vehicle and Pedestrian)</b>		
E/C	4/71	Re-Tensioning of Safety Barriers
<b>Road Lighting Columns and Brackets, CCTV Masts and Cantilever Masts</b>		
E/C	13/70	Maintenance of High Mast and Other Lighting Incorporating Hoists Winches and Ropes
<b>Electrical Work for Road Lighting and Traffic Signs</b>		
E/C	14/71	Labour Requirements
E/C	14/73	Call out Report
E/C	14/75	Competent Person's Authorisation Certificate
<b>Winter Maintenance Operations</b>		
E/C	28/1	Supplies and Spreading Rates
E/C	28/2	Company's Vehicles and Plant
<b>Emergency Response</b>		
E/C	32/1	Incident Response
<b>Site Investigation</b>		
E/C	33/1	Structural Investigations Test Requirements

**Appendix 0/4: List of Drawings for the O&M Works**

Drawing Number	Title
<b>Land Made Available Drawings</b>	
M8-C-O&M-001 Rev 14	Land Made Available by the Scottish Ministers for the O&M Works Sheet 1 of 25
M8-C-O&M-002 Rev 14	Land Made Available by the Scottish Ministers for the O&M Works Sheet 2 of 25
M8-C-O&M-003 Rev 14	Land Made Available by the Scottish Ministers for the O&M Works Sheet 3 of 25
M8-C-O&M-004 Rev 14	Land Made Available by the Scottish Ministers for the O&M Works Sheet 4 of 25
M8-C-O&M-005 Rev 14	Land Made Available by the Scottish Ministers for the O&M Works Sheet 5 of 25
M8-C-O&M-006 Rev 14	Land Made Available by the Scottish Ministers for the O&M Works Sheet 6 of 25
M8-C-O&M-007 Rev 14	Land Made Available by the Scottish Ministers for the O&M Works Sheet 7 of 25
M8-C-O&M-008 Rev 14	Land Made Available by the Scottish Ministers for the O&M Works Sheet 8 of 25
M8-C-O&M-009 Rev 14	Land Made Available by the Scottish Ministers for the O&M Works Sheet 9 of 25
M8-C-O&M-010 Rev 14	Land Made Available by the Scottish Ministers for the O&M Works Sheet 10 of 25
M8-C-O&M-011 Rev 14	Land Made Available by the Scottish Ministers for the O&M Works Sheet 11 of 25
M8-C-O&M-012 Rev 14	Land Made Available by the Scottish Ministers for the O&M Works Sheet 12 of 25
M8-C-O&M-012 Rev 14	Land Made Available by the Scottish Ministers for the O&M Works Sheet 13 of 25
M8-C-O&M-014 Rev 14	Land Made Available by the Scottish Ministers for the O&M Works Sheet 14 of 25
M8-C-O&M-015 Rev 14	Land Made Available by the Scottish Ministers for the O&M Works Sheet 15 of 25
M8-C-O&M-016 Rev 14	Land Made Available by the Scottish Ministers for the O&M Works Sheet 16 of 25
M8-C-O&M-017 Rev 14	Land Made Available by the Scottish Ministers for the O&M Works Sheet 17 of 25
M8-C-O&M-018 Rev 14	Land Made Available by the Scottish Ministers for the O&M Works Sheet 18 of 25
M8-C-O&M-019 Rev 14	Land Made Available by the Scottish Ministers for the O&M Works Sheet 19 of 25

**Appendix 0/4: List of Drawings for the O&M Works**

M8-C-O&M-020 Rev 14	Land Made Available by the Scottish Ministers for the O&M Works Sheet 20 of 25
M8-C-O&M-021 Rev 14	Land Made Available by the Scottish Ministers for the O&M Works Sheet 21 of 25
M8-C-O&M-022 Rev 14	Land Made Available by the Scottish Ministers for the O&M Works Sheet 22 of 25
M8-C-O&M-023 Rev 14	Land Made Available by the Scottish Ministers for the O&M Works Sheet 23 of 25
M8-C-O&M-024 Rev 14	Land Made Available by the Scottish Ministers for the O&M Works Sheet 24 of 25
M8-C-O&M-025 Rev 14	Land Made Available by the Scottish Ministers for the O&M Works Sheet 25 of 25

**Reference Drawings**

M8-C-REF-001 Rev 03	Reference Drawing - Sheet 1 of 25
M8-C-REF-002 Rev 03	Reference Drawing - Sheet 2 of 25
M8-C-REF-003 Rev 03	Reference Drawing - Sheet 3 of 25
M8-C-REF-004 Rev 03	Reference Drawing - Sheet 4 of 25
M8-C-REF-005 Rev 03	Reference Drawing - Sheet 5 of 25
M8-C-REF-006 Rev 03	Reference Drawing - Sheet 6 of 25
M8-C-REF-007 Rev 03	Reference Drawing - Sheet 7 of 25
M8-C-REF-008 Rev 03	Reference Drawing - Sheet 8 of 25
M8-C-REF-009 Rev 03	Reference Drawing - Sheet 9 of 25
M8-C-REF-010 Rev 03	Reference Drawing - Sheet 10 of 25
M8-C-REF-011 Rev 03	Reference Drawing - Sheet 11 of 25
M8-C-REF-012 Rev 03	Reference Drawing - Sheet 12 of 25
M8-C-REF-013 Rev 03	Reference Drawing - Sheet 13 of 25
M8-C-REF-014 Rev 03	Reference Drawing - Sheet 14 of 25
M8-C-REF-015 Rev 03	Reference Drawing - Sheet 15 of 25
M8-C-REF-016 Rev 03	Reference Drawing - Sheet 16 of 25
M8-C-REF-017 Rev 03	Reference Drawing - Sheet 17 of 25
M8-C-REF-018 Rev 03	Reference Drawing - Sheet 18 of 25

**Appendix 0/4: List of Drawings for the O&M Works**

M8-C-REF-019 Rev 03	Reference Drawing - Sheet 19 of 25
M8-C-REF-020 Rev 03	Reference Drawing - Sheet 20 of 25
M8-C-REF-021 Rev 03	Reference Drawing - Sheet 21 of 25
M8-C-REF-022 Rev 03	Reference Drawing - Sheet 22 of 25
M8-C-REF-023 Rev 03	Reference Drawing - Sheet 23 of 25
M8-C-REF-024 Rev 03	Reference Drawing - Sheet 24 of 25
M8-C-REF-025 Rev 03	Reference Drawing - Sheet 25 of 25

**Appendix 0/4: List of Drawings for the O&M Works**

1.5 Standard Drawings

Drawing Number	Sheet Number	Rev.	Title
NDX1001-01ly	3	B	Typical Overall CEC Gantry/VMS Site Layout
NDX1001-01ly	4	B	Typical Layout or CEC Gantry/VMS Site
NDX1001-02ga	3	B	Typical Cantilever Variable Message Signs Ladder Access
NDX1002-00ga	1	D	Typical HA Type 600 Cabinet Installation - Plinths
NDX1002-00dt	2	E	Typical HA Type 600 Cabinet Foundations
NDX1002-00dt	4	C	Typical HA Type 600 Cabinet Door Security Strap
NDX1002-00dt	5	D	Typical HA Type 600 Cabinet Thermostat & Heater Type 1020
NDX1002-01ga	1	C	Typical HA 600 Cabinet Modified Internal Frame
NDX1002-01dt	6	C	Typical HA 600 Cabinet Communications Cable Clamping, Earth Stud & General Earthing Detail
NDX1002-06dt	1	B	Typical Electrically Energised Communications Cabinet Labels
NDX1002-06no	2	B	Typical Electrically Energised Communications Cabinet Labels
NDX1002-07ga	1	B	Typical CEC Cabinet Installation – Hard-Standing, Plinths and Foundations
NDX1002-07dt	2	A	Typical CEC Site Layout Including Vehicle Hard-Standing
NDX1002-07dt	3	A	Typical CEC Cabinet Labels
NDX1002-08ga	1	1	Typical Scottish Type 600(S) Cabinet – General arrangement
NDX1002-08dt	2	1	Typical Scottish Type 600(S) Cabinet – Foundations/Plinth
NDX1002-08dt	3	1	Typical Type 610 Frame for Scottish Type 600(S) Cabinet
NDX1002-08dt	4	1	Typical Type 610 Skirt for Scottish Type 600(S) Cabinet
NDX1002-09dt	1	1	Typical CECR Cabinet – Foundations/Plinth
NDX1002-09sp	2	1	For Future Use
NDX1002-10dt	1	1	Typical CECR+1 Cabinet – Foundations/Plinths
NDX1002-10dt	2	1	Typical CECR+1 Cabinet Site Layout including Vehicle hard standing
NDX1007-01cl	2	D	Typical Detector Loop Site
NDX1010-00cl	4	B	Typical 10 & 15 Metre CCTV Mast, Cabinet Base & Paved Area
NDX1011-01ga	1	E	Typical Electrical Supply & Distribution Cabinets Installation Detail

**Appendix 0/4: List of Drawings for the O&M Works**

Drawing Number	Sheet Number	Rev.	Title
NDX1011-01dt	7	E	Typical Labels For Electrical Supply, Distribution & Other Electrical Supply Equipment Cabinets
NDX1011-06ga	1	A	Typical Layout of Termination Pillar (TP)
NDX1011-06il	2	A	Typical Item List for Layout Termination Pillar (TP)
NDX1011-06no	3	A	Typical Notes for Termination Pillar (TP)
NDX1011-06cd	4	A	Typical Circuit Diagram of Termination Pillar (TP)
NDX1011-07ga	1	A	Typical Layout of Termination Pillar/Traffic Equipment Termination Pillar (TP/TEDP)
NDX1011-07il	2	A	Typical Item List for Typical Termination Pillar /Traffic Equipment Termination Pillar (TP/TEDP)
NDX1011-07no	3	A	Typical Notes for Termination Pillar/Traffic Equipment Termination Pillar (TP/TEDP)
NDX1011-07cd	4	A	Typical Circuit Diagram of Termination Pillar/Traffic Equipment Termination Pillar (TP/TEDP)
NDX1011-08ga	1	A	Typical Layout of Traffic Equipment Termination Pillar (TEDP)
NDX1011-08il	2	A	Typical Item List for Typical Traffic Equipment Termination Pillar (TEDP)
NDX1011-08no	3	A	Typical Notes for Traffic Equipment Termination Pillar (TEDP)
NDX1011-08cd	4	A	Typical Circuit Diagram of Traffic Equipment Termination Pillar (TEDP)
NDX1029-03ga	1	A	Typical Installation and Support Detail for Motorway Access Controller (MAC)
NDX1049-02no	1	E	Typical ERT354 General Installation Notes
NDX1049-02ga	2	C	Typical ERT354 Verge, no Safety Fence, no Kerb – Type A,N
NDX1049-02ga	3	C	Typical ERT354 Verge, no Safety Fence, with Kerb – Type B,O
NDX1049-02ga	4	C	Typical ERT354 Verge, no Safety Fence with Kerb – Type B1,O1
NDX1049-02ga	5	E	Typical ERT354 Verge with Safety Fence, no Kerb – Type C, P
NDX1049-02ga	6	E	Typical ERT354 Verge with Safety Fence with Kerb – Type D, Q
NDX1049-02ga	7	C	Typical ERT354 Verge with Safety Fence & Wheelchair Access Bay – Type D1, Q1

**Appendix 0/4: List of Drawings for the O&M Works**

Drawing Number	Sheet Number	Rev.	Title
NDX1049-02ga	8	C	Typical ERT354 Accommodating ERT at Verge with Safety Barrier - Type L
NDX1049-02ga	9	E	Typical ERT354 Wall Mounting – Type G
NDX1049-02ga	10	C	Typical ERT354 End of Safety Fence with Kerb – Type J
NDX1049-02ga	11	E	Typical ERT354 Alternative for Existing Post 71 – Type M
NDX1049-02ga	12	E	Typical ERT354 Site Specific Design Erskine Bridge – Type M1
NDX1049-02ga	13	C	Typical ERT354 Fabricated Guard Rail
NDX1049-02dt	14	C	Typical ERT354 Standard Concrete Plinth Hand Rail
NDX1049-02dt	15	C	Typical ERT354 600 Cube Concrete Plinth
NDX1049-02dt	16	C	Typical ERT354 Cable Pit Moulding
NDX1049-02no	17	C	Typical ERT354 Stock Code List for Replacement Units & Spares
NDX1049-02ga	18	B	Typical ERT354 Accommodating ERT at Verge with Safety Barrier
NDX1049-02ga	19	B	Typical ERT354 Accommodating ERT at VMS Hard Standing
NDX1061-00dt	2	B	Typical Method of Sealing Unused Cable Ends
NDX1061-00dt	3	C	Typical Cable Identification Labels
NDX1063-00dt	1	D	Typical Ducts
NDX1063-00dt	2	B	Typical Installation of Deep Transverse Ducts
NDX1063-00dt	3	D	Typical Duct Installation - Longitudinal
NDX1063-00dt	4	C	Typical Duct Installation - Local Ducts
NDX1063-00dt	5	C	Typical Duct Installation - Transverse Ducts
NDX1063-00dt	6	C	Typical Duct Installation – Spacers, Strapping and Longitudinal Duct Cable Allocation
NDX1063-00dt	7	D	Typical Duct Installation - Mechanical Duct Plugs
NDX1063-00cl	9	G	Typical Plan View of General Ducted System Layout- Both Verges
NDX1063-00cl	10	H	Typical Plan View of General Ducted System Layout- Single Verge
NDX1063-01ga	1	C	Typical Type A Chamber Construction Detail
NDX1063-02ga	1	C	Typical Type B Chamber Construction Detail
NDX1063-03ga	1	C	Typical Type C Chamber Construction Detail
NDX1063-04ga	1	D	Typical Type D Chamber Construction Detail Detector

**Appendix 0/4: List of Drawings for the O&M Works**

Loop Sites			
Drawing Number	Sheet Number	Rev.	Title
NDX1063-04wd	2	C	Typical Loop Wiring In Roadside Chamber At Detector Loop Sites (PTC Joint)
NDX1070-01ga	1	B	Typical Site Access Steps
NDX1070-02ga	1	B	Typical Site Access Safety Handrail Detail
NDX1072-00cl	2	E	Typical Traffic Scotland Site Maintenance Hard-Standing.
NDX1097-01ga	1	B	Typical 6-lane : 2x3.5 Class 1 Piezo-loop-Piezo WiM General Site Layout - loops
NDX1097-01ga	2	B	Typical 6-lane : 2x3.5 Class 1 Piezo-loop-Piezo WiM General Site Layout - cabinets
NDX1097-01dt	3	A	Typical WiM BL Sensor Installation
NDX1097-01dt	4	A	Typical WiM Induction Loop Installation

1.6 List of Drawings Brought into the Agreement by Reference

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

**List of Drawings Brought into the Contract by Reference**

Drawing Number	Title	Date	Aspect/Alternative(s) if Not Whole Drawing
MCHW Volume 3, Section 3	MCX Series of Drawings*	Various	Deleted
Various	All drawings notwithstanding the requirements of other parts of the Agreement		

\* Where an MCX standard drawing has not been replaced by an NDX standard drawing or other specific drawing with the written consent of the Traffic Scotland Manager

#### **Appendix 0/4: List of Drawings for the O&M Works**

1.7 List of Specifications Brought into the Agreement by Reference  
1.7.1 "Traffic Scotland NDS" series of documents including inter alia:-

Document Number	Title
NDS 1551	Requirements for Electricity Supply to Traffic Scotland and Associated Equipment Sites
NDS 1624	Standards and Procedures for the Preparation of Traffic Scotland Drawings
NDS 9001	Traffic Scotland Health and Safety File Requirements and Model Forms
NDS 9551	Requirements for Electricity Supply to Traffic Scotland and Associated Equipment Sites
NDS 9565	Guidance on the Use of standard Traffic Scotland Termination Pillars (TP) and Traffic Equipment Distribution Pillars (TEDP).

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

Document Number	Title/Reference
TR 2130	Environmental Tests for Motorway Equipment
MCG 1022	Testing for Newly Installed Communication and Power Cable (to be read in conjunction with NDS 9593)
MCG 1055	Testing for Newly Installed Motorway Optical Fibre Communication Cable (Single mode)
MCH 1540	Installation of Loop Detectors on Motorways and All Purpose Trunk Roads
MCH 1589B	Guide to the Siting of Inductive Loop Detectors on Motorways
TR 2161	Armoured Energy Cable
TR 1100 & Associated Appendix A	(Equivalent Standards Applicable are as per TR 1100C Section 3) Modified Section for Scotland
WOEM 4421	(Transport Wales) Armoured Fibre Optic Cable
-	Disability Discrimination Act: Good Practice for Roads (Transport Scotland Publication)
British Telecom CW1128/1198 - xx	xx denotes the number of pairs – 0.9mm conductor in petroleum jelly
TRG 600	Self Certification Procedures for Statutory Approval for Traffic Control Equipment

### Appendix 0/5: Special National Alterations of the Scottish Ministers

The following additions, substitutions, cancellations and minor alterations shall be made:

#### **List of Substitute Clauses, Tables and Figures**

Clause Number	Title	Page Number
850SE	Crushed Gravel Sub-base Material Type 1	
1202TS	General Requirements for Permanent Traffic Signs	
1204TS	Posts for Permanent Traffic Signs	
1218TS	Detector Loops	
1301TS	General	
1302TS	Design of Lighting Columns, Brackets, CCTV Masts, Cantilever Masts, Foundations, Anchorages and Attachment Systems	
1303TS	Data Sheets	
1304TS	Identification and Location Markings	
1308TS	Handling, Transport and Erection	
1401TS	General	
1402TS	As-built and operational Records	
1403TS	Location of Lighting Units and Feeder Pillars	
1407TS	Luminaires	
1409TS	Photo-electric Control Units	
1412TS	Ballasts	
1416TS	Cut-outs, Fuse Holders, Fuses and Miniature Circuit Breakers (MCBs)	
1417TS	Base Compartment Fixing Arrangements	
1418TS	Feeder Pillars	
1419TS	Wiring	
1420TS	Earthing	
1421TS	Underground and Ducted Cable	
1422TS	Cable Joints	

**Appendix 0/5: Special National Alterations of the Scottish Ministers**

Clause Number	Title	Page Number
1423TS	Armoured Cable Terminations	
1424TS	Inspection and Testing to be Carried Out by the Contractor	
1501A	Introduction	
1502A	General Requirements	
1503A	Materials, Equipment and Workmanship	
1504A	Site Records	
1505A	Provision of Cabinets, Cables and Ancillary Items	
1506A	Cables	
1507A	Cable Installation	
1508A	Installation of Cabinets	
1509A	Gantries for Overhead Equipment	
1510A	Emergency Roadside Telephones	
1511A	Marker Tape	
1512A	Provision of and Installation of Ancillary Items	
1513A	Jointing and Termination of Multi-pair Communications and Feeder Cables	
1514A	Cable Connectors	
1515A	Jointing and Termination of Fibre Optic Communications Cables	
1516A	Termination and Jointing of Power Supply Cables for Communications	
1517A	Earthing and Bonding	
1518A	Cable Testing	
1519A	Labelling and Numbering	
1520A	Loading	

**Appendix 0/5: Special National Alterations of the Scottish Ministers**

Clause Number	Title	Page Number
1521A	Removal and Re-siting of Existing Equipment	
1522A	Works Impacting on Operational Traffic Scotland Systems	
1523A	Loop Detectors	
1524A	Trial Pits	
1525A	Not Used	
1526A	The Inspection and Testing of Electrical Installations and Electrical Equipment	
1527A	Cable Installations at Transmission Stations	
1528A	Modifications of Existing Cabinets	
1529A	Temporary Roadside Emergency Telephones	
1530A	Cable Ducts	
1531A	Installation of Ducts	
1532A	Chambers for Traffic Scotland Cables	
1533A	Proving and Testing of Ducts	
1534A	Closed Circuit Television	
1535A	Variable Message Signs	
1536A	Traffic Monitoring Units	
1537A	SRTDb Detectors and SRTDb Equipment	
1538A	Lane Control Signalling Equipment	
1539A	Paved Areas, Access Paths, Access Steps and Hard Standings	
1540A	Required Documentation	
1541A	Journey Time Equipment	
1542A	Communications Equipment	
1543A	Specific Equipment Commissioning, Testing, Integration and Certification	

**Appendix 0/5: Special National Alterations of the Scottish Ministers**

Clause Number	Title	Page Number
1544A	Power Supplies for Traffic Scotland Equipment	
1545A	Spares	
1546A	Meteorological Equipment	
1547A	Ramp Metering	
1548A	Enforcement Systems	
1549A	Weigh In Motion Equipment	
1550A	Damage Repair Procedures	
1911SE	Paint and Similar Protective Coatings	
1912SE	Testing of Paints	
1920SE	Additional Requirements for the Protection of Steel in Bridge Bearings	

**List of Minor Alterations Clauses, Tables and Figures**

Clause Number	Title	Page Number
1702.2	Concrete – Ordinary Structural – Constituent Materials	
N / A	Appendix A	

**Appendix 0/5: Special National Alterations of the Scottish Ministers**

**Substitute Clauses, Tables and Figures**

Clause Number	Title														
850SE	<p><b>1 Crushed Gravel Sub-base Material Type 1</b></p> <p><b>Material Properties</b></p> <p>1.2 For the purpose of this Clause gravel is defined as aggregate derived from a natural, unconsolidated, coarse-grained sedimentary deposit consisting of water-worn rock fragments.</p> <p>1.3 Crushed gravel granular sub-base material Type 1 shall be derived from natural cobble-sized material (60 millimetres – 200 millimetres), or larger, crushed and screened to be well-graded and lie within the grading envelope of Table 8/50SE below.</p> <p><b>TABLE 8/50SE: Sub-base Type 1 Range of Grading</b></p> <table> <thead> <tr> <th>BS sieve size</th> <th>Percentage by mass passing</th> </tr> </thead> <tbody> <tr> <td>75 millimetres</td> <td>100</td> </tr> <tr> <td>37.5 millimetres</td> <td>85 – 100</td> </tr> <tr> <td>10 millimetres</td> <td>40 – 70</td> </tr> <tr> <td>5 millimetres</td> <td>25 – 50</td> </tr> <tr> <td>600 microns</td> <td>8 – 22</td> </tr> <tr> <td>75 microns</td> <td>0 – 10</td> </tr> </tbody> </table> <p>1.4 The particle size shall be determined by the washing and sieving method of BS EN 933-1</p> <p>1.5 The material passing the 425 microns BS sieve shall be non-plastic as defined in BS 1377: Part 2 and tested in compliance therewith.</p> <ul style="list-style-type: none"> <li>ii) The degree of crushing of individual particles in the mixed material shall meet the following requirements:</li> <li>iii) not less than 90 per cent by mass of the particles passing BS 50 millimetres and retained on BS 6.3 millimetre sieve shall exhibit at least three freshly broken faces; and</li> <li>iv) not less than 80 per cent by mass of the particles in each BS EN 13043 specified size fraction within the size range stated at (i) above shall exhibit at least three freshly broken faces.</li> <li>v) The material shall satisfy the minimum CBR requirement of Appendix 7/1 when tested in accordance with Clause 7 of BS 1377 : Part 4. The material shall be tested at the density and moisture content likely to develop in equilibrium field conditions which shall be taken as being the density relating to the uniform air voids content of 5 per cent and the optimum moisture content determined in compliance with BS 5835. The specimens shall be tested in a soaked condition.</li> <li>vi) The material shall have a ten per cent fines value of 50 kilonewtons or more when tested in compliance with BS 812 :</li> </ul>	BS sieve size	Percentage by mass passing	75 millimetres	100	37.5 millimetres	85 – 100	10 millimetres	40 – 70	5 millimetres	25 – 50	600 microns	8 – 22	75 microns	0 – 10
BS sieve size	Percentage by mass passing														
75 millimetres	100														
37.5 millimetres	85 – 100														
10 millimetres	40 – 70														
5 millimetres	25 – 50														
600 microns	8 – 22														
75 microns	0 – 10														

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Clause Number	Title
	<p>Part 111 except that the samples shall be tested in a saturated and surface-dried condition. Prior to testing, the selected test portions shall be soaked in water at room temperature for 24 hours without previously having been oven-dried.</p> <p>1.6 The aggregate will be considered suitable if:</p> <ul style="list-style-type: none"> <li>i) aggregate from the source, when tested in accordance with BS 812 : Part 121, has a soundness value greater than 65; or</li> <li>ii) evidence can be provided to the Employer of satisfactory use of aggregate from the source as Type 1 sub-base material.</li> </ul> <p>1.6.1 The water absorption of the coarse aggregate from the source determined in accordance with BS 812 : Part 2 shall also be declared.</p> <p>1.7 <b>Transportation and Compaction</b></p> <p>1.7.1 The material shall be transported, laid and compacted to the requirements of Clause 801 at a moisture content within the range one per cent above to two per cent below the optimum moisture content determined in compliance with BS 5835 and without drying out or segregation.</p> <p>1.8 <b>Trafficking Trial</b></p> <p>1.8.1 When required by Appendix 7/1, the Contractor shall construct a trial area incorporating the crushed gravel sub-base material proposed for use in the Works. The trial area shall be constructed, trafficked and assessed in accordance with the procedure described in Appendix 7/1. The mean vertical deformation after 1000 standard axles shall be less than 30 millimetres when measured in accordance with the stated procedure.</p> <p>1.9 <b>Performance of Crushed gravel Sub-base</b></p> <p>1.9.1 A brief performance report on the behaviour of the crushed gravel sub-base is required.</p>
1202TS	<p>1 <b>General Requirements for Permanent Traffic Signs</b></p> <p>Delete entire clause and insert following:-</p> <p>1.1 Materials for permanent traffic signs and their construction, assembly, location and erection shall comply with this Series, Series 1400 and the requirements of the Contract. The manufacture and installation of traffic signs shall be in accordance with the quality management scheme described in Appendix A.</p> <p>1.2 Each complete traffic sign or part thereof shall be capable of passing the tests in BS EN 12899-1:2001. Additionally, unless protected by existing safety barriers, signs shall be, by preference be designated Passively Safe and shall therefore conform to testing as BSEN12767:2007, TD89/08 and be installed in compliance with TD19/06.</p>

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Clause Number	Title
	<p>1.3 Sign panels of internally illuminated signs, transluminated signs and luminaire face panels shall, comply with impact BS EN 12889-1:2001.</p> <p>1.4 All lit traffic signs shall comply with Category 1 luminance of BS EN 12899-1:2001</p> <p>1.5 Before the commencement of fabrication of any traffic sign, the Company shall submit for the Overseeing Organisation's approval:</p> <ul style="list-style-type: none"> <li>(i) fabrication drawings for 'directional informative' and 'informative' signs shall be as required by Appendix 1/4;</li> <li>(ii) the information about 'warning', 'regulatory' and other traffic signs required in Appendix 12/1.</li> </ul> <p>1.6 A traffic sign housings 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.</p> <p>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 Apparatus and Lighting Identification System'. The identifying code shall be provided by the Company responsible for the road. Contact details are provided in Appendix 12/1.</p> <p>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.</p>
1204TS	<p><b>1 Posts for Permanent Traffic Signs</b></p> <p>Delete entire clause and insert the following:-</p> <p>1.1 Posts for permanent traffic signs shall be as described in Appendix 12/1 and shall comply with BS EN 12899-1:2001. The surface protection requirements shall similarly comply with BS EN 12899-1:2001. Sign posts shall also conform to testing as BSEN12767:2007 and be installed in compliance with TD19/06 and the following:</p> <ul style="list-style-type: none"> <li>(i) steel posts shall be tubular or rectangular hollow section complying with BS EN 10 210, joists, universal beams or columns complying with BS 4-1, and shall be manufactured from steel complying with grade S275 JO or S275 J2;</li> <li>(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;</li> <li>(iii) Concrete posts only to be used for special and specific applications. Such use shall be agreed with the Overseeing Organisation on a site by site basis.</li> </ul>

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Clause Number	Title
	<p>1.2 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 50mm. Posts shall be fitted with suitable permanently affixed weatherproof cap of a type capable of providing watertight protection for a minimum of 20 years.</p> <p>1.3 Internally illuminated posts for pedestrian crossing beacons shall comply with this Clause and where appropriate with BS EN 12899-1:2001.</p> <p>1.4 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.</p> <p>1.5 Compartments for electrical apparatus shall be as described in Appendix 12/1 and, wherever practicable, access doors shall be on the side of the compartment furthest from approaching traffic. 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.</p> <p>1.6 Flange plates shall have holes or slots as described in Appendix 12/1 to accommodate the attachment system.</p>
1218TS	<p><b>1 Detector Loops</b></p> <p>Delete entire clause and insert the following:-</p> <p>1.1 The installation and testing of detector loops shall be in accordance with the Series 1500 National Alterations of the Overseeing Organisation of Scotland and the Specification MCH 1540.</p> <p>1.2 The positioning and layout of such loops shall, where applicable, be in accordance with MCH 1589 unless otherwise described in Appendix 12/1.</p> <p>1.3 Loops for use with Traffic Signals shall be installed in accordance with the requirements for such installations.</p>
1301TS	<p><b>1 General</b></p> <p>Delete entire clause and insert the following:-</p> <p>1.1 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:</p> <p>(i) For aluminium lighting columns:</p> <p>(a) aluminium columns shall not exceed 15 metres nominal height;</p> <p>(b) columns shall be tapered with an integral bracket. The maximum bracket outreach shall be no greater than 0.5 metres</p> <p>(ii) For steel columns</p> <p>(a) post top columns not exceeding 20 metres nominal height, these columns shall be of continuously tapered folded steel construction;</p>

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Clause Number	Title
	<p>(b) columns with brackets not exceeding 18 metres nominal will have a maximum bracket outreach of 0.5 metres</p> <p>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.</p> <p>(iii) For glass fibre reinforced plastic lighting columns:</p> <p>(a) unless specifically specified columns not exceeding 10 metres nominal height;</p> <p>(b) bracket projections shall not exceed 0.5 metres</p> <p>(iv) For steel CCTV masts:</p> <p>(a) post top masts not exceeding 25 metres nominal height.</p> <p>(v) For steel cantilever masts:</p> <p>(a) nominal height not exceeding 8.5 metres;</p> <p>(b) cantilever projection not exceeding 8.5 metres.</p> <p>(c) bracket projections for cantilever masts not exceeding <math>0.25 \times</math> nominal height or 3 metres whichever is the lesser.</p> <p>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)</p>
1.2	<p>The Company shall provide verification from the manufacturer that the lighting columns and brackets, CCTV masts and cantilever masts comply with the quality management scheme described in Appendix A and all other certification as described in BSEN40 and BSEN12767:2007.</p> <p>Additionally, 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 BSEN12767:2007. Installation shall always be in compliance with TD19/06.</p>
1.3	<p>Lighting columns and brackets, CCTV masts and cantilever masts shall be supplied and installed in compliance with the relevant requirements of guidance document PD6547 and requirements of BS EN 40-1, BS EN 40-3-1, BS EN 40-3-2, BS EN 40-4, BS EN 40-5, BS EN 40-6 and BS 5649-2, BS 5649-5 and BS 5649-7 together with the amendments and additions stated in Clauses 1309, 1310 and 1311 and all the other requirements of this Series.</p>
1.4	<p>Lighting brackets shall include wall mounted brackets and fixtures.</p>

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Clause Number	Title
	<p>1.5 Temporary lighting at temporary diversions for traffic, and crossovers, shall comply with this Series.</p> <p>1.6 Where lighting columns, CCTV masts and cantilever masts are installed in the vicinity of overhead power lines the Company/Designer shall ensure that the appropriate Electricity Authorities are notified. The Company shall notify and obtain written agreement on the specific clearances required and that warning notices as described in Appendices 13/1, 13/4 and 13/7 are permanently fixed to these columns prior to erection. All to conform to GS6 'Avoidance of danger from overhead electric power lines' published by the Health and Safety Executive. Also ILE / HSE document 'Safety during the installation and removal of lighting columns and similar street furniture in proximity to high voltage overhead lines' and the Overseeing Organisation guidance document LDS8001_09 "Trunk Road Lighting and Associated Electrical Apparatus Identification System"</p> <p>1.7 Headroom over the carriageway for cantilever mast shall be in accordance with the requirements of paragraph 3.2 of Standard BD 88 (DMRB 2.2.13).</p> <p>1.8 Non-hygrosopic base compartment back-board not less than 15mm thick and of a sufficient size to accept the selected cut-out and control apparatus 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 apparatus and components to this wooden back-board shall be of stainless steel.</p> <p>1.9 In compliance with the operational requirements of the Transport Scotland IRIS inventory and management system standards the Overseeing Organisation shall make access available to the Company. The Company shall provide all information generally in accordance with the Overseeing Organisation attributes as required to correctly populate and operate all required functions of the Scottish Lighting Management System. Direct on-line access to the Transport Scotland Lighting Management System is available to the Company. The Company shall provide their collected information in a format agreed with the Overseeing Organisation's requirements.</p> <p>1.10 Aluminium lighting columns shall be manufactured with a flush mounted access door correctly positioned relative to with the integral bracket. This position to ensure that access through the door can only take place when facing the oncoming traffic.</p> <p>1.11 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 of 150mm x 75mm with the lower edge of the slot 600mm below ground level. The cable entry slot shall be free from irregularities</p>

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Clause Number	Title
	<p>and burrs.</p> <p>1.12 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. .</p> <p>1.13 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 Company is required to adhere to such aspects of the guidance provided in PD6484 as it relates to dissimilar metals in contact with aluminium. The selection of electrical earthing components shall also comply in this and other respects with the requirements of BS 7430.</p> <p>1.14 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 the Contract each column access door shall have two locks using 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 adequately size.</p> <p>1.15 On completion of the installation, all door locking components shall be coated with an application of suitable corrosion inhibitor grease providing lubrication and protection from seizure and general deterioration.</p> <p>1.16 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. 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.</p> <p>1.17 Where columns are mounted on structures and behind parapets, the access doors shall be positioned such that the access opening is fully accessible above the upper height of the protective parapet and facing the maintenance personnel.</p>

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Clause Number	Title
	<p>1.18 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. The nuts and exposed bolts shall be made suitably tight and then coated with protective paste and tape. All fixings shall be compatible with the column material.</p> <p>1.19 Where the column flange is not in accordance with BS EN 40-2 the Company shall liaise with the Company responsible and agree details of the flange sizes and fixing centres. The Company shall implement a design based upon the agreed flange fixing and provide the design to the column manufacturer.</p> <p>1.20 Where separate bracket arms are used such bracket arms shall be of compatible material to the column and fixed in accordance with the manufacturer's written instructions to prevent rotation using an anti-rotational device.</p> <p>1.21 Road lighting columns and brackets shall be manufactured, located and erected in compliance with this Series, the 1400 Series and all relevant requirements.</p> <p>1.22 Where wall brackets and associated service boxes are installed they shall, where applicable, match existing items.</p>
1302TS	<p><b>1 Design of Lighting Columns, Brackets, CCTV Masts, Cantilever Masts, Foundations, Anchorages and Attachment Systems</b></p> <p>Delete entire clause and insert the following:-</p> <p>1.1 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.</p> <p>(i) 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 Standards BD 94 (DMRB 2.2.1), BD 83 (DMRB 2.2.11), BD 88 (DMRB 2.2.13) and the technical approval scheme adopted by the Overseeing Organisation. The Company shall similarly comply with PD6547 and the referenced standards within it. The Company shall use the soil type information as described in Appendices 13/1 and 13/7. The Company shall design</p>

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Clause Number	Title
1.2	<p>foundations for all columns and masts detailed in the Contract and drawings.</p> <p>(ii) The Company shall be responsible for the design of all:</p> <ul style="list-style-type: none"> <li>(a) anchorages and attachment systems for columns and masts with flange plates to foundation or bridge deck;</li> <li>(b) foundations for columns and masts with flange plates;</li> </ul> <p>All as described in Appendices 13/1, 13/4 and 13/7</p> <p>(iii) The 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 by a competent person to ensure compliance with the required standards and check certificates issued for lighting 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.</p> <p>(iv) The 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 BS EN 40.</p> <p>(v) 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.</p> <p>(vi) Alternative foundations can be used with the prior agreement of the Overseeing Organisation.</p> <p>Aesthetic Requirements</p> <p>The aesthetic design of lighting columns, including those with bracket arms, shall be submitted by the Company to the Overseeing Organisation for consideration and approval.</p> <p>(i) 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 both 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</p>

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	<p>with existing apparatus.</p> <p>(ii) Where fold-down columns greater than 8 metres high are installed these should be hydraulically raised and lowered.</p>
<b>1303TS</b>	<p><b>1 Data Sheets</b></p> <p>Delete entire clause and insert the following:-</p> <p>1.1 The Company shall complete the details in Appendices 13/2, 13/5 and 13/8 in accordance with the Instructions given in Appendices 13/3, 13/6 and 13/9.</p> <p>The Company shall provide the Overseeing Organisation with triplicate copies of the completed Data Sheets for each type of column and bracket, CCTV mast and cantilever mast not later than the date stated in Appendices 13/1, 13/4 and 13/7.</p> <p>1.2 The columns and brackets, CCTV masts and cantilever masts shall not be ordered or erected until the Overseeing Organisation has notified its acceptance of the completed Data Sheet in writing to the Company.</p> <p>1.3 The Company shall within one month of the commencement of the works 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.</p>
<b>1304TS</b>	<p><b>1 Identification and Location Markings</b></p> <p>Delete entire clause and insert the following:-</p> <p>1.1 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. Also all such masts, columns and brackets shall be correctly labelled with the CE mark confirming conformance with the appropriate directive(s).</p> <p>1.2 The column and mast identification marks shall be permanent and legible and be made clearly visible in one of the following ways:</p> <p>(i) on a permanent fixed label; or</p> <p>(ii) hard stamped; or</p>

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	<p>(iii) formed into the material of the column/mast external face only.</p> <p>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.</p> <p>All hard stamping shall be carried out in a manner that will not induce any stresses into the material of the column/mast.</p> <p>1.3 Where separate brackets are approved for use by the Overseeing Organisation the bracket identification mark shall also be permanent and legible and be either:</p> <ul style="list-style-type: none"> <li>(i) hard stamped; or</li> <li>(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.</li> </ul> <p>1.4 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_09 "Trunk Road Lighting and Associated Electrical Apparatus Identification System". The identifying code for use on the labels shall be provided by the appropriate Company and agreed with TS. To enable the Company to provide the ID codes the Company shall provide the company with site design layout drawings and electrical schematics. All records relating to the lighting columns shall include this identifying code.</p>
1308TS	<p><b>1 Handling, Transport and Erection</b></p> <p>Delete entire clause and insert the following:-</p> <p>1.1 Lighting columns and brackets, CCTV masts and cantilever masts shall be handled, transported and stored in such a manner that avoids any structural damage or damage to the surface protection system. Any damage incurred shall be made good in such a way that the structural performance and durability of the item shall be in no way reduced.</p> <p>1.2 Lighting columns and brackets, CCTV masts and cantilever masts shall be stored clear of the ground in such a way that contact with cement, groundwater, soil or ash or other deleterious material is prevented and that water does not accumulate on any surfaces or inside sections.</p>

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	<p>Suitable packing shall be placed between the columns/masts to allow a free passage of air and dispersion of water.</p> <p>1.3 All rivets, bolts, nuts, washers, screws, small plates and small articles generally shall be suitably packed and identified. All such items shall be stored under cover.</p> <p>1.4 Columns and masts shall be installed in accordance with the manufacturer's instructions and all requirements of the design specification and Employers Requirements.</p> <p>1.5 Wall mounted lighting brackets and fixtures shall be fixed as described in Appendix 13/1.</p> <p>1.6 All verge located lighting columns 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. Where agreement for such alternative orientations is to be sought this must form part of the initially proposed project design.</p>
1401TS	<p><b>1 General</b></p> <p>Delete entire clause and insert following:-</p> <p>1.1. The lighting installation shall not be energised until the Company has complied with the Electricity at work Regulation 1989 and provided to the Overseeing Organisation all completed BS7671 Inspection and Testing Certificates. In addition to the provision of the BS7671 Inspection and Testing Certificates the 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.</p> <p>(i) Materials, apparatus and workmanship required under the Contract shall comply with BS 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 MCHW.</p> <p>The Company shall ensure that only competent persons that are registered with the Highway Electrical Registration Scheme (HERS) or are registered with another Approving body, such as SELECT or NICEIC shall be employed on works that fall within the scope of this</p>

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Clause Number	Title
	<p>series. In addition Authorised Persons shall be registered as specified in the 'Handbook for the Highway Electrical Industry Scheme for the Registration of Authorised Persons, Highway Electrical, Highway Electronic &amp; Associated Highway Works'.</p> <p>The 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'.</p> <p>The Company shall employ only competent personnel each of whom holds a "Competent Persons Authorisation Certificate" in accordance with the model form in Appendix B of the above document G39/1. For this purpose G39/1 shall be modified as specified below. The modified document shall be duly completed by the Company and authorised by a designated responsible person in the Authority or company as defined in Clause 2 of G.39/1, all in accordance with Clause 10 of G.39/1. The form of certificate as specified above shall be modified on page B2 of G.39/1 by insertion of the following after the space for 'Name and Address of Employer':</p> <p>"Name of Authority or Company .....</p> <p>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 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 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 works.</p> <p>The Company/ Designer is required to pay particular attention to those sections, detailed within this National Alteration, where the Transport Scotland requirements differ from those of the standard Manual of Contract Documents for Highway Works (MCHW) and other Highways Agency documents.</p> <p>The Company/ Designer shall at all times comply with all the statutory regulations of the Electricity at Work Regulations 1989.</p> <p>1.2. The following definitions shall apply: -</p> <p>(i) A Road Lighting Unit shall consist of the following, as described in the Contract, column, bracket, wall mounting, internal wiring and</p>

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	<p>the electrical apparatus as defined in (iv) below.</p> <p>(ii) An illuminated (lit) Sign Unit shall consist of a traffic sign requiring an electricity supply and electrical apparatus and wiring as in (i) above for its illumination.</p> <p>(iii) The term Road Lighting Unit applies inter alia to lighting assemblies on road lighting columns and wall brackets, bollards, illuminated signs, underpass lighting, bulkhead lighting, and lighting at/in bus shelters, service/ administration buildings and all similar equipment provided for the illumination of roadside assets, road surface and other publicly accessible assets.</p> <p>(iv) Electrical apparatus for Road Lighting Units shall include but not be limited to the following or as otherwise described in the applicable contract: luminaires, photo-electric control units (PECUs), shorting plugs, lamps (including Light Emitting Diodes (LED)), time switches, magnetic and electronic ballasts, LED drivers, ignitors, starters, capacitors, cut-outs, fuses, fuse holders, miniature circuit breakers (MCBs), luminaire mounted modules, sub-assemblies and other roadside equipment forming part of an Intelligent Lighting Control System (ILCS) / Central Management System (CMS) and Light Emitting Diodes (LED) and their associated drivers.</p> <p>(v) The Network is the electrical distribution network installed by the Company from the DNO cut-out to the Lighting Units. This will include inter alia feeder pillars, cabinets, housings and similar enclosures that form part of the installed electrical distribution network.</p> <p>(vi) Roadside Electrical Assets (REA) are those items included and forming part of the Scottish Road Network electrical equipment inventory held in the IRIS which is generally as detailed in Schedule 4 Part 1.</p> <p>(vii) Lighting Management System, also known as Lighting Management Function is that part of the Transport Scotland IRIS inventory and management system covering lighting and Roadside Electrical Assets (REA).</p> <p>(viii) The Transport Scotland Intelligent Lighting Control System (ILCS) also known as Lighting Central Management System (CMS) shall be considered as the combined total of all systems installed on the Scottish Trunk Road network to allow for the some form of remote control and monitoring of the Transport Scotland Road Lighting and lit assets. The Company shall refer to S1.10.3 of Schedule 2 Part 2 of the New Works Requirements for additional requirements concerning the Intelligent Lighting Control System (ILCS).</p>

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	<p>1.3. Each network shall operate on a nominal single phase 230V ac, - 6% to +10% or three phase 400V - 6% to +10%. It will be the Company/designer responsibility to ensure that the apparatus supplied will operate correctly at the voltage 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 Company/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.</p> <p>Following on from this the following should be noted:</p> <ul style="list-style-type: none"> <li>(i). TN-C distribution shall not be used for any part of any new road lighting electrical distribution network</li> <li>(ii). Where a 3-phase (400V) supply has been provided by the Supplier this 3-phase supply shall not be distributed within the Network as a 3-phase supply but only as three separate single phase supplies.</li> <li>(iii) The single phase supplies derived from a 3-phase electricity supply shall not under any circumstances be defined as being an 'individual' or 'separate' single phase supply. They shall not be used to supply apparatus other than road lighting related circuits. Road lighting circuits include any anti-condensation heaters and maintenance sockets and similar housed within lighting pillars.</li> </ul> <p>1.4. The Company/Designer shall provide sufficient access and area within electrical apparatus to allow the electricity supplier to install their service connection and associated cut-out. This shall be considered as the origin the circuit. (feeder pillar?)</p> <p>1.5. 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 approved by the Overseeing Organisation supplies provided to electrical apparatus for third parties, internal and external to the Overseeing Organisation, shall not be connected to the Overseeing Organisation's Network. Any such supplies so provided shall conform to the Overseeing Organisation's specific instructions as specified in the Overseeing Organisation guidance document LDS8006_09 "Electricity Supply to Roadside Electrical Apparatus and Lighting sites. Before making any form of electrical connection into any part of the Overseeing Organisation's lighting Network a completed TSD... Appendix A form shall be submitted and approved by the Overseeing Organisation 21 days prior to the connection being made.</p> <ul style="list-style-type: none"> <li>(i) Temporary lighting may be required at any Site where Operations shall be being undertaken. All temporary lighting shall provide no less illuminance than existing lighting over the area of the</li> </ul>

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	<p>carriageway. Mounting heights for this lighting shall be the same as the existing lighting. The installation of temporary lighting shall comply with the relevant Acts and Regulations (for example Electricity at Work Regulations and BS 7671:2008). It shall not form a hazard to motorists. No existing street lighting shall be disconnected until it has been replaced by either the new permanent lighting or a temporary lighting system to the written consent by the Overseeing Organisation. The temporary lighting shall remain operative until the new permanent lighting is brought into use. Temporary lighting arrangements shall have written consent by the Overseeing Organisation before the commencement of any affected work.</p> <p>1.6. The Company shall fit ID labels and conspicuity bands in accordance with the Overseeing Organisation guidance document LDS8001_09 "Trunk Road Lighting and Associated Electrical Apparatus Identification System"</p> <p>1.7. This document shall be read in conjunction the DMRB Technical Directives TD 19/06 (Road Restraint Systems), BS EN12767 Use of Passively Safe Signposts, Lighting Columns and Traffic Signal Posts), TD 23/99 (Inspection &amp; Maintenance of Road Lighting) and TD 25/01 (Inspection of Traffic Signs).</p> <p>1.8. Other relevant documents include:</p> <ul style="list-style-type: none"> <li>(i) Electricity at Work Regulations 1989.</li> <li>(ii) The Electricity Safety, Quality and Continuity Regulations 2002 (amended 2006,2009)</li> <li>(iii) Waste Electronic and Electrical Equipment (amendment) Regulations 2006.</li> <li>(iv) Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2008 (the "RoHS Regulations").</li> <li>(v) IET Wiring Regulations 17<sup>th</sup> Edition: British Standard (BS) 7671:2008 Requirements for Electrical Installations incorporating Note No 1 - 2011.</li> <li>(vi) BS 7430: Code of practice for earthing.</li> <li>(vii) BS EN 50110 Part 1 &amp; 2: Operation of Electrical Installations.</li> <li>(viii) HSE Publication HSR25: Memorandum of Guidance on the Electricity at Work Regulations 1989.</li> <li>(ix) HSE Publication GS6: Avoidance of Danger from Overhead Electric Lines.</li> <li>(x) HSE Publication HSG85: Electricity at Work – Safe Working Practices.</li> <li>(xi) HSE Publication HSG47: Avoiding danger from underground services</li> <li>(xii) Institution of Lighting Engineers (ILE) Code of Practice for Electrical Safety in Highway Electrical Operations</li> </ul>

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	<ul style="list-style-type: none"> <li>(xiii) Energy Networks Association (ENA) 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.</li> <li>(xiv) ENA Technical Specification 43-8: Overhead Line Clearances.</li> <li>(xv) County Surveyors' Society (CSS) Publication: Guidance Notes on Electrical Safety on the Highway to Achieve Compliance with the Electricity at Work Regulations, 1995.</li> <li>(xvi) CSS Publication: Code of Practice for the Installation and Operation of Seasonal Decorations on or above the Public Highway, 1995.</li> <li>(xvii) National Joint Utilities Group (NJUG) Publication 1: Recommendations on the avoidance of danger from underground electricity cables.</li> <li>(xviii) NJUG Publication 3: Cable Locating Devices</li> <li>(xix) Well Lit Highways. Code of Practice for Highway Lighting Management</li> </ul>
1402TS	<p><b>1 As-built and operational Records</b></p> <p>Delete entire clause and insert the following:-</p> <p>1.1 In accordance with the requirements of the Electricity at Work Regulations the 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 apparatus requiring electrical connections, ducts, underground cables and joints and the type and depth of cables. The Company shall also supply test certificates and Operation and Maintenance manuals. Any additional requirements for records shall be as described in Appendix 14/1.</p> <p>(i) The Company shall amend drawings provided by the Director 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 Director for approval. Locations of Constructional Plant and apparatus shall be referenced in accordance with the Trunk Road Network Referencing System.</p> <p>1.2 As built drawings shall be produced by the Company the (private) Network and all lighting units in accordance with this clause.. The Company shall complete the as-built drawings in AutoCAD™ format and provide them drawings in AutoCAD.</p> <p>1.3 As-built drawings shall include both geographical and schematic drawings</p> <p>(i) a schematic distribution layout drawing indicating the distribution arrangement of each private cable network;</p>

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	<p>(ii) a schedule of abandoned cables including location;</p> <p>(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;</p> <p>(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. Every lighting unit shall be marked in a manner such that it can be determined what the column height, material lantern type, lamp wattage, illuminated sign TRGD ref. No. , type and wattage of sign lighting unit.</p> <p>1.4. Operational Records shall include:</p> <p>(i) maintenance or operating manuals for installed apparatus;</p> <p>(ii) inspection and test certificates in accordance with BS 7671;</p> <p>(iii) Data required for inventory purposes in the format stipulated in the Employers Requirements</p>
1403TS	<p>1 <b>Location of Lighting Units and Feeder Pillars</b></p> <p>1)</p> <p>Delete entire clause and insert the following:-</p> <p>1.1. Unless otherwise described in Appendix 14/2, electrical isolation pillars shall, where required, be provided on the network at the maintenance boundary fence. Final positioning of such pillars shall be with the prior agreement of the Overseeing Organisation.</p> <p>1.2. In cases where the location of an item, already determined, but is subsequently changed, due to underground obstruction or similar difficulties, then any excavation already made shall be back-filled and reinstated to its original condition.</p> <p>1.3. Unless described in Appendix 14/2 the location of feeder pillars shall be in accordance with the Company's submitted design. The 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 works. The Company shall be responsible for recording</p>

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	<p>and documenting all aspects of the final site layout and the as-installed apparatus.</p> <p>1.4. Protection of feeder pillars and other above-ground electrical enclosures shall conform with the requirements of TD19/06 and where appropriate fulfil the requirements relating to unprotected apparatus in terms of Passive Safety.</p> <p>1.5. The location of cabinets or pillars provided to house the electricity supplier's apparatus shall be agreed with the Overseeing Organisation prior to its installation.</p> <p>1.6. In general all such housings shall be lighting feeder pillars and other above-ground electrical enclosures relative to electrical and communications enclosures installed by others shall fully comply with the proximity and electrical bonding requirements described in Clause 1420TS.</p> <p>1.7. Unless otherwise described in Appendix 14/2 the number, rating, type and location of all road lighting units shall form part of the Company's lighting design.</p>
1407TS	<p><b>1 Luminaires</b></p> <p>Delete entire clause and insert the following:-</p> <p>1.1. Luminaires fitted with integral control gear or driver circuits which shall be fitted with a fuse holder, incorporating direct touch protection, adjacent to the luminaire terminal block and other potentially exposed components.</p> <p>Unless otherwise agreed with the Overseeing Organisation preference shall always be given to designs incorporating LED luminaires. Other high efficiency devices may be optionally proposed for specific situations.</p> <p>All luminaires and lighting components shall be, as agreed with the Overseeing Organisation, suitable for use with Intelligent Lighting Control System ("ILCS") control and communications modules and other similar sub-assemblies. Suitability will include features for the correct fitting and housing of any such additional components and allow for the ready access to them for maintenance. Suitability will also cover the interface arrangements of the electronic DALI compatible enabled and accredited ballast or LED Driver assembly. Luminaires and lighting components shall be considered as including but not limited to road lighting, illuminated signs and lit bollards and assets covered by Clause 1401TS 2. (iii) above.</p> <p>Unless agreed otherwise with the Overseeing Organisation, each luminaire shall be fitted with a control and monitoring module</p>

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	<p>incorporating DALI compatible enabled and accredited lighting control and monitoring circuitry and wireless radio frequency communication technology allowing secure data exchange with the roadside base stations. The control and monitoring module shall be directly powered from the same mains supply as the asset it is controlling.</p> <p>Roadside base stations shall be provided by the Company in accordance with the functional requirements of Transport Scotland's existing ILCS. Transport Scotland will be responsible for any charges associated with the data communication for the operation of the ILCS.</p> <p>1.2. Luminaires for road lighting shall comply with BS EN 60598-2-3, and be as described as or better than specified in this clause;</p> <ul style="list-style-type: none"> <li>(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.</li> <li>(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.</li> <li>(iii) unless otherwise specified in Appendix 14/4 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.</li> <li>(iv) unless otherwise specified in Appendix 14/4 only the 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.</li> <li>(v) luminaires to be controlled by the ILCS shall be fitted with a compatible control and monitoring module;</li> <li>(vi) meet the structural design and aesthetic approval requirements of Clause 1302. Unless otherwise specified in Appendix 14/4 the external finish shall be to BS4800 RAL9007 Silver.</li> <li>(vii) a range of luminaires of varying rating shall be available in a common style/design.</li> <li>(viii) For High Intensity Discharge (HID) lighting, unless otherwise specified in Appendix 14/4 only curved glass manufactured from toughened safety glass shall be used. Flat glass HID luminaires</li> </ul>

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	<p>shall only be used in the vicinity of railways, airfields and navigable waterways or by agreement with the Overseeing Organisation. Luminaires shall be of the full cut off / low threshold increment type as agreed with the Overseeing Organisation. For LED luminaires Flat Glass is acceptable in all locations and luminaires shall have a minimum G4 classification;</p> <p>(ix) unless otherwise specified in Appendix 14/4 Elexon approved electronic ballast units shall be provided in luminaires. Luminaires using electronic ballasts shall be limited to the use of 250 Watt lamps, however LED based luminaires have no similar restriction allowing LED luminaires rated as equivalent to 400 Watt to be used.</p> <p>(x) Ballasts shall be suitable for operation over the voltage range of 210 – 250 volts. Electronic ballasts shall incorporate over temperature protection and have a power factor no less than unity. Prior to delivery of any luminaire using electronic control gear the Overseeing Organisation shall be provided by the Company with a “statement of compatibility” from the supplier of the luminaire. This statement shall detail and confirm that the electronic control gear being supplied is capable of operating over the temperature range to which it will be exposed in use within the luminaire housing and that the lamp and control gear are fully compatible with each other. The “Statement of Compatibility” shall describe the testing regime used to ensure such compatibility.</p> <p>(xi) conventional ballast units shall have a power factor no less than 0.85.</p> <p>(xii) luminaires shall incorporate some form of anti-condensation vent or similar measures to minimise moisture build-up within the luminaire.</p> <p>(xiii) all luminaires shall operate correctly over the temperature range of -20deg. C to +35deg. C.</p> <p>(xiv) luminaires may be:</p> <p>Class I where the luminaire has an integral earth terminal linked to all exposed metalwork This allows an earth connection to be made to the metalwork of the supporting structure and to the earth conductor of the supply cable. Fortuitous earth connection provided by connection to mechanical fixings shall not be relied upon.</p> <p>Or</p> <p>Class II where there is no earth terminal provided for connection of the luminaire's exposed metalwork to the circuit protective</p>

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	<p>conductor.</p> <p>(xv) 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. and incorporate an automatic disconnection of the incoming supply when opened.</p> <p>(xvi) unless otherwise specified in Appendix 14/4 the luminaire housing shall be manufactured from corrosion resistant die-cast aluminium. suitable for use in their intended environments. This shall include locations directly adjacent to the sea, e.g. at ferry terminals and similar salt-laden locations.</p> <p>(xvii) Any electrical wiring that could be subjected to heat shall be fitted with additional heat insulating sleeving.</p> <p>(xviii) Luminaires with remote control gear shall not be used unless previously agreed with the overseeing organisation</p> <p>(xix) Luminaires shall conform to the requirements of the appropriate sections of the ROHS and WEEE Regulations.</p> <p>1.3. Traffic sign luminaires shall comply with BS EN 12899 and meet the minimum requirements expressed in this clause. Furthermore traffic sign luminaires shall conform to the following sub-clauses as well any additional requirements described in Appendix 14/4:</p> <p>(i) luminaires shall use low energy, high efficiency lamps with electronic control gear. Unless otherwise agreed with the Overseeing Organisation preference will always be given to designs including LED based lamps.</p> <p>(ii) traffic sign luminaires shall be manufactured from cast aluminium unless otherwise specified.</p> <p>(iii) the external finish shall be to BS4800 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.</p> <p>(iv) For the overhung illumination of a sign:</p> <p>(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.</p> <p>(b) the sign lighting luminaire(s) shall provide efficient illumination of the sign.</p> <p>(c) all luminaires shall include integral control gear which shall be mounted on a single readily removable tray.</p> <p>(d) suitable arrangements must be incorporated to prevent un-</p>

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1.4.	<p>necessary light spillage.</p> <p>(v) For up-lighter illumination of a sign:</p> <ul style="list-style-type: none"> <li>(a) the mounting arrangement of the luminaire(s) shall incorporate a vandal and wind loading resistant anti-rotational support.</li> <li>(b) the sign lighting luminaire(s) shall provide efficient illumination of the sign.</li> <li>(c) all luminaires shall include integral control gear.</li> <li>(d) suitable arrangements must be incorporated to prevent unnecessary light spillage.</li> </ul> <p>(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</p> <p>(vii) access doors into lamp and control gear compartments on all luminaire types shall be hinged and tamperproof</p> <p>(viii) unless otherwise stated in Appendix 14/4 the mean sign luminance shall be Category I of BS EN 12899 and use high efficiency lamp(s).</p> <p>(ix) unless otherwise stated in Appendix 14/4 impact strength shall be Category 1 of BS EN 12899; and</p> <p>(x) sign lighting luminaires shall conform to the requirements of the appropriate sections of the ROHS and WEEE Regulations.</p> <p>Illuminated Traffic Bollards shall generally comply with or exceed the requirements of this clause. and may be of either a rigid or flexible design. Furthermore these bollards shall conform to the following sub-clauses as well any additional requirements described in Appendix 14/4</p> <ul style="list-style-type: none"> <li>(i) all graphics shall be high profile 'moulded-in' with a minimum life for such graphics of 5 years.</li> <li>(ii) all bollard units shall be date coded</li> <li>(iii) the bollard body shall be interchangeable with other industry standard base apparatus in all important physical and electrical parameters.</li> <li>(iv) the access cover on the base unit shall be fitted with stainless steel hinges and locking mechanism. Unless otherwise specified in Appendix 14/4 the base unit lens shall be manufactured from UV stabilised polycarbonate.</li> <li>(v) the base unit shall be cast aluminium construction with sealing to no less than IP67. The unit shall be suitable for use in all environments including directly adjacent to the sea at ferry terminals</li> </ul>

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	<ul style="list-style-type: none"> <li>(vi) the bollard base unit shall incorporate high efficient lamps compatible with the electronic control gear</li> <li>(vii) the bollard shall conform to the requirements of the appropriate sections of the ROHS and WEEE Regulations.</li> </ul>
1409TS	<p><b>1 Photo-Electric Control Units (PECUs)</b></p> <p>Delete entire clause and insert the following:-</p> <p>1.1 Photo-electric control units (PECUs) shall comply with BS 5972 1980 BS2011 for vibration and certified to EN 50081-1 EMC Emissions and to EN 50082-1. The PECU shall incorporate synchronous switching technology.</p> <p>The PECUs shall:</p> <ul style="list-style-type: none"> <li>(i) be protected against mains borne surges and spikes.</li> <li>(ii) unless otherwise agreed with the Overseeing Organisation, have NEMA type mounting sockets only.</li> <li>(iii) be of 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.</li> <li>(iv) have a power consumption of no more than 0.25Watts with a uniform operating temperature range of -20deg. C to +50deg. C.</li> <li>(v) where used to control contactors, be able to switch a continuously rectified circuit of less than 20Watts.</li> <li>(vi) date stamped and have a manufacturer's guarantee of at least 6 years.</li> <li>(vii) be designed so that in the event of a fault occurring in the unit they cause the load to be switched 'on'.</li> </ul> <p>1.2. PECUs shall:</p> <ul style="list-style-type: none"> <li>(i) be secured as appropriate to the: <ul style="list-style-type: none"> <li>(a) road lighting luminaire canopy;</li> <li>(b) top of pole located close to feeder pillar;</li> <li>(c) top of sign post;</li> <li>(d) internally illuminated sign housing; or</li> <li>(e) luminaire of externally illuminated sign;</li> </ul> </li> <li>(ii) include a delay device to prevent the lamp being switched in response to transient changes in light conditions;</li> <li>(iii) be indelibly marked with the (a) manufacturer's identification mark (b) model number and (c) switch on level;</li> </ul>

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	<p>(iv) be provided with a gasket or grommet to maintain the IP protection rating of the luminaire;</p> <p>(v) be installed to the manufacturer's instructions.</p> <p>1.3. 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 e.g. 20mph signs at school.</p>
1412TS	<p><b>1 Ballasts</b></p> <p>Delete entire clause and insert the following:-</p> <p>1.1 Ballasts and other lamp control gear, including LED lamp drivers shall be electronic and comply with Clauses 1407.2. Unless otherwise specified in Appendix 14/4 ballasts shall comply, with BS EN 61347-1, BS EN 61347-2-1, BS EN 61347-2-8, BS EN 61347-2-9 and BS EN 60921 or BS EN 60923 as appropriate and where required be tap selected to the specified operating voltage of the network. Where applicable lantern control gear shall be rated at 300volts, 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.</p> <p>1.2 The terminals shall be indelibly marked to indicate all wiring connections and operating voltages.</p>
1416TS	<p><b>1 Cut-outs, Fuse Holders, Fuses and Miniature Circuit Breakers (MCBs)</b></p> <p>Delete entire clause and insert the following:-</p> <p>1.1 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. Protection of circuits shall be by MCBs unless agreed with the Overseeing Organisation.</p> <p>1.2 Cut-outs shall be double pole and comply with BS7654.</p> <p>1.3 Terminals shall be sufficient size to accommodate the conductors as required by the installation design. All terminals shall be clearly labelled to differentiate circuits and phases.</p> <p>1.4 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</p>

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	<p>isolation the fuse carrier shall incorporate the means of neutral disconnection.</p> <p>1.5 Fuse links shall comply with the requirements of BS EN 60269-1, BS EN 60269-2, BS 646/BS 2950, or BS 1361. They shall be of high rupture capacity (HRC) type and be of a rating as specified in sub-clause 15 below.</p> <p>1.6 Miniature circuit breakers shall be in accordance with BS EN 60898 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 16KA unless back-up protection is provided allowing the short circuit current rating to be no less than 10KA. The Company shall ensure by enquiry of the Electricity Supplier that the prospective short circuit current rating, of the supply is no greater than 16KA.</p> <p>1.7 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.</p> <p>1.8 Where MCBs are intended to be used as isolating devices, a 'lock off' facility shall be provided to allow the device to be secured in the disconnected (OFF) condition.</p> <p>1.9 All single phase road lighting cut-outs shall be 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 the earth path will not be broken by the removal of the cut-out fuse carrier.</p> <p>1.10 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 25mm sq. 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.</p> <p>1.11 At columns fitted with more than one luminaire, each luminaire shall be wired and fused separately. Where a PECU is fitted to any of the luminaires then the cut-out for that luminaire shall carry the fuse for the PECU and provide simultaneous isolation of both PECU and luminaire. Each cut-out shall be clearly marked indicating the luminaire or device that it protects.</p> <p>1.12 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 apparatus such as lit bollards and signs. The supply to each spur shall</p>

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	<p>have its own dedicated circuit protection and be individually isolated by a separate fused cut-out. Where spurs are required for supplies to third parties then reference should also be made to Cl. 1401S.6.</p> <p>1.13 The fused cut-out shall be to BS7654:1997 (ESI 12-19).</p> <p>1.14 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.</p> <p>1.15 Circuit protection on lamp circuits shall be provided by high rupturing capacity (HRC) fused links complying with BS 88 category of duty 300 AC 16 rating Q1 and shall be rated to suit the lamp circuit type.</p> <p>Typical fuse rating for High pressure sodium and Metal Halide lamp types are:</p> <p>6A for 70-150 Watts 10A for 151 to 250 Watts 16A for 251 to 400 Watts</p>
1417TS	<p><b>1 Base Compartment Fixing Arrangements</b></p> <p>Delete entire clause and insert the following:-</p> <p>1.1 Electrical apparatus described in Clauses 1411 to 1416 installed within the base compartment of columns or posts shall be positioned and fixed in accordance with manufacturers' instructions and secured with corrosion resistant fixing screws.</p>
1418TS	<p><b>1 Feeder Pillars</b></p> <p>Delete entire clause and insert following:-</p> <p>1.1. Feeder pillars, forming part of a road lighting installation, are required to inter alia:</p> <ul style="list-style-type: none"> <li>(i) house the DNO service connection facilities;</li> <li>(ii) provide the electrical distribution to individual circuits and their associated circuit protection;</li> <li>(iii) provide circuit energisation where applicable under the control of an Intelligent Lighting Control System ("ILCS"), PECUs or time-clocks.</li> </ul> <p>Note: Where time-clocks are used these shall be housed within the</p>

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	<p>feeder pillars. PECUs shall be mounted on an immediately adjacent column or post as per clause 1409TS 2(i)</p> <p>1.2 Feeder pillars shall be constructed in the materials described in Appendix 14/4 and shall comply with IP54. They shall include a securely installed full sized backing board at least 15 mm thick manufactured from varnished marine plywood or other suitable non-hygrosopic material. Alternatively a purpose-designed apparatus mounting system may be used. Cable entry shall be via the root only.</p> <p>1.3 The distribution MCB or fuse enclosures shall have sufficient spare capacity to accommodate at least one extra circuit. (e.g. one single phase spare way on a single phase distribution unit) and there shall be at least 25% usable spare space on the backing board. All MCBs, fuses, isolators, switches, contactors, bus-bars and similar parts shall be clearly identified by correctly fitted permanent labels.</p> <p>1.4. 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 BS7671 using fuses to BS EN 60947-3 rated as appropriate for the consumer circuits.</p> <p>1.5 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 BS 7671 and BS 7430.</p> <p>1.6 Unless otherwise stated in Appendix 14/4, feeder pillars shall be mounted typically 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.</p> <p>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 BS 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 below 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.</p> <p>1.7 Lighting feeder pillars shall be used for the energising of the lighting apparatus and associated electrical circuits only.</p>

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	<p>1.8 Feeder pillars shall be constructed from stainless steel, hot dipped galvanised steel or aluminium to the required standard. The enclosure shall be adequately ventilated by a suitable method preventing the ingress of water, snow or foreign bodies.</p> <p>1.9 The feeder pillars shall carry a nameplate showing the manufacturers name or trade mark and the type designation or identification number of the product.</p> <p>1.10 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.</p> <p>1.11 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.</p> <p>1.12 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.</p> <p>1.13 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 agreed with the Overseeing Organisation.</p> <p>1.14 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.</p> <p>1.15 A durable warning sign indication 'Danger 415 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 &amp; 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.</p> <p>1.16 Circuit details, including details of the supply circuit 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.</p>

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	<p>1.17 All apparatus fitted within the feeder pillars shall be securely fixed. to the back board.</p> <p>1.18 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.</p> <p>1.19 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.</p> <p>1.20 The bonding conductor cross-sectional area for all lighting feeder pillars shall be not less than 10mm sq. Tri-rated.</p> <p>1.21 The inner enclosure should contain the following apparatus;</p> <ul style="list-style-type: none"> <li>(i) A single phase double pole / 3 phase &amp; neutral isolator to BS5419.</li> <li>(ii) A single phase single pole/3-phase contactor rated at BS 5424.</li> <li>(iii) A push button operated test switch accessible from within the outer enclosure and providing a timed over-ride of the photocell.</li> <li>(iv) A DIN rail fitted with BS EN 60898 miniature circuit breakers/ Modular fuse holders fitted with fuses to BS 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.</li> <li>(v) A neutral rail and an earth rail to accept the installed wiring with at least one spare termination provided on each rail.</li> </ul> <p style="text-align: center;">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.</p>
1419TS	<p><b>1 Wiring</b></p> <p>Delete entire clause and insert the following:-</p> <p>1.1. All wiring and installation of components within the column, post, illuminated sign, bollard or pillar shall conform to the requirements of the Contract and be as described within this clause.</p> <p>1.2. 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 2.5mm sq. flexible cable. This cable shall generally be to BS6500 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</p>

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	<p>column cut-out in the base compartment.</p> <p>NOTE: Under no circumstances shall domestic grade flat 'Twin and earth' cable be used for any purpose within road lighting installations.</p> <p>1.3. All wiring/cables shall be correctly colour coded throughout their length and labelled appropriately at all points of termination and at each chamber.</p> <p>NOTE : The Company's attention is drawn to BS7671:2008 with regard to harmonized wiring colours and the warning notices required should 'old' and "harmonized" wiring colours form part of a single installation.</p> <p>1.4. Unsupported lengths of cable shall be kept to a minimum and shall not be allowed to come into contact with components by their freedom of movement. Where there is more than one cable they shall be secured together at one metre intervals throughout the unsupported length. Vertical cables within posts or columns shall be adequately anchored and supported along their length and at the top of the cable run. Correctly selected and fitted plastic glands shall protect and seal all cable penetrations.</p> <p>1.5. 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 BS7671. 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.</p> <p>1.6. All unused cores shall be cut to a suitable length for safe, unobtrusive stowage and the ends sealed and insulated.</p> <p>1.7. Under no circumstances shall wiring, cables and cable tails come into direct contact with the inner surfaces of access doors or be located adjacent 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.</p>
1420TS	<p><b>1 Earthing</b></p> <p>Delete entire clause and insert the following:-</p> <p>1.1. Circuit protective and equipotential bonding conductors shall be installed in accordance with BS7671 and BS7430 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</p>

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	<p>connections shall be made using brass or stainless steel or other compatible non-ferrous nuts, bolts and washers</p> <p>1.2. A separate circuit bonding conductor not less than 10mm sq. cross-sectional area shall connect the earth terminal of the luminaire to the adjacent earth stud of the column/bracket.</p> <p>1.3. All extraneous conductive parts, as described in BS 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 10mm<sup>2</sup> 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 cross-sectional area. Earthing of lighting apparatus in general and the design and installation of earth electrodes in particular shall all be in accordance with BS7674 and BS7430.</p> <p>1.4. Where lighting pillars, columns, signs are adjacent to the same or separately supplied electrical apparatus i.e. apparatus fed from different electrical supply pillar, and these are located within 3 metres of each other, then they shall be bonded together in accordance with BS7671 Reg. 411.3.1. However in accordance with BS7671 Reg. 559.10.3.1(v) bonding is not required to adjacent metallic structures such as safety fences, handrails and similar however where lightning protection is to be provided the bonding shall satisfy BS EN 62305.</p> <p>1.5. It should also be also noted that:</p> <ul style="list-style-type: none"> <li>(i) with the exception of para. 4. above, no lighting infrastructure apparatus shall be located within 5 metres of metallic conductive parts forming part of a separately supplied electrical apparatus, such as Traffic Scotland and similar apparatus. Bonding between the metal parts of such apparatus is specifically excluded by this note in accordance with BS7671 Reg. 542.1.8</li> <li>(ii). Where an electrical supply is required to permanently power third party apparatus 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 BS7671 Reg. 411.3.1</li> </ul> <p>1.6. 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 sq. the main earth conductor is 16mm sq. The main earth conductor shall connect the main earthing terminal to the incoming supply earth.</p>

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	<p>NOTE: 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.</p> <p>Crimp connections for earth conductors shall meet the performance criteria suggested in BS 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 apparatus metalwork.</p> <p>1.7. 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 BS7671 and BS7430. 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 BS7671 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.</p> <p>1.8. 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.</p>
1421TS	<p><b>1 Underground and Ducted Cable</b></p> <p>Delete the entire clause and insert the following:-</p> <p>1.1. Cables shall have purple XLPE insulation and sheathing material i.e. coloured in accordance with National Joint Utilities Group publication "Guidelines on the positioning and colour coding of utilities' apparatus". The identification of the conductors by colour shall be as per Table 51 of BS 7671 and every core shall be identifiable by colour throughout its length. The sheathing material shall be appropriate to the ground conditions in which it will be laid. In ground that is liable at any time to become waterlogged, then the sheathing material shall have an ASTM F 1249-1 tested maximum permeability of 2.0 g.d-1-2, 90% R.H, 1 mm. The cables shall be 600/1000 V grade with steel wire or aluminium strip armouring to BS 6346 or BS 5467 and all conductors shall be of equal cross-sectional area. The Company shall provide to the Overseeing Organisation evidence that each cable length delivered to Site has</p>

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	<p>been tested at the place of manufacture and complies with the testing requirements of BS 6346 or BS 5467 according to the cable used.</p> <p>1.2. Service ducts shall be self coloured purple i.e. in accordance with National Joint Utilities Group publication "Guidelines on the positioning and colour coding of utilities' apparatus" and shall comply with Series 500 and Appendix 5/2.</p> <p>1.3. Where used cable covers for protection of underground buried cables shall comply with BS 2484 and shall be installed as described in Appendix 14/4. When cable covers are installed, marker tapes are not required.</p> <p>1.4. Cable trenches shall be excavated to the lines described in Appendix 14/4 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.</p> <p>1.5. Cables shall be laid without sharp bends and kinks and in accordance with any particular requirements in Appendix 14/4. If required, additional protection and support shall be provided as described in Appendix 14/4. 6. Where cables are laid across or within 500 mm of filter drains they shall be contained within a duct. The duct shall be surrounded with 50 mm of ST2 concrete in compliance with Clause 2602.</p> <p>1.6. Cables following the same route shall, unless otherwise described in Appendix 14/4, occupy the same trench with a clearance of 50 mm between the outer sheaths of the cables.</p> <p>1.7. Electrical supply cables shall not be installed within 500 mm of signal or communication cables or within 300 mm of HV cables, unless otherwise described in Appendix 14/4.</p> <p>1.8. Cables shall only be laid when the ambient temperature is above 0°C on a rising thermometer, and the cable has been stored at a temperature greater than 0°C for the previous 24 hours.</p> <p>1.9. Cables shall not be bent to an internal radius of less than 12 times the external diameter of the cable or less than the radius recommended by the manufacturer, whichever is greater.</p> <p>1.10. Sufficient length of cable shall be allowed for its termination. When termination does not proceed immediately following the installation of the cable, its end, with sufficient length to terminate, 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 pre-cast concrete block having a</p>

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	<p>mark as described in Appendix 14/4 indented into its top surface and recorded on the site records.</p> <p>1.11. When duct alignments differ from those of the trench the transition from one to the other shall not exceed 1:30 horizontally or vertically.</p> <p>1.12. Unless part of a temporary electrical installation cables shall not be laid in troughs Such temporary electrical installations shall be installed only with agreement of the Overseeing Organisation..</p> <p>1.13. Cables laid in a trench shall, unless otherwise specified in Appendix 14/4, be both bedded on and covered by a 100 mm thickness of lightly compacted graded sand or equivalent material passing a 2 mm BS sieve. Class 8 material complying with Table 6/1 and compacted to the requirements therein shall then be deposited to a thickness of 175 mm prior to further back-filling in compliance with sub-Clause 16 of this Clause.</p> <p>1.14. Metallic trace marker tape shall be laid above the duct or cable to permit cable detection by electronic route tracing apparatus. This shall be yellow, self-coloured PVC or polythene plastic tape for cable marking 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.</p> <p>1.15. Where cables are required to be laid in ducts the Company shall swab through the duct prior to drawing in the cables and a further draw rope. On completion of cabling, ducts shall be left with a draw rope in place and re-sealed with split plugs, or suitable alternative material, to adequately seal the ducts against the ingress of foreign matter.</p> <p>1.16. Backfilling to cable trenches shall comply with Clause 602 and to prevent damage by the ingress of foreign matter shall whenever practical be undertaken immediately after the specified operations preceding it have been completed. The Company shall backfill above the cable marking tape or duct with Class 1, 2 or 3 material complying with Table 6/1 and compacted to the requirements therein, except that he shall:</p> <ul style="list-style-type: none"> <li>(i). spread and compact the material evenly without dislodging, disturbing or damaging cables or ducts; and</li> <li>(ii). not use power rammers within 300 mm of cables or ducts.</li> </ul> <p>1.17. Where described in Appendix 2/2, buried cables shall be taken up and</p>

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	<p>removed by the Company. Conductors shall be disconnected from the apparatus in which they are terminated, the terminal screws and glands re-tightened, then the cable withdrawn clear of the apparatus.</p> <p>1.18. Unless ducts terminate at cabinets or mounting posts or columns, their ends shall be marked as described in Appendix 5/2, with marker blocks complying with sub-Clause 11 of this Clause and location posts so that their location can be clearly identified without exploratory excavation.</p> <p>1.19. 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.</p> <p>1.20. 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.</p> <p>1.21 When laid in carriageways, road lighting service ducts shall be twin walled high density polypropylene with smooth bore of 150mm in internal diameter to BS EN 50086-2-4, purple in colour and printed "STREET LIGHTING" at intervals of not more than one metre lettering throughout out its length. A minimum cover of 650mm shall be provided.</p> <p>1.22 Cable duct laid under carriageways shall consist of 2 No. 100mm 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 BS EN 50086-2-4, purple in colour and printed "STREET LIGHTING" at intervals of not more than one metre lettering throughout out its length and shall terminate in an underground draw-in chamber at each side of the carriageway.</p> <p>1.23 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 BS EN 50086-2-4, purple in colour and printed "STREET LIGHTING" at intervals of not more than one metre lettering throughout out its length. A minimum cover of 650mm shall be provided.</p> <p>1.24 Ducts shall be impervious to water, capable of being laid in temperature down to -10 degrees C and be sufficiently flexible to follow undulation in a trench bottom.</p>

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	<p>1.25 At least 75mm clearance shall be given between the cable duct and the sides of the trench and between ducts sharing the same trench.</p> <p>1.26 At least 150mm clearance shall be given between cable ducts and services pipes belonging to other Statutory Undertaker.</p> <p>1.27 At least 500 mm minimum between lighting electrical cable ducts and communications cable ducts.</p>
<b>1422TS</b>	<p><b>1 Cable Joints</b></p> <p>Delete entire clause and insert the following:-</p> <p>1.1 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 BS 6910-1 which shall be installed in compliance with BS 6910-2. The Company shall repair damaged cables by replacing the full length of the damaged cable.</p> <p>1.2 A record shall be kept to enable cable joints to be identified with the jointer responsible for the work.</p> <p>1.3 Approval is required from the Overseeing Organisation for any remedial jointing during new works.</p> <p>1.4 Jointing shall only be carried out when all materials to be used in the jointing are free from visible signs of moisture and joints shall be left protected from the weather during the curing period.</p> <p>1.5 Joints shall be adequately supported at all times. Backfilling shall not take place until the joint is fully completed in accordance with the manufacturer's instructions including curing times, and is in a fit condition to withstand any stresses which may be imposed upon it.</p> <p>1.6 Cable joint marker blocks, as described in sub-Clause 1421.11 shall be placed over the cable joint and reference measurements taken from nearby permanent features.</p> <p>1.7 All cable jointing shall be made under the protection of a specialist jointing tent.</p>
<b>1423TS</b>	<p><b>1 Armoured Cable Terminations</b></p> <p>Delete entire clause and insert the following:-</p> <p>1.1 Cables shall be individually terminated and existing cables re-terminated, and secured at switches, cut-outs and other electrical</p>

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	<p>apparatus by means of a compression type gland and, where not provided as part of the apparatus, a gland plate compatible with the apparatus material and complying with 'BS 6121-1, BS EN 50262'. All as described in Appendix 14/4.</p> <p>1.2 Earth connection to the cable armouring shall be made to the gland plate. At least one non ferrous earthing terminal compatible with the apparatus shall be provided on the gland plate.</p> <p>1.3 Overall with PVC sleeves of the same colour as the PVC over sheath. All of the conductors within the cable shall be terminated with cable lugs.</p> <p>1.4 Cable glands shall be manufactured in brass to BS 2874.</p>
1424TS	<p><b>1 Inspection and Testing to be Carried Out by the Contractor</b></p> <p>Delete entire clause and insert following:-</p> <p>1.1. Every Lighting Unit and Network, on completion and before being energised, shall be inspected and tested to verify that the requirements of BS 7671 have been met. The method of testing shall be such that no danger to persons or property or damage to apparatus can occur even if the circuit tested is defective.</p> <p>1.2. Unless otherwise agreed by the Overseeing Organisation, 3 months prior to commencing testing the Company shall submit an Inspection and Testing Method Statement, Risk assessments, and the Extent and Limitations statement, forming part of the BS7671 Electrical Installation Certificate, initial verification, The Extent and Limitations shall include inter alia:</p> <ul style="list-style-type: none"> <li>(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.</li> <li>(ii) the extent of the network fixed wiring covered by BS7671 including the point of termination within the lighting units and the point of supply (origin) for the installation.</li> <li>(iii) any specific issues relating to the inspection and testing of the particular electrical installation.</li> </ul> <p>The 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 BS7671. 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</p>

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	<p>laminated or otherwise protected against damage by moisture or handling during use.</p> <p>The Company shall undertake all required aspects of the electrical installation is sufficiently and correctly inspected and tested as required by BS7671 Part 6 and as further described in IEE Guidance Note 3 titled 'Inspection and Testing'. Without reduction to the importance of any other aspect of BS7671 Inspection and Testing the attention of persons undertaking this work is particularly drawn to the following:</p> <ul style="list-style-type: none"> <li>(i) A cable over-sheath insulation test shall be carried out prior to any other testing of the Network cables.</li> <li>(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'.</li> <li>(iii) The resistance of all earth electrodes shall be measured and recorded.</li> <li>(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.</li> <li>(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.</li> <li>(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. 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.</li> <li>(vii) The Company shall ensure that a voltage reading is taken at each feeder pillar and at the terminals of the last current-using apparatus on each circuit, with all apparatus 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</li> </ul>

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	<p>apparatus on a given circuit shall be below 223.1V (3% of 230V; BS7671:2008) at full load.</p> <p>(viii) The 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 <math>Z_s</math> measured for any circuit shall not exceed those given in BS7671 Tables 41.2 and 41.3 for 0.4 second disconnection.</p> <p>(ix) The 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 Statutory Regulations.</p> <p>1.3. 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 Company and all corrected results submitted to the Overseeing Organisation.</p> <p>1.4. The cable sheath insulation test shall be carried out using an insulation tester. The insulation resistance test of 1000 V, direct current, shall be applied and maintained for not less than one minute between the continuous cable armouring or earth conductor and the general mass of earth. The measured insulation resistance shall not fall below 1.0 Mohm for the full duration of the test. The cable sheath insulation test shall be carried out after the cable has been laid and the trench back-filled, but before jointing has taken place.</p> <p>1.5. The 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.</p> <p>1.6. The Company shall furnish the Overseeing Organisation with two copies of a certificate verifying compliance with BS 7671 upon satisfactory completion of the inspection and tests. The layout of the BS7671 Certificate shall conform to the BS7671 Certificate as provided in the TS LDS8005 Guidance Note 'Electrical Inspection and Testing of Lighting and associated Electrical Apparatus and Installations with Model Forms'. The separate certificate as described in the same Guidance Note and covering the testing of the luminaires and similar</p>

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	<p>items considered outside of the scope of BS7671 shall also be submitted. Such equipment is described In Clause 1424TS.9 below.</p> <p>1.7. The value of <math>Ze</math> 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 <math>Ze</math> maximum values. The Company shall ensure the <math>Ze</math> values are achieved by the DNO prior to acceptance of the supply on behalf of the Overseeing Organisation.</p> <p>1.8. The Company shall ensure that all test instruments have been calibrated and adjusted in accordance with BS EN ISO 9001 and come complete with calibration certificates to verify that BS EN ISO 9001 has been complied with.</p> <p>1.9. Electrical equipment not forming part of the fixed wiring of the installation shall be disconnected while carrying out BS7671 testing on the electrical installation. Items so excluded from the BS7671 inspection and testing shall be inspected and tested in accordance with the HSE publication "Maintaining portable and transportable electrical equipment" HSG107 and the "Code of Practice for In-service Inspection and Testing of Electrical Equipment" or as otherwise agreed with the Traffic Scotland Manager. The frequency of the inspection and testing of such equipment shall be appropriate for the equipment type, its frequency of use and environment in which it is used.</p>
1501A	<p><b>1 Introduction</b></p> <p>1.1 Motorway and Trunk Road Communications for the Scottish Trunk Road Network shall be referred to as Traffic Scotland Equipment. The Traffic Scotland Equipment is provided to support the provision of Traffic Scotland service and forms part of the Scottish Minister's Intelligent Transport System. All work relating to the design provision, uplifting, diversion, relocation, construction, installation, connection, testing, commissioning, integration, documentation and handover of Traffic Scotland Equipment shall comply with this Series. This Series supersedes all previously published versions of this Specification Series. For the purposes of this Series unless otherwise described in the Scottish Ministers the word "provide" or "provision" means design, uplift, divert, relocate, construct, install, connect, test, commission, integrate, document and handover to maintenance and operations.</p> <p>1.2 This document serves as the outline specification for the provision of Traffic Scotland Equipment which shall typically consist inter alia of the following elements :</p> <ul style="list-style-type: none"> <li>(a) ducting and chambers and cable management systems;</li> <li>(b) cables and all cable fittings;</li> <li>(c) cabinets and all ancillary items;</li> </ul>

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	<ul style="list-style-type: none"> <li>(d) Emergency Roadside Telephones ("ERT");</li> <li>(e) Closed Circuit Television ("CCTV") cameras;</li> <li>(f) vehicle (Traffic Scotland) detection equipment – 3 classification levels;</li> <li>(g) Scottish Roads Traffic Database ("SRTDb") vehicle detection – EuroVI classification levels;</li> <li>(h) Variable Message Signs ("VMS");</li> <li>(i) Lane and Speed Control Signalling;</li> <li>(j) Motorway Access Control ("MAC");</li> <li>(k) Journey Time ("JT") equipment;</li> <li>(l) Ramp Metering ("RM");</li> <li>(m) not used;</li> <li>(n) not used;</li> <li>(o) enforcement systems;</li> <li>(p) Weigh-in-Motion ("WIM") systems;</li> <li>(q) communications infrastructure;</li> <li>(r) mains power supply and distribution infrastructure;</li> <li>(s) Instation equipment;</li> <li>(t) hard landscaping;</li> <li>(u) transmission stations;</li> <li>(v) structural infrastructure on which Traffic Scotland equipment is mounted on.</li> </ul>
1.3	The Overseeing Organisation is Transport Scotland, an agency of the Scottish Government. The representative of the Overseeing Organisation is the Traffic Scotland Manager who is responsible for all aspects of the Traffic Scotland Equipment. Contact details for the Traffic Scotland Manager are provided in the Scottish Ministers.
1.4	The Traffic Scotland Equipment and system are unique and differ in many respects from other driver information and control systems operating within the UK such as those operated by the Highways Agency. The Company shall ensure that all parties working on any Traffic Scotland element of the Agreement take cognisance of the differences as expressed in this Series 1500 and other relevant documents.
1.5	This Series 1500 is applicable to all work undertaken under any Agreement that includes Traffic Scotland Equipment and structural infrastructure on which Traffic Scotland Equipment is mounted.
1.6	Roadside verges on or into which Traffic Scotland infrastructure or equipment is to be provided shall be of an adequate width and topology

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	<p>acceptable to Traffic Scotland. The Traffic Scotland roadside sites shall be of suitable for future maintenance activities and if required access by ERT user and shall either be finished horizontal or be of an appropriate minor single gradient.</p> <p>1.7 The design and construction of any works adjacent to a Traffic Scotland Equipment location shall be such as to adequately route surface water away from the Traffic Scotland Equipment.</p> <p>1.8 The design of safety fences, barriers and works directly adjacent to Traffic Scotland Equipment shall ensure that such works are achievable and are undertaken without the adjacent Traffic Scotland Equipment being damaged or the service provided by that Traffic Scotland Equipment being adversely affected.</p> <p>1.9 There are requirements for all Traffic Scotland Equipment to be located and suitably protected from collision and either vehicle restraint systems or passively safe infrastructure shall be provided in accordance with all relevant requirements and specifications relating to vehicle restraint systems or passively safe equipment</p>
1502A	<p><b>1 General Requirements.</b></p> <p>1.1 The Company shall carry out all such work as required by the Agreement in such a way as to comply with this 1500 Series and the Scottish Ministers.</p> <p>1.2 The NDX drawings are typical/none site specific representing the Overseeing Organisation's preferred arrangements. The Company is required to develop a design based on the principles laid down in these drawings.</p> <p>1.3 Traffic Scotland Equipment that is issued by the Overseeing Organisation is referred to as Scottish Ministers Issued Equipment in this Series 1500. Scottish Ministers Issued Equipment is listed in the Scottish Ministers. The Company, unless otherwise described in the Scottish Ministers, shall be responsible for the collection and loading of Scottish Ministers Issued Equipment from the Overseeing Organisation's stores. The general location of the Overseeing Organisation's stores is given in the Scottish Ministers. The Company shall be responsible for all effort associated with the uplifting of Scottish Minister Issued Equipment. The operating hours of the Overseeing Organisation's stores are standard office opening hours unless given within the Scottish Ministers.</p> <p>1.4 The Company shall be responsible for the management, maintenance, safe handling and safe keeping of all Traffic Scotland Equipment whether supplied by the Company or supplied as Scottish Ministers Issued Equipment from the point in time that the equipment is uplifted by the Company from the Scottish Ministers Nominated EIE Store or delivered by the Scottish Ministers to the Company's TSE Assembly Point, until the Taking Over Certificate is issued. Where Traffic Scotland Equipment is not being directly installed following it coming</p>

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	<p>into the Company's possession, the Company shall store all equipment within a secure, safe, pest proof, dry ambient warehouse environment. At the time of Scottish Ministers Issued Equipment uplift the Overseeing Organisation shall provide a record stating that the Scottish Ministers Issued Equipment is operationally compatible with the Scottish Ministers' Traffic Scotland Equipment. The Company shall prepare and issue a report and method statements detailing proposals associated with the management, maintenance and safe keeping of all Traffic Scotland Equipment.</p> <p>1.5 The Company shall provide a written request detailing what Scottish Ministers Issued Equipment is required, its type, and configuration, required date for delivery to or uplift by the Company. All Scottish Ministers Issued Equipment shall be uplifted in accordance with the arrangements agreed with the Traffic Scotland Manager and the organisation responsible for the Overseeing Organisation's stores at the times and in the manner described in the Scottish Ministers. The Company shall adjust the requested uplift time as reasonably requested by the organisation responsible for the Overseeing Organisation's stores. The Company shall retain a record of all documentation associated with requesting and uplifting Scottish Ministers Issued Equipment as described in the Scottish Ministers and such records shall form part of the records and documentation in compliance with Clauses 1504A and 1540A.</p> <p>1.6 Unless otherwise stated in the O&amp;M Works Information, the Company shall be responsible for providing written notice within 24 hours and documented evidence within three days, of any defects or damage to equipment received or uplifted from the Overseeing Organisation's store.</p> <p>1.7 The Company shall be responsible for undertaking all works associated with repairing and replacing any Traffic Scotland Equipment damaged or missing after purchase by the Company or uplifted from the Overseeing Organisation's stores. In compliance with the Agreement the Company shall be responsible for the Company's and Overseeing Organisation's costs associated with repairing and replacing any Traffic Scotland Equipment damaged or missing after purchase by the Company or uplifted from the Overseeing Organisation's stores. The period for which the Company shall be responsible and all associated costs for replacement and repairing of Traffic Scotland Equipment shall be in compliance with the Agreement.</p> <p>1.8 Prior to commencing any site work the Company shall supply to the Overseeing Organisation written information and confirmation of compliance with the Agreement for all Company supplied Traffic Scotland Equipment and Traffic Scotland related materials that will be incorporated in the O&amp;M Works. This information shall include the following details;</p> <p>(i) Detail of the manufacturer</p>

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	<ul style="list-style-type: none"> <li>(ii) The specification, safety regulations and statutory requirements the equipment is compliant with</li> <li>(iii) The manufacturers' product number</li> <li>(iv) A specification sheet</li> <li>(v) Transportation, handling and storage requirements</li> <li>(vi) Installation instructions,</li> <li>(vii) Safety information for installation and operation</li> <li>(viii) Maintenance requirements.</li> <li>(ix) Operational Instructions</li> <li>(x) De-commissioning information</li> </ul>
1.9	<p>The Company shall provide all self certification, production acceptance testing and factory testing documentation and test results for each item of active/operational Traffic Scotland Equipment that the Company has to provide in accordance with the Scottish Ministers. The testing undertaken shall be no less than that detailed in the Scottish Ministers.</p>
1.10	<p>In order to allow time for the integration, testing and commissioning of the Traffic Scotland Equipment, the Company shall programme the O&amp;M Works or sections thereof so that the Traffic Scotland Equipment is available for integration, testing and commissioning for a period of time before the O&amp;M Works or sections thereof is open to the road user and such period of time shall be in compliance with the testing requirements highlighted within the Scottish Ministers.</p>
1.11	<p>The Company shall provide information, access and appropriate facilities for and to the Electricity Supply Company and communication suppliers as required by them to fulfil their obligations to undertake service connections, disconnections, repairs and reconnections, in compliance with the Agreement. The Company shall provide information, access and facilities for and to the Scottish Ministers and other Traffic Scotland Service providers as required by them to fulfil their appropriate obligations associated with the O&amp;M Works in compliance with the Agreement. The Company shall provide site supervision resources at all times.</p>
1.12	<p>The Company shall provide all drawings, documentation and certification in compliance with the Agreement</p>
1.13	<p>The Company shall only employ personnel, sub-contractors and consultants qualified and experienced in the provision of Intelligent Transport Systems and associated Internet Protocol (IP) communications systems. The Company shall provide the Overseeing Organisation with full details of the qualifications and experience of all personnel, sub-Contractors and consultants whom he proposes to employ. Such details shall be provided in writing, 56 days prior to the commencement of any Traffic Scotland Equipment work or at any earlier date as required to comply with the Scottish Ministers.</p>

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	<p>1.14 The Company shall be responsible for the appropriate disposal of all waste, existing equipment and materials, in compliance with TR1100, the WEEE Regulations and any additional obligations required for compliance with the Scottish Ministers. The Company shall maximise recycling of all forms of waste arising from existing equipment materials and shall detail such recycling measures in the Project Environmental Plan.</p> <p>1.15 The Company shall comply with all energy generation requirements as detailed in the Scottish Ministers.</p> <p>1.16 Unless stated otherwise in the Agreement, the Company shall prepare specific method statements for all work to be undertaken under the Agreement and provide such method statements to the Overseeing Organisation for comment at least 28 days prior to the specific type of work commencing that the method statement refers to.</p>
1503A	<p><b>1 Materials, Equipment and Workmanship</b></p> <p>1.1 The Company's Electrical workmanship, materials and equipment supplied shall comply with current BS 7671 Requirements for Electrical Installations (IEE Wiring Regulations), the Electricity at Work Regulations and the Electricity Safety, Quality and Continuity Regulations (ESQCR).</p> <p>1.2 Unless otherwise described in the Scottish Ministers, Traffic Scotland Equipment shall not share any electricity supply with any other equipment.</p> <p>1.3 All Traffic Scotland Equipment provided by the Company shall comply with TR1100, and subsequent Scottish amendments to TR1100 and shall be fitted with such mounting, support and access arrangements to allow for compliant installation, maintenance and operation within the Traffic Scotland Equipment cabinet space or on post, mast, bracket or gantry as made available by the Overseeing Organisation or Company.</p> <p>1.4 The Company shall take full account of future maintenance requirements of all Traffic Scotland Equipment to be undertaken by the Scottish Ministers. When taking account of future maintenance the Company shall comply with the requirements of Construction (Design and Management) Regulations 2007, or subsequent revisions, and the need for the Overseeing Organisation to maintain journey time reliability through minimising traffic management and meet all specific objectives of the Traffic Scotland Service as described in the Scottish Ministers.</p> <p>1.5 The minimum general technical and Quality Control requirements for work carried out on the Traffic Scotland Equipment shall be as those set out in the document TR1100 and subsequent Scottish amendments to TR1100 and within the Company's Quality Plan and method statements. The method statements shall ensure outputs are delivered that are in compliance with this Series 1500 and the Scottish Ministers. The Company's Quality Plan shall include reference to a recognised</p>

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	<p>and current workmanship standards document and the Company shall comply with such workmanship standards and the Company's method statements.</p> <p>1.6 A listing of Standard Drawings and other Specifications to be supplied to the Company and used for this Agreement is given in Appendix 0/4 of this Series 1500. The Scottish Ministers details all Agreement specific drawings and documents applicable to this Agreement.</p>
1504A	<p><b>1 Site Records</b></p> <p>1.1 The Company shall keep a daily record in duplicate in a clear and legible form of all work carried out for Traffic Scotland Equipment as it proceeds. One copy of the daily records shall be kept available on site for inspection by the Overseeing Organisation during the Agreement and shall form part of the overall documentation package as detailed in the Scottish Ministers to be handed to the Overseeing Organisation for record purposes. All design phase records and design information shall be kept available on site for inspection by the Overseeing Organisation during the Agreement and shall form part of the documentation as detailed in the Scottish Ministers to be handed to the Overseeing Organisation for record purposes. As a minimum the following information shall be recorded by the Company:</p> <ul style="list-style-type: none"> <li>(i) Duct locations including depth, offset from carriageway edge, number and size of ducts and duct material, duct joints/seals used, ducted network layout, infill material used, record sheets showing dates and results of mandrelling and pressure testing</li> <li>(ii) Chamber locations including type, depth, incoming and outgoing ducts, type of chamber cover, and duct plugs or duct sealing method used</li> <li>(iii) Cabinet locations, configuration and type</li> <li>(iv) Cabinet and cable identifiers</li> <li>(v) Route, length and type and cable drum number of each individual length of installed cable</li> <li>(vi) Position of Electricity Supplier supply points together with Electricity Supplier name and Electricity Supplier provided information as detailed in NDS9551 "Requirements for Electricity Supply to Traffic Scotland and Associated Equipment Sites"</li> <li>(vii) Position of any private communications interfaces together with private wire supplier name, type identifying no, circuits records, capacity and capability.</li> <li>(viii) Within an electronic spreadsheet all Traffic Scotland Equipment within the Site shall be logged and contain the Traffic Scotland Operational ID, the Ordnance Survey grid reference of all Traffic Scotland Equipment, configuration, addressing and serial numbers, site reference/Operational ID and Traffic Scotland</li> </ul>

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	<p>marker post reference and cross sectional position with kerbline offsets of all installed Traffic Scotland equipment including all equipment within cabinets, racks and buildings. This will form part of an overall Traffic Scotland Equipment Inventory. The means of establishing the identifier for Traffic Scotland Equipment is described in the Scottish Ministers. Both the Company's identification method and final chainage/Traffic Scotland Operational ID shall be provided within the same document.</p> <p>(ix) Details regarding the removal only and removal and re-siting of existing Traffic Scotland Equipment. These records shall detail the original location, the date it was made disused and the method of disposal of any Traffic Scotland Equipment.</p> <p>(x) Details of all works undertaken in the Traffic Scotland Control Centre (TSCC), transmission stations and any other location where Traffic Scotland Equipment is provided so that the necessary as built records can be prepared and in compliance with the Scottish Ministers.</p> <p>(xi) Any additional requirements detailed in the Scottish Ministers.</p> <p>(xii) The Company shall maintain an up to date record of all equipment and cable provided by the Overseeing Organisation as detailed in the Scottish Ministers.</p> <p>(xiii) At a minimum, in an electronic spreadsheet, a record of requests for, uplift, storage and installation, integration, commissioning, testing and handover of Scottish Ministers Issued Equipment and Company supplied Traffic Scotland Equipment so that there is an up to date understanding of the current status of all Traffic Scotland Equipment</p> <p>(xiv) Current and historic equipment calibration records.</p>
1505A	<p><b>1 Provision of Cabinets and Ancillary Items</b></p> <p>1.1 All cabinets shall be manufactured using aluminium or stainless steel unless described otherwise in the O&amp;M works Information and shall be painted using a paint system suitable for the cabinet material and complying with the 1900 Series. The top coat exterior colour shall be Slate Grey RAL 7015. Ancillary Items shall be provided as detailed in the Scottish Ministers.</p> <p>1.2 All locking mechanisms shall be stainless steel and shall use a form of lock and key that is compatible with existing Traffic Scotland Equipment cabinets. Where dissimilar materials will be encountered, suitable barriers or gaskets shall be supplied to prevent corrosion or galvanic action resulting from the direct contact of dissimilar metallic materials.</p>

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1506A	<p><b>1 Cables</b></p> <p>1.1 Traffic Scotland cable types shall be in compliance with the Scottish Ministers.</p> <p>1.2 Other than cables used for internal wiring of cabinets and equipment, non-armoured communications cables and mains power cable shall not be used. Cables that are only located within cabinets and racks shall be referred to as wiring.</p> <p>1.3 Unless otherwise described in the Scottish Ministers, the Company shall be required to submit reasons to the Overseeing Organisation for any installations requiring the use of mains power cable with conductors larger than 25mm<sup>2</sup>. If such reasons are justifiable the Overseeing Organisation shall approve the use of conductors larger than 25mm<sup>2</sup> otherwise the request shall be rejected and a compliant design shall be made by the Company.</p> <p>1.4 Each drum of cable delivered to the Site shall have quality inspection certificates attached to each flange in accordance with the relevant cable specification. The Company shall ensure that the certificate relates to the cable to which it is attached. The certificate shall form part of the Site Records and a copy shall be given to the Overseeing Organisation prior to the installation of the cable. Before installing armoured communication cables, the Company shall test and accept the integrity of the sheath in accordance with cable test specification MCG1022 (for copper cables) or MCG1055 (for fibre cables). All cable test results shall form part of the Site Records (Clause 1504) of and a copy of all cable test result shall immediately, on completion of each cable test, shall stored with the Site Records and be provided to the Overseeing Organisation. The Company shall include the necessary hold points within the Quality Plan for the immediate provision of cable test results. The location in the ground of cable lengths by reference to their drum numbers shall be kept with the daily records in compliance with Clause 1504A.</p> <p>1.5 All underground Traffic Scotland Equipment cables shall be installed in ducts.</p> <p>1.6 The outer sheath of all Traffic Scotland Equipment cables shall be coloured black.</p> <p>1.7 The Company shall return part used drums of cable to the Company's site compound area for subsequent use. Part used drums shall be clearly marked and kept separate from unused drums. The Company shall keep and maintain a register of all cable drums; the register shall for each cable drum include the cable drum number, cable size and the length(s) of cable removed. Surplus cable lengths shall be neatly coiled or drummed as appropriate and the Company shall record the length and other details as for drummed cable specified above. Cable ends will be sealed in accordance with NDX Drawing NDX1061-00.</p> <p>1.8 The Company shall be responsible for arranging with the cable supplier</p>

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	<p>for the collection of empty cable drums where the cable supplier offers such a service. The Company shall provide a record of all drums collected. Where no collection of empty cable drums is offered by the supplier the Company shall then offer the empty cable drums to the cable supply industry otherwise the Company shall dispose of the empty cable drums in an environmentally friendly manner and shall confirm the method of disposal to the Overseeing Organisation.</p>
1507A	<p><b>1 Cable Installation</b></p> <p>1.1 All cables shall be laid in accordance with this Clause.</p> <p>1.2 Cables shall only be laid when the ambient temperature is above 0° C on a rising thermometer, and the cable has been stored for at least the previous 24 hours at a temperature greater than 0° C.</p> <p>1.3 Sufficient length of cable shall always be installed to allow for correct cable termination and provision of service loops all in accordance with Clause 1507.1.18A. When termination does not proceed immediately following the installation of the cable, the cable ends shall be protected from damage and sealed against the ingress of moisture in accordance with drawing NDX1061-00.</p> <p>1.4 The Company shall not install cables into ducts until the duct mandrel testing and pressure tests have been completed and stored with the daily records as described in Clause 1504A. The Company shall make the completion of the mandrel and pressure test a hold point in the Company's quality plan. Furthermore the Company shall satisfy himself that ducts are, in all respects, suitable for cable installation prior to the installation of cables.</p> <p>1.5 No cable shall be left exposed at the end of any work period.</p> <p>1.6 In the event of any damage whilst cables are being installed, the whole of the length of cable shall be removed, replaced or repaired, reconnected and re-tested at the Company's expense prior at the earliest possible date. All cable repairs shall be at the discretion and to the satisfaction of the Overseeing Organisation.</p> <p>1.7 Every cable shall be permanently labelled using plastic cable markers (Critchley type or equivalent) to identify the destination of the cable in accordance with the drawing NDX1061-00 to ensure its unambiguous identification immediately following its installation. The cable markers shall be near to the cable terminations and visible within the cabinet.</p> <p>1.8 The Overseeing Organisation shall be provided with the opportunity to witness the installation of all cables and the Company shall provide an indication to the Overseeing Organisation of where cable installation will take place at least 14 days prior to the cable installation unless otherwise detailed in the O&amp;M Works Requirements.</p> <p>1.9 For duct installations cables shall be drawn into cable ducts and chambers that have been installed in compliance with Clauses 1530A, 1531A and 1532A. For cable tray or similar cable management</p>

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	<p>installations the cable installation shall be in accordance with this Clause 1507A.</p> <p>1.10 Unless otherwise described in the Scottish Ministers Requirements, power supply cables shall not share the ducts with longitudinal communications cables. For power supply cable runs less than 50 metres, a relaxation has been permitted to allow shared ducts for power and communications cables. For power cable runs greater than 50 metres a separate duct shall be installed for the power cable which at no point is less than 0.5 metres from the ducts containing communications cabling.</p> <p>1.11 Cables shall be installed from a central chamber point outwards using a static mechanical winch fitted with an adjustable clutch, the setting of which shall ensure that at no time during the drawing of cables will the maximum longitudinal mechanical cable loading be exceeded. A copy of the current calibration certificate relating to the winch shall be provided to the Overseeing Organisation prior to use and shall also be held with the daily records in compliance with Clause 1504A.</p> <p>1.12 The ducts shall be lubricated during installation using a suitable water based, biodegradable lubricant. Such lubricant shall be compatible with all elements of the installed cable and duct infrastructure. The draw cord shall not be used for cable installation. The Company shall use the draw cord to pull through a purpose made cable pulling rope which shall then be used for cable installation. The cable pulling rope shall be attached to the cable by means of a pulling eye fitted to a stocking (copper and power cable) or a pulling eye attached directly to the central strength member (fibre cable). In all cases the Company shall attach a swivel between the cable pulling rope and the pulling eye.</p> <p>1.13 Purpose made bell-mouths shall be fitted to the exit and entry of every duct, including all intermediate points, prior to the commencement of cable installation. A purpose made cable chute shall be used at the cable entry point to the network. Also, during cable laying purpose made rollers shall be temporarily secured to the chamber cover frame to ensure the cable sheath is protected from contact with the frame metal. Cable guides shall be used to support the cable at all intermediate chambers through which the cable is being installed.</p> <p>1.14 Where intermediate chambers exist on a cable route, the cables shall where practical, be installed through these chambers in one operation; the Company shall ensure that an operative is present at every such chamber to ensure the safe installation without damage to the cable. Where cables pass through intermediate chambers, the Company shall, immediately after installation, label each cable with the destination of the cable and chamber or equipment reference as appropriate approximately 150 mm from the entry and exit points of the chamber. The type of labelling to be used shall comply with drawing NDX1061-00.</p> <p>1.15 Where more than one cable is to be installed in a duct, before the second cable is pulled the Company shall ensure that the duct is</p>

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	<p>unobstructed and the cable pulling rope to be used does not pass around the existing cable. If the Company cannot ensure the cable pulling rope is not around the existing cable the Company shall introduce a new pulling rope by using rods or other means independent of the existing draw rope. Where multi-pair copper and optical fibre cables are to be installed into the same duct, the multi-pair copper cable(s) shall be installed first.</p> <p>1.16 Optical fibre cables shall additionally be marked at intervals of 500 mm along their length, inside chambers. If the cable sheath is not indelibly marked during manufacture the marking shall be added using 25 mm wide, yellow PVC adhesive tape or alternative fit for the purpose.</p> <p>1.17 Cables shall not be bent to an internal radius of less than 12 times the external diameter of the cable or the radius recommended by the manufacturer, whichever is greater.</p> <p>1.18 Unless otherwise described in the Scottish Ministers Requirements, all fibre optic and copper communications cables shall be provided with service loops. These service loops shall be installed in a Type 'C' chamber located at each copper or fibre termination pillar of sufficient dimensions to ensure the cable is not exposed to bends below the minimum bending radius. Each loop shall be made of a minimum of 3 metres of each cable and comply with drawing NDX1063-03.</p> <p>1.19 Unless otherwise described in the Scottish Ministers Requirements or required by the Overseeing Organisation, no uncoated metal cable supports shall be fitted within the chambers. All metal supports shall be plastic coated or similar.</p> <p>1.20 The Company shall ensure that on completion of the cable installation works a draw cord is installed in each duct and both ends secured within the terminating chambers or enclosure.</p> <p>1.21 The use of verge located cable troughs shall not be permitted without the specific written authority of the Overseeing Organisation unless used in temporary situations to provide continuity of service. Such written authority shall only be provided where the Company can provide evidence of constraints that would prevent the installation of ducts.</p> <p>1.22 In above ground situations cables shall be installed on cable management systems such as ladder type cable trays or trunking or troughs. The cable management systems shall prevent the cables being bent to a diameter less than that specified in Clause 1507.1.17A. No cables in an external environment shall be left exposed and cable tray lids and trunking covers shall be provided to protect the cables from physical and environmental damage. All cable tray lids and trunking covers shall be positively retained using suitable fixings. In situations where the cable management system covers and lids could fall and cause injury or damage the covers and lids shall be provided with stay chains or wires to prevent the covers and lids falling. On horizontal cable management systems the cables shall be tied to the cable management system at intervals not exceeding 5 metres and at points</p>

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	<p>where the cables change direction. On vertical cable management systems the cables shall be tied to the cable management system at intervals not exceeding 500mm and shall be tight enough to provide cable strain relief. The support and attachment mechanisms for the cable management systems shall be of sufficient strength to support the calculated cable mass and the spacing of the support and attachment mechanisms shall be at intervals that will only allow a maximum deflection of 10mm in the cable tray or trunking. All cable management system parts, fittings supports and attachment mechanisms shall be protected from corrosion and shall be fit for purpose for at least 30 years within the environment they are installed.</p> <p>1.23 Cables shall be routed within masts and posts.</p>
1508A	<p><b>1 Installation of Cabinets – General items</b></p> <p>1.1 Cabinet types shall be those as described in the Scottish Ministers Requirements.</p> <p>1.2 The Company shall provide and install paved areas around cabinets together with access paths, steps and hard standings in accordance with Clause 1539A. With the cabinet door fully open a minimum 700mm clearance shall be provided between any the edge of the cabinet door and any retaining wall, fence, embankment or cutting. The 700mm clearance does not take into account the required working width and access requirements and such requirements shall be included in the overall clearance between cabinets and adjacent features.</p> <p>1.3 The Company shall install foundations and erect cabinets in accordance with the appropriate NDX or Agreement Specific Drawing.</p> <p>1.4 Unless otherwise described in the Scottish Ministers Requirements or where Common Equipment Cabinets (CECs) are utilised, cabinets shall be situated in groups located in a consistent sequence as shown typically in NDX1063-00.</p> <p>1.5 Cabinet doors shall be orientated to provide the safest possible environment for roadside maintenance staff and wherever possible cabinets shall be orientated so when the doors are open they provide protection from spray from vehicles. Cabinet doors shall be capable of opening and closing without being fouled by paved area or access paths or steps.</p> <p>1.6 Where cabinets are to include a resin seal then after completion of the terminations and testing, but before the addition of gravel, the entry and exit ducts into the base of the cabinets or below the cabinets shall be sealed with expanded foam to prevent the ingress of soil, pea gravel and water into the duct ends. The internal void within the plinth or base shall then be filled with 6mm-pea gravel to the level shown on the relevant cabinet drawing. Furthermore the base of each cabinet shall additionally be resin sealed typically in accordance with drawing NDX1002-01 or specific Agreement Drawing. To achieve the required resin seal the duct ends shall be above the finished level of the resin</p>

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	<p>seal by a minimum of 10mm and a maximum of 30mm. The resin seal shall be poured to provide a waterproof seal to all cables and finished to provide a smooth and level surface.</p> <p>1.7 For CEC cabinets and similar where cable entry takes place via penetrations through a suspended metal base plate then correct and compatible glands shall be used in accordance with the cabinet manufacturer's instructions.</p> <p>1.8 The Company shall keep the interior of cabinets free from moisture and dirt. The Company shall ensure that the doors of each cabinet are closed and properly secured after the installation of Traffic Scotland Equipment in the cabinet and after the completion of any other work.</p> <p>1.9 The Company shall ensure that all enclosures and cabinets, following the drilling cutting or removal of cable entry knockouts, maintain the manufacturer's quoted IP Classification ratings and are cleaned of all waste, swarf and surplus material prior to any further work being undertaken. Where such drilling and modification of an enclosure and cabinet causes removal or damage to any protective coating, the coating shall be made good in accordance with the manufacturer's instructions and/or in accordance with Series 1900.</p> <p>1.10 The Company shall ensure that power is available and all cabinet environmental control equipment is tested, commissioned and operational before any Active Equipment is installed in the cabinet.</p> <p>1.11 Power supply distribution and protection circuits shall be housed in cabinets. The power supply cabinets are as detailed in drawings NDX1011-06, NDX1011-07 and NDX1011-08. The layout of the supply distribution and protection circuits shall be as detailed in the drawings. The circuits detailed on the NDX Drawings are shown for example only and the Company shall provide power schematic layout drawings in a format as agreed with the Overseeing Organisation. The Company shall also ensure that this work conforms to the requirements of the BS7671.</p> <p>1.12 Where cabinet type 600(S) is used, they shall be installed as shown on drawings in NDX1002 series. The Company shall install such wiring and supports to accommodate equipment to be housed in accordance with the Agreement. Where a termination frame arrangement is required, the frame shall be wired using 0.5 mm single stranded copper twisted jumper wire for the links. Where appropriate the frame can be wired off-site. All wiring shall be mechanically supported and retained using suitable ties or cord and terminations shall conform to the relevant sub-clause of Clause 1513A and shall satisfy the requirements of the applicable Workmanship Standards Manual that forms part of the Quality Plan.</p> <p>1.13 Where specialist cabinets or CECs are used, they shall be installed in accordance with the Agreement Drawings and/or manufacturer specific installation requirements.</p>

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1509A	1	<b>Gantries for Overhead Equipment</b>
	1.1	Where required to be installed, the Company shall provide Gantries in compliance with the Scottish Ministers Requirements.
1510A	1	<b>Emergency Roadside Telephones</b>
	1.1	The Company shall install HA type 354 Emergency Roadside Telephones including foundations, posts housings and handsets in compliance with this Series 1500 and the Scottish Ministers Requirements. NDX Drawing NDX1049-02 provides further information about the provision of Emergency Roadside Telephones. The layout for each site shall be agreed by the Overseeing Organisation.
	1.2	All non-operational Emergency Roadside Telephones shall be covered with purpose made bags displaying the words 'Not in Use' until such time as the telephones have been commissioned and are available for use by the public.
1511A	1	<b>Marker Tape</b>
	1.1	All ducts installed underground shall have their position indicated by the use of detectable marker tape. Unless otherwise described in the Scottish Ministers such marker tape, as described below, shall be buried in the trench above the cable/duct as detailed in NDX1063-00.
	1.2	Marker tape shall be manufactured from self coloured thermoplastic material not less than 150 mm wide; it shall have a metallic insert or backing which will allow detection by electronic route tracing equipment. The detectable metallic component and the form of tape construction shall be either: <ul style="list-style-type: none"> <li>(i) Stainless steel wire or wires with a minimum total cross sectional area of 0.30 mm sq. laid in a sinusoidal wave form or stainless steel strip with minimum dimensions of 10 mm wide and 100 micron thick. The stainless steel wire or strip shall be sandwiched in between two layers of thermoplastic tape with a combined minimum tape thickness of 150 micron or bonded to one layer of thermoplastic tape with a minimum thickness of 150 micron.</li> <li>(ii) Aluminium foil with minimum dimensions of 50 mm wide and 9 micron thick totally enclosed in between two layers of thermoplastic tape. The combined thickness of the two tape layers shall be a minimum of 400 micron.</li> </ul>
	1.3	Joints between successive lengths of tape shall be made using crimps or clamps such that the electrical continuity and tensile strength of the tape is maintained. The joint shall be protected from corrosion and attack from ground chemicals.
	1.4	The wording on the marker tape shall read "CAUTION COMMUNICATIONS/ POWER CABLES BELOW". The wording shall occur at intervals up to a maximum of 1m apart. The letters of the wording shall be a minimum of 30 mm high with a minimum of 5 mm

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	<p>line thickness</p> <p>1.5 Marker tape shall be yellow in colour, with wording in black.</p>
1512A	<p><b>1 Provision of and Installation of Ancillary Items</b></p> <p>1.1 Unless otherwise described in the Scottish Ministers Requirements, the Company shall provide all ancillary items forming part of the Traffic Scotland Equipment as required to complete the O&amp;M Works.</p> <p>1.2 The Company shall be responsible for all provision associated with ancillary items of Traffic Scotland Equipment at all locations where such ancillary items are required unless otherwise described in the Scottish Ministers Requirements.</p>
1513A	<p><b>1 Jointing and Termination of multi-pair communications and feeder Cables</b></p> <p>1.1 No permanent multi-pair communications cable underground joints are permitted on Traffic Scotland installations. Temporary above and below ground joints in damaged operational cables shall be allowed until the full length of damaged cable is replaced. Repairs to operational cables shall be undertaken immediately after the damage has occurred. Cable replacement shall take place as soon as possible. Unless otherwise described in the Scottish Ministers Requirements the Company shall be responsible for all cable repairs and replacement.</p> <p>1.2 All permanent multi-pair communication cables joints and terminations shall take place with a cabinet except in the loop tail to feeder cable joints as described in Clause 1513.1.3A.</p> <p>1.3 The Company shall use the type of cable joints between detector loops tails and feeder cables shall be as detailed in NDX1063-04 and shall comply with Clause 1523A of this 1500 Series. The loop tail and feeder cable joints shall be installed in loop roadside chambers in accordance with NDX1063-04. The conductors shall be secured by tightening the screws with a torque screwdriver to within the range 0.4 to 0.6 Nm. The conductors shall be of sufficient length to facilitate routine maintenance and allow for four subsequent re-terminations. Care shall be taken at all times to maintain correct pairing. The Company shall use proprietary cable markers clearly identify all cables and cable cores by using correctly fitting labels at both ends. To terminate multi-pair cables in cabinets, the outer SWA shall be removed at the gland plate and the inner sheaths at the highest point within the frame. This shall be carefully removed from the cable ends to reveal the pairs of insulated conductors. All surplus jelly shall be removed by the use of a clean dry cloth taking care not to stretch the insulation, and any fluid substance to aid the cleaning process shall have had the prior approval of the cable manufacturer and be shown to have no detrimental effect on the cable or, if applicable, the jointing system.</p> <p>1.4 Cables shall be glanded and dressed neatly and routed within the</p>

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	<p>cabinet with proprietary pair ties and pair identification markers in a neat and orderly manner and shall be terminated in compliance with the pair allocation tables as detailed in the Scottish Ministers Requirements. The Company shall route the incoming and outgoing cables to vertically align the cables gland plate position with the point they enter/leave the cabinet</p> <p>1.5 The lay of the cable shall be maintained up to the termination position. All conductor pairs shall be identified by means of a numbered plastic sleeve or collar.</p> <p>1.6 Conductors shall be terminated in terminal blocks complying with Clause 1514A. The conductors shall be secured by tightening the screws with a torque screwdriver to within the range 0.4 to 0.6 Nm. The conductors shall be of sufficient length to facilitate routine maintenance and allow for four subsequent re-terminations. Care shall be taken at all times to maintain correct pairing. The Company shall clearly identify all links by using correctly fitting labels at both ends.</p> <p>1.7 Where the Company is required to joint or terminate cables onto existing operational cables, the Company shall comply with clause 1522A.</p> <p>1.8 Links shall be installed and connected using, as appropriate, the insulated conductors of multi-pair/0.9 mm cable with its outer sheath, armour and inner sheath removed. The links shall be of sufficient length to facilitate routine maintenance and allow for four subsequent re-terminations and shall not obstruct any other accessory. The Company shall maintain multi-pair colour coding so that colour code duplication does not occur. Care shall be taken at all times to maintain correct pairing. Unused ends of all conductors shall be neatly tied back.</p> <p>1.9 Where the Company requires to terminate multi-pair communication cables in existing multi-pair communication cable termination cabinets or cabinets which contain operational Traffic Scotland Equipment the Company shall comply with Clause 1522A.</p>
1514A	<p><b>1 Cable Connectors</b></p> <p>1.1 Cable connectors shall be as described within the Scottish Ministers Requirements and be of a suitable industry standard for the cable type and intended use. Where required, the connectors shall be provided with suitable retaining clips to prevent vibration causing loosening of the connection.</p>
1515A	<p><b>1 Jointing and Termination of Fibre Optic Communications Cable</b></p> <p>1.1 Fibre Optic Communication cables shall be jointed and terminated in Common Equipment Cabinets (CEC), Type 600(S) or within transmission stations using standard 1U 19" termination units and associated break out boxes.</p> <p>1.2 Within existing Transmission Stations, the Company shall use the</p>

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	<p>existing fibre optic cable jointing and termination facilities or provide the same as existing fibre optic cable jointing and termination facilities if the existing facilities do not have the capacity to accommodate the fibre optic cable being provided in compliance with the Scottish Ministers Requirements.</p> <p>1.3 Where fibre optic cables are required to terminate within a non environmental enclosure then the cables shall be terminated in an approved hermetically sealed box containing silica gel to prevent damage due to the occurrence of moisture. The fibres shall be fusion spliced and protected from mechanical strain. The fusion splicing shall not cause losses greater than that detailed in MCG 1055</p> <p>1.4 Unless required for equipment connection, all joints shall be permanent, fusion spliced type.</p>
1516A	<p><b>1 Termination and Jointing of Power Supply Cables for Traffic Scotland Equipment</b></p> <p>1.1 Underground joints may in limited circumstances be permitted on Scottish Motorways Communications system but only with the specific approval of the Overseeing Organisation and in compliance with NDS 9565 "Guidance on the use of standard Traffic Scotland termination pillars"</p> <p>1.2 Termination of power supply cables shall be undertaken in accordance with good working and recognised electrical engineering practices. Prior to commencing with power supply terminations the Company shall deliver to the Overseeing Organisation method statements and a Scottish Ministers Issued Equipment power cabinet fully terminated and complete as evidence of the workmanship that will be provided as part of the Works</p> <p>1.3 Where the Company requires to terminate power supply cables in existing power supply cabinets or cabinets which contain operational Traffic Scotland Equipment the Company shall comply with Clause 1522A.</p>
1517A	<p><b>1 Earthing and Bonding</b></p> <p>1.1 The earthing and bonding of the Traffic Scotland installations shall comply with the recommendations contained in BS7671 and BS7430. Where required, further details of the earthing and bonding requirements may also be given in the Scottish Ministers Requirements.</p> <p>1.2 The area of gland plates or boxes, which will come into contact with a cable gland shall be cleaned prior to fitting of all paint and, in existing equipment any corrosion, before a cable gland is fitted. Once the gland is fitted, exposed metalwork of gland plates or enclosures where required, shall be suitably treated to protect against corrosion. Furthermore an appropriate earth tag forming part of the gland kit, and retained by the gland fixing nut, shall also be installed and connected to</p>

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	<p>the main earth bonding point within the cabinet using correctly sized cable and crimps as required by the Electricity Safety, Quality and Continuity Regulations. This bonding cable shall be copper and have insulation coloured green/yellow – also see Clause 1517.1.5A below.</p> <p>1.3 All connections to bolted fixtures shall be made through crimped type lugs and using correctly sized bolts with appropriate washers and lock nut all as NDX1002-01</p> <p>1.4 All Traffic Scotland Equipment cabinets grouped in close proximity shall be effectively earth bonded together in accordance with the requirements of BS7671 Requirements for Electrical Installations. The Company shall introduce correct and adequate earth bonding arrangements particularly when the cabinet group includes lighting or similar cabinets energised by a different Electricity Supply Company supply to the Traffic Scotland Equipment. It is the Company's responsibility to design the installation to ensure no high fault currents from earth faults on other systems enter the Passive Network.</p> <p>1.5 In all Traffic Scotland Equipment cabinets all SWA gland earth tags shall be installed within the cabinet and bonded together and to the cabinet earth stud using green/yellow insulated bonding wire unless otherwise required by applicable Regulations. This requirement applies to all SWA Communications and Power Supply cables.</p> <p>1.6 At all equipment sites where a power supply is installed it is a requirement that an earth rod be installed as follows:</p> <ul style="list-style-type: none"> <li>(a) If the Termination Pillar contains the DNO's cut out, then an earth rod will be installed adjacent to the Termination Pillar in accordance with the requirements of BS7671 and BS7430 to act as the Electricity Supply local protective earth.</li> <li>(b) Where Traffic Scotland equipment includes a mast or support introducing an increased risk of damage by lightning then a earth rod shall be installed adjacent to the cabinet as a communications local earth. The earth impedance of the earth rod shall be no greater than 10 ohms.</li> </ul> <p>1.7 All pillar, cabinet and Signal pole doors shall be earth bonded to the main structure chassis using a flexible 6 mm sq. green/yellow insulated conductor cable reference. The bonding conductor shall be sufficiently long as not to be strained when the doors are fully extended. Where crimp terminals are used these shall be sound in assembly and protected from strain typically using an insulated clip or similar retaining arrangement.</p>
<b>1518A</b>	<p><b>1</b> <b>Cable Testing</b></p> <p>1.1 Armoured communications cables shall be tested by the Company in accordance with the Specifications MCG1022 (for multi-pair communications cable) and MCG1055 (for optical fibre cable). The Company shall undertake tests on cables as detailed in this document</p>

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	<p>and the Specification for Highway Works. Appendix 1/5. Scottish modifications to the MCG1022 are as follows :</p> <ul style="list-style-type: none"> <li>(a) Communications cables to MCE1173 shall be tested to MCG1022C paragraphs. 2.3.1. 2.3.3.(a), 2.3.4.(a) and 3.1. corrected as 1518.2</li> <li>(b) Communications cables to CW1128/1198 shall be tested to MCG1022C paragraphs. 2.3.3.(a) , 2.3.4.(a) and 3.1. corrected as 1518.2</li> <li>(c) Power cables to BS6346 (3- core SWA) shall be tested to MCG1022C paragraphs. 2.3.2., 2.3.3.(b), 2.3.4.(b) and 3.2.</li> </ul>
1.2	<p>Modifications to MCG1022C are as follows;</p> <ul style="list-style-type: none"> <li>(a) Para 1.5.2. <ul style="list-style-type: none"> <li>i. delete "loading patterns"</li> <li>ii. delete "attenuation" and "impedance" diagrams in Appendix 2</li> </ul> </li> <li>(b) Para. 3.1. <ul style="list-style-type: none"> <li>i. Attenuation measurements shall be on all pairs at all listed frequencies.</li> <li>ii. No loading will be installed - all pairs treated as identical (600 ohms)</li> <li>iii. Graphs shall be produced to cover all pairs</li> </ul> </li> <li>(c) Para. 3.1.5. Measurement of Near End cross talk with 600 ohm termination only.</li> <li>(d) Para. 3.1.6 Not undertaken</li> <li>(e) Para. 3.1.7. To be carried out on all pairs.</li> <li>(f) Para. 3.1.8 Not undertaken</li> <li>(g) Para. 3.1.9 Not undertaken</li> <li>(h) Para. 3.1.10 Not undertaken</li> <li>(i) Para. 3.1.11 Not undertaken</li> <li>(j) Telephone pair test: Measure loop resistance to telephone and note value. (Max. 29ohms/Km) and using 600 ohm termination measure attenuation at 800Hz to telephone and note value. (Max. 0.74dB/Km).</li> </ul>
1.3	<p>All Cables, both optical fibre and copper, supplied by the Company to specification shall be tested in accordance with MCH1221 at the manufacturer's works prior to delivery to ensure compliance with those specifications and the testing shall be witnessed by a specialist consultant appointed by the Company.</p>
1.4	<p>Loop detector and feeder cables shall be tested in accordance with</p>

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	<p>Clauses 1523A and 1537A.</p> <p>1.5 Power cable testing shall be carried out in accordance with both MCG1022 and BS7671 and Clause 1526. The Overseeing Organisation may appoint by a specialist consultant to witness all testing.</p> <p>1.6 No site cable tests shall be carried out until the cable trench containing the cable duct has been back-filled and the ground above the cable reinstated and the cable ends have been installed (un-terminated) in the respective termination cabinets. No site cable tests shall be carried out until all the cables to be installed in one duct have been installed. No site cable tests shall be carried out until adjacent work, which may damage the cable have been completed.</p> <p>1.7 Cable test result documentation shall be in compliance with clause 1504A and Clause 1540A. The cable being tested and the instruments being used to complete the test shall be clearly marked on each cable test result.</p> <p>1.8 The Company shall provide all safety equipment, display warning notices, erect barriers and ensure trained personnel are present at all points where dangerous voltages may be present during testing.</p> <p>1.9 All test instruments requiring calibration shall have a current calibration certificate. Copies of the calibration certificate covering the whole period of cable testing shall be provided with the cable test results.</p> <p>1.10 The Company shall give at least 14 days' notice, in writing, to the Overseeing Organisation of his intention to test any cable and shall be provided with the opportunity to witness the installation of all cables.</p> <p>1.11 In the event of the Company drawing further cables through a duct after cables have been tested, then all cables in the duct shall be re-tested.</p> <p>1.12 Any cable damage identified shall be rectified by the Company in accordance with sub-clause 1550A and re-tested.</p>
1519A	<p><b>1 Labelling and Numbering</b></p> <p>1.1 All Traffic Scotland equipment when detailed in drawings and documentation prepared by the Company shall be numbered in accordance with the Traffic Scotland Equipment numbering scheme in the NDX series drawings and the Scottish Ministers Requirements. The Company shall not use any other equipment numbering at anytime.</p> <p>1.2 Cabinets, Emergency Roadside Telephones, Signals, and cables shall be numbered and labelled, in accordance with the relevant NDX drawings, using Traffic Scotland labelling procedures and, unless specified otherwise in the Scottish Ministers Requirements, it shall be the responsibility of the Company to provide such manufactured labels. All equipment labels shall be attached in accordance with the NDX series drawings unless otherwise described in the Scottish Ministers</p>

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	<p>Requirements.</p> <p>1.3 The Company shall not leave cables unlabelled at any time and shall provide temporary labelling accordingly to facilitate testing and termination prior to the implementation of permanent labelling.</p> <p>1.4 All cabinets containing power shall be labelled to indicate the source of supply, destination, circuit arrangements and details of testing in accordance with the BS7671 regulations. Cabinets shall also include a copy of the applicable electrical schematic.</p> <p>1.5 All cabinets containing Traffic Scotland Equipment shall have the circuit diagrams of both the cabinet and the external cable circuits stored within the cabinet so that the maintenance engineer can understand the cable connections and cable routing. These circuit diagrams should be an extract of the as built drawings and should be supplied in a modifiable electronic form to the Overseeing Organisation as part of the documentation requirements.</p> <p>1.6 All records contained within cabinets shall be waterproof and version controlled.</p> <p>1.7 Where the Company carries out modification work to existing cabinets, new labels shall be fitted where appropriate and shall update the existing records in compliance with the Scottish Ministers Requirements.</p> <p>1.8 All standard warning labels shall be supplied by the Company and installed on cabinet doors.</p>
1520A	<p>1 <b>Loading</b></p> <p>1.1 Not used.</p>
1521A	<p>1 <b>Removal and Re-siting of Existing Equipment</b></p> <p>1.1 Prior to existing Traffic Scotland Equipment being removed/re-sited as determined by the design, the Company shall provide a report titled "The Strategy for Delivery of the ITS works for Traffic Scotland Equipment" in accordance with the Scottish Ministers Requirements.</p> <p>1.2 Unless otherwise described in the Scottish Ministers Requirements, the Company shall remove and dispose of all existing equipment in compliance with this 1500 Series.</p> <p>1.3 Where required in accordance with "Strategy for Delivery of the ITS works for Traffic Scotland Equipment", as prepared by the Company under Clause 1521.1.1A, the disconnection and reconnection of Traffic Scotland Equipment shall either be witnessed or undertaken by the Traffic Scotland Term Contractor for Maintenance and General Works in compliance with Clause 1522A.</p> <p>1.4 All Traffic Scotland Equipment that has not to be disposed of shall be stored by the Company until required or returned to Overseeing Organisation stores. The Company shall store equipment to be returned</p>

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	<p>to the Overseeing Organisation for a period of up to 3 months or as otherwise detailed in the Employers Requirements.</p> <p>1.5 Items of equipment to be re-sited shall be unbolted from their plinths or supports together with their holding down bolts, stored, and removed or re-sited. Where any foundations, support infrastructure and hard landscape associated with existing site is not required in the future the Company shall undertake all necessary site clearance in compliance with Clause 201 of the Specification.</p> <p>1.6 Conductors shall be disconnected from the equipment in which they are terminated, the terminal screws and glands re-tightened and the cable withdrawn clear of the equipment.</p> <p>1.7 Where cables are to be recovered, they shall be carefully withdrawn, and the Company shall comply with the requirements for duct sealing, cleaning and roping. Recovered cables shall be coiled onto drums at the time of removal and transferred to the Company's site storage area for subsequent re-use or removal to the Overseeing Organisation's Store, unless otherwise detailed in the Scottish Ministers Requirements.</p> <p>1.8 The sites of cabinets, plinths and cable trenches shall be reinstated to the level of the surrounding ground as in Clause 201 of the Specification, unless otherwise described in the Scottish Ministers Requirements.</p> <p>1.9 All re-used cables shall be tested in accordance with Clause 1506A and 1507A.</p> <p>1.10 Where cables are being disconnected, or being disconnected and left in situ, the operation shall be carried out in a safe manner which does not form a hazard to maintainers, operators or Users and shall be in compliance with the Scottish Ministers Requirements.</p>
1522A	<p><b>1 Works Impacting on Operational Traffic Scotland Systems</b></p> <p>1.1 All works shall be programmed and planned to prevent any detrimental impact on the operation of Traffic Scotland Equipment and systems in accordance with the Overall Strategy for Delivery of the ITS works for Traffic Scotland Equipment document which forms part of the Scottish Ministers Requirements. The details of the works to mitigate the impact on the Traffic Scotland Service or part thereof shall be prepared by the Company and made available to the Overseeing Organisation and the relevant Traffic Scotland Service providers prior to the start of such works. Notification of any such mitigating arrangements shall, unless otherwise stated within the Scottish Ministers Requirements be no less than 28 days prior to the works commencing.</p> <p>1.2 Detrimental impact may include but not be limited to loss of service due to cable damage, loss of electrical supply or communications link or damage to equipment and similar.</p> <p>1.3 Mitigating arrangements may include temporary equipment housing, temporary electrical supply, temporary communications link by copper</p>

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	1.4	cable, optical fibre cable, line-of-sight microwave or similar or combinations of these.
	1.5	Where no alternative is available, the Company shall provide documentation detailing all the investigated alternatives.
	1.5	Where migrating arrangements introduced by the Company fail to correctly protect the operation and integrity of the Traffic Scotland systems and equipment the Scottish Ministers shall, at his own discretion, seek to claim damages in accordance with Scottish Ministers Requirements.
<b>1523A</b>	<b>1</b>	<b>Loop Detectors</b>
	1.1	Where required and unless otherwise described in the Scottish Ministers Requirements, the Traffic Scotland Loop detectors shall be installed in accordance with Specification MCH1540 and NDX 1097.
	1.2	The roadside loop chamber as described in Clause 1532A shall be installed prior to the detector loops being installed and at the completion of detector loop installation all loop tails shall located within the roadside loop chamber and each tail shall be labelled.
	1.3	Slots for the detector loops shall be cut from within the base course level.
<b>1524A</b>	<b>1</b>	<b>Trial Pits</b>
	1.1	Trial pits shall be excavated by the Company to determine the location of Traffic Scotland Equipment located below the surface. The use of mechanical digging methods is prohibited.
<b>1525A</b>	<b>1</b>	<b>Not Used</b>
<b>1526A</b>	<b>1</b>	<b>The Inspection and Testing of Electrical Installations and Electrical Equipment</b>
	1.1	The Company shall carry out all works associated with the Inspection and Testing of Electrical Installations in compliance with BS7671 and Guidance Note 3 for BS7671 and for equipment not forming part of the fixed installation be in accordance with the latest edition of "Code of Practice for In-service Inspection and Testing of Electrical Equipment" published by the IET. The Company shall provide paper copies of the Inspection and Completion Certificates to the Overseeing Organisation in accordance with BS 7671 and also in 'soft copy'. Both paper and softcopy shall generally conform with the NICEIC format for BS7671 Certificates and be compatible with Industry standard archiving software.
	1.2	Where the Inspection/Tests show that existing cabinets or electrical circuits, or the earthing arrangements do not meet with the requirements of BS 7671, the Company shall make the installation safe

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	<p>and carry out all such works to make the installation compliant with BS7671. When designing the electrical installation, the Company shall take fully into account all aspects of access for maintenance. Also, where the Company considers safety and operational risks associated with quarterly testing of a Residual Current Device (RCD) to be unacceptable an alternative design must be provided.</p> <p>1.3 For the purposes of carrying out the Tests the Company shall use appropriate instruments which shall be tested and calibrated at six monthly intervals. Copies of the test/calibration certificates shall be forwarded to the Overseeing Organisation with the first certificate dated within three months of the Commencement Date. The Earth Loop Impedance testing instrument shall be of the digital display type and shall operate from zero to 19.99 Ohms (Accuracy <math>\pm 1\%</math> ES. <math>\pm 1.5\%</math> Reading) with 0.01ohm Resolution. Where alternating current measurements are required, testing instruments shall be of the digital display type and shall be capable of operation with an accuracy of <math>\pm 1\%</math> in the useable ranges.</p> <p>1.4 Where appropriate and prior to testing the installation in accordance with the requirements of BS7671 all extent and limitations to be applied must be agreed with the Overseeing Organisation. The agreed extent and limitations must include consideration of all cables and equipment making up the installation that may be required to be excluded from the testing of the fixed electrical installation.</p> <p>1.5 Such electrical equipment not forming part of the fixed wiring of the installation shall be disconnected while carrying out BS7671 testing on the electrical installation. Items so excluded from the BS7671 inspection and testing shall be inspected and tested in accordance with the HSE publication "Maintaining portable and transportable electrical equipment" HSG107 and the "Code of Practice for In-service Inspection and Testing of Electrical Equipment" or as otherwise agreed with the Traffic Scotland Manager. The frequency of the inspection and testing of such equipment shall be appropriate for the equipment type, its frequency of use and environment in which it is used.</p> <p>1.6 The frequency of inspection and testing of fixed installations shall be;</p> <ul style="list-style-type: none"> <li>(a) Periodic BS7671 Inspection and Testing – 5 yearly</li> <li>(b) Routine Check as BS7671 Guidance Note 3 – Annually</li> <li>(c) Where RCDs are an integral part of the installation earth fault protection then the RCDs shall be tested quarterly. TT supplies shall not form part of the permanent electrical supply infrastructure. RCDs shall be tested at minimum load.</li> </ul> <p>1.7 The Company shall provide all safety equipment, display warning notices, erect barriers and ensure personnel with suitable skill and ability are present at all points where dangerous voltages may be present during testing.</p>

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1527A	<p><b>1 Cable Installation at Transmission Stations</b></p> <p>1.1 Cables shall be installed into and terminated within Transmission Stations in compliance with the Scottish Ministers Requirements.</p> <p>1.2 Work shall not be undertaken in active Transmission Station by the Company until the Company is in compliance with Clause 1522A.</p>
1528A	<p><b>1 Modification of Existing Cabinets</b></p> <p>1.1 The Company shall terminate new cables, terminate diverted cables, install Traffic Scotland Equipment and undertake such other modifications to existing Traffic Scotland Equipment cabinets in compliance with the Scottish Ministers Requirements and this 1500 Series.</p> <p>1.2 The Company shall, prior to laying any underground duct or cable to or from the existing Traffic Scotland Equipment cabinets, locate, by electronic means, the position of all cabling and ducting, expose all cables and ducts by careful hand excavation and identify the type, size and designation of each cable found.</p> <p>1.3 The Company shall as required undertake any or all of the following as required to comply with the Scottish Ministers Requirements</p> <ul style="list-style-type: none"> <li>(a) remove, retain for re-use, and replace the cabinet base pea gravel</li> <li>(b) remove and relay any hard standing;</li> <li>(c) remove all redundant materials and make good soft landscaping</li> <li>(d) excavate to expose cable remake loop,</li> <li>(e) excavate duct and cable routes;</li> <li>(f) re-route cable to gain sufficient lengths for the proposed modification;</li> <li>(g) reinstate duct and cable trenches;</li> <li>(h) break open and re-seal resin filled base;</li> <li>(i) disconnect and reconnect, undo existing gland and re-gland, including the provision of new gland assemblies and cable termination ancillaries where required;</li> <li>(j) withdraw and reinstall cables at cabinet base</li> <li>(k) un-terminate, re-terminate and terminate cables</li> <li>(l) remove and or relocate existing Traffic Scotland Equipment and install new Traffic Scotland Equipment and connect internal wiring</li> <li>(m) reroute and provide new internal wiring to create a tidy wiring and incoming outgoing cable layout</li> <li>(n) modify power distribution unit by adding or removing out going circuits and adding or altering the electrical distribution protection</li> </ul>

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	<p>devices</p> <p>(o) remove all waste and redundant material and clean out the cabinet</p> <p>(p) renew external label</p> <p>(q) undertake any works such as painting, replacing locks, hinges and general cabinet maintenance works such as oiling and greasing the hinges, adding a document holder</p> <p>(r) updating records and inserting records to be held in cabinet</p> <p>1.4 All existing direct buried cables exposed during modification of existing Traffic Scotland Equipment shall be installed in ducting laid in compliance with Clauses 1530A and 1531A. Also where remake loops in direct buried cables are exposed, Type C chambers shall be constructed to accommodate the remake loop.</p>
1529A	<p><b>1 Temporary Roadside Emergency Telephones</b></p> <p>1.1 Temporary Emergency Roadside Telephones shall be installed for use by the public when it would be necessary to cross either a live traffic lane or construction site to use the nearest working Roadside Emergency Telephone. When not in use temporary Roadside Emergency Telephones shall either be removed or covered with purpose made bags displaying the words 'Not in Use' until such time as the telephones have been commissioned and are available for use by the public.</p> <p>1.2 The direction to the Temporary Emergency Roadside Telephones shall be indicated in a manner approved by the Overseeing Organisation at 100 metre intervals. The location and orientation of temporary Roadside Emergency Telephones shall be agreed with the Overseeing Organisation.</p> <p>1.3 Telephone instruments and posts shall be supplied by the Scottish Ministers unless otherwise described in the Scottish Ministers Requirements.</p> <p>1.4 Cable for temporary Emergency Roadside Telephones shall be identified at 20 metre intervals in a suitable manner. Cables shall be laid in existing ducts to cross the carriageway and on the surface elsewhere when suitable protection from damage can be reliably provided.</p> <p>1.5 Cable for temporary Emergency Roadside Telephones shall be connected to the nearest Copper Termination Pillar or equivalent on the live communications network. A loop of cable of 3 metres length shall be coiled on the ground adjacent to the cabinet or pillar.</p> <p>1.6 Connections and disconnections from the live communications network shall be carried out by the Overseeing Authorities' Transport Scotland Operations and Infrastructure Services Contractor. The Company shall give at least two week's written notice of the need for such work. The</p>

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	<p>need for this work shall be identified in advance in the Company's programme and agreed with the Overseeing Organisation.</p> <p>1.7 The Company shall install, place in position, maintain, cover up, uncover, reposition, re-cable and remove temporary Emergency Roadside Telephones and associated work as necessitated by the progress of any O&amp;M Works.</p> <p>1.8 Maintenance of temporary Emergency Roadside Telephones connected onto the network shall only be undertaken by the Overseeing Authorities' Transport Scotland Operations and Infrastructure Services Contractor. The Company must allow, at all times, access arrangements to any Overseeing Authorities' Traffic Scotland Maintenance Contractor and Traffic Scotland Operator.</p>
1530A	<p><b>1 Cable Ducts</b></p> <p>1.1 The term cable duct used in this Series describes the ducts used for Traffic Scotland Equipment communication and power cables.</p> <p>1.2 Longitudinal ducts are those ducts forming the longitudinal route of ducts installed generally parallel to the carriageway. Transverse ducts are those ducts linking the longitudinal ducts and installed underneath and at right angles to the carriageway. Local ducts are those ducts installed from chambers forming part of the longitudinal duct network to the cabinets and Traffic Scotland Equipment</p> <p>1.3 The ducts installed to this specification are used for all types of Traffic Scotland cables</p> <p>1.4 The ducts shall comply with this Series and the Scottish Ministers Requirements. The Company shall be responsible for ensuring that all components used within the ducts are compatible with each other, with the cable and with existing ducts to which they may be connected.</p> <p>1.5 The ducts shall comply with the general requirements of BS EN 50086-1 and in particular requirements of BS EN 50086-2-4. The ducts shall have a current British Board of Agreement Roads and Bridges Certificate or equivalent in accordance with Clause 104 of the Specification.</p> <p>1.6 The ducts shall be manufactured from thermoplastic material. The internal bore shall be smooth and even. The external surface shall be even or corrugated in the longitudinal section. The ducts shall be twin walled. Non homogeneous ducts with honeycomb or foam filled construction between the inner and outer surfaces shall not be permitted.</p> <p>1.7 The longitudinal, transverse and local ducts shall meet BS EN 50086-2-4 and be classified as "Normal duty" and rigid. These ducts will be supplied and laid in lengths no greater than 6 metres and be jointed using compatible couplers, sealing rings and lubricant. Rigid smooth walled pre-formed bends and junctions shall be used. Pliable or flexible</p>

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	<p>ducting shall not be used to provide a continuous route.</p> <p>1.8 The nominal sizes of the ducts shall be as described in the Scottish Ministers Requirements. The minimum internal diameters shall be 150 mm, 100 mm and 50 mm.</p> <p>1.9 The external wall of the ducts shall be coloured black for all Traffic Scotland installations regardless of whether they contain power or communications cable.</p> <p>1.10 The materials from which the duct and fittings are made shall be treated so that they are protected from the deleterious effects of short term exposure to ultra violet light and shall be resistant to degradation by acids, alkalis, common chemicals, bacteria, fungi, and moulds occurring in soils. The Company shall protect the duct and fittings on site in accordance with the supplier's recommendations.</p> <p>1.11 Each duct shall be fitted with a pigmented, stranded polypropylene or equivalent rot-proof material draw cord of 5kN breaking load and having a design life of not less than 20 years, the ends of which shall be secured within the chamber or enclosure to which the duct is terminated. Draw cords shall be secured to the duct plugs where fitted. Draw cords shall not be knotted within ducts; where a joint is required it shall be a spliced joint.</p> <p>1.12 The duct network shall be sealed in compliance with Clause 1533A.</p> <p>1.13 Ducts containing Traffic Scotland cables or power cables for motorway communications systems installed on motorways shall be clearly and permanently marked with the legend "MOTORWAY COMMUNICATIONS /POWER" in two, diametrically opposite, planes. The ducts shall be installed such that the legend is uppermost. The method of marking shall not affect the integrity of the duct. This marking is in addition of the markings required in the BS EN 50086 series. The method marking and the durability test shall comply with the BS EN 50086 series.</p> <p>1.14 Each duct shall be fitted with a proprietary branded duct insert as shown in NDX1063-00.</p> <p>1.15 Four and six way ducts shall be supplied with purpose made spacers and strapping as indicated on drawing NDX1063-00. The strapping shall bind the ducts tightly in the specified formation during installation, back-filling and for the whole life of the duct. The spacing of the strapping shall be such that the ducts shall not separate by more than 50 mm; this spacing would typically be 1m. The contact area between spacer and duct shall be large enough to ensure that the spacer cannot penetrate or distort the walls of the duct.</p>
1531A	<p><b>1 Installation of Ducts</b></p> <p>1.1 Ducts shall be laid at the level as shown in NDX1063-00 and at a typical offset of 2 metres from the edge of the carriageway. Longitudinal ducts shall generally be run parallel to the edge of the hard shoulder.</p>

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	<p>Transverse ducts shall run at right angles to the carriageway. The exact location of the ducts shall be in accordance with the drawings or where applicable the Company's Design. All ducts shall terminate in an access chamber. Excavations shall comply with Clauses 502 and 602. Immediately following the excavation of the trench, the ducts shall be jointed and laid on the bedding material. Newly laid ducts shall not deviate unnecessarily from straight such as to cause undue loading on the cables during installation. The deviation in level from that specified at any point shall not exceed 50mm</p> <p>1.2 Ducts and fittings shall be examined for damage and the joint surfaces and components shall be cleaned immediately before laying. Measures shall be taken to prevent soil or other material from entering ducts, and to anchor each duct to prevent movement before the work is complete.</p> <p>1.3 Cable ducts shall comply with the appropriate British Standard and shall be tested in accordance with Clause 1533A. Ducts with push-fit joints shall have a register and clear markings to ensure that the duct joint is fully engaged.</p> <p>1.4 Cable duct configurations, bedding, haunching and surround shall be as shown on drawing NDX1063-00.</p> <p>1.5 Backfilling shall be undertaken immediately after the required operations preceding it have been completed.</p> <p>1.6 Trenches for the cable ducts shown on drawing NDX1063-00 shall be backfilled with Class 8 lower trench fill material, as described in Table 6/1 and in compliance with the 600 Series, which shall be placed above the surround material. The Class 8 material shall extend to within 150 mm of ground level. The material shall be spread and compacted evenly without dislodging, disturbing or damaging the ducts. Power hammers shall not be used within 300 mm of the ducts.</p> <p>1.7 For ducts shown on drawing NDX1063-00, top soiling, grass seeding and/or turfing as described in Clause 618 and 3005 shall be placed in the top 150 mm of the cable duct trench unless otherwise specified in the Scottish Ministers Requirements.</p> <p>1.8 For ducts shown on drawing NDX1063-00 marker tape shall be laid within the trench excavation at a depth of 150 mm or at the class A/topsoil interface whichever is the greater. The marker tape shall comply with Clause 1511A.</p> <p>1.9 Prior to mandrelling, the Company shall swab through each duct to clear all debris.</p> <p>1.10 Ducts that are laid across or within the filter drains (French drains) shall be surrounded with 150 mm of mix ST2 concrete in compliance with Clause 2602. In the event that the route of a duct comes within 500mm of the line of a filter drain then either an alternative line shall be determined or precautions taken to ensure that the granular infill used to surround the ducting cannot, over time, compromise the integrity of the filter drain by migration of the infill material into the drain. Any</p>

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	<p>damage caused by the Company to any drain shall be repaired to the satisfaction of the Overseeing Organisation and at no cost to the Scottish Ministers.</p> <p>1.11 Unless otherwise described in the Scottish Ministers Requirements the Traffic Scotland Equipment duct network comprises of :</p> <ul style="list-style-type: none"> <li>(a) quad 100mm inside diameter sealed longitudinal communication ducts installed along both verges terminating at each roadside longitudinal Type A chamber constructed at each equipment site and at transverse duct locations and additional location such that no duct run is greater than 250m. A nominal spacing of Type A chambers shall be 250m centres. Additional Type A chambers shall be provided where changes of level or direction occur.</li> <li>(b) Six way 100mm inside diameter sealed communication ducts at carriageway cross connection points terminating at each roadside longitudinal Type A chamber at frequencies detailed in the Scottish Ministers and at both extents of entry/exit slip roads.</li> <li>(c) single 100mm inside diameter local ducts as typically shown in NDX1063-00;</li> <li>(d) Single 50mm inside diameter local ducts as NDX1063-00 to provide for cables connecting to the Roadside Emergency Telephones.</li> <li>(e) Single 150 mm inside diameter local power ducts for power cable connection from Termination Pillar to Traffic Equipment Distribution Pillars where not local to the CEC.</li> </ul>
1532A	<p><b>1 Chambers for Traffic Scotland Cables</b></p> <p>1.1 Chambers shall be either a Type A, B, C or Loop chamber (Type D). Chambers Type A, B and C are rectangular in plan with a standard plan size and are constructed so that their covers are raised 50mm above the level of the adjacent ground. Type A and B are shown in the drawings NDX1063-01 and NDX1063-02. Type C is shown on NDX1063-03. The construction of the Detector Loop roadside chamber is shown in NDX1063-04.</p> <p>1.2 Chambers shall be used solely for Traffic Scotland Equipment.</p> <p>1.3 Unless otherwise described in the Scottish Ministers Requirements, the following chamber types shall be installed at the locations as follows:</p> <ul style="list-style-type: none"> <li>(a) Type A chambers shall be placed between 400m and 500m intervals along the length of the longitudinal ducts in both verges. The chambers shall be installed at the same chainage in both verges. Additionally, six way transverse ducts installed at gantry locations and at 400-500m intervals.</li> <li>(b) Type A intermediate chambers shall also be installed in both verges along the longitudinal ducts midway between chambers detailed in the sub clause 1532.1.3A (i) so providing duct access</li> </ul>

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	<p>at between 200 and 250m intervals. At these intermediate chambers no transverse ducts are required to be installed.</p> <p>(c) A cable stowage Type C chamber shall be constructed adjacent to all individual or group of communications cable termination cabinets and at other locations where cable service loops are required.</p> <p>(d) Additional Type A chambers where Traffic Scotland Equipment site is not adjacent to the Type A chambers detailed in sub clause 1532.1.3A (i) and (ii)</p> <p>(e) Additional Type A chambers for cable access shall also be constructed wherever the associated ducts change level or direction;</p> <p>(f) Type A or Type B chambers shall also be constructed as required to accommodate local ducting containing Electricity supply or Private wire interface cables.</p>
1.4	Roadside Loop Chambers shall be installed in the verge adjacent to each Traffic Scotland vehicle detection site and each SRTDb vehicle classification detection site.
1.5	Foundations to chambers shall be of mix ST4 concrete in accordance with Clause 2602.
1.6	Brickwork shall comply with the 2400 Series and be built with mortar designation (i) in English bond. The joints of brickwork where exposed shall be finished as specified for un-pointed joints in Clause 2412. The ends of all ducts shall be neatly built into the brickwork and finished flush with mortar designation (i).
1.7	Chambers not exceeding 1.3 metres in depth to invert may be constructed from complete plastic units or other units in equivalent material. Where the units do not meet the loading requirements of BS 5911: Part 200, they shall be surrounded by 150 mm of mix ST4 concrete. Where preformed plastic chambers are used with duct entries then correctly located round duct access holes shall be core cut to provide a clearance fit on each duct. The outer surface of the ducts shall be sealed against the chamber wall using epoxy putty or similar as required by the manufacturer's instructions. No more than 6 off 100mm diameter ducts shall enter on a single wall. Unless otherwise agreed with the Overseeing Organisation plastic chambers shall be installed in accordance with, the manufacturer's instructions and this Series 1500.
1.8	Where the depth of invert of chambers exceeds 900 mm below the finished surface of the carriageway or the adjacent ground, manhole steps complying with BS 1247: Part 1 or Part 2 shall be built in as specified in BS 5911: Part 200. Steelwork fittings shall comply with BS 970: Part 1 and be galvanised in compliance with Clause 1909 after fabrication. Threaded components shall be galvanised in compliance with Clause 1909. The depth of chambers shall not exceed the

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	<p>dimensions given in the NDX series drawings.</p> <p>1.9 Excavation around chambers shall be backfilled with general fill materials as described in Table 6/1 and compacted in compliance with Clause 612. Where mechanical compaction is impracticable, the excavation shall be backfilled with mix ST2 concrete complying with Clause 2602. Where there are pre-cast concrete access shafts to pre-cast or similar concrete chambers, the shafts shall be surrounded by a minimum thickness of 150 mm of mix ST4 concrete, and the remaining excavation backfilled with general fill material as described in Table 6/1 compacted in compliance with Clause 612 of the Specification.</p> <p>1.10 Chamber covers and frames shall be suitable for purpose to comply with BS EN 124 and be agreed by the Overseeing Organisation. Special duty covers for use in carriageways and other special situations shall be as agreed with the Overseeing Organisation.</p> <p>1.11 A concrete apron shall be provided at all Traffic Scotland chambers in accordance with the NDX Drawings. Such aprons shall be constructed to provide adequate surface run-off and should generally be arranged to form a continuous and level hard standing area joining with the access pathway and other such adjacent paved or concrete aprons. Under no circumstances should the chamber apron form any part of safety fence foundations or similar civils construction.</p> <p>1.12 Four sets of lifting keys as described in shall be delivered to the Overseeing Organisation for each type of cover supplied. Additionally, a suitable cover lifter shall be delivered to the Overseeing Organisation.</p> <p>1.13 Frames for chamber covers shall be set in cement mortar designation (i) complying with Clause 2404 or a suitable proprietary quick setting mortar of equivalent strength.</p> <p>1.14 Chambers shall be constructed with a sump as shown NDX Drawings. This sump shall be constructed to drain into a soak away immediately below the chamber. It is a requirement of this specification that the chamber drainage is adequate to minimise the accumulation of water in the chamber. Under no circumstances should running water be allowed to drain through the chambers.</p> <p>1.15 Chambers shall be clearly identified by the legend "MOTORWAY COMMUNICATIONS"; the lettering shall be 25 mm high and shall be embossed into each cover. Where covers have a concrete infill a plate manufactured from a non-corrodible metal or steel, galvanised in accordance with Clause 1909, shall be cast into the concrete flush with the concrete surface.</p>
1533A	<p><b>1 Proving and Testing of Ducts</b></p> <p>1.1 Longitudinal and transverse ducts shall be proved by drawing a wooden or plastic mandrel as shown on HCD Drawing I2 through the ducts. Local ducts shall be proved by drawing through each length of completed duct a spherical mandrel of a diameter 10% less than the</p>

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	<p>nominal bore of the duct. On the successful completion of each mandrel pull the Company shall certify compliance of the duct and immediately plug the duct in accordance with Clause 1530A.</p> <p>1.2 All longitudinal and transverse ducts shall be tested in sections, e.g. between chambers, by means of the air test described in sub-Clause 3 of this Clause after backfilling. On the successful completion of each test the Company shall certify compliance of the duct and immediately plug the duct in accordance with Clause 1530.1.14A</p> <p>1.3 To undertake the air test, air shall be pumped into the duct by suitable means until a stable pressure of 100 mm head of water is indicated in a U-tube connected to the system. The air pressure shall not fall to less than 75 mm head of water during a period of five minutes without further pumping, after an initial period to allow for stabilisation.</p> <p>1.4 A register of mandrel and air test certificates shall be maintained by the Company and handed to the Overseeing Organisation on the successful completion of the ducting work.</p> <p>1.5 Unless otherwise described in the Scottish Ministers Requirements, the Company shall provide and install in the end of every duct at every point of entry into cabinets, purpose made push fit duct inserts/end caps. These inserts/end caps will be installed in a fashion to allow the polypropylene draw cord to pass through. NDX drawing 1063-00 sheet 7 of 10 refers.</p>
1534A	<p><b>1 Closed Circuit Television</b></p> <p>1.1 Closed Circuit Television (CCTV) typically consists of cameras, associated masts, Pan Tilt and Zoom (PTZ) units, camera mast cables and video transmission equipment.</p> <p>1.2 At sites remote from gantry locations, the Company shall design and install a camera mast foundation in accordance with the standards detailed in the mast manufacturer's instructions, the Scottish Ministers Requirements and typically described in the NDX1010 Series Drawings.</p> <p>1.3 All Sites shall be designed and configured to enable safe maintenance and access.</p> <p>1.4 At gantry locations, the Company shall design and install a camera mast fixing arrangement in accordance with the standards detailed in the mast and CCTV manufacturer's instructions, the Scottish Ministers Requirements and the Agreement Drawings.</p>
1535A	<p><b>1 Variable Message Signs</b></p> <p>1.1 Variable Message Sign equipment will consist of a variation of Sign types and mounting arrangements as stated within the Scottish Ministers Requirements.</p>

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	<p>1.2 Where the Company provides and installs VMS foundations and associated infrastructure these shall be in accordance with the standards and requirements detailed in the Agreement Documents. NDX1001-02 describes a typical ladder arrangement to satisfy the access requirements of the equipment to be installed.</p> <p>1.3 Cabinet types shall be in line with typical gantry requirements.</p> <p>1.4 Any ducting required to pass through the foundation shall comply with the O&amp;M works Information.</p>
1536A	<p><b>1 Traffic Monitoring Units</b></p> <p>1.1 Traffic Monitoring Units shall be installed in the types of cabinets as described in the O&amp;M Works Information.</p> <p>1.2 Cabinets housing TMU's shall be co-located at other Traffic Scotland Equipment sites. The length of feeder cable connecting the loop tails to the TMU shall not exceed 200 metres. Within the cabinet housing the TMU the loop feeder cables shall be terminated in terminal blocks complying with Clause 1514, secured to the equipment frame. Terminal screw tightness shall be within the range 0.4 to 0.6 Nm. Each feeder cable shall have a minimum of 3 metre of cable coiled in the chamber adjacent to the Cabinet housing the TMU to allow for subsequent re-terminations. Each feeder cable shall be individually identified in compliance with NDX1061-00.</p> <p>1.3 Where a standalone TMU site is required the Company shall provide all power and hard landscape in compliance with that required of any Traffic Scotland Equipment site and detailed in the O&amp;M Works Information.</p>
1537A	<p><b>1 SRTDb Detectors and SRTDb Equipment</b></p> <p>1.1 A SRTDb site comprises of loop detectors providing vehicle parameters for all lanes and hard shoulders in both directions and SRTDb vehicle count equipment. Unless otherwise described in the Scottish Ministers SRTDb sites shall be installed in addition to Traffic Scotland vehicle detection sites but shall be co-located with a Traffic Scotland Equipment site unless specifically required to be standalone.</p> <p>1.2 Where a standalone SRTDb site is required the Company shall provide all power and hard landscape in compliance with that required of any Traffic Scotland Equipment site and detailed in the Scottish Ministers Requirements.</p> <p>1.3 The SRTDb Detectors and SRTDb equipment shall be provided as described in the Scottish Ministers Requirements and this 1500 series.</p> <p>1.4 SRTDb equipment shall be installed within a specialist Scottish Ministers Issued Equipment cabinet, suitably located and protected in full compliance with TD19.</p>

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	1.5	A D type chamber shall be provided adjacent to the cabinet for loop tail stowage.
	1.6	The distance between where the loop tails enter the verge and the detector unit shall not be more than 200 metres including any stowed loop tails.
1538A	1	<b>Lane Control Signalling Equipment</b>
	1.1	Lane Control Signalling Equipment shall be provided and installed as described in the Scottish Ministers Requirements and within the Agreement Drawings.
	1.2	Lane Control Signalling Equipment will consist of a combination of Enforceable and Non-Enforceable Lane Control Units (LCUs) and Motorway Access Control (MAC) units with the capacity to display aspects on accordance with MCX1031.
1539A	1	<b>Paved Areas, Access Paths, Access Steps and Hard standings</b>
	1.1	Paved areas, access paths, access steps, handrails and hard standings shall be provided at each existing and new Traffic Scotland equipment site that the Company shall require to modify or provide. Each existing and new equipment site is unique and the Company shall provide and install paved areas, access paths, access steps, handrails and hard standings appropriate to each new and existing site.
	1.2	The general requirements for paved areas, access paths, access steps and handrails shall be as typically shown on NDX Drawings and detailed within the O&M Works Information.
	1.3	Hard standings shall be of a size and construction to provide safe parking of a vehicle off the hard shoulder. Such an arrangement shall be contiguous with the access pathway to the Traffic Scotland equipment and provide safe access for the maintenance engineer. Unless installed adjacent to an Emergency Roadside Telephone installation, the hard standing shall be constructed from open cementitious block and be typically as shown in the NDX1072-00.
1540A	1	<b>Required Documentation</b>
	1.1	TR1100, and subsequent Scottish Amendments to TR1100 shall be considered as a general guide to Traffic Scotland deliverable documentation requirements. The final overall documentation package relating to the Traffic Scotland Equipment shall reflect inter alia the contents, requirements, structure and format as described in the Traffic Scotland NDS9001 'Traffic Scotland Health and Safety File Requirements and Model Forms'. Any significant changes with respect to this requirement shall be agreed with the Overseeing Organisation.
	1.2	All final As-Built Documentation as required by this Clause 1540A forming all or part of the Traffic Scotland deliverable documentation

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	<p>shall be provided in accordance with the O&amp;M Works Information.</p> <p>1.3 Documentation shall be made available to the Overseeing Organisation on request relating to Traffic Scotland Equipment until issue of the Performance Certificate.</p> <p>1.4 The Company shall provide new Traffic Scotland documentation in a style and format identical to the existing Traffic Scotland documentation as indicated in the Traffic Scotland Equipment Manual, the Traffic Scotland Maintenance Manual and the Traffic Scotland drawings. Where the Company is required by the Agreement to update existing Traffic Scotland documentation the Overseeing Organisation shall release the necessary Traffic Scotland documentation to the Company and the Company shall update the documentation. All such updated documentation shall be presented to the Overseeing Organisation for approval.</p> <p>1.5 The Company shall use current versions of AutoCAD™ computer software and Microsoft Word/Excel to provide or modify all Traffic Scotland Equipment documentation. All soft versions shall be supplied without any software restriction and shall be capable of being modified by the Overseeing Organisation. The standards and procedures for all CAD Drawings provided under the requirements of this Agreement shall comply with the O&amp;M Works Information. All test results and test certificates shall be produced in a suitable software format or by an industry standard software package.</p> <p>1.6 An up to date Drawing/Document Register will at all times be maintained reflecting issue, revision dates, status and application. All changes to drawings, or documents, shall be indicated by a change of issue.</p> <p>1.7 Location measurements shall be taken of the underground equipment to the nearest 100mm from the nearest edge of the carriageway or fence line. Offsets to the cables/ducts shall be recorded at 20 metre intervals and at every change of direction along the line of the cable/duct. Offsets shall be defined longitudinally by distance from a permanent highway feature, a marker post or other point and agreed with the Overseeing Organisation. All details shall ensure compliance with the requirements of the Agreement relating to the NRSWA.</p>
1541A	<p><b>1 Journey Time Equipment</b></p> <p>1.1 Journey time equipment shall be as described in the O&amp;M Works Information</p>
1542A	<p><b>1 Communications Equipment</b></p> <p>1.1 Communications equipment shall be as described in the O&amp;M Works Information.</p>

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1543A	<p><b>1 Specific Equipment Commissioning, Testing Integration and Certification</b></p> <p>1.1 Specific equipment commissioning, testing, integration and certification shall be as described in the O&amp;M Works Information.</p>
1544A	<p><b>1 Power Supplies for Traffic Scotland Equipment</b></p> <p>1.1 Power supplies shall be provided in accordance with the O&amp;M Works Information.</p> <p>1.2 All Electrical supplies shall be single phase and in accordance with NDS9551 “Requirement for electricity supply for Traffic Scotland and associated sites.”</p> <p>1.3 Earthing and bonding shall be as Clause 1517A.</p> <p>1.4 Inspection and Testing shall be to Clause 1526A.</p>
1545A	<p><b>1 Spares</b></p> <p>1.1 Unless otherwise stated in the O&amp;M Works Information, spares shall be as described within NDS9001 “Traffic Scotland Health and Safety File Requirements and Model Forms”</p>
1546A	<p><b>1 Meteorological Equipment</b></p> <p>1.1 Meteorological Equipment does not normally form part of the Traffic Scotland Equipment. However where Meteorological equipment (weather stations) are required the meteorological equipment shall be located within a Traffic Scotland Equipment site and will consist of a combination of sensors and inputs at a roadside location which will include a roadside CEC/600 Cabinet type. The equipment type and layout shall be manufacturer specific and details will be provided by the Overseeing Organisation.</p> <p>1.2 Meteorological Equipment shall be provided and installed as described in the O&amp;M Works Information and within the Agreement Drawings.</p>
1547A	<p><b>1 Ramp Metering</b></p> <p>1.1 The Company shall install Ramp Metering and all ancillary support in accordance with the requirements of the Agreement. This will be in accordance with the Agreement Drawings and as described in the O&amp;M Works Information.</p>
1548A	<p><b>1 Enforcement Systems</b></p> <p>1.1 The Company shall install the necessary enforcement systems, mountings, power and communications in accordance with the requirements of the Agreement. This will be in accordance with the Agreement Drawings and as described in the O&amp;M Works Information.</p>

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1549A	<p><b>1 Weigh In Motion Equipment</b></p> <p>1.1 Weigh in Motion Equipment will consist of a series of specialist detectors providing detection for all lanes and both directions where required combined with a standalone detection unit.</p> <p>1.2 Weigh in Motion equipment shall be installed within a specialist Scottish Ministers Issued cabinet, suitably located and protected in accordance with TD19/06.</p> <p>1.3 The Company shall install Weigh in Motion Equipment and all ancillary support systems in accordance with the requirements of the Agreement. This will be in accordance with the Agreement Drawings and as described in the O&amp;M Works Information.</p> <p>1.4 Typical site layout and cabinet arrangement is shown in NDX1097-01.</p>
1550A	<p><b>1 Damage and Repair Procedures</b></p> <p><i>Reserved for completion by Traffic Scotland. Contact the Traffic Scotland Manager</i></p>
1911SE	<p><b>1 Paint and Similar Protective Coatings</b></p> <p>1.1 The term "paint" shall be deemed to refer also to similar protective coatings including specialist coatings such as grease paints.</p> <p>1.2 Where a registered paint is specified, the Contractor shall ensure that the paint conforms with the formulation which has been registered by the manufacturer with the Highways Agency on or before the date entered at Part 2 of Appendix 19/1 Form HA/P1 (Works) paint system sheet.</p> <p>1.3 All paints shall be supplied in sealed containers of not more than 5 litre capacity and these shall be used in order of delivery. Each container shall be of the completely removable lid type and be clearly marked on the side to show the name of the manufacturer, registered description of the material (including purpose, e.g. whether primer, undercoat or finish), colour, Item No, paint manufacturer's reference number, batch number and date of manufacture. Where date of manufacture is coded, the Contractor shall provide the code key.</p> <p>1.4 The Company shall ensure that the properties of the paints he has selected are suitable for the conditions in the shops and on site, including temperature and humidity, and that he is able to apply the</p>

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Clause Number	Title
	<p>paints satisfactorily to all parts of the Structure in these conditions.</p> <p>1.5 Unless otherwise described in Appendix 19/5, all paints forming any one protective system, or overlapping systems, shall be obtained from the same manufacturer, as named by the Contractor in Form HA/P1 (Works) Paint System Sheet.</p> <p>1.6 The requirements of Sub-Clauses #1911.3, 7, 8, 9, 10 and their respective tables shall apply in Scotland.</p>
1912SE	<p><b>1 Testing of Paints</b></p> <p>1.1 Unless otherwise described in this Contract, the Contractor shall provide unopened 5 litre samples, known as 'A' samples, of each type of paint to be used in the Works for testing for quality assurance purposes. 'A' samples shall be taken from the first batch of each type of paint delivered to the fabricator's shop or site. In addition, during the painting work, the Contractor shall supply 500 millilitre samples, known as 'B' samples taken from painters' kettles or from nozzles of airless spray guns directly into clean new tins. For 2-pack systems separate samples of the base and activator shall be dispatched by the Contractor to the testing authority.</p> <p>1.2 Depending upon the importance of the proposed painting application, the Employer may elect to have 'A' samples sent for limited testing by a local paint testing firm or other agency specified by the Employer. Appropriate forms for use in connection with limited testing shall be derived from the standard paint forms and shall be agreed with the Employer.</p> <p>1.3 The Contractor shall supply paint in sufficient time to allow for sampling and testing of 'A' samples before the start of application. The Contractor shall be responsible for handling, provision of clean tins for samples, packing as necessary and prompt despatch and transit of all samples for testing.</p> <p>1.4 'A' and 'B' samples are tested for paint composition and / or properties against the original formulation issued by the paint manufacturer at the registration with HA.</p> <p>1.5 The requirements of Sub-Clauses #1912.10, 11 and 12 shall apply in Scotland.</p> <p>1.6 Except for procedure trials painting shall not start until the first of the 'A' samples are confirmed as satisfactory.</p>
1920SE	<p><b>1 Additional Requirements for the Protection of Steel in Bridge Bearings</b></p> <p><b>1.1 Applicable Clauses</b></p> <p>1.1.1 Unless otherwise described in this Contract, the work described in this Clause shall be carried out in compliance with Appendix 19/1 and with Clauses 1901 to 1919 inclusive.</p>

**Appendix 0/5: Special National Alterations of the Scottish Ministers**

Clause Number	Title
	<p>1.2 <b>Supply of Coatings</b></p> <p>1.2.1 Information, including the name of the paint manufacturer, required for completing Form HA/P1 (Works) Paint System Sheet, for the bearings, shall be obtained by the Contractor from the bearing manufacturer.</p> <p>1.2.2 Item 155 and MIO Epoxy paints when required for application on site shall be obtained from the manufacturer of the shop applied coats. Paint applied to the bearings on site to match the bridge steelwork paint system shall be obtained from the manufacturer of that system.</p>

**Appendix 0/5: Special National Alterations of the Scottish Ministers**

**List of Minor Alterations Clauses, Tables and Figures**

Clause Number	Title
1702.2	<p><b>1      Concrete – Ordinary Structural – Constituent Materials</b></p> <p>1.1      At end of Clause add the following:</p> <p>The minimum testing frequency shall be in accordance with Table 3 of BS812: Part 120: 1989.</p>
N/A	<p><b>1      Appendix A, Page 8</b></p> <p>1.1      Delete Note 2 and replace with the following:</p> <p>The implementation date of this scheme is the Base Date.</p>

**Appendix 1/5: Testing to be Carried out by the Company**

**1 Notes:**

- 1.1 Unless otherwise stated below, all sampling and testing in this Appendix shall be undertaken by the Company.
- 1.2 Tests comparable to those specified in this Appendix will be necessary for any equivalent work, goods or materials proposed by the Company (See sub-clause 105.4 of the Specification)
- 1.3 (N) indicates that a United Kingdom Accreditation Service (UKAS) or European Co-operation for Accreditation of Laboratories (EAL) accredited laboratory sampling and test report or certificate is required.
- 1.4 Unless otherwise shown in this Appendix, tests for work, goods or materials as scheduled under any one Clause are required for all such work, goods or materials in the Works.
- 1.5 Cube strengths are not required for concrete complying with Clause 2602 of the Specification.
- 1.6 Unless otherwise shown in this Appendix, test certificates for work, goods or materials as scheduled under any one Clause are required for all such work, goods or materials in the Works.
- 1.7 The Company's attention is drawn to the Requirements for additional testing requirements.
- 1.8 The Company shall incorporate in the schedule of tests required under Clause 36 of the Conditions of Agreement as a minimum the tests detailed in the following table together with all additional tests required by the Agreement.
- 1.9 All samples and cores taken for testing in accordance with series 900 of the Specification shall be photographed against a suitable base scale to the approval of the Scottish Ministers.
- 1.10 The photographs, together with corresponding RRS1 and CRS1 Forms included in Clause 970AR of Appendix 0/1, shall be delivered to the Scottish Ministers within seven days of the sampling on site.
- 1.11 All reference to FWD within this Appendix shall mean Falling Weight Deflectometer as described in HD29 of the DMRB.
- 1.12 All references to LWD within this Appendix shall mean Light Weight Deflectometer as described in Clause 895 of Interim Advice Note 73/06. The use and interpretation of the LWD shall be in accordance with Interim Advice Note 73/06 and the "LWD Good Practice Guide" (2009) produced by Loughborough University.
- 1.13 Where supplier declaration is required for material properties then this shall be in accordance with the factory production control system outlined in Annex C and D respectively of BS EN 13285.

**Appendix 1/5: Testing to be Carried out by the Company**

Clause	Works, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 300					
306	Permanent fencing			Quality management scheme applies	
	Concrete components	Cover to reinforcement	1 per consignment (maximum 1 per 100 components) (BS 1722)		
308	Gates and stiles			Quality management scheme applies	
	Reinforced concrete posts	Cover to reinforcement	1 per consignment (maximum 1 per 100 components) (BS3470)		
308 and 311	Preservation of timber	Full sapwood penetration	As required in sub-Clause 311.2(v)	Required for each batch	Quality management scheme applies.
Series 400					
402	Welding	Welding procedures (Manufacturer's tests)	(Every seven years)	Required	Quality management scheme applies
		Welder qualification (Manufacturer's tests)	As required in sub-Clause 402.6 (iii)		
		Production testing (Manufacturer's tests)	As required in sub-Clause 402.6(iv)		
403	Anchorages and attachment systems for use in drilled holes.	Ultimate tensile load (Manufacturer's tests).		Required	To provide well attested and documented evidence.
404	Anchorages in drilled holes	On-site tensile load test	As required in Appendix 4/1	Required	
	Post foundations				
406	Vehicle Parapets.			Required	Quality Management Scheme applies
407	Anchorages and attachment systems for use in drilled holes	Ultimate tensile load (Manufacturer's tests)		Required	To provide well attested and documented evidence.

**Appendix 1/5: Testing to be Carried out by the Company**

Clause	Works, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 400 continued					
409	Vehicle parapet posts	Production testing as specified in BS 6779-1 1998 (Amd No 14290, 21 March 2003) (Manufacturer's tests		Required	Certification in accordance with Clause 409 is required
410	Anchorages in drilled holes	On site tensile load test	As required in Appendix 4/1	Required	

**Appendix 1/5: Testing to be Carried out by the Company**

Clause	Works, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 500					
501	Pipes for drainage and service ducts				Product certification scheme applies
	Vitrified clay				
	Concrete - PC/SRC	not exceeding 900mm diameter	(Manufacturer's tests)		
	Concrete - Pre-stressed				
	Iron - cast				
	Iron - ductile				
	PVC-U				
	GRP				
	Plastics. See Table 5/1				
	Corrugated steel		Required (AASHTO)		
	Corrugated steel bitumen protection	Not exceeding 900 mm diameter			
	Other materials		Required	BBA certification (or equivalent) applies	
503	Pipe bedding	Grading and fines content	1 per week (min of 3)	Required	
		Water-soluble sulphate (WS) content (N)	5 per source		
		Oxidisable sulfides (OS) content and total potential sulfate (TPS) content (N)	5 per source		
		Resistance to fragmentation (N)	1 per source		

**Appendix 1/5: Testing to be Carried out by the Company**

Clause	Works, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
	Series 500 continued				
505	Filter medium backfill	Plastic index (N)	1 per source	Required	
		Resistance to fragmentation (N)	1 per source		
		Water-soluble sulphate (WS) content (N)	5 per source		
		Oxidisable sulfides (OS) content and total potential sulfate (TPS) content (N)	5 per source		
		Grading and fines content	1 per week		
		Permeability (N)	1 per source		
506	Sealing existing drains				
507	Chambers				Product certification scheme applies
		Precast concrete		Required	Product certification scheme applies
		Corrugated galvanized steel	(Manufacturer's tests)		
		Manhole steps			
		Steel fitments			
		Covers, grates and frames			Product certification scheme applies
		Cover bolts			Quality management scheme applies

**Appendix 1/5: Testing to be Carried out by the Company**

Clause	Works, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 500 continued					
508	Gullies and pipe junction				Product certification scheme applies
	Precast concrete				
	Clay				
	Cast iron and steel				
509	Watertightness of joints	Air test	All pipelines with watertight joints	Required	
512	Backfill to pipe bays	Grading	1 per 50 tonnes (min of 3)	Required	Minimum to allow for natural variability of sulphur compounds
	Water-soluble sulphate (WS) content (N)	5 per source			
	Oxidisable sulfides (OS) content and total potential sulfate (TPS) content (N)	5 per source			
513	Permeable backing to earth retaining structures	Plastic index (N)	1 per source	Required	
	Water-soluble sulphate (WS) content (N)	5 per source		Required	
	Oxidisable sulfides (OS) content and total potential sulfate (TPS) content (N)	5 per source			
	Resistance to fragmentation (N)	1 per source			
	Grading	1 per 200 tonnes (min of 3)			
	Permeability (N)	1 per source			
	Precast hollow concrete blocks	(Manufacturer's tests)		Required	

**Appendix 1/5: Testing to be Carried out by the Company**

Clause	Works, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 500 continued					
514	Fin Drains	(Manufacturer's tests)		Required	BBA certification (or equivalent) applies
515	Narrow filter drains	Geotextile, pipes and fittings	(Manufacturer's tests)	Required	BBA certification (or equivalent) applies
		Granular fill	Plastic index (N)		
			Resistance to fragmentation (N)		
			Water-soluble sulphate (WS) content (N)		
			Oxidisable sulfides (OS) content and total potential sulfate (TPS) content (N)		
			Grading and fines content		
			Permeability (N)		
516	Combined drainage and kerb systems	Load test	A minimum of 1 test and not less than 1 test per 1000 metres for each type and source	Required	Certification that the systems comply with Clause 516 is required
517	Linear Drainage Systems	Load Test	A minimum of 1 test and not less than 1 test per 1000 metres for each type and source	Required	Certification that the systems comply with Clause 517 is required
518	Thermoplastics structured wall pipes and fittings	(Manufacturer's tests)		Required	BBA certification (or equivalent) applies

**Appendix 1/5: Testing to be Carried out by the Company**

Clause	Works, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 600					
601, 631 to 637, 640	Acceptable material			Required	
	Class	General Description			
	1	General granular fill	Grading/uniformity coefficient mc/MCV (N) SMC of chalk (N)	Twice a week 2 per 1000 m <sup>3</sup> up to max of 5 per day Twice a week	
		1C only	Resistance to fragmentation (N)	Weekly	
	2	General cohesive fill	Grading mc/MCV/PL Undrained shear strength (N) SMC of chalk (N) Bulk density (pfa) (N)	Twice a week 2 per 1000 m <sup>3</sup> up to max of 5 per day Twice a week 2 per 1000 m <sup>3</sup> up to max of 5 per day	Required
	3.	General chalk fill	mc(N) SMC (N)	2 per 1000 m <sup>3</sup> up to max of 5 per day Daily	Required
	4.	Landscape fill	Grading/mc/MCV (N)	Daily	
	5.	Topsoil	Grading	Daily	
	6.	Selected granular fill	Grading/uniformity coefficient PI/LL (N) Resistance to fragmentation (N) SMC (N) omc/mc, mc or MCV (N)	1 per 400 tonnes Daily Weekly for on-site material Weekly 1 per 400 tonnes	

**Appendix 1/5: Testing to be Carried out by the Company**

Clause	Works, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 600 continued					
601, 631 to 637 640 cont	6 (cont'd)	Selected Granular fill (cont'd)	Organic matter/water soluble (WS) sulphate content (N)	Weekly	Required
			Oxidisable sulfides (OS) content and total potential sulfate (TPS) content (N)	Weekly	
			pH/chloride ion content (N)	Weekly	
			Resistivity (N)	As required	
			Undrained and drained shear parameters (N)	As required	
	6F4 and 6F5	Selected Granular fill	Size designation and overall grading category	1 per week	
			Maximum fines and oversize categories	1 per week	
			Volume stability of blast furnace slag	6 monthly	
			Volume stability of steel (BOF and EAF) slag	6 monthly	
			Other aggregate requirements	Annex C of BS EN 13242	
			Laboratory dry density and optimum water content		
			Water content		
7.	Selected cohesive fill	Grading/mc/ MCV/ bu k density (N)	1 per 400 tonnes	Required	
		SMC of chalk (N)	Twice a week		
		PI/LL (N)	Daily		
		Organic matter/total or water soluble (WS) sulphate content (N)	Twice a week or daily when sulphates are expected		

**Appendix 1/5: Testing to be Carried out by the Company**

Clause	Works, Goods or Material		Test	Frequency of Testing	Test Certificate	Comments
Series 600 continued						
601, 631 to 637 640 cont	7. cont'd	Selected cohesive fill cont'd	Oxidisable sulfides (OS) content and total potential sulfate (TPS) content (N)	Twice a week or daily when sulfides are expected	Required	
			pH/chloride ion content (N)	Weekly		
			Resistivity (N)	As required		
			Undrained and drained shear parameters (N)	As required		
			Permeability (N)	As required		
	8.	Miscellaneous fill	mc/MCV (N)	Daily		
	9.	Stabilised materials	Pulverisation	1 per lane width per 200 metre length		
			mc/MCV (N)			
			Bearing ratio (N)			
	Pulverised fuel ash		Chemical analysis	1 per consignment		
	Furnace bottom ash		Grading	1 per 300 tonnes		
	Fill adjacent to cementitious material or metallic items		Water-soluble sulphate (WS) content, oxidisable sulfides (OS) content and total potential sulfate (TPS) content (N)	1 per 400 tonnes or per location if less than 400 tonnes		
602	Earthworks material beneath surface of a road or paved central reserve		Frost heave (N)		Required	
	(i) Off site source			1 every four months		
	(ii) On Site source			1 per source		
609 621	Geotextiles		Tensile load	1 per 400 square metres	Required	
			Permeability			
			Pore size			

**Appendix 1/5: Testing to be Carried out by the Company**

Clause	Works, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 600 continued					
612	Compaction of fills			Required	
		Method compaction	Field dry density (N)		
		End product compaction	Optimum mc (2.5kg rammer/vibrating hammer method) (N)		
614	Cement stabilisation to form capping	Rate of spread of cement	1 per 500 square metres of cement spread	Required	
615 641 643	Lime stabilisation to form capping	Rate of spread of lime	1 per 500 square metres of lime spread	Required	
		Available lime content	Each source of lime weekly during stabilisation operation		
622 638 639	Earthworks for reinforced soil and anchored earth structures	Redox potential	5 locations within the affected area	Required	
		Drainage layers	Grading		
			Chemical analysis		
		Reinforcing elements	Coeff. of friction	Each type of element with each type of fill	
		Anchor elements	Adhesion		
624	Ground anchorages	Proof loading	As required in Appendix 6/10	Required	
626	Gabions			Required	
		Fill	Grading		
			10% fine values (N)		
		Geomesh			
631	Subgrade	LWD tests augmented by independently verified dynamic Plate Bearing Tests	1 No. LWD test at each hardstanding area. 1 No. Dynamic Plate Bearing at each hardstanding area	Required (ASTM G23)	Subgrade Surface Modulus
642	Capping or Stabilised Materials	Falling Weight Deflectometer Testing (FWD) augmented by independently verified dynamic Plate Bearing Tests	1 No. FWD test at each hardstanding area. 1 No. Dynamic Plate Bearing at each hardstanding area	Required	Stiffness Modulus
642	Earthworks materials for corrugated steel buried structures	Constrained soil modulus (M*)	3 on each side of each structure	Required	

**Appendix 1/5: Testing to be Carried out by the Company**

Clause	Works, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 700					
710	Constituent materials in recycled aggregate and recycled concrete aggregate	Quality control	Checks are to be carried out by the Company in accordance with the 'Quality Protocol for the production of aggregates from inert waste' and the requirements of Clause 710	Required	The quality control procedure should be in accordance with the 'Quality Protocol for the production of aggregates from inert waste' and the @producers compliance checklist published by Waste and Resources Action Programme (WRAP) The results of all quality control checks shall be delivered promptly to the Scottish Ministers on request
711	Overbanding and inlaid crack sealing systems			Required	BBA certification (or equivalent) applies
Series 800					
801	General requirements for Unbound Mixtures for adjacent to cement bound materials, concrete pavements, structures or products  Unbound mixtures beneath surface of a road or paved central reserve	Water-soluble sulfate (WS) content (N)	1 per 400 tonnes or per location if less than 400 tonnes	Required	
803		Oxidisable sulfides (OS) content and total potential sulfate (TPS) content (N)	1 per 400 tonnes or per location if less than 400 tonnes		
804		Frost heave (N)	1 per source		
805		Grading and fines content	1 per week		
806		Plastic index (N)			
		Resistance to fragmentation (N)	6 monthly		
		Resistance to wear micro-Deval test			
		Resistance to freezing and thawing (magnesium sulfate soundness) (N)	1 per source		
		Water absorption (N)	As required		
		Volume stability of blast furnace slags	6 monthly		
		Volume stability of steel (BOF and EAF) slags	6 monthly		
		CBR (N)	1 per source and then monthly		
		OMC/mc (N)	As required		
		Density (N)	As required		
		Water absorption (N)	As required		

**Appendix 1/5: Testing to be Carried out by the Company**

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 800 (continued)					
821, 822, 823, 830, 831, 832, 834, 835, 840	Cement and other Hydraulically Bound Mixtures (HBM)	Tests for control and checking og HBM	Tests specified in table 8/14 and Table 8/15	Required	
		Coefficient of linear expansion			
		Tests for laboratory mixture design	Test specified in Clause 880		
Series 900					
901, 925, 937, 938, 943	Aggregates for bituminous material			Required	National quality management scheme applies
		Resistance to fragmentation (hardness)	Resistance to fragmentation (N)		Washing and sieving method to be used
		Resistance to freezing and thawing (durability)	Soundness (N)		[BS EN 1097-3]
			Water absorption (N)		
		Cleanness	Sieve test (mass passing 0.063mm sieve) (N)		
		Shape	Flakiness index (N)		
		Blast furnace slag	Bulk density (N)		
			Soundness (N)		
			Dicalcium silicate disintegration (N)		
			Iron disintegration (N)		
		Steel slag	Bulk density (N)		
			Volume stability (N)		
		Coarse aggregate for surface courses	Resistance to polishing (PSV) (N)		
			Resistance to surface abrasion (AAV) (N)		
	Binders for bituminous materials	Penetration (N)	1 per 750 tonnes	Required	National quality management sector schemes apply. Modified binders should have a BBA HAPAS Roads and Bridges Certificate. In the event that no such Certificates have been issued, then in the interim ,only modified binders undergoing BBA assessment should be considered for approval by the Scottish Ministers
		Softening point (N)	1 per 750 tonnes		

**Appendix 1/5: Testing to be Carried out by the Company**

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 900 continued					
903 to 907, 909 to 912, 914, 916, 925, 926, 929, 930, 937, 938, 941, 943, 946 to 948	Bituminous mixtures	Grading (N)  Binder Content (N)	For Audit Test purpose only		National quality management sector schemes apply
929	Base and Binder Course Asphalt Concrete (Design Mixtures)	In situ air void content (N)  Refusal air void content (N)  Binder volume (N)  Grading (N)  Binder content (N)  Deformation Resistance  Deformation Resistance (Design)  Stiffness (Design)	As required	Required	
930	EME 2	In situ air void content (N)  Binder volume (N)  Grading (N)  Binder content (N)  Richness modulus (design)  Duriez (design)  Deformation Resistance (Design)  Stiffness (Design)	As required	Required	The test certificate is the CE Mark for the mixture
911	Hot Rolled Asphalt surface course (Design Mixtures)	Design Binder content	1 per source	Required	The test certificate is the CE Mark for the mixture
915	Coated chippings for application to Hot Rolled Asphalt Surfacings	Grading (N)  Binder content (N)  Flakiness Index (N)  Resistance to polishing PSV (N)  Resistance to surface abrasion (AAV)(N)  Hot sand test (N)  Rate of spread (N)	1 per stockpile  1 per stockpile  1 per source  1 per source  1 per source  1 per source  As required	Required	National quality management sector schemes apply
921	Surface macrotexture	Volumetric Patch (N)	BS EN 13036-1	Required	

**Appendix 1/5: Testing to be Carried out by the Company**

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 900 continued					
924	High friction surfaces	Quality control checks	As required in sub- Clause 924.5	Required	BBA HAPAS Roads and Bridges certification (or equivalent) applies
		System coverage	As required in sub- Clause 924.6		
	Aggregate	Resistance to polishing PSV (N)	1 per source and as required for coated chippings in Clause 915.3	Required	

**Appendix 1/5: Testing to be Carried out by the Company**

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 900 continued					
937	Stone mastic asphalt (SMA) binder course and regulating course	In situ air void content (N)		Required	The test certificate is the CE Mark for the mixture
		Deformation resistance			
		Binder drainage test		Required	
		Deformation resistance (design)			
938	Porous asphalt surface course				National quality management sector scheme applies
		Relative hydraulic conductivity	In accordance with Clause 938		
		Modified binder storage stability	In accordance with Clause 941		Modified binders should have a BBA HAPAS Roads and Bridges Certificate. In the event that no such Certificates have been issued, then in the interim, only modified binders undergoing BBA assessment should be considered for approval by the Scottish Ministers.
		Binder drainage test	In accordance with BS 594987: 2010		
942	Thin surface course systems				National quality management sector scheme applies. BBA certification (or equivalent) applies.
		Binder drainage test	In accordance with BS 594987: 2010		
943	Hot Rolled Asphalt surface course and binder course (performance-related design mix)	In situ air void content (N)	As required	Required	National quality management sector scheme applies
		Deformation resistance			
		Grading (N)			
		Binder content (N)			
		Density (N)			
		Wheel tracking rate (N)			
		Wheel tracking rut depth (N)			
		Deformation resistance (design)	As required		The test certificate is the CE Mark for the mixture

**Appendix 1/5: Testing to be Carried out by the Company**

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 900 (continued)					
918	Slurry surfacing incorporating microsurfacing				
	Binder				Modified binders should have a BBA HAPAS Roads and Bridges Certificate. In the event that no such Certificates have been issued, then in the interim, only modified binders undergoing BBA assessment should be considered for approval by the Scottish Ministers.
	Product identification	Per product per source	Required		Tests are expected to be repeated every two years
	Vialit cohesion	Per product per source	Required		Tests are expected to be repeated every two years
	Rate of spread	For each machine	Required		Not more than 6 weeks prior to start of work
	Penetration at 25°C and 5°C (N)	Every manufactured batch			Manufacturer's QA test results may be submitted
	Aggregates	Flakiness index (N)	1 per source	Required	
	Resistance to polishing (PSV) (N)	Source approval	Required		
	Resistance to surface abrasion (AAV) (N)	Source approval	Required		
	Grading (N)	1 per 200 tonnes	Required		
	System	TAIT or BBA/HAPAS		Required	
920	Bond coats, tack coats and other bituminous sprays				
	Binder	Product identification	1 per product per source	Required	Tests are expected to be repeated every two years
		Vialit cohesion	1 per product per source	Required	Tests are expected to be repeated every two years
		Accuracy of spread	1 for each binder and sprayer per month	Required	Not more than 6 weeks prior to start of work and one per month
		Rate of spread	1 per week		
		Penetration at 25°C and 5°C (N)	Every manufactured batch		Manufacturer's QA test results may be submitted

**Appendix 1/5: Testing to be Carried out by the Company**

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 900 (continued)					
919	Surface Dressing				National management quality sector scheme applies
922					
	Binder				Modified binders should have a BBA HAPAS Roads and Bridges Certificate. In the event that no such Certificates have been issued, then in the interim, only modified binders undergoing BBA assessment should be considered for approval by the Scottish Ministers.
	Product identification	1 per product per source	Required		Tests are expected to be repeated every two years
	Vialit cohesion (N)	1 per product per source	Required		Tests are expected to be repeated every two years
	Accuracy of spread	1 for each binder and sprayer per week	Required		Not more than 6 weeks prior to start of work and one per week
	Rate of spread	Every 1000 linear metres initially	Required		Frequency to be reduced to daily after 3 satisfactory results, but not less than 1 test per site
	Penetration at 25°C and 5°C (N)	Every batch			For cut back binders as supplied, manufacturer's QA viscosity test results may be submitted
	Chippings	Resistance to (PSV) polishing (N)	Source approval	Required	Less than 6 months prior to work
	Resistance to abrasion (AAV) (N)	Source approval	Required		Less than 6 months prior to work
	Grading (N)	1 per 200 tonnes	Required		
	Binder content (N)	1 per 200 tonnes	Required		Coated chippings only
	Flakiness index (N)	1 per 200 tonnes	Required		
	Accuracy of spread (N)	1 for each chipping spreader for every change of chipping size or source	Required		Initial test not more than 6 weeks prior to start of work
	Rate of spread	Every 500 linear metres initially			Frequency to be reduced to daily after 3 satisfactory results, but not less than 1 test per lane per site
	System	TAIT or BBA/HAPAS		Required	
	Rollers	Spray bars working	Before work starts and daily during works		

**Appendix 1/5: Testing to be Carried out by the Company**

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 900 (continued)					
950	Depressions				BBA HAPAS Roads and Bridges Certification (or equivalent) applies.
Series 1000					
1001	Cement			Required	Quality management and product certification schemes apply
1030					
1044	Portland cement CEM I Portland blastfurnace cement Blastfurnace cement CEM III/A Portland PFA cement CEM II/B-V Pozzolanic cement CEM IV/A Portland cement with microsilica Pulverised - fuel ash Ground granulated blast furnace slag Admixtures			Required (BS6610)	Tests and test certificates are required
	Mixing water	Sulphate content (N)	Monthly	Required	BBA Roads and Bridges Certificate required for microsilica
	Aggregates	Resistance to freezing and thawing - magnesium sulphate soundness (N) Water absorption (N)	1 per source As required	Required	Tests and test certificates are required. Product certification schemes apply to pfa and slag.

**Appendix 1/5: Testing to be Carried out by the Company**

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 1000 (continued)					
1001	Aggregates cont'd	Flakiness index (N)	Monthly	Required	
1030		Shell content (N)	1 per source		
1044		Resistance to fragmentation (N)	6 monthly		
cont'd		Resistance to polishing (PSV) (N)	1 per source		
		Resistance to abrasion (AAV) (N)	1 per source		
		Grading and fines content (N)	1 per week as per source		
		Chloride content (N)	Weekly or as otherwise agreed (1 per source for CBM Aggregate)		
		Total sulphur (TS) and acid-soluble sulphate (AS) content (N)	Every 6 months		
	Flint coarse aggregate containing white flints	Water absorption (N)	3 per source thereafter weekly	Required	
	Sand (i.e. Fine aggregate)	Acid-soluble material (N)	Monthly		Not required for CBM aggregate
	Blastfurnace slag	Bulk density (N)	Every 6 months		
		Dicalcium silicate disintegration (N)	Every 6 months		
		Iron disintegration (N)	Every 6 months		
		Total sulphur (TS) and acid-soluble sulphate (AS) content (N)	Every 6 months		
	Pulverised-fuel ash			Required (BS3892: Part 2)	

**Appendix 1/5: Testing to be Carried out by the Company**

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 1000 continued					
1002	Pavement Concrete	Air content test (N)	As required in Table 10/10	Required	Product certification scheme applies
1003		Density (N)	As required in Table 10/10		
1004		Strength (N)	As required in Table 10/10		
1005	Consistence (Workability)	Degree of Compactability (Compaction Index) (N)	As required in Table 10/10	Required	
		Vebe (N)			
		Slump[ (N)			
1011	Dowel bars Tie bars			Required (BS4449)	Product certification scheme applies
1012		Dowel bars and supporting cradles	Load test		
		Sheathed dowel bars	Bond stress		
		Cranked tie bars (coated)	Bend test		
			Salt fog cabinet		
1015	Joint filler board  Cork filler board	Weathering test	3 per source	Required	Normally undertaken by manufacturer
		Compression and recovery	4 per source		
		Extrusion	1 per source		
		Immersion in water	2 per source		
		Immersion in acid	2 per source		
1016		Initial Penetration	1 per 1000 m or 1 per day		
1017	Applied sealants	Resilience	1 per 1000 m or 1 per day	Required (BS EN14188-1, BS 2499-2, BS5212-1, BS5212-2) (BSEN13880-2, BSEN13880-3 and BS4254)	

**Appendix 1/5: Testing to be Carried out by the Company**

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 1000 continued					
1016 1017 cont.	Compression seals			Required (ASTM D2628)) (BS2752)(BS 4443:Part 4) Method 10 and BS EN ISO 2440) (BS EN ISO 1856) (BS903: Part A16 or BS IS) 1817	
		Compression set	1 per type of seal		
		Immersion in oil	1 per type of seal		
		Self expanding cork seal	Tests specified in Clause 1017	1 per type of seal	Required
1026 1044	Surface macrotexture	BS EN 13036 - 1 Volumetric Patch Technique (N)	1 per day (set of 10)	Required	
1027	Aluminised curing compound	Efficiency index	1 per source	Required	
1030	Wet lean concrete	Density	As required in Table 10/9	Required	
		Cube strength (N)			
1043	Foamed Concrete	Cube strength (N)	2 cubes per 12m <sup>3</sup>	Required	
Series 1100					
1101	Precast concrete kerbs, channels, edgings and quadrants	Bending Strength	Minimum of 8 per 1000 units of each product (BS EN 1340)	Required	
1102	In situ asphalt kerbs	Grading	1 test per 500 metres laid	Required	
		Binder content			

**Appendix 1/5: Testing to be Carried out by the Company**

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 1100 continued					
1104	Precast concrete flags	Bending strength	Minimum of 8 per 1000 m <sup>2</sup> of each product (BS EN 1339)	Required	
		Bedding	Granular material		
1107	Concrete block paving	Compressive strength	Minimum of 8 per 1000 m <sup>2</sup> of each product (BS EN 1338)	Required	
1108	Clay pavers	Bending strength	Minimum of 8 per 1000 m <sup>2</sup> of each product (BS EN 1344)	Required	
		Skid resistance			
Series 1200					
1202	Permanent traffic signs			Required	Quality management scheme applies. Certification that the traffic sign is capable of passing the tests in BS 873: Part 1 is required.
1207	Anchorage in drilled holes to supports of traffic signs	Loading test on site			
1210	Holding down bolts and anchorages to bases of permanent bollards			Required	Certification that the holding down bolts and anchorages are capable of complying with the performance requirements of BS873:Part 3 is required.
1212	Road Markings	Tests specified in BS EN 1824		Required	National quality management sector scheme applies. Procedures are given in BS EN 1824
	Glass Heads	Arsenic trioxide content, Lead content and Antimony content (N)	One per contract and/or per specific source of supply	Required	

**Appendix 1/5: Testing to be Carried out by the Company**

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 1200 continued					
1214	Permanent traffic cones and traffic cylinders			Required	Certification that permanent traffic cones and cylinders have been tested and comply with BS873:Part 8 is required
		Test specified in BS873:Part 8	2 of each size and category/type		
	Flat traffic delineators			Required	Certification that the FTD's have been tested and comply with Clause 1214 is required
		Test specified in Clause 1214	As required		
	Other traffic delineators			Required	Certification that the delineators have been tested and comply with Clause 1214 is required.
	Temporary cones, cylinders, FTD's and other delineators			Required	Certification that at least 1 in 500 of any batch of cones, cylinders, FTD's and other delineators to be used in the Temporary Works have passed the tests in Clause 1214 as appropriate is required.
1217	Traffic signals				Quality management scheme applies. Statutory type approval of equipment applies.
		Cables			Product certification scheme applies
		Controllers <i>[Other equipment]</i>	Test specified in Appendix 12/5	Each controller before delivery to Site and again after installation	
		Cabling	Tests a, b, c, e, f, g, h, j as defined in sub-Clause 1424.2	Each traffic signals installation	Required Certification that the installation complies with BS7671 (the IEE Wiring Regulations) is required

**Appendix 1/5: Testing to be Carried out by the Company**

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 1200 continued					
1218	Detector loops				
	Cable			Required	Certification that completed cables comply with specification TR 2029 is required
	Epoxy resin			Required	Certification that the epoxy resin complies with specification MCH 1540 is required
	Feeder cable			Required	Certification that completed cables comply with specification TR 2031 is required.
	Joints	Pull test (4 kgf)	Each crimp		
	Installation	Series resistance	Each loop	Required	Certification in accordance with specification MCH 1540 is required
		Insulation resistance			
		Inductance			
Series 1300					
1305	Anchorages for use in drilled holes	Tensile load (Manufacturer's tests)		Required	To provide well attested and documented evidence
1306	Anchorages in drilled holes to columns and masts with flange plates	Loading test on site	As required		
1310	Welding	Welding procedures (Manufacturer's tests)	(Every seven years)		Quality management scheme applies
		Welder qualification (Manufacturer's tests)	(Sub-clauses 1310.1 and 1310.2 (7.1.3.))		Quality management scheme applies
		Production testing (Manufacturer's tests)	(Sub-Clauses 1310.1 and 1310.2 (7.1.4))		
	Welded joints	Destructive testing	(Sub- Clause 1310.1 and 1310.2 (7.1.5))		
1313	GFRP laminates	Loss of ignition	1 per 50 production columns		
		Colour fastness	1 per batch		
		Electric strength			

**Appendix 1/5: Testing to be Carried out by the Company**

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
<b>Series 1300 continued</b>					
1313 cont.	GFRP laminates cont'd	Water absorption	1 per batch		
		Impact strength			
1314	Brackets for laminated GFRP lighting columns			Required	
	Polyurethane foam	Bulk density	1 per batch		
		Surface hardness			
		Apparent bulk density	2 per batch		
		Impact strength			
		Flexural stress			
<b>Series 1400</b>					
1421	Cable				Product certification scheme applies
1424	Lighting Units	Tests specified in Clause 1424	Each unit	Required	Product certification scheme applies Certification that the installation complies with BS7671 (the IEE Wiring Regulations) is required.
	Networks	Test specified in Clause 1424	Each network	Required	Certification that the installation complies with BS 7671 (the IEE Wiring Regulations) is required
<b>Series 1500</b>					
1506	Copper communications cable			Required	Certification that each completed cable complies with specification TR2150 or TR 2158, as appropriate, is required
	Optical fibre communications cable			Required	Certification that each completed cable complies with specification TR2151 or TR 2159, as appropriate, is required
	Coaxial communications cable				Certification that each completed cable complies with specification TR2152 or TR 2160, as appropriate, is required
	Energy cable			Required	Certification that each completed cable complies with specification TR2153 or TR 2161, as appropriate, is required

**Appendix 1/5: Testing to be Carried out by the Company**

Clause	Works, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 1500 continued					
1513	Cable joint enclosures	Test specified in Clause 1513.12	Each CJE	Required	Certification that CJE satisfies the air pressure test is required
1518	Coaxial and copper Communications and power cable	Tests specified in specification MCG 1022 or MCG 1099, as appropriate	Each cable (Stage 1) As required in Appendix 15/1 (Stage 2)		Results to be reported in accordance with MCG 1022 or MCG 1099, as appropriate
	Optical fibre communications cable	Tests specified in specification MCG 1055 or MCG 1099, as appropriate	Each cable (Stage 1) As required in Appendix 15/1 (Stage 2)		Results to be reported in accordance with MCG 1055 or MCG 1099, as appropriate
1522	Motorwarn System				
	Steel posts			Required (BS 6323)	
1526	Electrical installations	Tests specified in BS 7671	Each installation	Required	Certification that the installation complies with BS7671 (the IEE Wiring Regulations) is required
1530	Cable ducts	Tests specified in BS EN 50086-1, 2 and 4	Each supplier	Required	Current British Board of Agrément Certificate is required
1533	Cable ducts				
		Mandrel test	Tests specified in Clause 1533	Each duct	Required
		Air test	Tests specified in Clause 1533	Each duct	Required
Series 1600					
1601	Soil samples In situ soil tests			Required	
1602 to 1606	Concrete Grout Reinforcement Prestressing			Required	
1610 to 1615	Steelwork Welding Protection against corrosion				
1606	Coatings for protection against corrosion	Adhesion	As required in Appendix 16/6		

**Appendix 1/5: Testing to be Carried out by the Company**

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 1600 continued					
1607	Reduction of friction on piles				
1608	Integrity testing				
1616	Dynamic testing				
1609	Static load testing of piles			Required	
1612	Self hardening slurry mixes			Required	
1617	Instrumentation			Required	
1618	Support fluids	To be proposed by the Company			See Appendix 16/18
Series 1700					
1702 1704	Cement types as stated in sub- Clause 1702.1			Required	Certificate to be provided monthly for each type of cement.  Quality management and product certification schemes apply.
	Cements (all types)	Chloride content	Monthly		Tests to be carried out by the manufacturer and results included on the test certificates required above
	Pulverised-fuel ash	Sulfate content	Monthly		
	Ground granulated blast furnace slag	Acid-soluble alkali content	Daily (PC) Weekly (pfa ggbs)		
	Aggregates	Grading and fines content	1 per delivery (per source)		Results of routine control tests from the factory production control system operated by the producer to be provided - see Annex H of BS EN 12620
		Shell content (N)	Monthly		Product certification scheme applies
		Flakiness index (N)	Monthly		
		Resistance to fragmentation (N)	Monthly		
		Drying shrinkage (N)	1 per 5 years		
		Chloride content (N)	1 per week or as otherwise agreed		
		Sulphate Content (N)	Yearly		
	Blastfurnace slag	Bulk density (N)	Every 6 months		
		Stability (N)	Every 6 months		
		Sulphur content (N)	Every 6 months		
	Water	Tests specified in BS EN 1008	As required		

**Appendix 1/5: Testing to be Carried out by the Company**

Clause	Work Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
1700 continued					
1702	Water cont	Chloride content	Monthly		
1704 cont		Sulphate content	Monthly		
		Acid-soluble alkali content	Weekly		
	Admixtures	Chloride Content	1 per consignment	Required (BS-934-2)	
		Sulphate content	1 per consignment	Required	
		Acid-soluble alkali content	1 per consignment		
1707	Concrete	Cube strength (N)	Pre stressed concrete two cubes from 12 m <sup>3</sup> or 2 batches whichever represents the lesser volume	Required	Company to cast and test sufficient additional cubes to demonstrate cube strength before transfer
			Reinforced concrete two cubes from 24 m <sup>3</sup> or 4 batches whichever represents the lesser volume		
			Mass concrete - two cubes from 50 m <sup>3</sup> or 50 batches whichever represents the lesser volume		
			Additional cubes for special purposes		
		Cube strength - identity testing as described in Appendix 17/4 (N)	2 cubes from each of 2 samples of each batch		
		Density	As required		
		Modus of elasticity			
	Fresh concrete	Consistence (slump or compacting factor or Vebe) (N)	Each batch	Required	
		Air content	Each batch		
		Cement content	As required		
		Water/cement ratio			

**Appendix 1/5: Testing to be Carried out by the Company**

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 1700 (continued)					
1709	Silane			Required for each delivery	Certification that the silane complies with Clause 1709 is required
		Refractive Index	Three samples		
		Trial panels, where required in the Contract			
1710	Concrete packing Mortar packing Epoxy resin bonding agent				
	Precast concrete manufactured off Site	Cube strength (Manufacturer's tests)			Company to make available records of tests by the manufacturer
1711	Grouting and Duct Systems for Post-tensioned tendons				CARES Scheme for supply and installation of Post-tensioned Systems In Concrete Structures or an equivalent scheme is required.  Quality management and product certification schemes for cement apply.
		Full scale trials, where required in the Contract			See sub-clause 1711.1 and Appendix 17/6
		Air pressure tests			See sub-clause 1711.3 and Appendix 17/6

**Appendix 1/5: Testing to be Carried out by the Company**

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 1700 (continued)					
1711 cont'd	Grouting and Duct Systems for Post-tensioned tendons cont'd	Duct assembly verification tests  Wall thickness of ducts after tensioning  Fluidity  Bleeding  Volume change  Cube strength  Sieve  Sedimentation			See sub-clause 1711.3 and Appendix 17/6  See sub-clause 1711.3 and Appendix 17/6. Company should provide evidence of testing  See sub-clause 1711.8 and sub-clause 1711.9 and Table 17/5
	Admixtures			Required	Quality management and product certification schemes apply. Data on their suitability, including previous experience should be made available.  See sub-Clause 1711.10
1712	Reinforcement	Steel bars  Steel wire  Steel fabric  Stainless Steel		Required (BS4449)  Required (BS4482)  Required (BS4483)  Required (BS6744)	Product certification scheme applies
1713	Fabricated reinforcement			Required	Certification that fabricated reinforcement complies with the routine inspection / testing requirements of BS 8666 shall be required if the fabrication is not covered by a product certification scheme listed in Appendix B
1716	Reinforcement jointing systems	Permanent elongation Characteristic strength (Manufacturer's test)		Required for each type of connection	BBA Roads and Bridges certificate or CARES certificate of product assessment or fully equivalent scheme apply

**Appendix 1/5: Testing to be Carried out by the Company**

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 1700 (continued)					
1717	Reinforcement metal arc welding	Welding procedure approval (BS7123) Welder approval (BS7123)	As required in BS7123		Tests should be carried out by an independent testing body specified in BS 8666
1718	Prestressing tendons	Steel wire Steel bar Seven-wire strand Prestressing steel (all types)	Proof load Breaking load Elongation Ductility Relaxation Modulus of elasticity	Required (BS5896) Required (BS4486) Required (BS5896) As required	Product certification scheme applies
		Super strand to BS5896 or other than lowest strength 3-7 millimetres dia wires to BS5896	0.1% proof load Breaking load	Each reel	
1724	Post-tensioning anchorages	Tests in accordance with BS EN 13391 (Manufacturer's tests)		Required (BS EN 13391)	Product certification scheme applies
1726	Stainless steel bar			Required (BS6744)	Product certification scheme applies
1727	Inspection and testing of structures and components				
Series 1800					
1801 1803	Structural steels to BS EN 10025-1 to -4 and , BS EN 10025-6, BS EN 10210 Structural steels to BS 7668 Stainless steels to BS 970,BS EN 10084, BS EN 10087, BS EN 10095,			Required Required (BS7668) Required (BS 970, BS EN 10084, BS EN 10087, BS EN 10095)	

**Appendix 1/5: Testing to be Carried out by the Company**

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 1800 continued					
1801	Stainless steels to BS EN 10029, BS EN 10048, BS EN 10051, BS EN 10258, BS EN 10259.			Required (BS EN 10029, BS EN 10048, BS EN 10051, BS EN 10258 and BS EN 10259)	
1803 cont'd	Steel plate	Ultrasonic testing	As required		
	Bolts, nuts and washers				Quality management scheme applies
	All types except high strength friction grip	Test specified in BS 4395: Part 2	As required in BS 4395: Part 2		
	High Strength Friction Grip	Test specified in BS 4395: Part 1 or Part 2	As required in BS 4395: Part 1 or Part 2		
	Tension Control Bolts	Test specified in JSS II-09-1996 or BS 4395	As required in JSS II-09-1996 or BS 4395		
	Welding electrodes			Required (BS EN 499)	
	Covered steel			Required (BS EN 756, BS EN 760)	
	Wire				
	Welding				
	Welding procedures	Tests specified in BS EN ISO 15614-1	As required in BS ISO 15614-1 and Appendix 18/1		Results to be reported in accordance with Annex A of BS EN ISO 15614-1
	Welder qualification	Tests specified in BS EN 287: Part 1	As required in BS EN 287: Part 1 for each welder	Required (BS EN 287: Part 1)	Certificate to be in accordance with Annex B of BS EN 287: Part 1
	Butt weld 'run-off' plates	Destructive tests specified in BS 5400: Part 6	As required in BS 5400: Part 6		
	Butt welds and adjacent areas of steelwork	Non-destructive tests using methods to be agreed	As required in BS 5400: Part 6		
	Fillet welds	Non-destructive tests			

**Appendix 1/5: Testing to be Carried out by the Company**

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 1800 continued					
1801	Welding (cont'd)				
1803 cont'd		Flame cutting and shearing	Tests to demonstrate procedures comply with BS5400: Part 6 and Appendix 18/1	As required in Appendix 18/1	
		Stud shear connectors	Fixing (BS 5400: Part 6) Bending (BS5400: Part 6)	Each stud As required	
Series 1900					
1903	Abrasives	Grading	As required		
		Hardness			
1909	Galvanised coatings  Aluminium and zinc spray coatings  Sherardized coatings  Zinc electroplated coatings  Plating to high strength friction grip and tension control bolts	Test specified in BS EN ISO 1461	As required		
		Test specified in BS EN 22063	As required		Areas to be tested to be in accordance with Clause 1910
		Aluminium coating material		Required (BS EN 1301-1)	
		Zinc coating material		Required (BS EN 1179)	
		Test specified in BS 4921	As required		
		Test specified in BS 3382: Part 2	As required		
		Plating to high strength friction grip and tension control bolts			
1910	Metal spray coatings	Tensile test specified in BS EN 22063	As required		
		Grid test specified in BS EN 22063	As required		

**Appendix 1/5: Testing to be Carried out by the Company**

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments	
Series 1900 continued						
1911	Paints	'A' and 'B' Samples	Specific gravity		Samples will be selected in accordance with Clause 1911SE	
			Colour match			
			Composition			
			Application characteristics			
Series 2000						
2003	Permitted waterproofing systems				Registration and BBA Roads and Bridges Agreement certification apply	
	Additional bituminous protection		Tests specified in BS594: Part 1		Sampling to comply with BS594: Part 1	
	Stability value		Test specified in BS598: Part 107			
2004	Tar		Tests specified in BS76		Sampling to comply with BS76	
	Cut back bitumen		Tests specified in BS3690: Part 1		Sampling to comply with BS3690: Part 1	
Series 2100						
2101	Bridge bearings	Elastomeric bearings	Hardness	As required      Required (BS5400: Section 9.2)		
			Tensile strength			
			Elongation			
			Ageing			
			Compression set			
			Ozone resistance			
		Complete bearings	Tests specified in Appendix 21/1	As required in Appendix 21/1		

**Appendix 1/5: Testing to be Carried out by the Company**

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 2400					
2401	Masonry cement			Required (BS EN 413-1)	Quality management scheme applies
		Chloride content	Monthly	Required	Test to be carried out by the manufacturer and results included on the test certificate
2402	Sand			Required per consignment (BS EN 13139)	
		Chloride content	Monthly		Test to be carried out by the manufacturer and results included on the test certificate
2403	Water	Tests specified in BS EN 1008	As required		
2404	Mortar admixtures			Required (BS EN 934-3)	
2405	Lime			Required (BS EN 459-1)	
2406/ 2417	Bricks				
		Clay	(Soluble salt content Efflorescence Comprehensive strength  Water absorption Initial rate of suction) (BS EN 771-1/TRL Report 447)		
		Calcium silicate		Required (BS 187)	
		Concrete		Required (BS 6073-1/BS EN 772-2)	
2407	Blocks				
		Concrete		Required (BS6073-1/BS EN 772-2)	

**Appendix 1/5: Testing to be Carried out by the Company**

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 2400 continued					
2408	Reconstituted stone				
2410	Stainless steel				
2411	Wire/fabric			Required (BS EN 10088-1)	
	Bars			Required (BS6744)	
	Ready mixed mortars			Required (BS4721)	
	Mortars	Tests specified in Appendix A1 of BS EN 10521-1	1 set of tests per mix		
Series 2500					
2501	Materials for corrugated steel buried structures exceeding 900 mm clear span or internal diameter			Type approval applies	
	Steel components			Required as appropriate to the standard or specification listed in the type of approval Certificate	
	Zinc coating				BBA Roads and Bridges Certification applies
	Protective coating				
	Paved invert system				
2502	Materials for reinforcing elements, prefabricated facing and capping units, and washers			BBA Roads and Bridges Certification applies	
	Carbon steel strip			Required (BS1449: Part 1.1 or BS EN 10025-1) and BS EN 10025-2)	Silicon content and mechanical properties to be stated on the certificate
	Stainless steel strip			Required (BS EN 10029, 10048, 10051, 10258 and 10259)	Mechanical properties to be stated on the certificate
	Reinforcing bar for anchor elements			Required (BS4449)	Tests scheduled under Clauses 1717 and 1909 are required for welding and galvanising of anchor elements

**Appendix 1/5: Testing to be Carried out by the Company**

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 2500 continued					
2502 cont'd	Materials for fasteners			Required (BS EN 10088-1 (BS EN ISO 3506-1 and 3506-2))	Tests scheduled under Clause 1909 are required for hot dip galvanising
2503	Materials for pocket type reinforced brickwork retaining wall structures				
	Clay bricks	(Soluble salt content Efflorescence Compressive strength  Water absorption  Initial rate of suction) (BS 3921/TRL Report 447) (N)	1 set of tests per type of brick		
2504	Environmental barriers			As required in Appendix 25/4	Quality management scheme applies
		Barriers	Sound absorption		
			Sound insulation		
	Post foundations	Loading test on site	As required in Appendix 25/4		
2505, 2506	Drainage structures/buried rigid pipes for drainage structures.  Pipes for drains and culverts having diameters or clear span exceeding 900 mm				
	Vitrified clay			Product certification scheme applies  See sub-clause 2506.28  Type Approval Certificate and BBA Roads and Bridges Certificate apply	Product certification scheme applies  See sub-clause 2506.28  Type Approval Certificate and BBA Roads and Bridges Certificate apply
	Concrete PC/SRC	(Manufacturer's test)			
	Iron				
	Corrugated steel	(Manufacturer's test)			

**Appendix 1/5: Testing to be Carried out by the Company**

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 2600					
2601	Bedding mortar materials			Required for each batch	Certification in accordance with Clause 2601 is required
	Bedding Mortar	Flow cone test Flow between glass plates Compressive strength Expansion test Water absorption Elastic stability	Each batch		Laboratory tests
		Flow cone test Compressive strength	Each load		Site control tests
2604	Plastic coating to fencing posts, gates and ancillaries			Required (BS 1722 : Part 16)	Certification by powder manufacturer and coating applicator is required.
2607	Granolithic concrete				Testing to be in accordance with Clauses 1702, 1703, 1707 and 1710
Series 3000					
3001	General				Inspection reports as required in Appendix 30/1
3005	Grass Seeding, Wildflower Seeding and Turfing	Rate of spread of fertiliser	1 per 1000 square metres		
		Rate of spread of seeding	1 per 1000 square metres		
		Chemical analysis of fertiliser	1 per source		
		Grass seed germination and purity (Official Seed Testing Station tests)	1 per source and mix variety	Required prior to sowing	
Series 5000					
5003	Abrasives	Grading Hardness	As required		
5005	Aluminium and zinc spray coatings	Test specified in BS EN 22063	As required	Areas to be tested in accordance with Clause 5006	
	Aluminium coating material		Required (BS EN 1301-1)		
	Zinc coating material		Required (BS EN 1179)		

**Appendix 1/5: Testing to be Carried out by the Company**

Series 5000 continued					
Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
5005 cont	Sheradized coatings	Tests specified in BS 4921	As required		
	Zinc electroplated coatings	Tests specified in BS 3382: Part 2	As required		
	Plating to high strength grip and tension control bolts				
5006	Metal spray coatings	Tensile test specified in BS EN 22063	As required		
		Grid test specified in BS EN 22063	As required		
5007	Paints				
5007SE	'A' and 'B' Samples	Specific gravity			Samples will be selected in accordance with Clause 5007SE
		Colour match			
		Composition			
		Application Characteristics			

## Appendix 1/7: O&M Site Extent and Limitations of Use

### **1 O&M Works Site Extent**

- 1.1 The O&M Works Site extent is detailed in the Agreement and comprises:
  - a The land as detailed in the 'Land Made Available by the Scottish Ministers for the O&M Works' drawings listed in Appendix 0/4; and
  - b Any further land acquired by or conveyed to the Scottish Ministers (from any persons, including the Company) from time to time for the purposes of the Design and the O&M Works.
- 1.2 The Company shall make provision for carrying out work on private land as required under this Agreement for example Accommodation Works, traffic signing, road lighting, drainage works and otherwise.

### **2 Limitations on the Use of the O&M Works Site**

- 2.1 The O&M Works Site shall be used solely for the construction and completion of the O&M Works.
- 2.2 The Company shall not use areas of land with a temporary right of access for any purpose other than the construction and completion of the O&M Works.
- 2.3 The Company shall ensure that all areas of land which have been temporarily occupied are reinstated to the satisfaction of the affected landowner, occupier and the Relevant Authorities.
- 2.4 Road access to the O&M Works Site shall be gained solely via roads as detailed by Appendix 1/19.
- 2.5 The Company may gain entry to the O&M Works Site via private land only with the prior express agreement in writing of the landowner and occupier/tenant. Any access to private land from a public road shall be to the satisfaction of the Relevant Authority. The Company shall bear full responsibility for negotiation, paying for and bearing all costs relating to these accesses and for any matters arising with parties who consider themselves to be affected by these accesses.
- 2.6 The Company shall erect appropriate signs to show accesses and restricted routes.
- 2.7 The Company shall comply with the restrictions imposed by Network Rail for all O&M Works to be carried out within or adjacent to Network Rail property.
- 2.8 The Company shall not cross any watercourses via the river banks and bed and shall take all necessary measures to avoid any disturbance of the banks and bed.
- 2.9 The Company's attention is drawn to the Special Requirements detailed in these O&M Works Requirements.

## **Appendix 1/9: Noise Control Applicable to the O&M Works Site**

### **1 Noise Control Applicable to the O&M Works Site**

- 1.1 The Company shall consult and comply with the requirements of:  
Glasgow City Council;  
North Lanarkshire Council; and  
South Lanarkshire Council  
as appropriate, prior to commencement of work on the O&M Works Site.
- 1.2 These requirements, together with the Company's proposed methods of work and Constructional Plant, shall be discussed and agreed in writing by:  
Glasgow City Council;  
North Lanarkshire Council; and  
South Lanarkshire Council  
as appropriate, prior to commencement of the relevant activities.
- 1.3 The Company shall provide Consultation Certificates in accordance with the Certification Procedure in respect of these requirements.
- 1.4 The Company shall comply with the contents and recommendations of British Standard 5228: 'Noise and Vibration Control on Construction and Open Sites', together with the specific requirements of this Appendix 1/9.
- 1.5 Further to this, the company shall refer to the Department for Environment, Food and Rural Affairs 'Update of Noise Database for Prediction of Noise on Construction and Open Sites' which is an update to the existing construction plant noise database, contained in Annex C, Part 1 of British Standard 5228 'Noise and Vibration Control on Construction and Open Sites'.
- 1.6 All Constructional Plant used for the O&M Works shall be subject to the acknowledgement of the Overseeing Organisation and shall be the quietest of its type practical for carrying out the work required and shall be maintained in good condition with regard to minimising noise output.
- 1.7 In this respect, the Company shall refer to the Department for Environment, Food and Rural Affairs 'Update of Noise Database for Prediction of Noise on Construction and Open Sites', which contains details of typical Constructional Plant noise levels that the Scottish Ministers shall use as a basis prediction.
- 1.8 All Constructional Plant shall be operated and maintained in accordance with the manufacturer's written recommendations including the use and maintenance of any specific noise reduction measures.
- 1.9 Where the Design requires a diversion for traffic which places the traffic temporarily closer to adjacent properties, the Company shall carry out an assessment of the predicted noise levels associated with the construction and completion of the O&M Works (either temporary or permanent) and the use by traffic. If this assessment indicates an increase in the ambient noise levels at any properties of more than 3dB LA10(18hr), a suitable noise barrier (temporary or permanent) shall be provided as a minimum for the duration of the diversion works and diversion, and shall be placed prior to the commencement of any such work.

### **Appendix 1/9: Noise Control Applicable to the O&M Works Site**

- 1.10 Best practicable means shall be employed including the positioning of Constructional Plant and activities to minimise noise at sensitive locations, the use of mufflers on pneumatic tools, the use of non-reciprocating Constructional Plant and the use, where practical, of affective sound reducing enclosures to ensure all Constructional Plant used in connection with the O&M Works operates with the minimum of noise.
- 1.11 The Company shall ensure that any piling works are kept to a practicable minimum and that machinery and vehicles are switched off when not in use.
- 1.12 Subject to the other requirements of this Agreement, the normal working hours within the O&M Works Site shall be Monday to Friday between 0700 and 1900 hours and Saturday between 0800 and 1300 hours, with no working on Sundays and public holidays.
- 1.13 Permissible construction noise levels for these periods in relation to pre-construction ambient noise levels are detailed in Table 9/1 below. Consent for work outside these hours may be given by Glasgow City Council, North Lanarkshire Council and South Lanarkshire Council as appropriate.
- 1.14 The Company shall have written permission to operate at the relevant permissible noise levels for each area, within the normal working hours, from Glasgow City Council, North Lanarkshire Council and South Lanarkshire Council as appropriate.
- 1.15 The Company shall apply, in writing, for consent to work outside normal working hours to Glasgow City Council, North Lanarkshire Council and South Lanarkshire Council as appropriate, at least 14 days in advance of the proposed work.
- 1.16 The granting of such consents shall be dependent, amongst other things, on the Company demonstrating to the satisfaction of Glasgow City Council, North Lanarkshire Council and South Lanarkshire Council as appropriate in their application that:
  - (a) it is not reasonably practicable to carry out the work during standard working hours;
  - (b) the Company has considered all mitigation measures and has implemented appropriate measures;
  - (c) all interested parties have been consulted; and
  - (d) all alternative means to reduce the amount of work to be undertaken outwith standard working hours has been explored.
- 1.17 Written confirmation of consent shall be required for each and every occasion when the Company proposes to work outwith standard working hours.
- 1.18 In the event of written permission being granted, the Company shall provide the Scottish Ministers with a copy of the written permission at least 48 hours prior to commencing the work.
- 1.19 The Company shall also arrange for leaflets to be delivered to residents within 200 metres of the proposed O&M Works, giving a full description of the proposed Works, their duration, and of the sources, character and levels of noise expected to arise, including a named contact to respond to any noise or vibration concerns or nuisance.
- 1.20 Operating times and noise levels for Sundays and public holidays shall be subject to the agreement and written consent of Glasgow City Council, North Lanarkshire Council and South Lanarkshire Council as appropriate.
- 1.21 A pre-construction ambient noise assessment shall be undertaken by the Company, using an appropriately qualified acoustician who is a member of the Institute of Acoustics for agreement with Glasgow City Council, North Lanarkshire Council and South Lanarkshire Council as appropriate within 100 metres of where the O&M Works shall be undertaken, before the commencement of the O&M Works.

### **Appendix 1/9: Noise Control Applicable to the O&M Works Site**

- 1.22 The noise assessment shall demonstrate the typical pre-construction ambient noise levels at representative properties adjacent to the O&M Works Site..
- 1.23 Measurement locations chosen for the pre-construction ambient noise assessment shall be representative of surrounding properties, shall be considered the “worst case” property in terms of noise levels for that particular area, and shall be directly compatible with the noise levels given in Table 9/1 below for LAeq, 2hr (0800 – 1000) and LAeq 2hr (1900 – 2100).
- 1.24 The Company's acoustician shall be required to undertake additional assessments or noise measurements at locations and methods agreed previously in writing with the Scottish Ministers, Glasgow City Council, North Lanarkshire Council and South Lanarkshire Council as necessary.
- 1.25 The pre-construction ambient noise levels, as detailed in paragraph 1.21 above, shall be used to calculate maximum permissible construction noise levels.
- 1.26 Any measured construction noise level shall not exceed any appropriate level, given in Table 9/1 below when compared to the pre-construction ambient noise level. The permissible construction noise level shall not be exceeded at any property in the surrounding area of the O&M Works.
- 1.27 In exceptional circumstances, permission may be granted to carry out works which exceed the levels given in Table 9/1 below with the agreement of the Glasgow City Council, North Lanarkshire Council and South Lanarkshire Council as appropriate, provided that the Company can demonstrate that all possible mitigation measures shall be implemented.
- 1.28 Notwithstanding the specific requirements of this Appendix 1/9, the Company shall comply with the contents of Scottish Office Roads Directorate Office Section Instruction 2/92, The Noise Insulation (Scotland) regulations 1975.

**Appendix 1/9: Noise Control Applicable to the O&M Works Site**

**TABLE 9/1: PERMISSIBLE CONSTRUCTION NOISE**

Typical Pre-Construction Ambient Noise as appropriate	Permissible Construction Noise Levels							
	Weekday working Monday to Friday excluding Public Holidays							
	Day (07.00-19.00) *L <sub>Aeq,12hr</sub>	L <sub>Amax</sub> (Fast)	Evening (19.00-22.00) *L <sub>Aeq,3hr</sub>	L <sub>Amax</sub> (Fast)	Night Hours (22.00-07.00)	Saturday (08.00-13.00) *L <sub>Aeq, 5hr</sub>	L <sub>Amax</sub> (Fast)	Sunday and public holidays
35	65	86	55	65	Given on request	65	86	Given on request
40	65	86	55	65		65	86	
45	65	86	60	70		65	86	
50	70	92	60	70		70	92	
55	75	96	65	75		75	96	
60	75	96	65	75		75	96	
65	75	96	65	75		75	96	
70	80	101	80	90		80	101	
75	80	101	80	90		80	101	

\*All permissible levels should be façade.

**Notes**

- (i) The pre-construction ambient noise level shall be the total L<sub>Aeq</sub> as determined from the pre-construction ambient noise assessment from all the noise sources at the measurement location over the specified period.
- (ii) Maximum sound level shall be the highest value indicated on a sound level meter. New sound level meters shall comply with EC 61672-1:2002 (BS EN 61672-1:2003 Electroacoustics; Sound Level Meters; Specifications), Class 1 or 2. For all others, compliance with BS EN 60651:1994 or its equivalents, and also to BS EN 60804:1994 if either Leq or SEL is available, to Types 0, 1 or 2.
- (iii) The measurement location shall be representative such that the measurements are representative of the noise which is experienced by the neighbouring properties and the microphone shall not be subject to any unusual screening.

**2 Vibration Control**

- 2.1 The Company shall consult and comply with the requirements of, Glasgow City Council, North Lanarkshire Council and South Lanarkshire Council as appropriate prior to commencement of O&M Works.
- 2.2 These requirements, together with the Company's proposed methods of work and Constructional Plant to be used shall be discussed and agreed in writing by Glasgow City Council, North Lanarkshire Council and South Lanarkshire Council as appropriate, prior to commencement of the relevant activities on Site.

### **Appendix 1/9: Noise Control Applicable to the O&M Works Site**

2.3 The Company shall provide Consultation Certificates in accordance with the Certification Procedure in respect of this requirement.

2.4 The maximum permitted peak particle velocity generated by continuous construction of the O&M Works shall be 5 millimetres/second measured at the property closest to the operations being carried out and applies to all operations.

2.5 Where the Construction of the Work is intermittent, the maximum permitted peak particle velocity generated shall be no greater than 10 millimetres/second.

2.6 Ground vibration at any Structure, property or building and otherwise affected by blasting, shall be kept within the levels given in BS 7385: Part 2. Evaluation and Measurement for Vibration in Buildings; Guide to Damage Levels From Groundborne Vibration.

2.7 The maximum peak component particle velocity measured next to any Structure under construction shall be:

- Equal to or less than a zero to peak displacement of 0.6mm/s at frequencies less than 4Hz;
- Less than 15mm/s at 4Hz, rising to less than 20mm/s at 15Hz; and
- Less than 20mm/s at 15Hz, rising to less than 50mm/s at 40Hz or above.

2.8 With regard to vibration, the level for up to a maximum of three blasts per day, should be 8.5mms, Monday to Friday between 10.00 hours and 16.00 hours. At any other times it should be 2.8mms.

2.9 The Company shall provide written details of the proposed method and periodicity of monitoring of the Vibration Dose Value, to Glasgow City Council, North Lanarkshire Council and South Lanarkshire Council as appropriate.

### **2.10 Vibration Monitoring Equipment**

2.10.1 The type of instrumentation suitable for monitoring vibration shall be a digital seismograph having the following minimum specification:

- Minimum sampling rate 1000 samples/second/channel;
- Capable of recording Peak Particle Velocity (Directly), Peak Acceleration (Calculated), Peak;
- Displacement (Calculated), Frequency at the Peak Velocity (Calculated);
- Dual Mode instrument having (a) Self Triggering Mode and (b) Continuous Monitoring Mode;
- Transducer - 3 orthogonally mounted transducers on one mounting unit;
- Frequency Range - 4.5 to 200 Hertz;
- Minimum Resolution - 0.05 millimetres/second, velocity;
- Range - 0 to 100 millimetres/second, velocity;
- Record of Events - hard copy printout and storage on solid state memory or disc for subsequent printout; and
- Power - 240 volt mains for continuous unattended operation plus internal battery with minimum of 24 hours capacity.

## Appendix 1/17: Traffic Safety and Management

### **1 General Requirements**

- 1.1 All traffic management shall be carried out in a manner which avoids causing traffic to divert on to alternative routes, minimises the impact on the local community and minimises delays and disruptions to existing traffic. The Company shall demonstrate to the satisfaction of those consulted as given in Part 1 of these O&M Works Requirements that his traffic management proposals have been developed such that they include all necessary measures to minimise delays, disruptions and diversions to traffic. This shall include traffic modelling measures as appropriate using micro-simulation measures and the like. Consultation Certificates shall be submitted in accordance with the Certification Procedure.
- 1.2 Subject to the other requirements of this Agreement the Company shall comply at all times with the requirements of Chapter 8 of the Traffic Signs Manual 2009 and any relevant Transport Scotland Publication including those detailed in the DMRB.
- 1.3 The Company shall submit details of its proposed traffic management programme to the Scottish Ministers at least 6 weeks before the date for commencement of the O&M Works.. The programme shall identify the Temporary Traffic Management Scheme associated with each construction operation, and the duration of each phase of the programme. The scheme or schemes proposed shall take into account the information contained in this Appendix 1/17 and in Appendices 1/18, 1/19 and 1/20, and be consistent with any traffic management measures and construction operations being undertaken on adjacent roads.
- 1.4 All applications relating to Traffic Orders and/or authorisation of signs and/or signals shall be submitted to the Scottish Ministers in writing and require the following notice:
  - i) amending or making temporary traffic orders - 8 weeks;
  - ii) authorisation of temporary traffic signals - 3 weeks;
  - iii) authorisation of non prescribed signs – 1 week.
- 1.5 For advance notice of requirements for diversions, occupations and works occupations refer to Appendix 1/18.
- 1.6 The Company shall be responsible for the payment of all charges associated with the preparation and publication of all road related orders.
- 1.7 The Company shall undertake Stage 2 and Stage 3 Road Safety Audits and submit Road Safety Audit Certificates in respect of the Temporary Traffic Management Schemes in accordance with Part 1 of these O&M Works Requirements and the Certification Procedure.
- 1.8 Prior to any Works starting on the O&M Works Site, the Company shall supply to the Scottish Ministers details of traffic management proposals including, but not limited to, the following:
  - i) phasing of Works;
  - ii) drawings showing traffic management layouts including, but not limited to, the following:
    - a. position of traffic signs, signals and cones;
    - b. width of lanes;

### Appendix 1/17: Traffic Safety and Management

- c. working areas;
- d. safety zones;
- e. details of temporary barriers for the protection of personnel;
- f. entry and exit points for site traffic;
- g. provisions for emergency vehicles;
- h. provisions for vehicle recovery;
- i. provisions for wide loads; and
- j. crossovers;

iii) timing of Operations;

1.9 Sufficient information to demonstrate the objectives stated in paragraph 1 of this Appendix 1/17 can be achieved.

1.10 Names and telephone numbers of a minimum of 3 personnel who can be contacted by the Police and/or Scottish Ministers, both during or outwith the working day, and who shall be responsible for initiating whatever action shall reasonably be required in the event of an emergency. At least 2 of these contacts shall be available at any one time including periods when the O&M Works Site is closed.

1.11 The erection and removal of any traffic management installation, temporary diversion or Stage 3 Road Safety Audit shall not be carried out during the following hours and at any other time periods specified by the Scottish Ministers:

1.12 Monday to Saturday – 06:00 to 09:30 hours inclusive and 16.00 (15.30 on Fridays) to 20:00 hours inclusive and on any local or national public holiday unless agreed in writing by the Relevant Authority, or on specific instructions from the Police.

1.13 Where the Company proposes to carry out the erection and removal of any traffic management installation, temporary diversion or Stage 3 Road Safety Audit on a Sunday, they shall give at least 7 days notice of their proposals to the Police and shall not carry out such work without the approval of the Police.

1.14 Temporary crossovers shall be designed for a minimum Design speed (85 percentile speed) of 70kph, or a minimum of 60kph where it can be demonstrated to the Scottish Ministers that it is necessary in the interests of safety.

1.15 The Company shall maintain access across the O&M Works Site to the requirements and standards in Table 1/18 of Specification Appendix 1/18.

1.16 The Company shall ensure that while any Temporary Traffic Management Schemes are in force they are inspected and constantly monitored, any Defects identified being rectified immediately to the satisfaction of the Scottish Ministers, the Police and Glasgow City Council, North Lanarkshire Council and South Lanarkshire Council, as appropriate.

1.17 Frequency of inspections and maximum response times shall be as follows:

**Appendix 1/17: Traffic Safety and Management**

Location	M8 ,M73, M74, A8 & A725		All other Roads	
	Frequency of inspection per 24 hour period	Maximum Response Time	Frequency of inspection per 24 hour period	Maximum Response Time
<b>Advance Signing</b>	4	60 minutes	2	60 minutes
<b>Taper</b>	12	15 minutes	6	15 minutes
<b>Lane Closure</b>	6	30 minutes	3	30 minutes
<b>End Signing</b>	4	60 minutes	2	60 minutes

1.18 During the period when traffic restrictions are imposed on any road, the Company shall provide a minimum of two responsible and appropriately experienced operatives with an appropriate vehicle on a 24 hour day, 7 days a week basis whose sole responsibility shall be for the operational supervision of the Temporary Traffic Management Scheme.

1.19 The operatives shall be equipped with a mobile cellular telephone and mobile message pager to enable direct communication with them at all times. They shall be empowered to accept instructions from the Police and Roads Authority personnel with regard to the layout of the Temporary Traffic Management Scheme for which they are responsible.

1.20 The Company shall keep a daily record of all Defects in any Temporary Traffic Management Schemes, the times when they were identified or reported to him, the action taken to correct the defects, and the times when they were successfully corrected.

1.21 A copy of this record shall be forwarded to the Scottish Ministers on the following day.

1.22 In the event of a traffic accident occurring in or adjacent to the O&M Works Site, the Company shall immediately contact the Police, Fire and Ambulance emergency services as appropriate and the Scottish Ministers informing them of the following:

- i) Location of the accident; and
- ii) The seriousness of the accident and whether any persons are trapped; whether the collision involves vehicles carrying inflammable, corrosive or hazardous substances; whether there is a possibility of ignition from leaking fuel or chemicals.

1.23 The Company shall attend such accidents in accordance with the requirements for recovery set out in Specification Appendix 1/20.

1.24 The Company shall remove any debris from the road to restore the road surface to a serviceable condition and shall then carry out any interim repairs or reinstatement that is required to reinstate the traffic control to its original layout. In any event complete reinstatement shall be made within 24 hours of the accident.

1.25 The Company shall ensure that sufficient personnel and a sufficient stock of spare signs and cones etc, are available at all times to make good damage to any traffic control layout.

1.26 When a contraflow is in operation an emergency lane shall, where practicable, be provided at all times for emergency vehicles. The emergency lane shall be kept free of

### Appendix 1/17: Traffic Safety and Management

materials, plant and stationary vehicles but it may be used for site access. The route shall be signed and delineated in order to ensure easy and free flow of any emergency vehicle.

1.27 The needs and safety of non motorised users shall be considered at all times.

1.28 The Company shall comply with the advice of paragraph D3.10.4-6 and O3.13 of Chapter 8 of the Traffic Signs Manual 2009.

1.29 All non motorised users diversions shall have a hard surface and adequate drainage to prevent flooding or ponding. They shall be kept clean and free from all materials, Construction Plant and stationary vehicles.

1.30 Excessively long lengths should be avoided where possible to avoid 'shortcuts'. Care shall be taken to avoid crossing areas regularly traversed by heavy plant.

1.31 No at-grade crossings of the A725 Trunk Road, A8 All Purpose Road, M8 Motorway, M73 Motorway or the M74 Motorway shall be permitted.

1.32 All diversions of pedestrian routes which are normally lit shall be provided with a standard of lighting at least equal to that of the original route.

1.33 Refer to the standards given in Table 1/18B of Appendix 1/18.

1.34 Works required to Pedestrian Underpasses shall be undertaken in such a way that the non motorised access provided by adjacent Underpasses is not restricted at any one time.

1.35 All drivers including those delivering Constructional Plant and materials shall be given clear instructions regarding the traffic arrangements applicable at any particular time.

1.36 Provision for the passage of abnormal loads through the O&M Works shall be as follows:

- i) The Company shall assist the Police in moving abnormal loads through the Works by modifying the signing/coning as necessary; and
- ii) Signs/cones so moved shall be replaced immediately the abnormal loads have passed through the O&M Works.

1.37 For the purposes of this Appendix, an abnormal load shall consist of any number of vehicles in convoy at any one time, requiring special measures to be taken in order to gain passage through the O&M Works.

1.38 Meetings between the Scottish Ministers, the Company, Police and Glasgow City Council, North Lanarkshire Council and South Lanarkshire Council, as appropriate, shall be arranged by the Company monthly throughout the duration of the O&M Works, at initiation or changes of traffic management layouts and at any other time deemed necessary by any of these parties.

1.39 The Company shall ensure that his traffic management proposals take account of events and public holidays which are likely to affect traffic flows.

1.40 The Company shall accommodate roadwork schemes adjacent to the O&M Works and shall consult and comply with the Relevant Authority in this respect.

## **2 Monitoring of Roadworks**

2.1. The Company shall nominate two members of staff to liaise with Traffic Scotland at all times.

2.2. The Company shall inform the Traffic Scotland Control Centre (TSCC), Transport Scotland, AA Roadwatch, RAC, Radio Scotland, local radio, local press, South East Management Unit, South West Management Unit, M80 DBFO Company, Glasgow City

### Appendix 1/17: Traffic Safety and Management

Council, North Lanarkshire Council, South Lanarkshire Council, and the emergency services at least two weeks in advance of any planned major changes to the traffic management layouts, including any plans to reduce the number of lanes in accordance with paragraph 5.2.

- 2.3. In accordance with Appendix 1/24 the Company shall within his method statements for traffic management include procedures to inform the motoring public of delays and queues on the approaches to and within the O&M Works Site.
- 2.4. The following organisations shall be informed of the frequencies indicated in the reporting frequencies section of paragraph 3.0 below:
  - i) Traffic Scotland Control Centre;
  - ii) AA Roadwatch;
  - iii) Radio Scotland;
  - iv) Local Radio Networks;
  - v) Traffic Link; and
  - vi) any other organisations as specified by the Scottish Ministers
- 2.5. Traffic queues shall be monitored at all times during periods when Temporary Traffic management Systems are in operation for the duration of this Agreement.
- 2.6. Traffic queues shall be measured by means of time delay.
- 2.7. Queue lengths measured as being less than eight minutes shall be defined as representing "*no substantial delay*".
- 2.8. Substantial delay queue lengths shall be quoted in the following bands;

<b>Measured Delay</b>	<b>Quoted Delay</b>
Up to 8 minutes	No substantial delay
Between 8 and 12 minutes	10 minute delay
Between 13 and 17 minutes	15 minute delay
Between 18 and 22 minutes	20 minute delay
Subsequent 5 minute time bands	add 5 minutes

- 2.9. When communicating a traffic queue its length shall also be quoted as a distance in miles.
- 2.10. For the purposes of this Agreement, a queue is defined as being where the speed of vehicles is less than 20 miles per hour.

### **3 Reporting Frequencies**

- 3.1 Traffic Information Outlets shall be informed if:
  - i) a queue reaches eight minutes delay;
  - ii) queue changes by five minute band;
  - iii) substantial delay ends i.e. delay less than eight minutes; and
  - iv) the Company shall report to TSCC every 30 minutes irrespective of traffic conditions.
- 3.2 The Company shall not open any area to traffic unless the following requirements are met:
  - i) appropriate road markings have been laid or removed;

## **Appendix 1/17: Traffic Safety and Management**

- ii) the carriageway has been fully swept and cleared of all items of Construction Plant, personnel, materials and debris;
- iii) adjacent road restraint systems, where required, have been erected and tensioned;
- iv) the Company shall not have to impose future traffic restrictions on the section of carriageway to undertake O&M Works which could have reasonably been completed under the preceding traffic control period; and
- v) all temporary or permanent signing and lighting is in place.

## **4 Traffic Safety and Control Officer**

- 4.1 The Company shall appoint a senior member of its staff to act as Traffic Safety and Control Officer. This person shall be responsible for all traffic safety and control during the O&M Works and shall liaise with the Relevant Authorities as required. The Traffic Safety and Control Officer shall take instructions direct from the Scottish Ministers and, in the case of emergency, from the Police where they have assumed control. Radio contact should be maintained at all times with the Traffic Safety and Control Officer.
- 4.2 The responsibilities of the Traffic Safety and Control Officer shall include the following:
  - i) All traffic management measures associated with the O&M Works;
  - ii) Ensuring that all equipment is in place and in full working order at all times;
  - iii) Enforcement of all relevant Health and Safety directives, relating to operations and live traffic;
  - iv) Enforcement of site access requirements;
  - v) liaison with the Scottish Ministers and the Relevant Authorities and continued monitoring of the traffic management measures adopted; and
  - vi) Arranging for watchmen and other staff so that the O&M Works Site is patrolled and inspected at all times and equipment attended to and maintained and in the case of accidents have replacement signs, cones, bollards and lights and the like erected without delay.
- 4.3 The Company shall notify the Scottish Ministers and the Relevant Authorities with the name and 24 hour contact telephone number of the Traffic Safety and Control Officer appointed.

## **5 Lane Occupations**

- 5.1 Notwithstanding other provisions of this Agreement, one lane for use by all permitted classes of vehicles and one narrow lane for the use of cars and other light vehicles shall be provided in each direction on the mainline carriageway of the M8 Motorway, M73 Motorway, M74 Motorway, A725 trunk road and the A8 trunk road during the O&M Works, as a minimum requirement.
- 5.2 The Company shall apply to the Scottish Ministers for written approval to reduce the Lane provisions described in paragraph 5.1 above to a minimum of one Lane for use by all permitted classes of vehicle in each direction on the mainline carriageway of the M8 Motorway, M73 Motorway, M74 Motorway, A725 trunk road, the A8 trunk road and the New M8 Motorway between the hours 2000 and 0600 Monday to Friday and 2000 and 0800 Saturday and Sunday during the O&M Works. In exceptional circumstances, the Company shall apply to the Scottish Ministers for written approval to reduce the Lane provisions

## Appendix 1/17: Traffic Safety and Management

described in paragraph 5.1 above to a minimum of one Lane for use by all permitted classes of vehicle in each direction on the mainline carriageway of the M8 Motorway (D2M), M73 Motorway (D2M), M74 Motorway (D2M), A725 trunk road the A8 trunk road and the new M8 Motorway (D2M) all day Saturday and Sunday, during the O&M Works.

5.3 The Company shall demonstrate to the Scottish Ministers that such applications are necessary in terms of either buildability or health and safety.

5.4 Applications shall be made a minimum of 4 weeks in advance of any planned reduction to the provision of paragraph 5.1 above during the O&M Works.

5.5 In very exceptional weather circumstances, such as very heavy snow, or in other very exceptional circumstances necessary for the carrying out of the O&M Works and approved by the Scottish Ministers, (which shall not be unreasonably withheld) a minimum of one Lane for use by all categories of vehicle in each direction shall be provided on the mainline carriageway of the M8 Motorway (D2M), M73 Motorway (D2M), M74 Motorway (D2M), A725 trunk road the A8 trunk road and the new M8 Motorway (D2M).

5.6 A minimum of one Lane for use by all permitted classes of vehicles shall be provided in each direction of the mainline carriageway of the Existing M73 Motorway (D2M) at all times.

5.7 Reduction to the provision of paragraph 5.1 above shall not be permitted during the following periods, except in the case of emergencies:

- i) Christmas and New Year holidays (24 December to 2 January inclusive);
- ii) On the M8 between junction 8 and junction 12 and on the M74 between junction 1 and junction 5 between 0600 and 2200 on any day in the period between 1 December and 15 January inclusive
- iii) Good Friday to Easter Monday inclusive;
- iv) between Friday and Monday inclusive on any local Bank holiday or public holiday weekend during May or September;
- v) the weekends at the start and end of the Glasgow Fair holiday; and
- vi) as directed by the Police.

5.8 On Side Roads reduction to the existing provision of Lanes shall be subject to the prior written approval of the Relevant Authorities or land owners or occupiers and a temporary replacement route or temporary diversion is in operation.

5.9 Lane Occupation charges shall be applied in accordance with Schedule 6.

## **6 Safety of Personnel**

6.1 Notwithstanding any other requirements of this Agreement, safety zones at all Temporary Traffic Management Schemes on the O&M Works Site shall be a minimum of 1.2 metres wide unless the Company shall as part of the Temporary Traffic Management Schemes incorporate safety barrier in lieu of other means of demarcation allowed under the other requirements of this Agreement.

6.2 No personnel or items of plant (other than that required for signing and coning operations) shall enter a newly closed off area until such times as the traffic has been satisfactorily diverted.

## **Appendix 1/17: Traffic Safety and Management**

- 6.3 The Scottish Ministers have the right to instruct the Company's workmen on any matter relating to the safety of personnel and traffic safety and control, including signing and coning.
- 6.4 All drivers including those delivering plant and materials shall be given clear instructions regarding the traffic management arrangements applicable at that particular time.
- 6.5 All personnel working on or adjacent to trafficked roads shall be issued with printed copies of appropriate safety instructions and receive training as necessary.

## **7 Requirements for Vehicles used on the O&M Works**

- 7.1 Where Works are carried out on or adjacent to a road open to vehicles, all vehicles and mobile plant operating on or adjacent to that road in the execution of the Works shall be painted in a conspicuous colour as described hereafter :
  - i) All vehicles used in mobile lane closures as defined in Section 6 "Type C Works" in Chapter 8 of the Traffic Signs Manual shall be painted in non-reflectorised yellow (Colour No 355 to BS 381 C or similar).
  - ii) Similarly all vehicles engaged in O&M Works within unprotected trafficked lanes (for example, setting up major traffic management layouts such as tapers and contraflows) on high speed roads shall be painted non-reflectorised yellow.
  - iii) All other vehicles undertaking O&M Works shall be generally light in colour preferably but not necessarily non-reflectorised yellow and/or provide, over the full width and height of the vehicle which is exposed to approaching vehicles, conspicuous markings and signs to define clearly that the vehicle is a roadworks vehicle.
  - iv) Vehicles shall have a sign board reading "Highway Maintenance" (to Diagram 740A of Schedule 12 Part V of the Traffic Signs Regulations and General Directions 1994) fixed at the rear.
  - v) The lettering shall be 150 millimetres "x height" except that for light vans and cars it shall be the largest "x height" that can be accommodated out of the following heights: 37.5, 50, 62.5 or 100 millimetres.
  - vi) The lettering shall be black capital letters from the alphabet described in the Traffic Signs Regulations and General Directions 2002 Schedule 13 Part II on a yellow non-reflectorised background in accordance with BS 381C, Colour No 355.
  - vii) Heavy goods vehicles shall be fitted with an audible reversing warning device.
  - viii) All vehicles entering the O&M Works Site for any purpose shall comply fully with the requirements of Specification Appendix 1/19.
- 7.2 Vehicles and plant shall be provided with either roof mounted light bars or at least two amber flashing beacons, and light vans and cars shall be provided with a roof mounted amber flashing distinctive lamp.
- 7.3 All warning lamps shall be switched on when the vehicle or plant is manoeuvring into or out of the location of the O&M Works, operating at low speed on the carriageway or hardshoulder open to vehicles or standing on a carriageway or hard shoulder open to vehicles.
- 7.4 Hazard warning lights are not an acceptable alternative to roof mounted flashing lamps, but may be used in addition.

### **Appendix 1/17: Traffic Safety and Management**

- 7.5 All vehicles and plant shall be free from oil and fuel leaks and if refuelled on the O&M Works Site care shall be taken to prevent spillage.
- 7.6 Side tipper vehicles shall be used where such shall limit turning manoeuvres alongside trafficked lanes.
- 7.7 No vehicle shall be permitted to stop on a live section of any carriageway to load or unload materials or personnel unless specifically and unavoidably for traffic management purposes.
- 7.8 During the hours of darkness no vehicle under the control of the Company shall be driven towards oncoming traffic on a closed section of the O&M Works Site adjacent to live traffic.

### **8 Temporary Traffic Signs**

- 8.1 The Company shall not take down existing local or advance direction signs or regulatory or informative signs without first either providing temporary signs displaying the same information or replacement permanent signs.
- 8.2 All traffic signs required by the Traffic Signs Regulations and General Directions 2002 to be reflective shall be made reflective by the application of Class 1 retroreflective material.
- 8.3 All temporary traffic signs shall comply with the Traffic Signs Regulations and General Directions 2002.
- 8.4 In addition to the minimum requirements for signing and coning under Chapter 8 of the Traffic Signs Manual the Company shall erect and maintain the following:
  - i) Advanced signing two miles prior to roadworks as drawing No (P) 7004 sheet 1 of 3) detailing modification to sign WBM 338.1 of Chapter 8 of the Traffic Signs Manual.
  - ii) The standard two-line legend "Road Repairs" shall be replaced by "Major Roadworks".
  - iii) Signing erected one mile in advance of roadworks as drawing No (P) 7005 detailing modification to sign WBM 338 of Chapter 8 of the Traffic Signs Manual.
  - iv) The standard two line legend shall read "Delays Possible" and a third line added to the legend indicating how long delays are possible.
  - v) At the commencement of the roadworks, the additional line shall read, for example "until July 09".
  - vi) At least ten working days before the end of the carriageway restrictions, the date shall be specified more precisely, for example "until 25 June 2009".
  - vii) This date shall be further revised if necessary, until the restrictions are removed.
  - viii) Only the following abbreviations shall be used: Jan, Feb, Mar, Apr, Aug, Sep, Oct, Nov and Dec.
  - ix) Traffic calming chevrons shall be provided within the left hand lane prior to the Works commencing at the end of the right hand Works coning splay over a length of 10 metres. See Drawing Number 100/1 illustrating traffic calming chevrons to be provided.
  - x) Signing to Drawing Numbers W(S) 148 and W(S) 149 shall be deposited in accordance with signs WBM 339.1 and WBM 339 respectively under Chapter 8 of the Traffic Signs Manual.

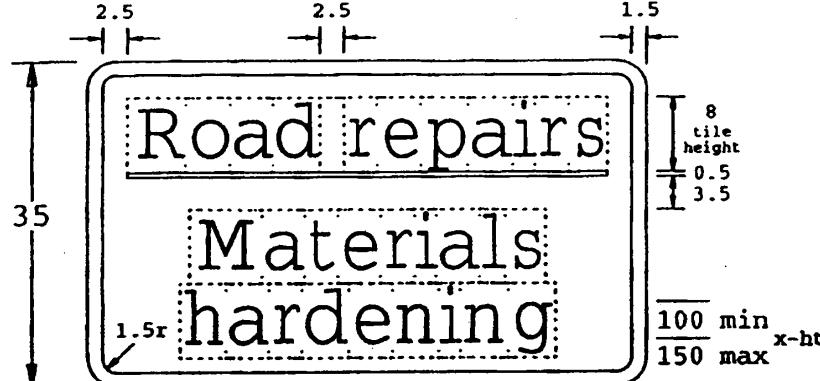
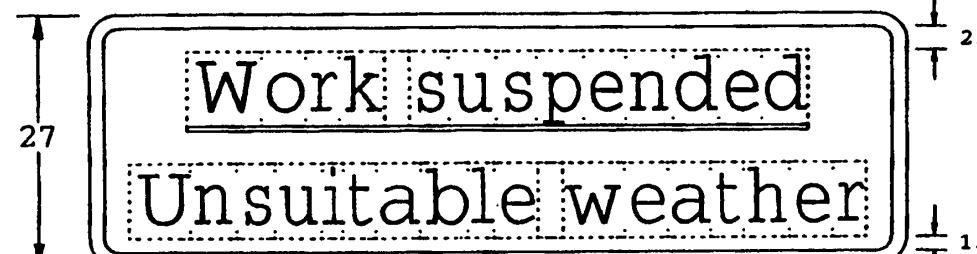
### **Appendix 1/17: Traffic Safety and Management**

- xi) Where within all of the drawings listed above reference is made to "The Scottish Office", it shall be deleted and replaced with "Transport Scotland".
- xii) Black on yellow signs as Drawing Numbers [(P) 7004 sheet 2 of 3] and [(P) 7004 sheet 3 of 3] sited at the beginning and at 1 kilometre intervals through the Works to explain why part of the road has been coned off but no Works is, or appears to be taking place.
- xiii) This signing shall comprise a frame on to which signs displaying any one of the approved messages below shall be fitted.
- xiv) This equipment shall either be permanently sited, for the duration of the Works, where it is safe and convenient to do so, or kept on one side ready for display when it is required.
- xv) The signs shall be constructed and mounted in accordance with the general principles outlined in Topic 3 of Chapter 8 of the Traffic Signs Manual.
- xvi) They shall be reflectorised by the use of Class1 retroreflective material.
- xvii) The legends required to the works are:
  - (a) WORK SUSPENDED
  - (b) UNSUITABLE WEATHER
  - (c) ROAD REPAIRS
  - (d) MATERIALS HARDENING
  - (e) LANE CLOSED FOR SAFETY
  - (f) CONCRETE SETTING
  - (g) LANE CLOSED TO PROTECT WORKFORCE
  - (h) FURTHER WORKS AHEAD
  - (i) LANE REMAINS CLOSED FOR SAFETY PURPOSES

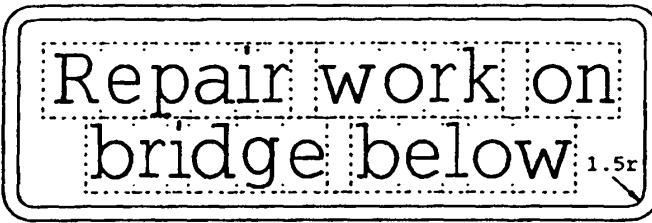
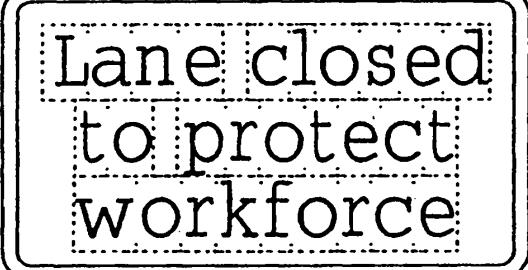
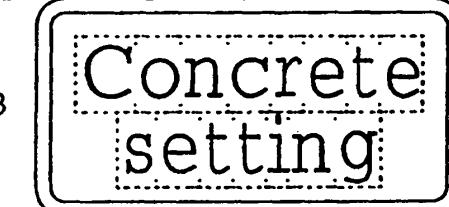
8.5 The minimum period of inactivity which would warrant the display of a sign is 15 minutes.

Appendix 1/17: Traffic Safety and Management

Appendix 1/17: Traffic Safety and Management

Drwg.No. (P) 7004	sheet 2 of 3	© CROWN COPYRIGHT. This drawing must NOT be reproduced. Further copies may be obtained from the Department of Transport, NMDI Division signs office.									
		<p>NOTES:-</p> <ol style="list-style-type: none"><li>1. The legends are from the Transport Heavy alphabet at the x-heights shown.</li><li>2. The outlines of the tiles do not form part of the signs.</li><li>3. Colours:- BS.873:Part 6 (Black &amp; White- Table 5) Legend, Borders and Underline--- Black Background----- Yellow</li><li>4. Illumination:- Internal or external lighting or reflectorised in accordance with the Traffic Signs Regulations and General Directions.</li><li>5. Dimensions :- x-heights are in millimetres, all other dimensions are in stroke widths (4sw = x-height).</li><li>6. The signs shall comply with the current edition of BS.873.</li></ol>									
		<table border="1"><tr><td>FIRST ISSUED: 18.6.92</td></tr><tr><td>REVISIONS:</td></tr><tr><td>THIS ISSUE: 18.6.92 Drawn: R.M. Approved:</td></tr><tr><td>Title: Roadworks</td></tr><tr><td><b>DESCRIPTION OF WORKS</b></td></tr><tr><td>DEPARTMENT OF TRANSPORT</td></tr><tr><td>Drwg.No. (P) 7004</td></tr><tr><td>sheet 2 of 3</td></tr></table>		FIRST ISSUED: 18.6.92	REVISIONS:	THIS ISSUE: 18.6.92 Drawn: R.M. Approved:	Title: Roadworks	<b>DESCRIPTION OF WORKS</b>	DEPARTMENT OF TRANSPORT	Drwg.No. (P) 7004	sheet 2 of 3
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<b>DESCRIPTION OF WORKS</b>											
DEPARTMENT OF TRANSPORT											
Drwg.No. (P) 7004											
sheet 2 of 3											
<p>P7004-2</p> <p>Before using this drawing, confirm that it has not been superseded..</p>											

Appendix 1/17: Traffic Safety and Management

Drwg.No. (P)7004 sheet 3 of 3	© CROWN COPYRIGHT. This drawing must NOT be reproduced. Further copies may be obtained from the Department of Transport, NMDI Division signs office.	
		
<p>NOTES:-</p> <ol style="list-style-type: none"><li>1. The legends are from the Transport Heavy alphabet at the x-heights shown.</li><li>2. The outlines of the tiles do not form part of the signs.</li><li>3. Colours:- BS.873:Part 6 (Black &amp; White- Table 5 Other colours- Clause 4.3.3) Legend &amp; Borders- Black Background----- Yellow</li><li>4. Illumination:- Internal or external lighting or reflectorised in accordance with the Traffic Signs Regulations and General Directions.</li><li>5. Dimensions :- x-heights are in millimetres, all other dimensions are in stroke widths (4sw = x-height).</li><li>6. The signs shall comply with the current edition of BS.873.</li></ol>		
		
		
<p>FIRST ISSUED: 18.6.92 REVISIONS:</p> <p>THIS ISSUE: 18.6.92 Drawn: R.M. Approved: Title: Roadworks <b>DESCRIPTION OF WORKS</b> DEPARTMENT OF TRANSPORT</p>		
<p>Drwg.No. (P)7004 sheet 3 of 3</p>		

P7004-3

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Appendix 1/17: Traffic Safety and Management

Drwg.No.  
(P)7005

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NOTES: 1. The legends are from the Transport Heavy alphabet at the x-heights shown.  
Details of Roadworks triangle on (P)7001.

2. The outlines of the tiles do not form part of the sign.

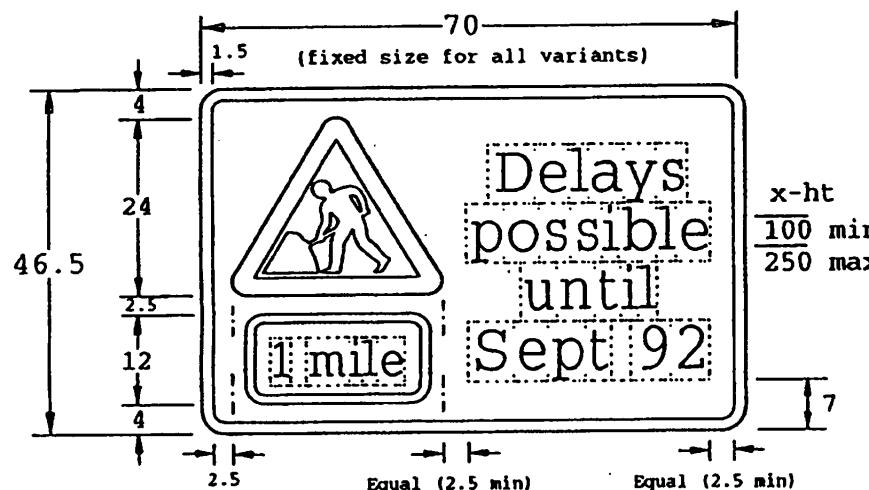
3. Colours:- BS.873:Part 6 ( Black & White- Table 5  
Other colours- Clause 4.3.3 )

Legend & Border---- Black  
Background----- Yellow P7001 triangle { Border----- Red  
Supplate { Border & Legend- Black  
Background----- White Symbol----- Black  
Background-- White

4. Illumination: The sign may be internally or externally lit, but if not so lit throughout ALL the hours of darkness it shall be reflectorised.

5. The date may be varied to suit the circumstances.

6. x-heights are in millimetres, other dimensions in stroke widths at large x-height.  
( 4sw equals the x-height )



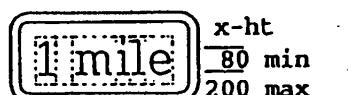
30 Feb

2.5

Sept 92

2.5

Supplate designed to x-ht used  
in it, distance may be varied.



modified WBM(R)338

FIRST ISSUED: 18.6.92

REVISIONS:

1. Spacing amendments 10.11.93

THIS ISSUE: 10.11.93  
Drawn: S.P. Approved:

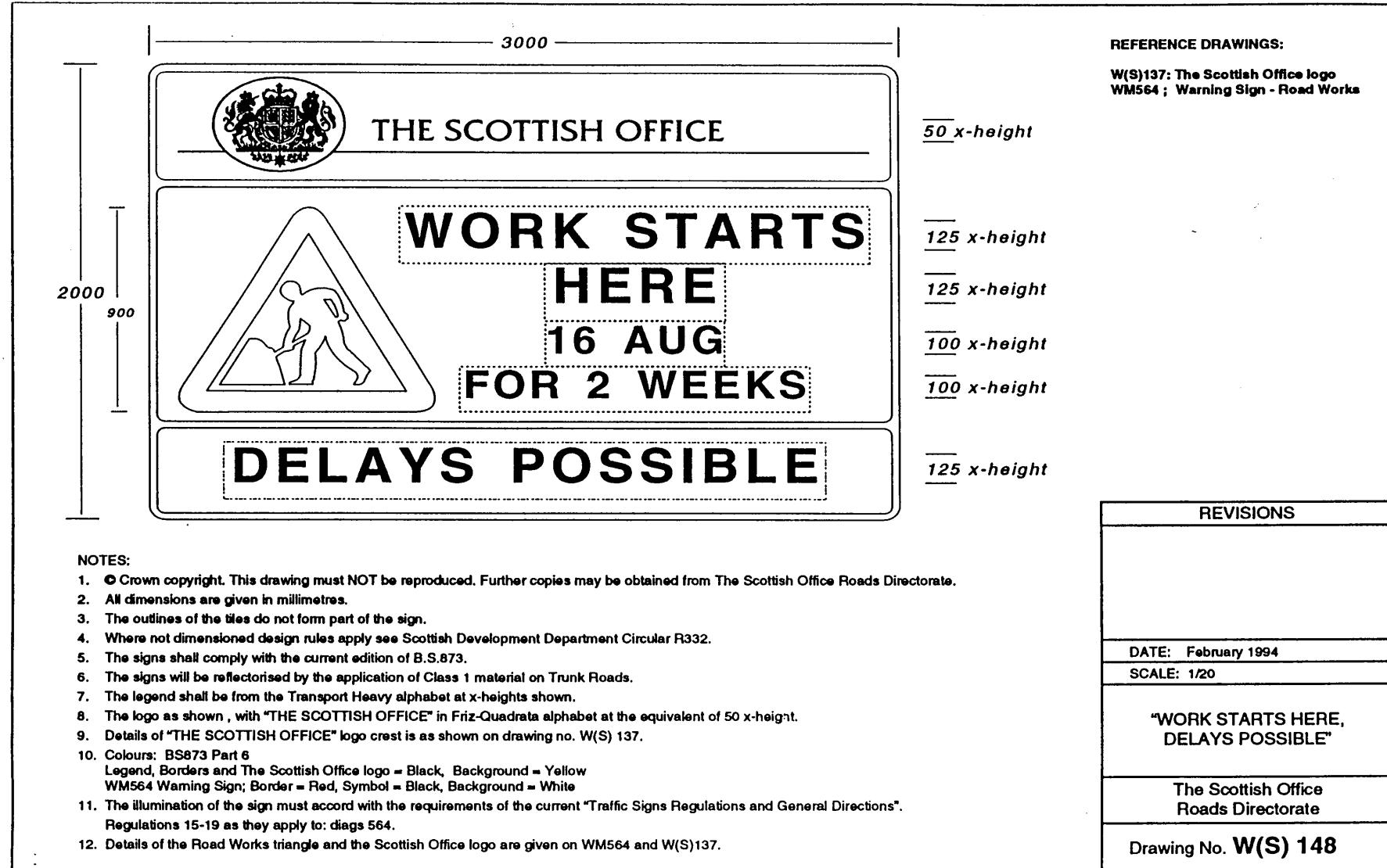
Title: Roadworks  
DELAY AND  
DISTANCE TO WORKS

DEPARTMENT OF TRANSPORT

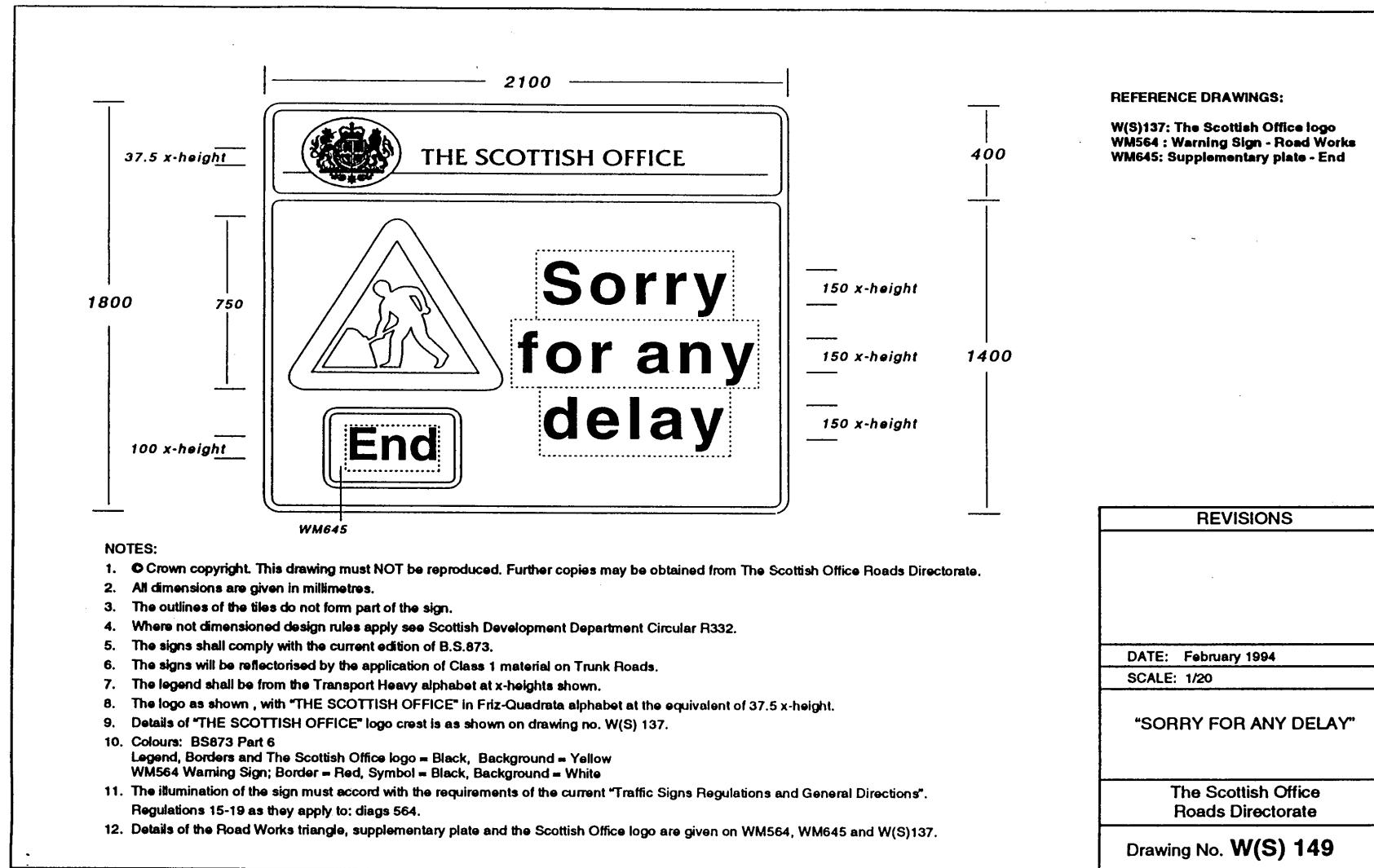
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(P)7005

P7005

Appendix 1/17: Traffic Safety and Management



Appendix 1/17: Traffic Safety and Management



## Appendix 1/18: Temporary Diversions for Traffic

### **1 Design Of Temporary Diversions For Traffic**

- 1.1 Safe access across the O&M Works shall be maintained or diversions provided in accordance with the minimum standards shown in Tables 1/18A and 1/18B to this Appendix.
- 1.2 The Company shall Design temporary diversions for traffic and the associated traffic management measures as required to suit the construction staging, methods of work and Undertakers diversions.
- 1.3 The Company shall provide and maintain access to all properties adjacent to the O&M Works. Temporary diversions shall be maintained at all times.
- 1.4 Where existing central reserve crossovers shall be used for temporary diversion of traffic such crossovers shall require to be upgraded in advance to current design standards detailed in the DMRB.
- 1.5 The Company shall construct temporary diversion ways wherever the O&M Works interfere with existing public or private roads or other ways over which there is a public or private right of way for traffic, whether vehicular or non motorised user.
- 1.6 The Company shall submit for approval to the Scottish Ministers their detailed proposals as below for the temporary diversion of traffic (including non motorised user routes) at least 6 weeks prior to the implementation date:
  - i) Phasing of the diversion works including all concurrent diversions;
  - ii) Drawings showing traffic management layout including as follows:
    - (a) position of traffic signs, signals and cones;
    - (b) width of lanes;
    - (c) working areas;
    - (d) safety zones;
    - (e) details of temporary barriers for the protection of personnel;
    - (f) entry and exit points for site traffic;
    - (g) provisions for emergency vehicles;
    - (h) provisions for vehicle recovery;
    - (i) provisions for wide loads; and
    - (j) crossovers.
  - iii) Making or amending traffic orders.
  - iv) The Company shall be responsible for the payment of all charges associated with the preparation and publication of all road related orders.
  - v) The standard of construction and lighting of diversions shall be suitable in all respects for the class or classes of traffic using the existing ways. Any temporary diversion of a road shall have a bituminous or asphaltic surface. All access provision shall be to a standard equivalent to that in place upon commencement of the O&M Works.
  - vi) Temporary diversions of the Trunk Roads and Motorways shall be designed in accordance with the DMRB to a minimum Design speed of 70kph.

### **Appendix 1/18: Temporary Diversions for Traffic**

- vii) Any temporary diversions of Slip Roads and Side Roads shall be designed to a minimum Design speed of 50kph.
- viii) The Company shall give the Scottish Ministers at least 14 days written notice of any phased Works which require Lane Occupations.
- ix) Table 1/18B gives minimum standards for diversions of traffic.
- x) The standards shall be used to Design temporary diversions of traffic for the road or way in question should it not be possible to maintain the required width on the existing carriageway.
- xi) Notwithstanding any other requirements of this Agreement any generator required for powering temporary traffic lights shall not be permitted within 100 metres of any occupied property.

## **2 Maintenance**

- 2.1 Temporary diversions are deemed to be temporary works and are the responsibility of the Company. They shall be maintained such that the routes are available and in a suitable condition for public use at all times while the diversion is in operation.
- 2.2 The Company shall make all necessary arrangements with owners and occupiers of any land, in addition to that provided in this Agreement, which is temporarily required for the diversion of traffic.
- 2.3 No revised arrangement affecting the bus stops as a consequence of the Design or the construction of the O&M Works shall be permitted without the prior written approval of the Relevant Authority. The Relevant Authority shall require a minimum of 3 weeks notice to consider such approval.
- 2.4 Temporary diversion signing shall be maintained in good order and covered or removed when the diversion is not in operation.

**Appendix 1/18: Temporary Diversions for Traffic**

**Table 1/18A: Requirements of the Scottish Ministers in the Execution of Temporary Diversions Necessitated by the O&M Works.**

Description	Requirements	Remarks
M8 Motorway (D3M and (D4M), M73 Motorway (D3M) and (D4M), M74 Motorway (D3M) and (D4M)	To be kept open at all times. One lane for use by all permitted classes of vehicles and one narrow lane for the use of cars and other light vehicles shall be maintained as a minimum in each direction except between the hours 2000 and 0600 Monday to Friday and 2000 and 0800 Saturday and Sunday where one Lane may be maintained as a minimum in each direction if approval is granted in accordance with Paragraph 5.2 of Appendix 1/17.	Refer to Appendix 1/17
A8 trunk road	To be kept open at all times. One lane for use by all permitted classes of vehicles and one narrow lane for the use of cars and other light vehicles shall be maintained as a minimum in each direction except between the hours 2000 and 0600 Monday to Friday and all day Saturday and Sunday where one Lane may be maintained as a minimum in each direction if approval is granted in accordance with Paragraph 5.2 of Appendix 1/17.	Refer to Appendix 1/17. Non motorised user access shall be provided at all times.
M8 Motorway (D2M), M73 Motorway (D2M), M74 Motorway (D2M).	To be kept open at all times. One lane for use by all permitted classes of vehicles and one narrow lane for the use of cars and other light vehicles shall be maintained as a minimum in each direction except between the hours 2000 and 0600 Monday to Friday and all day Saturday and Sunday where one Lane may be maintained as a minimum in each direction if approval is granted in accordance with Paragraph 5.2 of Appendix 1/17.	Refer to Appendix 1/17

**Appendix 1/18: Temporary Diversions for Traffic**

Description	Requirements	Remarks
All Existing Slip Roads.	Single Lane width of minimum 3.0 metres shall be kept open at all times unless otherwise agreed in writing with the Scottish Ministers and North Lanarkshire Council or South Lanarkshire Council, as appropriate.	Except where Slip Roads shall be closed permanently.
Existing A725 Trunk Road	To be kept open at all times. One lane for use by all permitted classes of vehicles and one narrow lane for the use of cars and other light vehicles shall be maintained as a minimum in each direction except between the hours 2000 and 0600 Monday to Friday and all day Saturday and Sunday where one Lane may be maintained as a minimum in each direction if approval is granted in accordance with Paragraph 5.2 of Appendix 1/17.	Refer to Appendix 1/17. Non motorised user access shall be provided at all times.
Westerhouse Road	To be kept open at all times unless agreed in writing with the Scottish Ministers and Glasgow City Council	Non motorised user access shall be provided at all times.
Halliburton Footbridge	To be kept open at all times unless agreed in writing with the Scottish Ministers and Glasgow City Council	Non motorised user access shall be provided at all times.
Wardie Road	To be kept open at all times unless agreed in writing with the Scottish Ministers and Glasgow City Council	Non motorised user access shall be provided at all times.
Easterhouse Road	To be kept open at all times unless agreed in writing with the Scottish Ministers and Glasgow City Council	Non motorised user access shall be provided at all times.
Bredisholm Road crossing the existing A8 Trunk Road	To be kept open at all times until such time that a suitable alternative right of way has been provided, unless agreed in writing with the Scottish Ministers and North Lanarkshire Council	Non motorised user access shall be provided at all times.

**Appendix 1/18: Temporary Diversions for Traffic**

Description	Requirements	Remarks
A752 Aitkenhead Road	To be kept open at all times unless agreed in writing with the Scottish Ministers and North Lanarkshire Council	Non motorised user access shall be provided at all times.
B802 Woodhall Mill Road	To be kept open at all times unless agreed in writing with the Scottish Ministers and North Lanarkshire Council	Non motorised user access shall be provided at all times.
B799 Bo'Ness Road	To be kept open at all times until such time that a suitable alternative route has been provided, unless agreed in writing with the Scottish Ministers and North Lanarkshire Council	Non motorised user access shall be provided at all times.
A73 Bellside Road	To be kept open at all times unless agreed in writing with the Scottish Ministers and North Lanarkshire Council	Non motorised user access shall be provided at all times.
Bothwellsheild Road	To be kept open at all times unless agreed in writing with the Scottish Ministers and North Lanarkshire Council	Non motorised user access shall be provided at all times.
Bredisholm Road crossing the Existing M73 Motorway	To be kept open at all times until such time that a suitable alternative right of way has been provided, unless agreed in writing with the Scottish Ministers and Glasgow City Council	Non motorised user access shall be provided at all times.
B7578 Blantrye Farm Road	To be kept open at all times unless agreed in writing with the Scottish Ministers and North Lanarkshire Council	Non motorised user access shall be provided at all times.
B7071 Glasgow Road	To be kept open at all times unless agreed in writing with the Scottish Ministers and North Lanarkshire Council	Non motorised user access shall be provided at all times.
Old Mill Road crossing the existing M74	To be kept open at all times unless agreed in writing with the Scottish Ministers and North Lanarkshire Council	Non motorised user access shall be provided at all times.

**Appendix 1/18: Temporary Diversions for Traffic**

Description	Requirements	Remarks
B756 Bellshill Road	To be kept open at all times unless agreed in writing with the Scottish Ministers and North Lanarkshire Council	Non motorised user access shall be provided at all times.
Fallside Road crossing the existing M74	To be kept open at all times unless agreed in writing with the Scottish Ministers and North Lanarkshire Council	Non motorised user access shall be provided at all times.
Bothwellpark Road crossing the Existing M74 Motorway	To be kept open at all times until such time that a suitable alternative right of way has been provided, unless agreed in writing with the Scottish Ministers and Glasgow City Council	Non motorised user access shall be provided at all times.
B7071 Bellshill Road	To be kept open at all times unless agreed in writing with the Scottish Ministers and North Lanarkshire Council	Non motorised user access shall be provided at all times.
Spindlehowe Pedestrian Underpass	To be kept open at all times unless agreed in writing with the Scottish Ministers and North Lanarkshire Council	Non motorised user access shall be provided at all times.
Cadzow Pedestrian Underpass	To be kept open at all times unless agreed in writing with the Scottish Ministers and North Lanarkshire Council	Non motorised user access shall be provided at all times.

**Appendix 1/18: Temporary Diversions for Traffic**

**Table 1/18B: Schedule of Standards for Temporary Diversions of Traffic**

Route	Parameter	Minimum Standard
Existing A725 Trunk Road, Existing A8 Trunk Road, New A8 All Purpose road, New M8 Motorway, Existing M73 Motorway and Existing M74 Motorway including Slip Roads	General	<p>Subject to the requirements of Chapter 8 of the Traffic Signs Manual.</p> <p>No diversion outwith the limits of the Trunk Roads or Motorways shall be permitted.</p>
	Temporary running surface on carriageway widening	<p>The standard of construction of diversions shall be suitable in all respects for the class or classes of traffic using the existing carriageways. Any temporary diversion of a road shall have a bituminous or asphaltic surface. All temporary diversions shall be maintained at all times. Gradients shall not be greater than 6 per cent (except where otherwise agreed by the Overseeing Organisation)</p>
	Central reserve crossing for contraflow operations	<p>The standard of construction of diversions shall be suitable in all respects for the class or classes of traffic using the existing carriageways. Any temporary diversion of a road shall have a bituminous or asphaltic surface. All temporary diversions shall be maintained at all times. Length of crossing shall not be less than 40 metres, with a maximum crossfall of 7 per cent.</p>
Side Roads	Construction	<p>The standard of construction of diversions shall be suitable in all respects for the class or classes of traffic using the existing carriageways. Any temporary diversion of a road shall have a bituminous or asphaltic surface. All temporary diversions shall be maintained at all times, with a maximum gradient compatible with the existing side road.</p>

## **Appendix 1/19: Routeing of Vehicles**

### **1 General**

- 1.1 The Company shall submit his proposals for O&M Works Site access points including access to offices etc. at least four weeks in advance of the proposed start date for construction.
- 1.2 Access to the O&M Works Site for the Company's vehicles of over 3 tonnes unladen weight shall be taken at the following points only:
  - i) M8 Motorway and associated slip roads;
  - ii) M73 Motorway and associated slip roads;
  - iii) A725 Trunk Road and associated slip roads;
  - iv) M74 Motorway and associated slip roads;
- 1.3 Any other existing public and private roads including footways, farm and house accesses shall only be used by the Company with the prior agreement of the owner, the Scottish Ministers and Glasgow City Council, North Lanarkshire Council and South Lanarkshire Council, as appropriate.
- 1.4 The Company shall provide, maintain and keep available at all times equipment as may be necessary to keep such ways clean.
- 1.5 The Company shall appraise itself of the standards of such routes with regard to height, weight or other restrictions by which its Operations may be limited or affected.
- 1.6 Any strengthening work required shall be carried out by the Company to the approval of the Scottish Ministers, Glasgow City Council, North Lanarkshire Council and South Lanarkshire Council, as appropriate.
- 1.7 The access and egress points shall be kept clear at all times and shall be constructed to a suitable standard to achieve a suitable gradient and running surface to permit a smooth access and egress of vehicles in a forward direction.
- 1.8 All accesses shall comprise a minimum paved width of 6.5 metres for a distance of 20 metres from the public road.
- 1.9 All accesses shall incorporate a suitable wheel wash on the exit side.
- 1.10 All roads and accesses within the O&M Works Site, including existing public and private roads, footpaths, bridleways, farm field and house accesses used by any vehicles engaged on the O&M Works or any new roads which are part of the O&M Works and which are being used by traffic shall be kept clean and clear of all dirt, mud or other materials dropped by the said vehicles.
- 1.11 The Company shall provide, maintain and keep available equipment, such as a vehicle incorporating a suction device and a road brush, as may be necessary to keep the roads clean.
- 1.12 If the proposed method of construction involves the use of any part of the permanent O&M Works by construction traffic, the Company shall take any necessary measures to protect such permanent O&M Works.
- 1.13 The Company shall submit to the Scottish Ministers details of proposed borrow pits and tipping areas, which are off O&M Works Site and the intended routing of vehicles to and from such sites.
- 1.14 The Company should also inform the Scottish Ministers of the type of such vehicles to be used for transport, which should be compatible with the standard of the above routes.

### **Appendix 1/19: Routeing of Vehicles**

- 1.15 The Company shall provide, erect and maintain such traffic signs, lamps and barriers etc. complying with Clause 117 of the Specification as may be required to ensure the observance of requirements and restrictions detailed in this Appendix.
- 1.16 At-grade right turns or U-turns to and from or on the Trunk Roads and Motorways shall be prohibited at all times.
- 1.17 Right turn manoeuvres shall only be permitted at grade separated interchanges.
- 1.18 Persistent infringement of the foregoing restrictions shall be deemed a Company Event of Default in terms of this Agreement.
- 1.19 If the Company wishes to make use of existing laybys as access points to the O&M Works Site, approval shall be obtained from the Relevant Authorities and, where required, an alternative layby provided for the duration of the O&M Works, to accommodate bus services, breakdown situations and police traffic monitoring operations.
- 1.20 Any work which necessitates machinery and plant crossing public roads shall only be permitted with the prior written approval of the Relevant Authority.
- 1.21 Notwithstanding such approval being granted all such work shall be in compliance with the requirements of Chapter 8 of the Traffic Signs Manual and Traffic Signs Regulations and General Directions 2002.

### **2 Movement of Machinery and Plant across Public Roads**

- 2.1 The Company shall not move excavated material across public roads unless written authorisation has been obtained from the Relevant Authorities.
- 2.2 Any plant crossing shall be traffic signal controlled and shall meet the requirements of Section 4.5 of Chapter 8 of the Traffic Signs Manual.
- 2.3 The Company shall keep the crossing area in a safe condition and as good a condition at all times as the road surface on either side of it. The Company shall take such action as is necessary to protect and maintain the surface of the public road crossed by Constructional Plant.

### **3 Temporary Structures for the Diversion of Public Roads or for Construction Traffic Spanning Areas used by the Public**

- 3.1 For any temporary structures which may be required for temporary diversions of public roads or for spanning areas used by the public, the following criteria shall apply:
  - i) The Company shall follow the technical approval procedures contained in BD2 of the DMRB for the design of all temporary structures required to carry public roads or to span areas used by the public.
  - ii) The Company shall provide copies of the Design and Design Check Certificates in accordance with the Certification Procedure.
  - iii) For temporary Structures spanning the Trunk Roads and Motorways, the headroom shall be not less than 5.7 metres, excepting where the road below is designated a 'High Load Route' , where the minimum headroom shall be 6.45 metres
  - iv) Notwithstanding the provisions of BD 2, all temporary structures for the diversion of public roads or spanning areas used by the public shall be designated as Category 3 structures.
  - v) Designs shall be undertaken in accordance with the DMRB and Transport Scotland's Interim Amendments.

## **Appendix 1/20: Recovery Vehicles for Breakdowns**

### **1 Recovery Vehicles to be Provided**

#### **1.1 Heavy Recovery Vehicles**

1.1.1 Consideration shall be given to the provision of 1 number heavy recovery vehicle on the O&M Works Site wherever works involve one or more of the following:

- 1) reduction in the number of lanes available;
- 2) narrow lane widths
- 3) sections of motorway without hard shoulders
- 4) hard shoulder running
- 5) known congestion sites and
- 6) decommissioning of emergency telephones over a significant length of carriageway.

Consideration shall include the preparation of a risk assessment. Where a heavy recovery vehicle is not considered necessary a copy of the risk assessment shall be provided to the Scottish Ministers before works commences.

Heavy recovery vehicles shall not be required for Type C Works.

1.1.2 The heavy recovery vehicle shall comply with the following:

- i) Be a 3 axled vehicle capable of suspend towing a fully laden 44 tonne vehicle up a slope of 4 per cent and shall comply with all appropriate current legislation including Road Vehicles (Construction and Use) Regulations, Road Transport Act and Road Traffic Act. The vehicle shall be fitted with either a 10 tonne single power winch or two power winches of not less than 8 tonnes each. All equipment shall be power-operated with safe working load ("SWL") indicated and with operating levers/buttons clearly marked for operational use.
- ii) Be equipped with chains, wire ropes and shackles suitable for the recovery a fully-laden 44 tonnes gross vehicle weight ("GVW") vehicle. All chains, wire ropes and shackles shall have test certificates and/or stamped showing the SWL, be free from snags, excess stretch and wear.
- iii) Have seating for not less than two adult passengers (in addition to the recovery operatives).
- iv) Be conspicuous, for example, by marking with suitable tape (not less than 125 mm wide) to sides and rear of the vehicle.
- v) The heavy recovery vehicle shall be fitted with the following as a minimum requirement:

<b>Quantity</b>	<b>Item</b>
1	Amber lightbar to comply with The Road Vehicles Lighting Regulations 1989
2	Fully adjustable lights to illuminate both sides and rear of the vehicle
2	Fire extinguishers (1 Number 6 kilograms (net) dry powder; 1 Number 9 litre (net) aqueous film forming foam
1	1-10 person first aid kit to include disposable surgical gloves
2	10 metres 12 tonne nylon straps
2	30 metres by 13 millimetres polypropylene rope

**Appendix 1/20: Recovery Vehicles for Breakdowns**

Quantity	Item
1	44 tonne straight tow pole
1	44 tonne cranked tow pole
10	Highway cones 750 millimetres high
1	Proof load tested crane. (Overlift proof test – static 7.5 tonnes, underlift proof test –static 7.0 tonnes.);
1	Suitable socket set including AF/Metric and BA sizes
1	Suitable tool kit
2	12 tonne bottle jacks
1	Suitable wheelbrace to fit Heavy Goods Vehicles in common use and a torque wrench
1	Suitable jump leads (24 volt)
1	Explosion and flame proof hand lamp
1	Crowbar
1	Copper hammer
	The necessary fittings for connection, from air braking system of a broken down or accident damaged vehicle, to the air braking system of the heavy recovery vehicle
2	Wheel chocks of Heavy Goods Vehicle size
4	Suitable lengths of wood block skidding
1	Rear lighting board incorporating 'ON TOW' legend in lettering of not less than 70 millimetres on conspicuously coloured background to conform with the size, colour and type illustrated by Diagram 5, Section B, Schedule 19 of the Roads Vehicles Lighting Regulations, 1989. The board shall be fitted with lights, reflectors and indicators. When required the recovery vehicle index number or trade license plate shall be fitted
1	Sledge hammer – 7lbs minimum
	ADR (HAZCHEM) chart
50kg	Dry fine sand stored in a waterproof container

vi) The heavy recovery vehicle shall also carry as a minimum requirement;

Quantity	Item
4	(a) 'D' shackles SWL 12 tonnes each
4	(b) 'D' shackles SWL 3 tonnes each
2	(c) Suitable length chains SWL 12 tonnes each
2	(d) Suitable length chains SWL 5 tonnes each
2	(e) Suitable length chains SWL 3 tonnes each

NOTE: All lifting chains and equipment shall be fully certified by an independent competent person to comply with all current legislation. Shackles listed in (vi) (a)

## **Appendix 1/20: Recovery Vehicles for Breakdowns**

and (b) should be stamped with the appropriate SWL. Equivalent wire ropes may be substituted for chains listed in (vi) (c), (d) and (e).

- vii) The heavy recovery vehicle shall carry, and use when necessary, equipment designed and manufactured for the purpose of locking the steering of the broken-down or accident damaged vehicle in order to tow in a reverse direction.
- viii) The heavy recovery vehicle shall carry equipment to enable the recovery crew to remove the drive line or shafts of the broken down or accident damaged vehicle.
- ix) The heavy recovery vehicle shall carry blocks with a SWL of 8 tonnes, 1 number per winch and 2 number on boom (crane) wires.

### **1.2 Light Recovery Vehicle**

**1.2.1** One number light recovery shall be provided on the O&M Works Site at all times available for roadworks to New and Existing Trunk Roads and Motorways.

**1.2.2** The light recovery vehicle shall comply with the following:

- i) be capable of carrying or towing, by means of an underlift, a vehicle weighing 2800kg up a slope of 4° and shall comply with all appropriate current legislation including Road Vehicles (Construction and Use) Regulations, Road Transport Act and Road Traffic Act.
- ii) Be capable of recovering motor cycles.
- iii) Be capable of recovering trailers (i.e. caravans, boat trailers, horse boxes, etc.)
- iv) Have seating capacity for four adult passengers (in addition to the recovery operatives).
- v) Be conspicuous, for example, by marking with suitable tape (not less than 125 mm wide) to sides and rear of the vehicle.
- vi) The light recovery vehicle shall be fitted with the following as a minimum requirement:

<b>Quantity</b>	<b>Item</b>
1	Amber lightbar to comply with The Road Vehicles Lighting Regulations 1989
2	Fully adjustable lights to illuminate both sides and rear of the vehicle
2	Fire extinguishers (1 Number 6 kilograms (net) dry powder; 1 Number 9 litre (net) aqueous film forming foam
1	1-10 person first aid kit to include disposable surgical gloves
1	30 metres by 13 millimetres polypropylene rope
1	6 tonne straight tow pole
10	Highway cones 750 millimetres high
1	Proof load tested winch and/or spectacle lift
1	Suitable socket set including AF/Metric and BA sizes
1	Suitable tool kit
1	3 tonne bottle or trolley jack
1	Suitable wheelbrace to fit cars and Light Goods Vehicles in common use
1	Suitable jump leads (24 volt)
1	Explosion and flameproof hand lamp

**Appendix 1/20: Recovery Vehicles for Breakdowns**

Quantity	Item
1	Crowbar
1	Quick change towing hitch suitable for 50 millimetres, 2 inch or jaw type fittings
1	Broom and shovel
1	Wheel chocks of Light Commercial size
2	Suitable lengths of wood block skidding
1	Rear lighting board incorporating 'ON TOW' legend in lettering of not less than 70 millimetres on conspicuously coloured background to conform with the size, colour and type illustrated by Diagram 5, Section B, Schedule 19 of the Roads Vehicles Lighting Regulations, 1989. The board shall be fitted with lights, reflectors and indicators. When required the recovery vehicle index number or trade licence plate shall be fitted
	Total lift facility – 2800kg slideback deck (7.6 metres minimum) or heavy duty dollies
50kg	Dry fine sand stored in a waterproof container

vii) The light recovery vehicle shall also carry as a minimum requirement:

Quantity	Item
4	(a) 'D' shackles SWL 3 tonnes each
2	(b) suitable length wire ropes SWL 3 tonnes each
2	(c) ratchet jackets SWL 6 tonnes each, or hydraulic equivalent
2	(d) suitable towing trolley

NOTE: All lifting chains and equipment shall be fully certified by an independent competent person to comply with all current legislation. An equivalent chain may be substituted for the wire rope listed in (vii) (b).

viii) The light recovery vehicle shall carry, and use when necessary, equipment designed and manufactured for the purpose of locking the steering of the broken-down or accident damaged vehicle in order to tow in a reverse direction.

## 2 Inspection Requirements

### 2.1 The Vehicle

2.1.1 The Company shall ensure that all recovery vehicles are maintained in such condition that at all times the vehicles conform to the Road Traffic Act and Regulations made thereunder (Construction and Use and Road Vehicle Lighting Regulations) so as to be fit to be used on the road. The Company shall provide to the Scottish Ministers evidence of this roadworthiness of the Company's recovery vehicles by successful completion of an inspection by the Vehicle Inspectorate or Freight Transport Association, conducted not less than 14 days nor more than 28 days before the vehicles are required.

2.1.2 The Company shall arrange for all recovery vehicles to be inspected by the Vehicle Inspectorate or Freight Transport Association at not less than 6 monthly intervals and shall provide evidence of inspection and testing results to the Scottish Ministers when necessary.

## **Appendix 1/20: Recovery Vehicles for Breakdowns**

### **2.2 Lifting equipment**

2.2.1 All lifting equipment shall be fully certified by an independent competent person to comply with all current legislation.

### **2.3 Reports**

2.3.1 A copy of each inspection report shall be:

- i) provided to the Scottish Ministers.
- ii) kept in the relevant recovery vehicle.

### **2.4 Record form**

2.4.1 The Company shall submit weekly to the Scottish Ministers duplicate record forms which log the regular checks made on each recovery vehicle. A sample form is given in Sheet 2 of this Appendix.

## **3 Location for Recovery Vehicle(s)**

3.1 Locations of vehicle shall be determined by the Company and agreed with the Scottish Ministers prior to commencement of each stage of the O&M Works.

3.2 The recovery vehicles shall be located within easy access to any Temporary Traffic Management Scheme.

## **4 Communication System**

4.1 In addition to the requirements of Appendix 1/3, the Company shall:

- i) provide a secondary 'back up' communications system (e.g. mobile telephone, 2-way radio link or land line) between the recovery base station and all recovery vehicles, and
- ii) provide an emergency telephone and direct land line between the recovery base station(s) and the police.

4.1.1 The Company shall be responsible for all associated equipment and payment of fees to operate the system which shall be established and fully tested prior to the start of the O&M Works.

## **5 Location(s) for Vehicle Removal**

5.1 At all times when Motorways have traffic management due to the O&M Works, the Company shall be responsible for the removal of shed loads and vehicles that are stationary due to mechanical breakdowns, accident damage or abandoned in the trafficked road. The Company shall accept the instructions of the Scottish Ministers or the Police in connection with this service but generally shall be required to remove the obstruction clear of the O&M Works, such that the running carriageway is cleared in the shortest possible time. Should the Police be unavailable then the driver's consent shall be obtained in writing if possible prior to such removal.

5.2 Broken down or accident damaged vehicles shall be removed to a safe location with public telephone facility on the local road network.

5.3 If a vehicle cannot be moved immediately and, in the opinion of the Police, the traffic flows are heavy enough to justify such action, the Company shall direct traffic onto an emergency route.

5.4 The Company shall make no charge for this recovery service to the owner or driver of the recovered vehicle.

## **Appendix 1/20: Recovery Vehicles for Breakdowns**

### **6 Explanatory Leaflet**

6.1 The Company shall ensure that the recovery vehicle operatives issue leaflets to the drivers of vehicles requiring assistance, before recovery commences. These shall have been prepared in liaison with the Police and in accordance with Sheet 3 of this Appendix, and have been approved by the Scottish Ministers before issue to the recovery firm.

### **7 Limits of Service**

7.1 The service shall operate within the limits of the O&M Works Site.

### **8 Requirements for Recovery Personnel**

8.1 Suitability: It is the responsibility of the Company to ensure that all personnel involved with vehicle recovery are suitable to work with 'vulnerable' motorists.

8.2 Training: The Company shall ensure that all personnel involved with vehicle recovery shall hold a certificate certifying successful completion of an appropriate vehicle recovery course recognised by either the Institute of the Motor Industry (IMI) or the Moor Industry Training Standards Council (MITSC). A copy of each certificate shall be provided to the Scottish Ministers not less than 14 days before the commencement of the O&M Works.

8.3 Personal Protective Equipment: In addition to the provisions identified in the Health and Safety risk assessment conducted by the Company, the following items shall be provided for each crew member of the recovery vehicle:

- i) Safety helmet CE marked to EN 397:1995 Specification for Industrial Safety Helmets;
- ii) Reflective safety garment complying with sub-Clause 117.18 of the Specification;
- iii) Boots with steel reinforcement toecaps and/or safety footwear in accordance with BSEN 345;
- iv) Suitable gloves with the appropriate CE mark; and
- v) Protective goggles in accordance with BS 2092.

Note: All personal protective equipment should be stored and maintained in good, clean condition.

8.4 Identification: The Company shall ensure that all personnel involved with vehicle recovery are issued with the following:

- i) An identity card which incorporates the name of the recovery contractor (or the Company), and the name and a photograph of the holder. This card shall be available for inspection at all times and a copy shall be submitted to the Scottish Ministers prior to commencement of the operative working.
- ii) A reflective safety garment (referred to in 2.13.2 above) which prominently displays the Company's name.
- iii) Working hours: Recovery vehicles shall be provided 24 hours a day during the O&M Works. Recovery operatives shall be on duty for a maximum of 12 hours with the provision that no work should be undertaken in the following 12 hour period.

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**Appendix 1/20: Recovery Vehicles for Breakdowns**

**9 Record Form**

9.1 The Company shall submit weekly to the Scottish Ministers completed duplicate record forms which log the assistance given by the recovery vehicle and their operatives. Sample forms are given in Sheet 4 of this Appendix.

**Appendix 1/20: Recovery Vehicles for Breakdowns**

**SHEET 2: FORM FOR 'RECOVERY VEHICLE DAILY CHECK SHEET'**

**RECOVERY VEHICLE DAILY CHECK SHEET**

**Week Commencing:.....**

<b>Driver's Name:</b>	<b>Vehicle Number:</b>	<b>Type/Registration</b>	<b>Mileage:</b>
-----------------------	------------------------	--------------------------	-----------------

**Driver to initial against check list below:**

	<b>Monday</b>	<b>Tuesday</b>	<b>Wednesday</b>	<b>Thursday</b>	<b>Friday</b>	<b>Saturday</b>	<b>Sunday</b>
<b>OIL LEVEL</b>							
<b>WATER</b>							
<b>ENGINE</b>							
<b>CLEANLINESS- interior</b>							
<b>CLEANLINESS- exterior</b>							
<b>WIPER/WASHERS</b>							
<b>TYRES</b>							
<b>LIGHTS</b>							

**Driver's Report (detail any problems):**

**Action Taken (to solve above problems):**

<b>Date:</b>	<b>Supervisor's Signature:</b>
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**COMPLETED SHEET TO BE RETURNED TO SCOTTISH MINISTERS EACH WEEK**

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### **Appendix 1/20: Recovery Vehicles for Breakdowns**

#### **SHEET 3: LEAFLET FOR ISSUE BY RECOVERY VEHICLE OPERATIVES TO DRIVERS OF ALL BROKEN DOWN OR ACCIDENT-DAMAGED MOTOR VEHICLES**

**Name of Scheme: M8 M73 M74 Motorway Improvements**

**Vehicle Recovery Service – Explanatory Leaflet authorised by Transport Scotland for issue to drivers of broken-down and accident-damaged motor vehicles within the above works.**

Leaflet to be distributed by recovery vehicle operatives of the appointed recovery firm on behalf of Transport Scotland.

The roadworks operations commence at the 'Roadworks Ahead – 3 miles' sign and end at the 'Roadwork End' sign.

The recovery service provided along the extent of the roadworks operation is free.

Vehicles will be recovered clear of the roadworks operations to a safe location on the local network unless otherwise directed by the police.

It will then be at the discretion of individual drivers of broken-down or accident damaged vehicles requiring assistance to arrange for assistance or the removal of their vehicle to a garage of their choice. The operators of the free recovery service do not make such arrangements.

Useful contact numbers are given below:

- (a) Local Garage
- (b) AA
- (c) RAC
- (d) Greenflag

Assistance will also be given by telephoning

If a motorway emergency telephone is used, the police will assist.

## Appendix 1/20: Recovery Vehicles for Breakdowns

#### **SHEET 4: Information to be provided by the Company**

\*P-Police

\*\*Y-Tow/Lift

#C-Car

## F-Fire Service

## R-Restart

## M/C-Motorcycle

## A-Ambulance

### F-False Call

V-Van

## HGV-Heavy Goods Vehicle

**Appendix 1/20: Recovery Vehicles for Breakdowns**

**SHEET 4 (Continued)**

VEHICLE RECOVERY LOGSHEET (2 of 2) <b>M8 M73 M74 Motorway Improvements</b>			Recovery Vehicle: .....	Week Ending:...../...../.....	Sheet Number:.....	
Date and Time	Type of Vehicle	Registration Number.	Name and Address of Driver or Firm	Location of Breakdown	Nature of Breakdown	Recovery Operator's Name

## Appendix 1/21: Information Boards

### **1 General**

- 1.1 Details of Network Customer Contact Signs shall be as provided in Appendix H of Part 1 of Schedule 4.
- 1.2 The locations of Network Customer Contact Signs shall be as required in Part 1 of Schedule 4.
- 1.3 The 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 O&M Works Site.
- 1.4 The size of these boards shall be no greater than the boards required for Network Customer Contact Signs and shall be subject to the written approval of the appropriate planning authority.

## Appendix 1/23: Substances Hazardous to Health

### **1 Substances Hazardous to Health**

1.1 The Company shall take all reasonably practicable steps to prevent members of the public being affected, due to its Operations, by substances hazardous to health (as defined in Clause 124 of the Specification), such, as inter alia, silane, bridge deck waterproofing systems, and paints.

#### **1.2 Restrictions in Relation to Traffic Management Measures**

1.2.1 The Company shall maintain vehicle and pedestrian access to the standards detailed in Appendix 1/18, on existing roads, as well as access to and from properties directly affected by or adjacent to the O&M Works, when planning measures to protect the public from substances hazardous to health.

1.2.2 If the Company proposes to carry out silane and deck waterproofing treatments for bridges over public roads without an enclosure, the Company shall arrange with the Relevant Authority an overnight closure of the road to allow these operations to proceed.

#### **1.3 Restrictions in Relation to Working Practices**

1.3.1 The Company shall make available all necessary personal protection equipment and other safety equipment necessary for the protection of all persons who may be exposed to substances hazardous to health in connection with the O&M Works. The Company shall ensure that all of its staff and sub-contractors' staff requiring such protection are fully trained in the use of the equipment and that the appropriate equipment is used by such persons when there is a risk of exposure to substance hazardous to health.

1.3.2 The Company shall submit detailed method statements, to the satisfaction of the Scottish Ministers, stating how the Company will ensure that the public are not affected by substances hazardous to health which may be used during the construction of the O&M Works. Such method statements shall state the proposed methods to prevent, control and monitor exposure of the public to the above substances when used or generated in or about the O&M Works.

#### **1.4 Measures to be taken to protect members of the public.**

1.4.1 Where the Company is using or generating substances hazardous to health in its operations, the work must be carried out within a fully screened enclosure, otherwise a temporary diversion shall be provided for vehicular and pedestrian traffic. The Company should take account of the weather conditions, and if any change in these conditions renders either the enclosure or traffic diversions provided unsuitable, any work involving the use or generation of substances hazardous to health shall cease immediately.

1.4.2 If the Company employs temporary diversions as a method of protecting the public from substances hazardous to health, it shall Design all appropriate signing in accordance with chapter 8 of the Traffic Signs Manual 1991.

#### **1.5 Monitoring to be undertaken by the Company.**

1.5.1 The Company shall prepare and maintain a register of all substances hazardous to health which are brought on to the O&M Works Site. The Company shall operate a documented system to control the issue and use of such material in connection with the O&M Works subject to the approval of the Scottish Ministers.

1.6 Compliance with the requirements of this Appendix shall not in any way relieve the Company of its statutory obligations.

**Appendix 1/24: Quality Management Systems**

The Company shall institute and operate a quality management system complying with Schedule 5 to this Agreement

## Appendix 1/75: TRISS Vehicle Liveries

### **LOGO REQUIREMENTS**

#### **1.1 Transport Scotland Logo**

The logo shown on the right is Transport Scotland's official brand. It is aimed at customers so they can recognise and access its services as well as identify accountability and credit for these services.



This Appendix gives the livery specification for use on vehicles used by the Company when engaged in maintenance and management Operations on the Unit.

The Transport Scotland logo consists of two elements the first is a graphical representation of a road and railway line. The second is the text "TRANSPORT SCOTLAND" using the typeface Gill Sans.

The logo and "TRANSPORT SCOTLAND" text colour is blue identified as:

<b>Pantone</b>	2736
<b>CMYK</b>	100/91/0/0
<b>RGB</b>	33/33/146
<b>HTML</b>	212192

Were the mark is to be used on a dark back ground then a white border shall be used surrounding the marking to maintain its distinct appearance.

### **2 LIVERY REQUIREMENTS**

#### **2.1 General**

This livery is to be applied to all Company fleet vehicles used for TRISS duties.

This Appendix only addresses the issues of branding and style for different vehicle types. The Company shall ensure that individual vehicles comply with the requirements for vehicle base colour, safety markings and conspicuity requirements in the Contract, the relevant national guidelines and statutory requirements.

One general vehicle classes has been selected as the basis for illustrating the vehicle livery scheme to be applied. This is:

(i) Long wheelbase, high roof van,

The livery is presented as a set of rules for the size and positioning of each individual required marking. The Company shall apply these rules with the minimum of adaptation to any vehicle in use on TRISS operations.

## Appendix 1/75: TRISS Vehicle Liveries

If the Company is unable to apply a livery scheme to a vehicle type without a significant departure from the prescribed scheme, the Company shall submit an alternative proposal to the Director for approval.

### **2.2 Vehicle Markings**

The TRISS vehicle markings shall be as detailed in this Appendix and Appendix 32/1.

The Table below defines the type and style of permitted Transport Scotland markings to be used on Company vehicles. All markings are available as graphics files from Transport Scotland in an "eps" format.

Logo	Description	Reference
	TS logo: block	TS-BE
	TS logo: stacked - positive	TS-SPE
	TS logo: linear - positive	TS-LPE

To ensure the Transport Scotland mark is clear and easily read no other markings or images shall be located within an exclusion zone surrounding the mark. This zone is defined as the height of the typographical element of the mark.

The aspect ratio must be preserved when re-sizing the Transport Scotland marking to suit different vehicles.

The measuring convention adopted for the positioning of markings on different vehicle types is very simplistic and generally described in words. The maximum size or area for the Company logo and Fleet Number are provided to ensure they do not overshadow the Transport Scotland logo.

To allow the Company a degree of flexibility with regards their logo the maximum size for some markings has been defined using a maximum square area instead of dimensions for overall length and height.

### **2.3 Long Wheelbase, High Roof Van**

The livery applicable to this vehicle type consists of the Transport Scotland brand applied to the bonnet and both vehicle sides, the Company brand applied to both front doors and the Company fleet number applied to both front wings as shown in Annex A.

The locations of each marking are detailed in Table 2.3/A and in Annex A – Scheme 2 & 2a; all dimensions given are in millimetre unless stated otherwise.

### Appendix 1/75: TRISS Vehicle Liveries

Additional markings are required to be carried due to the vehicle undertaking a specialist role. These additional markings are detailed in Appendix 32/1.

**Table 2.3/A**

<b>Marking</b>	<b>Location</b>	<b>Position</b>	<b>Max Size</b>
TS-SPE	Bonnet	Centred on panel	Minimum 200mm from edge of panel
TS-BE	Near-side	Centred on rear 50% of side panel(s)	Minimum 300mm from edge of panel
TS-BE	Off-side	Centred on rear 50% of side panel(s)	Minimum 300mm from edge of panel
Company brand	Near-side Front Door	Centred on panel below window	0.135m <sup>2</sup> (450 x 300)
Company brand	Off-side Front Door	Centred on panel below window	0.135m <sup>2</sup> (450 x 300)
Company fleet number	Near-side Front Wing	Centred on panel	0.03m <sup>2</sup> (200 X 150)
Company fleet number	Off-side Front Wing	Centred on panel	0.03m <sup>2</sup> (200 X 150)

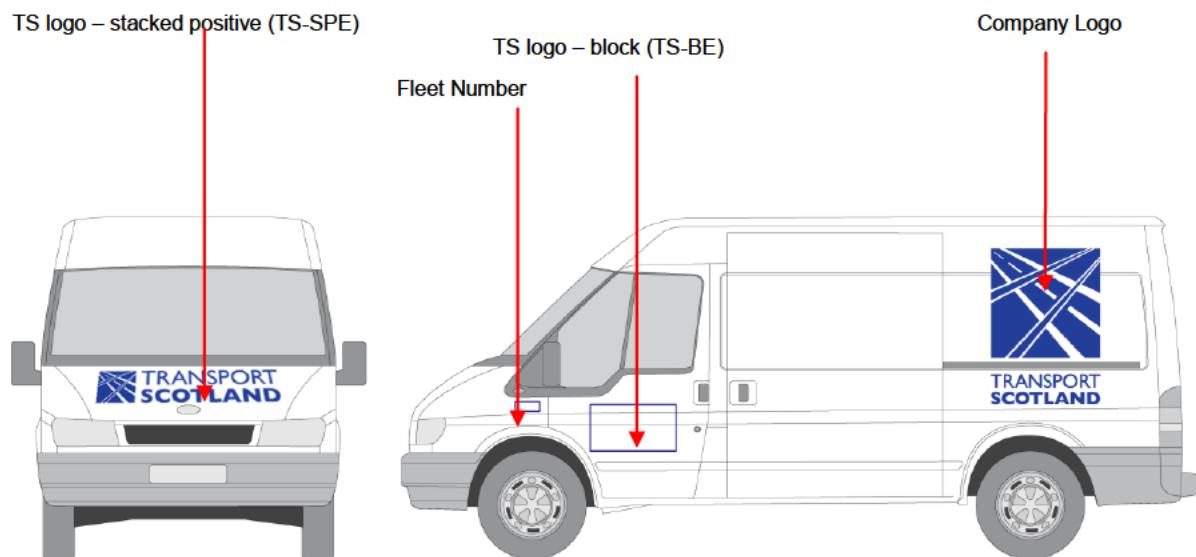
Care shall be taken when placing markings to avoid any vehicle features such as door slides, handles and non-body coloured trim that would conflict with the clarity of the marking.

Appendix 1/75: TRISS Vehicle Liveries

**ANNEX A**

**Vehicle Livery Schemes**

**Van (LWB Hi-Roof) – Scheme for specialist role vehicles (TRISS)**



**Appendix 1/76: TRISS Operative's Uniform.**

ISU and TRISS operatives shall be suitably attired with appropriate uniform style clothing and personal protection equipments.

Uniforms and personal protective equipment shall be appropriately badged.

**Appendix 1/77: Specification for TRISS Vehicle Mobile CCTV System.**

- 1 The Trunk Road Incident Support (TRISS) vehicles shall be equipped with a small and rugged pan tilt zoom (PTZ) camera, as described below, mounted on a pneumatic mast which can be raised and lowered from the vehicle via a remote control device located in the vehicle. The pneumatic mast shall be extendable to a height of approximately 6 metres above vehicle floor level and shall retract so that the camera height above the vehicle roof is minimal.
- 2 A 6.8" LCD/TFT Colour monitor shall be provided within the vehicle cab to provide an onsite confirmation of camera operation.
- 3 The camera shall connect to an encoder unit with a minimum of 4 video feeds which enables onward transmission of the video signal to the Traffic Scotland Control Centre and resilience rooms, Events control rooms, Silver Command Centres and Police control rooms. The Traffic Scotland Control Centre operators will be able to control the camera pan and tilt functions without assistance from the TRISS operatives.
- 4 The system shall allow multiple users viewing access.
- 5 The Operating Company may view the images at their depot with the written approval of the Director.
- 6 The transmitted image must be able to be displayed on the Traffic Scotland MOSAIC System. The images sent to the Control Centre must be able to be recorded at high resolution onto a plug in hard drive, to allow historical viewing of footage at full resolution and at a rate of 5 images a second when the vehicle returns to base.
- 7 The host server will be Traffic Scotland's which is compatible with the Traffic Scotland MOSAIC System. The Operating Companies chosen equipment shall be compatible with this server. Subject to the Director's consent, the Operating Company may provide their own host server which is compatible with their chosen equipment, and which shall be integrated with the Traffic Scotland MOSAIC system.
- 8 The vehicle mounted pan, tilt and zoom(PTZ) camera shall have the following features:
  - (a) 1/3" colour/monochrome, charge coupled device (CCD), high resolution, 480 television lines (TVL),
  - (b) High Resolution – 4CIF Display Capability, 2CIF for Transmission,
  - (c) Provide good quality Images in all weather conditions,
  - (d) Built-in optical auto zoom lens - magnification of 18:1,
  - (e) Be waterproof with a lens wiper,
  - (f) Be vandal resistant,
  - (g) Be operable remotely by Traffic Scotland Control Centre staff only.

**Appendix 1/78: Specification For Vehicle Mounted Variable Message Signs.**

- 1 The vehicle roof mounted variable message signs shall:
  - (a) have a power lift system and be suitable for the vehicle
  - (b) display legible messages under all conditions
  - (c) automatically detect and correct errors and faults
  - (d) be of robust, weather resistant construction with excellent rust and corrosion protection
  - (e) be easy to maintain and repair
  - (f) be capability of being deploy and operate while vehicle travels at low speed
  - (g) be battery powered and charged from the vehicle system with status display
  - (h) have a spare battery
  - (i) work while the vehicle engine is off.
- 2 The message panel shall have:
  - (a) a panel size approximately 2m wide x 1.2m
  - (b) a matrix size approximately 27 x 48 pixels
  - (c) a pixel size approximately 33mm x 30mm
  - (d) a minimum of 12 characters per line
  - (e) a minimum of 3 lines
  - (f) a minimum of 6 available fonts
  - (g) full matrix graphics capability
  - (h) LED display technology.
- 3 The message panel control consol shall have:
  - (a) ultra low powered solid state console circuitry
  - (b) a waterproof, backlit, alphanumeric console keyboard
  - (c) a LCD 8 line x 40 character with graphics back lit console display
  - (d) proprietary, field upgradeable programming software
  - (e) pre-programmed and user programmed minimum 50 message capacity
  - (f) minimum 2 messages each sequence capacity

**Appendix 1/78: Specification For Vehicle Mounted Variable Message Signs.**

- (g) real time clock and calendar time and date control
- (h) user-selectable (0.1 to 60 seconds) message display time
- (i) instantaneous display update time
- (j) separate backup battery non-volatile memory
- (k) user selectable, multi level password protection
- (l) easy to use menus for operator interface

### Appendix 1/79: Material Stocks

1 Typical items of materials to be held in stock shall be listed and quantified in Table 1 of this Appendix 1/79. The Company shall hold in accordance with its Quality Plan procedures the quantified list of material stocks and the storage location(s) of such materials. In preparing the list the Company shall comply with any requirement specified elsewhere in the Agreement.

**Table 1**

Type of Material	Location of Depot	Number available
<b>General</b>		
Sandbags (rot proof)		
Sand		
Liquid for removing oil from carriageways		
Oil absorbent granules (20 kg bags)		
5 kg bags bituminous instant repair material		
25 kg bags bituminous instant repair material		
25 kg bags Bitucrete or equivalent		
50 kg bags of cement		
<b>Fencing</b>		
Spares to all types of road restraint systems used within the O&M Works Site.		
Boundary Fence Rails BS 1722-7:2006 Fences; Specification for Wooden Post and Rail Fences		
Boundary Fence Posts BS 1722-7:2006 Fences; Specification for Wooden Post and Rail Fences		
10 metre rolls of cleft chestnut pale fencing		
25 metre rolls of sheep netting		
25 metre rolls of galvanised barbed wire		
25 metre rolls of galvanised 2.5 millimetre diameter plain wire		
50 millimetre x 2.765 millimetre diameter galvanised nails		
100 millimetre x 4.5 millimetre diameter galvanised nails		
<b>Signs</b>		
Type 1 marker Posts		
Type 2 Marker Posts		
Type 8b Marker Posts		
Marker post numerals (20 of each 0 to 9)		
Marker post telephone symbols		
“Road Closed” signs		
“Diverted Traffic” signs (variable arrows)		
<b>Drainage</b>		
Gully Grating GA2-456		
Pre cast gully pots		
Medium duty manhole cover MB2-60		
Heavy duty manhole cover MA60		

**Appendix 4/2: Information Required to Demonstrate Compliance of Vehicle Restraint Systems to BS 1317-1, BS EN 1317-2, BS EN 1317-3 and DD ENV 1317-4:2002**

**1 Information Required**

1.1 The Company shall submit the following supporting information demonstrating compliance with BS EN 1317-1, BS EN 1317-2, BS EN 1317-3 and DD ENV 1317-4:2002 to the Employer for acceptance:

**2 EUROPEAN COMMITTEE FOR STANDARDISATION (CEN) COMPLIANCE<sup>1</sup>**

2.1 Initial submission documents to be supplied for consideration of initial type test are as follows:

- (a) test report in accordance with BS EN1317-1, Clause 9 (and including any additional test data required under BS EN 1317-3, Clauses 7.3 and 7.4 and DD ENV 1317-4:2002, Clauses 7.3 and 7.4);
- (b) video / high speed film of test annotated showing date, test number and performance class;
- (c) still photographs of complete installation including anchorage points;
- (d) still photographs of vehicle before and after impact;
- (e) full drawings of tested items;
- (f) certification from the manufacturer that the item tested complies with drawing supplied; and
- (g) certificate from test house accredited in accordance with the requirements of Series 400 (MCHW 1.400).

2.2 Additional information, which will be required on acceptance of initial type test prior to installation:

- (a) manufacturer's specification;
- (b) installation drawings;
- (c) manufacturer's installation instructions including foundation requirements and test methods to verify their performance;
- (d) manufacturer's repair and maintenance manual;
- (e) certificate of compliance with the Quality Management Scheme 1 for the Manufacture of Fencing Components<sup>2</sup>;
- (f) compliance with the Quality Management Sector Scheme 2 - Supply and Installation of Fences:
  - (i) Sector Scheme 2B for Vehicle Restraint Systems<sup>3</sup>;
- (g) certificate of compliance for the Quality Management Sector Scheme 5 for the Fabrication and Installation of Bridge Parapets and Cradle Anchorages<sup>4</sup>:
  - (i) Sector Scheme 5A for The Manufacture of Parapets for Vehicle restraint systems; and
  - (ii) Sector Scheme 5B for The Installation of Parapets for Vehicle restraint systems; and
- (h) nominal loads (direct forces, moments and co-existent shears) to be transferred from the parapet to the Structure or foundations<sup>5</sup>.

**Appendix 4/2: Information Required to Demonstrate Compliance of Vehicle Restraint Systems to BS 1317-1, BS EN 1317-2, BS EN 1317-3 and DD ENV 1317-4:2002**

**Notes**

All documents are to be supplied in English.

<sup>2</sup> Item 2.2.2(e) is required for safety barrier systems and transitions.

<sup>3</sup> Item 2.2.2(f) is required for safety barrier systems and transitions.

<sup>4</sup> Item 2.2.2(g) is required for vehicle parapets.

<sup>5</sup> Section 2.2.2(h) is required for vehicle parapets, safety barrier systems and transitions

**Appendix 4/71: Re-Tensioning of Safety Barriers**

Sheet 1 of 4

SUBMISSION FOR COMPLIANCE WITH BS EN 1317-1, BS EN 1317-2, BS EN 1317-3, AND DD ENV 1317-4:2002

TYPE OF VEHICLE RESTRAINT SYSTEM:

CONTAINMENT PERFORMANCE CLASS/PERFORMANCE LEVEL/PERFORMANCE CLASS (\*):

TEST REPORT NUMBER: (Test of )

Test Type: Primary/Complementary Test) (\*)

TEST NUMBER: TEST DATE:

(\*) delete as appropriate

COMPANY NAME:

CONTACT:

ADDRESS:

Tel:/Fax:/E-mail:

PRODUCT NAME:

Initial submission documents to be supplied for consideration of Initial Type Test (ITT)

Item	Comment	Item Received (Y or N)	Date requested
1 Test report	In accordance with BS EN 1317-1, Clause 9 (and including any additional test data required under BS EN 1317-3, Clauses 7.3 and 7.4 and DD ENV 1317-4:2002, Clauses 7.3 and 7.4)		
2 Video/high speed film	Of test coverage as specified in relevant part of BS EN 1317 or DD ENV 1317-4:2002 Annotated showing date, test number and performance class		
3 Still photographs	Of complete installation including anchorage points		
4 Still photographs	Of vehicle before and after impact		
5 Drawings	Fully detailed drawings of tested item		
6 Certification from the manufacturer	Confirming that the item tested complies with drawing supplied		
7 Confirmation from test house	That the test conforms to the relevant requirements of BS EN 1317-1 (and including any additional test data required under BS EN 1317-2, BS EN 1317-3 and DD ENV 1317-4:2002)		

Additional information, which will be required on acceptance of initial type test prior to installation

8 System specification	Manufacturer's specification		
9 Installation details	Manufacturer's drawings		
10 Installation procedures	Manufacturer's installation instructions		
11 Maintenance Manual	Manufacturer's inspection, repair and maintenance instructions		
12 Certificate of compliance	With the Quality Management Scheme 1 for Manufacture of Fencing Components 2		
13 Certificate of compliance	With the Sector Scheme 2B for the Supply and Installation of Fences Vehicle Restraint Systems 2		
14 Certificate of compliance	With the Quality Management Schemes 5 for the Fabrication and Installation of Bridge Parapets and Cradle Anchorages 3  Sector Scheme 5A for The Manufacture of Parapets for Vehicle restraint systems; and  Sector Scheme 5B for the Installation of Parapets for Vehicle restraint systems		
15 Support loads	Nominal loads (direct loads, bending moments and shear forces) that have to be transferred from the vehicle restraint system to the supporting Structure or foundation 3		

Signature:

Name:

Date:

**Appendix 4/71: Re-Tensioning of Safety Barriers**

Sheet 2 of 4

SUBMISSION FOR COMPLIANCE WITH BS EN 1317-1, BS EN 1317-2, BS EN 1317-3, AND DD ENV 1317-4:2002

TYPE OF VEHICLE RESTRAINT SYSTEM: Safety Barrier, Vehicle Parapet or Transition (\*)

CONTAINMENT PERFORMANCE CLASS/LEVEL (\*):

TEST REPORT NUMBER: (Test of )

Test Type: Primary/Complementary Test) (\*)

TEST NUMBER: TEST DATE:

(\*) delete as appropriate

COMPANY NAME:

CONTACT:

ADDRESS:

Tel./Fax./E-mail:

PRODUCT NAME:

Initial submission documents to be supplied for consideration of Initial Type Test (ITT)

			Specified	Actual	Satisfactory (Yes or No)	Compliance	
BS EN 1317-1, Table 1	Vehicle Details	Impact Conditions					
		Total vehicle mass (kg)	..... (±...)				
		Speed (kmh)	..... (0, +7 per cent)				
		Angle (degrees)	..... (-1, +1.5)				
		Centre of Gravity					
		Vertical height (m)	..... (± 10 per cent)				
BS EN 1317-2, Clause 4.2	Vehicle Restraint System (VRS) Behaviour	Longitudinal (m)	..... (± 10 per cent)				
		Lateral (m)	± .....				
		Model				N/A	
BS EN 1317-2, Clause 4.3	Vehicle Behaviour	The VRS shall contain and redirect the vehicle without breakage of principal longitudinal elements of the system					
		No major part of the VRS shall become totally detached or present undue hazard to other traffic, pedestrians or personnel in a work zone					
		Elements of the VRS shall not penetrate the passenger compartment that can cause serious injuries are not permitted					
		Ground anchorages and fixings shall perform according to the design of the VRS					
BS EN 1317-2, Clause 5.3.2	Installation	The centre of gravity (CG) of the vehicle shall not cross the centreline of the deformed system					
		The vehicle shall remain upright during and after impact, although moderate rolling, pitching and yawing are acceptable					
		The vehicle shall leave the VRS after impact so that the wheel track does not cross a line parallel to the initial traffic face of the VRS, at a distance A (2.2 metres) plus vehicle width + 16 per cent of the length of the vehicle within a distance B (10 metres) from the final intersection (break) of wheel track with the initial traffic face of the VRS					
		The length of the VRS shall be sufficient to demonstrate the full performance characteristics of the system					
		If the VRS has to develop tension, end anchorages shall be provided in accordance with the VRS specification. Post foundation shall meet the design specification					

**Appendix 4/71: Re-Tensioning of Safety Barriers**

BS EN 1317-2, Clause 4.4	Severity Indices	SPECIFIED	ACTUAL		
		THIV Limit 33km/h PHD Limit 20g ASI Limit 1.4	THIV ..... km/h PHD ..... g ASI .....		
BS EN 1317-2, Clause 5.7, Figure 3	Photo graphic coverage	Photographics coverage shall be sufficient to clearly describe behaviour and vehicle motion during and after impact  High speed cameras shall be operated at a minimum of 200 frames per second and stills  As recommended in Clause 5.7 and Figure 3			
	Drawings	Drawings included			
					N/A = Not Applicable
FULLY COMPLIES WITH STANDARD: BS EN 1317-1, BS EN 1317-2, DD ENV 1317-4:2002					
Signature:		Name:			
Date:					

**Appendix 4/71: Re-Tensioning of Safety Barriers**

Sheet 3 of 4

SUBMISSION FOR COMPLIANCE WITH BS EN 1317-1, and BS EN 1317-3							
TYPE OF VEHICLE RESTRAINT SYSTEM:			Crash Cushion (Directive [R] or Non-directive [NR] (*)				
TEST REPORT NUMBER:			TEST TYPE: (Primary/Complementary Test) (*)				
PERFORMANCE LEVEL:			VELOCITY CLASS: (Test of )				
TEST NUMBER:			TEST DATE:				
(*) delete as appropriate							
COMPANY NAME: CONTACT: ADDRESS: Tel:/Fax:/E-mail: PRODUCT NAME:							
BS EN 1317-1	Vehicle Details		Specified	Actual	Satisfactory (Yes or No)		
		Impact Conditions	..... (±...)				
		Total vehicle mass (kg)	..... (0, +7 per cent)				
		Speed (kmh)	..... (-1, +1.5)				
		Centre of Gravity	..... (± 10 per cent)				
		Vertical height (m)	..... (± 10 per cent)				
		Longitudinal (m)	..... (± 10 per cent)				
		Lateral (m)	± .....				
				Model			N/A
						Model	
BS EN 1317-3, Clause 6.2	Crash Cushion Behaviour					Elements of the crash cushion shall not penetrate the passenger compartment of the vehicle. Deformations of, or intrusions into, the passenger compartment that could cause serious injuries are not permitted.  No major element of the crash cushion, having a solid mass greater than or equal to 2.0 kg, shall become totally detached, unless this is required by the working of the crash cushion. No major element of the crash cushion shall impede the path of adjacent traffic. The final position of the detached element shall be considered to determine the displacement classification.	
BS EN 1317-3, Clause 6.3	Vehicle Behaviour	1) The vehicle shall remain upright during and after the collision although yawing and moderate rolling and pitching are acceptable. The post-impact trajectory of the test vehicle shall be controlled by means of the exit box shown in Figure 2 and specified as detailed in Tables 11 and 12.					
BS EN 1317-3, Clause 7.3.2	Installation	1) The installation of the crash cushion for the test shall comply with the structural design details and the on-road system details as given in the design specification.					

**Appendix 4/71: Re-Tensioning of Safety Barriers**

BS EN 1317-3, Clause 5.4 and Table 4	Impact Severity Indices	SPECIFIED  Level A: THIV≤44km/h (Tests 1, 2 & 3 THIV≤ 33km/h (Tests 4 & 5 ASI ≤ 1.0  Level B: THIV≤44km/h (Tests 1, 2 & 3 HIV ≤ 33km/h (Tests 4 & 5 ASI ≤ 1.4  Levels A & B : PHD ≤ 20g	ACTUAL		
BS EN 1317-3, Clause 7.7, Figure 4	Photo graphic coverage	High speed cameras and / or high speed video cameras shall be operated at minimum of 200 frames per second.  Stills.  As recommended in Clause 7.7 and Figure 4.			
	Drawings	Drawings included			
FULLY COMPLIES WITH STANDARD: BS EN 1317-1, and BS EN 1317-3					N/A = Not Applicable
Signature:		Name:			
Date:					

**Appendix 4/71: Re-Tensioning of Safety Barriers**

Sheet 4 of 4

SUBMISSION FOR COMPLIANCE WITH BS EN 1317-1 AND DD ENV 1317-4:2002					
TYPE OF VEHICLE RESTRAINT SYSTEM: Terminal					
PERFORMANCE CLASS: (Test of )					
Test Type: Primary/Complementary Test) (*)					
TEST TYPE NUMBER:					
TEST NUMBER: (*) delete as appropriate			TEST DATE:		
<p>COMPANY NAME:</p> <p>CONTACT:</p> <p>ADDRESS:</p> <p>Tel:/Fax:/E-mail:</p> <p>PRODUCT NAME:</p>					
		Specified	Actual	Satisfactory (Yes or No)	Compliance
BS EN 1317-1, Table 1  DD ENV 1317-4: 2002, Clauses 7.4 and 7.5	Vehicle Details	Impact Conditions			
		Total vehicle mass (kg) Speed (kmh) Angle (degrees)	..... (±...) ..... (0, +7 per cent) ..... (-1, +1.5)		
		Centre of Gravity Vertical height (m) Longitudinal (m) Lateral (m)	..... (± 10 per cent) ..... (± 10 per cent) ± .....		
		Model			N/A
DD ENV 1317-4: 2002, Clauses 5.4 and 5.5.2	Terminal Behaviour	Elements of the terminal shall not penetrate the passenger compartment of the vehicle. Deformations of, or intrusions into, the passenger compartment that could cause serious injuries are not permitted.			
		No major part of the terminal shall be come totally detached and come to rest outside the permanent lateral displacement zones defined in Clause 5.4.			
		Anchorages and fixings shall perform to the terminal design specifications and other specified requirements as listed in the rest report.			
DD ENV 1317-4: 2002, Clause 5.5.3	Vehicle Behaviour	The vehicle shall not overturn, although rolling, yawing and moderate pitching may be accepted. For the performance class P1 rolling onto a side may be accepted.			
		The exit box values for the specified test are as defined in Figures 5.6 and 7 (as appropriate).			
DD ENV 1317-4, 2002 Clause 7.3.2	Installation	The terminal shall conform to the structural design details and with the system			

**Appendix 4/71: Re-Tensioning of Safety Barriers**

DD ENV 1317-4: 2002, Clause 5.5.4 and Table 5	Impact Severity Indices	<p>SPECIFIED</p> <p>Level A: THIV≤44km/h (Tests 1, 2 &amp; 3 THIV≤ 33km/h (Tests 4 &amp; 5 ASI ≤ 1.0</p> <p>Level B: THIV≤44km/h (Tests 1, 2 &amp; 3 HIV ≤ 33km/h (Tests 4 &amp; 5 ASI ≤ 1.4</p> <p>Levels A &amp; B : PHD ≤ 20g</p>	ACTUAL		
DD ENV 1317-4, 2002 Clause 7.7, Figure 7	Photo graphic coverage	<p>Photographic coverage shall be sufficient to describe clearly terminal and vehicle motion during and after impact</p> <p>High speed cameras and / or high speed video cameras at a minimum of 200 framer per second.</p> <p>Stills.</p>			
	Drawings	Drawings included			
FULLY COMPLIES WITH STANDARD: BS EN 1317-1 AND DD ENV 1317-4:2002					
Signature:		Name:			
Date:					

## **Appendix 4/71: Re-Tensioning of Safety Barriers**

Safety Barriers shall be re-tensioned in accordance with the following procedure:

### **1      Tensioned Corrugated Beam Safety Barrier**

- 1.1      Tensioned corrugated beam safety fence shall be re-tensioned in accordance with BS 7669 : Part 3, Section 2.1 or equivalent.
- 1.2      Tensioning between any two limits shall not proceed until each limit shall be anchored sufficiently securely to resist the load effects due to tensioning.
- 1.3      Tensioning shall be undertaken only when the ambient temperature shall be between 25°C and -5°C.
- 1.4      Adjuster assemblies shall be located not more than 70.5 metres apart and each installation shall incorporate at least one adjuster assembly.
- 1.5      On completion of tensioning, the centre of each screw securing beams to posts shall be not closer than 25 millimetres  $\pm 2$  mm to the end of the slotted hole in the beam.

### **2      Wire Rope Safety Barrier**

- 2.1      Wire rope safety fence shall be re-tensioned in accordance with BS 7669 : Part 3, Section 2.5 or equivalent.
- 2.2      Tensioning between any two limits shall not proceed until each limit shall be anchored sufficiently securely to resist the load effects due to tensioning.
- 2.3      Tensioning shall be undertaken only when the ambient temperature shall be between 30°C and - 10°C.
- 2.4      Before tensioning the ropes the ambient temperature shall be agreed by the Scottish Ministers.
- 2.5      The tension shall be measured using a tension indicating device approved in writing by the Scottish Ministers.
- 2.6      Before putting the safety fence into service the tension in each rope shall be checked and it shall be retensioned if necessary.

### **3      Tensioned Rectangular Hollow Section**

- 3.1      Assembly and tensioning shall be carried out in accordance with BS 7669 : Part 3, Section 2.4 or equivalent.
- 3.2      Tensioning between any two limits shall not proceed until each limit shall be anchored sufficiently securely to resist the load effects due to tensioning and that the safety fence has been completely assembled and connected to the anchorages.
- 3.3      Tensioning shall be undertaken only when the ambient temperature is between 10°C and 20°C.
- 3.4      Tensioner assemblies shall be located not more than 70.5 m apart and each installation shall incorporate at least one tensioner assembly.

## Appendix 6/10: Ground Anchorages, Crib Walling and Gabions

### **1 Permanent Soil Nailing**

#### **1.1 General**

1.1.1 This specification for soil nailing is provided as the minimum acceptable standard for soil nailing forming part of the O&M Works. The Designer may propose more stringent protective measures if these are considered necessary. If the Company wishes to propose any modifications to this Specification then supporting information shall be provided to the Scottish Ministers demonstrating that an equivalent quality of product will be provided.

1.1.2 Soil nails shall comprise both nail tendon and soil nail head components. Concrete pad soil nail heads shall be used.

1.1.3 Soil nail design shall be carried out in line with DMRB HA68/94 and CIRIA C637 Soil Nailing: Best Practice Guidelines taking cognisance where required of Geoguide 7 (Geotechnical Engineering Office, Civil Engineering Department, Government of the Hong Kong Special Administrative Region) for soil nail head design.

1.1.4 Corrosion protection for permanent soil nails shall be based on a detailed assessment of degradation risk, in line with CIRIA C637 Soil Nailing: Best Practice Guidelines. As a minimum, hot dip galvanised steel shall be used for tendon and head. In light of long term corrosion of the steel bar tendons, the Contractor shall allow for a reduction in effective diameter in the design of the soil nails.

1.1.5 Soil nails shall be fabricated and installed by a specialist contractor experienced in soil nail installation, using suitably trained personnel and to a method statement approved by the Designer.

1.1.6 The Company shall make every effort to create a green vegetated finish to soil nailed slopes including the use of recessed soil nail head assembly, with both erosion control fabric and mesh to encourage vegetation growth.

#### **1.2 Method Statement**

1.2.1 Soil nailing works shall be carried out in accordance with a detailed method statement, which is to be approved by the Designer. Approval by the Designer shall be sought at least four weeks prior to installing the first soil nails or carrying out associated earthworks. The approved method statement shall be forwarded to the Scottish Ministers two weeks prior to installing the first soil nails or carrying out associated earthworks. The method statement shall provide details of:

- (a) earthworks including maximum unsupported excavation width and depth;
- (b) method of nail installation, including measures to ensure minimum ground movements above the soil nailed slope and maximum standing time between drilling of holes to insertion of nail tendons;
- (c) soil nail head assembly details, including method of recessing soil nail heads concrete pads;
- (d) method of forming the facing, where appropriate;
- (e) method of connecting the nail head assembly to the facing, where appropriate;
- (f) methods of performing field tests;
- (g) method of assessing damage to protective coatings where appropriate;
- (h) grouting procedures including details on bleed, flowcone and strength testing;
- (i) temporary support of slopes;
- (j) the time after installation before a nail is considered to be fully operational;

## **Appendix 6/10: Ground Anchorages, Crib Walling and Gabions**

(k) maximum exposure period for untreated sections of excavation;

(l) form of the test records; and

(m) steel bar certificates; coupler, steel plate and nuts certificates; reinforcement bar certificates.

1.2.2 Soil nailing on existing slopes shall be undertaken without any risk of reducing the existing slope stability. Any proposed temporary excavation or placing of fill on the slope shall be agreed in advance with the Designer and detailed within the Company's method statement. Any such temporary works shall be reinstated to the original slope profile, or as otherwise agreed with the Designer, without damage or displacement of the soil nailing system.

1.3 **Alterations**

1.3.1 Once approval has been given to the method statement, details shall not be amended without prior approval of the Designer.

1.4 **Company Design**

1.4.1 Soil nails forming part of the O&M Works shall be designed by the Company to satisfy the requirements of this specification.

1.5 **Sources of Material Supply**

1.5.1 The proposed source of supply of the soil nails and such other materials as covered by this Specification shall be submitted by the Company for approval by the Designer prior to the commencement of the O&M Works. Sources of supply shall not be changed without prior approval by the Designer.

1.5.2 Details shall be provided to the Designer of the proposed soil nail reinforcement, splicers / couplers, centralisers, sheaths, load spreading plates, wedge washers, collar nuts, head assembly components and protective coatings for approval prior to the commencement of the Works. Details shall include:

- (a) galvanised steel bars
  - (i) galvaniser's certificate;
  - (ii) tensile test results;
  - (iii) bend test and rebend test results; and
  - (iv) galvanised coating (BS EN ISO 1461).
- (b) couplers, steel plates, nuts for couplers
  - (i) galvaniser's certificate;
  - (ii) permanent elongation and tensile test results;
  - (iii) galvanised coating (BS EN ISO 1461)

1.5.3 Materials shall be delivered to site in an undamaged condition and shall be handled, stored and protected in such a manner as to avoid corrosion or physical damage. Any soil nails or other such materials covered by this Appendix not conforming to these requirements shall be notified to the Designer for acceptance or rejection. Rejected materials shall be removed promptly from the site.

1.6 **Reinforcement**

1.6.1 High yield steel soil nails shall comply with BS 4449 or equivalent European national standard. The characteristic yield strength of the nail reinforcement shall be a minimum of 460 newtons per square millimetre.

## **Appendix 6/10: Ground Anchorages, Crib Walling and Gabions**

- 1.6.2 The permanent soil nails shall have long term corrosion protection in the form of full length hot dip galvanising. This shall be applied in accordance with BS EN ISO 1461.
- 1.6.3 All permanent soil nails shall be of solid thread bar type.
- 1.6.4 The galvanised mild steel (“GMS”) lock off plate shall be high yield steel conforming to BS 4449 or other equivalent Eurocode national standard. They shall be hot dip galvanised according to BS EN ISO 1461.

### **1.7 Splicers / Couplers**

- 1.7.1 Splicers and couplers used in the works which require the removal or repair to damaged coatings shall not be permitted for use in the O&M Works. Only nails greater than 4 metres in length may be spliced or coupled using a mechanical splicer or coupler. The tensile, bearing and shear strength of a splice or coupler shall be not less than 90 percent of the soil nail when considering the influence of the combination of stresses.
- 1.7.2 Bolts, screws and nuts shall comply with one of the following:
  - (a) BS EN ISO 898 and BS EN ISO 4016, BS EN ISO 4018 and BS EN ISO 4034, hot dip galvanized in compliance with Clause 1909 of the Specification for Highway Works. The property class of the bolts and screws shall be not less than 4.6, while the property class of the nuts shall not be less than 4.0; and
  - (b) stainless steel to BS EN ISO 3506-1 and BS EN ISO 3506-2 grade A4-70.
- 1.7.3 Plain washers shall be of either Form A or Form E complying with BS 4320 and shall be made from one of the following:
  - (a) cold rolled carbon steel strip CS4 complying with BS 1449: Part 1.1 hot dip galvanized in compliance with Clause 1909 of the Specification for Highway Works; and
  - (b) stainless steel strip designation 1.4401 or 1.4436 complying with BS EN 10029, BS EN 10048, BS EN 10051, BS EN 10258 and BS EN 10259.

### **1.8 Centralisers**

- 1.8.1 The Company shall provide a minimum of four centralisers shall be provided at suitable intervals over the total length of the nail. The centralisers shall be spaced at centres not exceeding 1.5 metres with the last centraliser 0.3 metres to 0.5 metres from the end of each nail.
- 1.8.2 The centralisers shall be fabricated from materials that have no deleterious effects on the soil nailing system. The centralisers shall be suitably robust to ensure they suffer no damage during installation, and maintain an appropriate grout cover to the nails and couplers.
- 1.8.3 Centralisers shall be designed to ensure that they permit the free flow of grout but retain the correct centralising function. Where soft or loose soils are encountered during nail installation, centralisers should be installed at closer spacing to ensure that the nails maintain the appropriate amount of minimum cover.

### **1.9 Grout**

- 1.9.1 Unless otherwise approved by the Designer, grout for soil nails shall comprise a cement grout consisting of a pumpable mixture of Portland cement and water that can reach a minimum compressive strength of 40 newtons per square millimetre in 28 days. A minimum of four grout cubes per day shall be made and tested according to BS 1881. The water cement ratio shall not exceed 0.45 to reduce loss of grout into surrounding ground. The grout shall not be subject to bleeding in excess of 2 percent after 3 hours.

## **Appendix 6/10: Ground Anchorages, Crib Walling and Gabions**

Admixtures that can control, bleed or retard the set of the grout shall be used only when approved in writing by the Designer. Their use shall be strictly according to the manufacturer's instructions. Flow cone tests, bleed tests and cube strength tests shall be completed on all grout to be used in soil nailing on site and results of each batch are provided to the Designer prior to use.

### **1.10 Soil Nail Head Design**

1.10.1 Soil nail head design shall be carried out to ensure both stability of the front face of the slope and design loads that may be applied under soil mobilisation. Sizing of soil nail heads shall be based on Highways Agency HA 68/94 Figure E.2(a) or Geoguide 7 (Geotechnical Engineering Office, Civil Engineering Department, Government of the Hong Kong Special Administrative Region) (Figure 5.4). Concrete pad soil nail head recessed into the slope shall be used (see Geoguide 7). These recessed pads shall be covered by hessian grow bags or similar and shall allow for a fully vegetated slope upon completion. A double layer of mesh and erosion control matting shall be fixed to the face to allow vegetation growth.

1.10.2 Concrete Pad: The concrete pad construction shall comprise excavation of the head, steel fixing and concreting. Reinforcement shall comprise a minimum of 3 T16 U bars in both directions. A minimum of 50 millimetres concrete cover around the reinforcing bars shall be provided. The number of T16 U bars in both directions shall be dependent upon the required head pad dimensions.

### **1.11 Limitations on Construction Plant**

1.11.1 All vehicles and construction plant having a mass more than 1000 kilograms shall be kept at least two metres behind soil nailed facing or external boundaries. Where appropriate, fill within two metres from the facing shall be compacted with compaction plant suitable for the class of fill material having a mass not more than 1000 kilograms.

### **1.12 Constructing Soil Nailed Slopes**

1.12.1 The Company shall construct soil nailed slopes from the top down as the soil in front of the cut slope is removed and the nails are installed and grouted at each level as approved in the method statement. The excavation shall be progressively formed in 'lifts' of not more than 2 metres height. Each lift shall be secured with any facing placed and secured in place before the subsequent lift is excavated.

1.12.2 The slope shall be excavated over the required width and depth as approved in the method statement. The excavated lift shall not be exposed for a period in excess of 24 hours or as specified in the method statement without prior approval of the Designer. Excavation shall proceed in stages exposing the minimum amount of soil which will allow the practical and expeditious installation of facing and soil nails while assuring stability of the excavated face and minimising ground movements. In all cases the maximum unsupported slope height shall not exceed 2 metres. Temporary surface protection shall be used for all cut faces exposed to inclement weather.

1.12.3 In anticipation of installing facing, the Company shall clean surfaces of all loose material and other foreign matter.

1.12.4 Where seeding of soil nailed slope faces is required seeding shall take place prior to topsoiling to reduce the risk of seed being washed away. Topsoiling and seeding shall be completed to within a maximum of 2 lifts above the working platform prior to the formation of a new lift. Erosion control matting shall be used for hydroseeding protection.

1.12.5 Adjacent panels of slope facing shall be joined together as instructed by the Designer.

1.12.6 Facing shall be terminated at the top and bottom of soil nailed slope as instructed by the Designer and detailed on the earthworks drawings.

## **Appendix 6/10: Ground Anchorages, Crib Walling and Gabions**

### **1.13 Drilling**

- 1.13.1 The Company shall drill holes for soil nails to the depth, diameter, alignment and position shown on the Designer's proposed earthworks drawings. Holes shall have a maximum deviation from the position shown on the drawings of +/- 50 millimetres. The maximum deviation of the drill holes from the specified horizontal alignment shall be +/- five degrees.
- 1.13.2 Casing shall not normally be required for soil nail holes. However, if the ground conditions are considered to be loose or of poor quality, casing may be considered. If casing is used, the method shall not promote mining and loosening of the soil at the perimeter of the drill hole or fracture soils with weak stratification planes by use of high pressures. Debris will need to be cleaned out of the hole prior to installation of the tendon.
- 1.13.3 Where the drill holes are located in such a way that debris can fall into the hole from the ground surface the drill hole shall be temporarily covered unless the soil nail is installed and grouted directly on completion of the drilling operation.
- 1.13.4 The drilled holes shall not be left open for more than 24 hours prior to the installation of the nail tendon and grouting, to prevent collapse of the holes. Nails should be grouted the same day.
- 1.13.5 Where soil nails are to be embedded into bedrock and bedrock level is found to be poorly defined the Company shall immediately inform the Designer and provide relevant draft drilling records to the Designer. The Designer shall then confirm bedrock level and hence required nail length prior to nail installation at that location. In all instances the decision of the Designer shall be final.
- 1.13.6 If heavily fractured bedrock material is encountered during drilling for soil nails to be embedded into bedrock the Contractor shall immediately inform the Designer and provide relevant drilling records to the Designer. The Designer shall then confirm whether longer nail lengths or additional nails are required prior to nail installation.

### **1.14 Grouting**

- 1.14.1 Prior to grouting works, all plant, batchers, mixers, pumps, materials etc must be approved by the Designer. Calibration certificates shall be provided by the Company to the Designer and the Scottish Ministers within 1 week of commencement of the grouting works.
- 1.14.2 The soil nails shall be installed in each drilled hole prior to grouting. The installation equipment and its operation shall be such as to minimise disturbance of the soil being treated. The maximum deviation of individual soil nails from the required angle of inclination shall be 1 in 30 unless otherwise specified. Each soil nail shall have a maximum departure from the positions shown on the drawings of +/- 50 millimetres.
- 1.14.3 Mixing equipment shall be used that produces a grout of homogenous consistency and shall be capable of providing a continuous supply to the injection equipment. The injection equipment shall be capable of continuous operation at a constant delivery pressure. The injection equipment shall include a system for recirculating the grout during pauses in the grouting operation.
- 1.14.4 Suitable grout testing shall be carried out (flowcone tests, bleed tests, strength tests, refer section 1.9.1 above.)
- 1.14.5 Grouting of drilled holes shall be carried out during withdrawal of the grout tube fixed onto the soil nail, or during the withdrawal of casing using tremie pipes, using hydrostatic, gravitational, or pressure grouting. Where pressure grouting is used the grout shall be injected at a pressure not exceeding 15 kilonewtons per square metre in soil and 20

## **Appendix 6/10: Ground Anchorages, Crib Walling and Gabions**

kilonewtons per square metre per metre depth of ground above the hole. Grout shall be injected at the lowest point of the drill hole to ensure that the drill hole is filled without introducing air voids. Grout shall be injected slowly and progressively from the bottom to the top until the hole is completely filled without interruption in the grouting process and clean grout of the same consistency as that injected is seen to run from the top of the hole.

- 1.14.6 For uncased holes, grout pipes shall be fixed to the tendon of the nail to ensure grout cover commences at the lowest end of the nail and grout should be pumped into the hole at a continuous and steady rate, slow enough to prevent entrapping air and to prevent voids forming.
- 1.14.7 Excess quantities of grout should be reported to the Designer to ensure adequate control of grout and prevent grout migration into service ducts, etc.
- 1.14.8 Grouting shall be discontinued if the ambient temperature falls below three degrees Celsius or if the grout temperature falls below five degrees Celsius. When the grout has developed a strength not less than 80 percent of that specified for the 28 day strength, the Contractor shall install the nail head assembly. The small galvanised mild steel ("GMS") lock-off plate shall be bedded down and the nail tensioned by applying torque that induces a nominal load of 10 kilonewtons. The Company's programme of operations shall include sufficient time for these requirements prior to further excavation of the slope face.
- 1.14.9 In the case of soil nailed slopes the grout shall fill the hole flush with the slope face. The holes shall be checked after three to five days to check for any grout loss which shall be made good.

### **1.15 Damage to Installed Nails**

- 1.15.1 If a soil nail or connection to slope facing or wall is damaged during installation it shall be replaced at the Company's expense unless otherwise instructed in writing by the Designer.

### **1.16 Records**

- 1.16.1 The Company shall keep daily records of the soil nails installed. Copies of these shall be submitted to the Designer within three days following the installation of each soil nail. The records shall show:
  - (a) date of installation;
  - (b) grid and area reference of each soil nail;
  - (c) position (chainage and slope length above or below a fixed point or berm), length and inclination of each soil nail;
  - (d) length of nail installed into competent strata (based on drillers log observations);
  - (e) (date and time of key installation activities (commencing drilling, completing drilling, commencing grouting and completing grouting);
  - (f) apparent nature and cause of obstructions (other than drilling in bedrock) and delays including time to resolve;
  - (g) grout loss;
  - (h) torque force applied to soil nail;
  - (i) number and type of tests carried out;
  - (j) readings from relevant instrumentation;
  - (k) relevant calibration certificates; and
  - (l) soil nail head dimensions and details.

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1.16.2 Any unforeseen conditions encountered and reported shall be noted in the records.

### **1.17 Testing of soil nails**

1.17.1 Prior to the installation of permanent soil nails, a minimum of six pull-out test nails shall be installed at locations agreed with the Designer and tested accordingly. Pull-out test numbers shall be around three per cent of the total number of working nails, ensuring that all soil types and levels in the slope are tested. In addition, proof testing of permanent nails shall be carried out at a rate of three tests per 100 installed soil nails at locations selected by the Designer and consistent with the progress of soil nailing operations.

1.17.2 Soil nails subjected to pull-out tests shall not form part of the Permanent Works. Any protrusions from the drill hole shall be cut flush with adjacent ground surfaces and the drill hole filled by grouting.

### **1.18 Test Equipment**

1.18.1 Displacement measuring gauges that can measure to 0.1 millimetres or better and are mounted on an independent reference frame shall be used to measure movement of the soil nail being tested. The frame shall be securely installed so that readings are not affected by vibration or soil movements. Drilling and other plant movements next to test nails shall be stopped during soil nail testing. The load frame shall ensure that the load is applied in the same direction as the nail and shall not be permitted to within one metre radius of the centre of the drilled hole.

1.18.2 Hydraulic equipment capable of inducing pull-out failure of any selected nail, together with a pressure gauge, calibrated as a unit shall be used to apply the test load. Alternatively the applied load may be monitored utilising a suitably calibrated load cell. The load measuring system shall be capable of measuring the load increments to an accuracy of one percent of the design load or better.

### **1.19 Pull-out Testing**

1.19.1 Unless instructed otherwise by the Designer, pull-out test nails are to be tested to 150 per cent of the design working loads of the nail or 90 per cent of the ultimate tensile stress of the steel bar, or until pull-out failure occurs, whichever is the lesser. The grouted portion of the test nail can vary, from the lower 2 metres of the bond length to the full bond length as specified by the Designer. The test nails shall be installed in accordance with the proposed construction methodology for the permanent soil nails. The nominal diameter of the drill hole shall be the same as for the permanent soil nails.

1.19.2 The Designer's approval of pull-out test results shall be obtained prior to installation of permanent soil nails for the Works. Unacceptable pull-out test results may result in the need to modify the nail lengths, testing and construction procedure or construction details. Such modifications shall be approved by the Designer and shall require the verification testing procedures to be repeated.

1.19.3 Pull-out test nails shall be grouted in place as part of a regular production grouting process. After grouting, the nail shall not be loaded until the minimum required 28 day compressive strength of the grout (40 newtons per square millimetre) has been proven by cube tests.

1.19.4 The pull-out tests shall be made by incrementally loading and unloading each nail over three cycles. Test loads shall be applied in accordance with testing pro-forma as proposed by the Company but with the approval of the Designer.

1.19.5 Pull-out failure is defined as movement in excess of 0.1 per cent of the tested bond length over the full test period or as confirmed by the designer. Movement shall be checked against possible extension of the steel tendon, movement between steel and grout as well as between grout and soil / rock.

## **Appendix 6/10: Ground Anchorages, Crib Walling and Gabions**

### **1.20 Proof Testing**

- 1.20.1 Permanent soil nails selected by the Designer shall be proof tested during the main soil nail works. Unless otherwise specified by the Designer these shall be tested by loading to 1.5 times the design working load or until pull-out failure, whichever is the lesser.
- 1.20.2 The proof testing procedure shall be similar to the requirements of Section 1.19 above for pull-out test nails, with the exception that the nails will be loaded and unloaded for only two cycles.
- 1.20.3 If earlier soil nail proof test results are accepted but subsequent tests fail to meet the acceptance criteria the Company shall inform the Designer without delay. All nails installed subsequent to the last successful test shall be proof load tested and if failed replaced.
- 1.20.4 Nails not meeting the acceptance criteria, or any nails identified by the Company or the Designer as being potentially defective shall be recorded by the Company along with the Company's proposals for treatment. These records shall be forwarded within 24 hours from testing to the Designer for comment.

### **1.21 Records of Tests**

- 1.21.1 The Company shall keep records of all soil nail tests carried. Field sheets from soil nail tests shall be provided to the Designer within one hour of completion of each test and final copies of the test results provided within three days. The test records shall describe:-
  - (a) the date of test;
  - (b) the area and location of test;
  - (c) the number of tests carried out;
  - (d) any variations from the specified procedure;
  - (e) details of the test results (including graphical result plots of load against displacement);
  - (f) any unforeseen conditions encountered; and
  - (g) any test procedure problems and how they will be resolved.

- 1.21.2 Test records shall be presented in the format as specified in the agreed method statement.

### **1.22 Temporary Soil Nails**

- 1.22.1 To be completed by the Company

## **Appendix 6/11: Grouting Works (Swallow Holes and Other Naturally Occurring Cavities and Disused Mineworkings)**

### **1 Work not Required**

1.1 Any Sections in this Appendix which relate to work or materials not required by the Contract shall be deemed not to apply.

### **2 General Safety**

2.1 The Company shall be aware of the danger from gas which may be present whilst undertaking the O&M Works at and around mineworkings and shafts. The Company shall take all possible precautions in this respect including the supply, maintenance and operation, in accordance with the manufacturer's recommendations, of suitable equipment for monitoring the emissions of flammable or noxious gases. The Company shall consult and comply with the requirements of the Coal Authority on matters relating to the problems and method of treatment of gas which may arise from the presence of abandoned mineworkings.

2.2 The Company shall be aware of the hazards associated with the respective constituent grout materials and take every precaution necessary in the delivery, storage and use of these materials in the Works to protect the health, safety and welfare of person, animals and the environment.

2.3 The Company shall provide with his method statement details of the safety measures he proposes to implement in order to comply with the requirements of this Appendix. The Company shall take all necessary safety precautions to safeguard his equipment, employees and the public from all risks.

2.4 Grouting works shall be carried out in accordance with a detailed method statement, which is to be approved by the Designer. Approval by the Designer shall be sought at least four weeks prior to commencement of drilling the first hole or carrying out associated probe drilling works. The approved method statement shall be forwarded to the Scottish Ministers two weeks prior to commencement of drilling. The method statement shall provide details of:

- (a) the proposed layout of the consolidation treatment works including details of the depth to and size of workings to be consolidated and angle of drill holes;
- (b) the method of drilling holes and associated casing requirements and materials;
- (c) the proposed flush medium and methods for monitoring flush returns and arisings;
- (d) the proposed drilling plant;
- (e) method of monitoring for mine gas;
- (f) method of mixing, batching and placement of grout;
- (g) source of grout materials and proposed grout mix design;
- (h) grout properties including strength, flow properties and bleed capacity;
- (i) method of testing grout properties;
- (j) limitation on placement of grout;
- (k) method of monitoring grouting pressure;
- (l) maximum allowable grouting pressures;
- (m) methods of performing pressure injection test holes;

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- (n) measures to minimise noise pollution and to prevent flush arising from drilling works and grout spillage running into existing drainage or watercourses;
- (o) form of the daily records and test records; and
- (p) material test certificates and equipment calibration records.

### **3 Pollution Control**

- 3.1 The Company shall be aware of the hazards from contaminated minewater to persons, animals and the environment. The Company shall consult and comply with the requirements of SEPA and the Coal Authority on matters relating to the hazards from contaminated minewater, its treatment and disposal. The Company shall take every precaution to contain and dispose of contaminated minewater, and to prevent contamination of the drainage system and the surrounding environment.
- 3.2 The Company shall be aware of the hazards from grout residues to surface-water courses. The Company shall consult and comply with the requirements of SEPA on matters relating to the hazards from grout residue. The Company shall take every precaution to prevent contamination of surface-water systems and the surrounding environment.
- 3.3 All works shall be carried out without unreasonable noise and disturbance to the site and its environs and shall comply with the noise control requirements of Appendix 1/9.

### **4 Services**

- 4.1 The Company shall take every precaution to avoid damage to or interference with apparatus and supplies, whether privately-owned or owned by Statutory Undertakers or local authorities and shall at his own expense rectify any damage done. He shall relieve the Scottish Ministers of all claims in respect of any interruption or loss arising from such damage.
- 4.2 The Company shall carry out closed circuit television surveys of the sewers and ducts in the vicinity of the consolidation works before commencement and after completion of the Works.
- 4.3 The survey shall identify the existing condition of the sewers and ducts and their condition upon completion of the grouting works. A written report supported by a copy of the survey on DVD shall be supplied to the Scottish Ministers by the Company within 7 days of the completion of each survey. The pre-condition report shall identify any defects within the sewers and ducts and provide proposals to protect them during the grouting works. The post-condition report shall identify any changes in condition of the sewers and ducts since commencement of the grouting works and provide proposals to remedy any defects.
- 4.4 The Company shall remedy any defects or damage to adjacent properties, apparatus and supplies caused by the grouting operations, as determined by the Scottish Ministers.

### **5 Method**

- 5.1 In respect of mineworkings and subsurface voids where more than one seam is to be treated then the uppermost seam shall be treated first and thereafter subsequent

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seams shall be treated in descending order, drilling through previously treated ground.

5.2 Where artesian groundwater conditions are encountered measures shall be taken to ensure that no permanent connection / pathway exists between the artesian water source and ground surface.

5.3 Drilling, batching, mixing, injecting, testing and the other various operations included in the Works shall be carried out in accordance with this Appendix.

5.4 After the area has been treated, it shall be tested by the sinking of further boreholes to confirm the adequacy of the works. The test procedure contained within this Appendix 6/11 shall then be followed.

### **6 Drilling**

6.1 Boreholes shall be drilled by rotary or rotary percussive techniques to intercept the mineworkings and subsurface voids and penetrate into the rock 1.0 metre below seam pavement level.

6.2 All boreholes shall be cased using steel casing within the drift deposits. The casing shall be sealed at an appropriate depth into rockhead so that there is no loss of grout to any superficial deposits during grout injection. Holes shall be cased in rock where soft, loose or broken strata are encountered below rockhead.

6.3 All boreholes shall be kept open over their full depth to enable them to be used for the injection of pea gravel and / or grout under pressure into the mineworkings and sub-surface voids and also into all breaks and fissures in the overlying rock strata. Collapsed or obstructed holes shall be redrilled, including the insertion of casing through the obstruction or zone of unstable / collapsing ground if necessary.

6.4 Where soft, loose or broken strata encountered below rockhead are associated with the mineworkings or with related void migration or racking then these strata shall also be consolidated by injecting grout under pressure. If the soft, loose or broken strata have been cased then the casing shall be withdrawn above these strata once the borehole has been grouted and pressurised and the grouting process shall be repeated in accordance with this Appendix.

6.5 Casing shall not be withdrawn until the grouting works are complete in any given borehole.

6.6 Drilling shall not take place within 18 metres of mineworkings that have been grouted within the preceding 24 hours.

#### **6.7 Perimeter Drilling (Optional)**

6.7.1 If required as part of the Company's design of the Works, vertical and inclined boreholes of 100 millimetres minimum diameter shall be drilled around the perimeter of the area of the grouting works, to be consolidated, as required, at not more than 3 metre centres at the seam pavement level.

6.7.2 Drilling of perimeter boreholes shall commence at the point where the worked seam is deepest and shall progress in both directions around the boundary of the grouting works.

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### **6.8 Infill Drilling**

6.8.1 When infilling the mineworkings and sub-surface voids, vertical and inclined boreholes of 50 millimetres minimum diameter, shall be drilled to the Company's grid pattern at seam pavement level.

### **7 Grouting**

7.1 Immediately prior to grouting each hole, the Company shall check that it is clear of obstructions over its full length and capable of being grouted down to the required grouting depth.

7.2 Grout shall be injected into the mineworkings and sub-surface voids via a steel pipe placed to the bottom of borehole or as otherwise agreed with the Scottish Ministers. Injection pressures, measured at ground level, should not exceed the lesser of 10 kilonewtons per square metre per metre of overburden or a maximum pressure of 200 kilonewtons per square metre. If one of these criteria is reached quickly, the grout pipes shall be lifted to check that a local obstruction is not preventing the flow of the grout into the strata. A suitably graduated pressure gauge with an appropriate full scale deflection shall be incorporated within the grout line near the top of the hole. The applied pressure shall be monitored on this gauge, care being taken to reduce any risk of ground heave. The grout pipe is to be raised during progress of injection as limiting pressures are reached or as grout appears at the borehole surface.

7.3 As soon as the grout appears at the point of injection, then final pressurisation shall take place using a pressure gauge and grout connection fitted directly to the top of the casing.

7.4 During grout testing, limiting pressures shall be used. The use of a lower pressure during grouting and pressurising shall not relieve the Company of the responsibilities laid down in this Appendix relating to testing of treated areas.

7.5 The Company shall be responsible for ensuring that no damage to watercourses, existing Structures and existing Public Utilities results from the Grouting Works.

7.6 Should the injection pipe become blocked then it shall be removed immediately and cleared.

7.7 Immediately before commencing or re-commencing grouting of any borehole the Company shall ensure that it remains open over its full depth and that no collapse has taken place. Where an obstruction is encountered the borehole shall be redrilled and, if necessary, cased through the blockage.

7.8 Casing shall not be withdrawn until grouting of any given borehole is complete.

7.9 No grout injection shall take place within 18 metres of drilling operations. Infill grouting shall not be carried out until at least seven days have elapsed since the completion of any perimeter boreholes within 10 metres of the proposed infill borehole. Distances shall be measured at the pavement of the seam being treated.

7.10 Boreholes shall be topped-up to ground level during or immediately after withdrawal of the casing in such a manner as to prevent the overburden collapsing in the hole and to ensure the structure and strength of the grout column. Bores shall be completely filled so that no settlement will occur, or subsequent depression form, in the superficial deposits.

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7.11 Care shall be taken to ensure that uplift pressures do not develop under any adjacent buildings or structure, including services, during grout injection. Where nearby buildings or structures may be affected by the grouting works, the Company shall take extra care and shall employ special monitoring techniques to record ground movement. Additionally, the Company shall monitor ground levels by precise levelling at intervals, both prior to and during operations.

7.12 The Company shall make every effort to remove any metal casing used. If the abandonment of any casing, or part of any casing, is unavoidable then the casing shall be grouted and cut a minimum of two metres below ground level. The location shall be permanently recorded by the Company and details included in the Operations and Maintenance Manuals and other relevant documentation.

7.13 **Perimeter Grouting**

7.13.1 Grout introduced into the mineworkings and sub-surface voids via perimeter boreholes shall be capable of setting quickly without undue spread and in such a way that an efficient barrier is formed in the worked seam around the perimeter of the grouting works. The rate of injection shall be limited to 1.5 tonnes of dry materials per hour per borehole.

7.13.2 A maximum of 7 tonnes shall be injected into one hole during any consecutive twelve hour period. In boreholes where cavities in excess of one metre high or interconnecting cavities in excess of 0.5 metres in height are encountered the Company will be required to simultaneously place pea gravel with the grout in the ratio 1:1 by weight using an approved hopper device. Consideration shall be given in the design to the addition of a thixotropic or accelerating agent.

7.14 **Infill Grouting**

7.14.1 For infill holes injection is to be carried out in such a way that all the mineworkings and sub-surface voids underlying the Site, together with all spaces, breaks and fissures therein and also in the overlying rock strata, are completely and tightly filled with grout.

7.14.2 If the limiting pressure is not achieved or grout has not appeared at the point of injection after 15 tonnes of grout materials have been placed, the grout tube or pipe shall be removed from the hole and the injection suspended. After a period of at least 12 hours, up to a further 10 tonnes of materials shall be injected. If grout has still not surfaced up the bore, injection shall again be suspended for at least 12 hours and the process shall be repeated with further quantities of 5 tonnes. If the hole is still accepting grout after a total of 50 tonnes of materials have been injected without any sign of the hole being completed the Company shall consult the Designer to determine whether the injection is to be continued or other measures, such as secondary or test holes are required.

7.14.3 Final tightening of each borehole shall be carried out by pumping an approved grout at a pressure, measured by a gauge at ground level, that should not exceed the lesser of 10 kilonewtons per square metre per metre of overburden or a maximum pressure of 200 kilonewtons per square metre to fill all joints and fissures in the rock strata overlying mineworkings and sub-surface voids. Mineral stoops encountered during drilling shall be treated in the same manner after being drilled to pavement level.

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### **8 Grout Mixing, Batching and Pumping Plant**

- 8.1 The grout mixer shall be capable of producing a homogenous mix with all particles thoroughly wetted and with no segregation.
- 8.2 It is essential that the mixer is fitted with a reliable automatic weigh batching device capable of consistently measuring the weight of component materials in the approved proportions.
- 8.3 Water supply to the mix shall be properly monitored by means of a suitable metering device incorporated in the mixer in order to ensure accurate control of the mixing water fed into each batch of dry materials.
- 8.4 After mixing the grout shall be fed into storage tanks fitted with powered agitators sufficient to ensure that no segregation of component materials occurs and that a continuous flow of grout is maintained at the insertion point.
- 8.5 Injection of the pre-mixed grouts shall be by means of positive displacement pumps and suitable pressure gauges shall be incorporated in the system to facilitate control of pressures.
- 8.6 Three valves shall be provided at each junction point to provide means for diversion of the grout away from the injection point when necessary and to prevent undue wastage of grout during transfer of the delivery line from one injection point to another.
- 8.7 The Company shall include within the relevant method statement details of the proposed methods of all O&M Works.

### **9 Grout materials**

- 9.1 Cement shall be ordinary Portland cement and shall comply with British Standard Specification BS EN 197 having a compressive strength class (Table 2) of 42.5 newtons per square millimetre or greater. The cement shall be suitably stored to prevent damage from the weather.
- 9.2 Sand for grouting shall comply with the requirements of BS EN 12620 and be of a suitable grading suitable for use in the Company's plant.
- 9.3 Pulverised fuel ash ("PFA") shall be fine grained complying with BS 3892: Part 3 Specification for PFA for use in grouts, be of a type suitable as a constituent for grout, meet grout workability and pumpability requirements and obtained from an approved supplier. PFA in storage shall be protected by tarpaulins, other covering or stored in a suitable container to prevent contamination with dust, protect the material from the effects of weather and prevent it becoming an airborne hazard.
- 9.4 Pea gravel shall be single sized 10 millimetres natural gravel and comply with requirements of BS EN 12620.
- 9.5 Bentonite shall be Fulbent 570 as supplied by the Fuller's Earth Contractor Limited, or approved equivalent.
- 9.6 Water:
  - (a) All water used in the Works shall be clean, fresh water, free from impurities and obtained from a public water supply.

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(b) The Company shall pay the appropriate charges for water and shall make all arrangements to ensure a proper and sufficient supply for the duration of the Contract. A hydrant connection will not be accepted.

9.7 All mixes shall be appropriate for the groundwater conditions and groundwater chemistry encountered in the abandoned mineworkings.

9.8 The Company shall conduct moisture content and grading tests on materials supplied to the Site and shall provide the Scottish Ministers with copies of the results of these tests. The frequency and the results of these tests shall be verified for compliance with the design before any grouting is commenced.

9.9 All materials shall be kept free from contamination with deleterious matter. Stockpiles of materials shall be kept adequately separated from one another

9.10 Unless otherwise directed, all materials shall be in accordance with the appropriate Clauses of the most recent applicable British Standard (or other) and all workmanship shall be in accordance with the appropriate Clause of the most recent British Standard Code of Practice (or other).

### **10 Grout Mixes**

10.1 The Company shall check for each proposed grout mix that 7, 14 and 28 day cube strength test results and flow test results comply with the design of the Works.

10.2 The minimum 28 day crushing strength shall be 1 meganewton per square metre.

10.3 All grout used in connection with the Contract shall contain cement.

10.4 Grout introduced at the perimeter probe hole locations shall have a cement content of between 120 and 150 kilograms per cubic metre of mixed volume.

10.5 Grout introduced at infill hole locations shall have a cement content of between 80 and 100 kilograms per cubic metre of mixed volume.

10.6 Using a "Colcrete" Flowmeter the following criteria shall apply with regard to grout flow properties.

(a) Perimeter and additional probe grout shall flow within the limits 300 millimetres to 400 millimetres.

(b) Infill grout shall flow within the limits 400 millimetres to 600 millimetres.

10.7 The Company shall undertake testing of grout mix proportions and materials. Results of these tests shall be verified for compliance with the design before any grouting is commenced.

### **11 Grout Tests**

11.1 Throughout the course of grouting works the Company shall take cubes with 100 millimetre sides in sets of six at the rate of one set per day. The cubes shall be cured and crushed at a UKAS accredited laboratory. The cubes shall be uplifted and transported to the laboratory within 36 hours of their casting. One cube shall be crushed at 7 days, one at 14 days and two at 28 days. The test will be taken as conforming if both 28 day strengths exceed the minimum requirement contained in this Appendix. The Company shall permanently and clearly mark cubes for identification, and shall keep records which shall indicate exactly the location of the grout or concrete, the flow test readings of the mix, the date of placing and mix

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reference. The marking of cubes, handling, storage and testing shall be in accordance with BS 1881.

11.2 The Company shall test the flow properties of each batch of mixed grout in accordance with this Appendix relating to grout mixes before it is injected and shall carry out such additional random tests as may be required to ensure compliance with the design of the Works.

### **12 Testing of Infilled Grout**

12.1 On completion of the grouting works the Company shall sink probe test holes into the filled mineworkings and subsurface voids (minimum of one probe per 500 square metres) and shall carry out grout injection tests to establish the adequacy of the works already completed. The Company shall provide details of numbers and locations of test holes to be undertaken to the Scottish Minister's Representative. Testing shall not be undertaken until a minimum of 48 hours has elapsed since the completion of treatment in the area to be tested.

12.2 These tests shall consist of injecting grout into the test holes in the normal fashion and noting the quantity required to produce an injection pressure of 200 kilonewtons per square metre or such lower pressure as specified in the design of the Works. When this injection pressure has been reached the injection pump shall be switched off and a suitable valve at the top of the hole closed to isolate any line pressure. The test shall be deemed successful where the quantity of grout injected is less than 0.5 tonnes or such higher quantity as specified in the design and where the pressure has not dropped by more than 10 per cent in three minutes.

12.3 The Company shall ensure that a good seal is maintained at rockhead during the test. Losses of grout and hence pressure at rockhead or into poorly consolidated fissures shall cause the test to fail if the conditions of the above Section are not met.

12.4 The Designer may in addition require core samples to be taken by rotary coring to check the adequacy of the grouting operation. Rotary coring shall be carried out in accordance with the MCHW, Volume 5, Section 3, Part 4.

12.5 Should any of the tests reveal incomplete grouting works or other defect, the Company shall make good such works in order to comply with the requirements of the Contract.

### **13 Cold Weather**

13.1 When the temperature of the air is near or below the freezing point of water, grouting works shall only be permitted at the entire risk of the Company, who shall take precautions to ensure that the materials are free from frost and to protect the grout or concrete from freezing.

13.2 The Company shall make good any works which may be damaged by frost. For the purpose of recording the air temperature a reliable maximum / minimum thermometer is to be located on the O&M Works Site. Precautions against cold weather conditions shall be such as to ensure that the grout shall, at no time during mixing, depositing, delivery to a point of injection or setting reach a temperature of, or below, five degrees Celsius.

13.3 The Company shall be deemed to have included for all measures necessary to comply with the aforementioned requirements.

## **Appendix 6/11: Grouting Works (Swallow Holes and Other Naturally Occurring Cavities and Disused Mineworkings**

### **14 Records**

14.1 The Company shall prepare a daily drilling journal and a separate daily grouting record for individual boreholes including test boreholes, providing the information in Section 14.2 below and this shall be provided to the Employer the day after the date the records relate to.

14.2 Daily drilling journals shall include:

- (a) job name, location, borehole reference number and date;
- (b) O.D. level at borehole location;
- (c) date;
- (d) contractors name;
- (e) staging level - embankment boreholes;
- (f) inclination of borehole;
- (g) plant in use, type of flush and crew details;
- (h) method of boring or drilling, flushing medium and type of drill bit;
- (i) type / diameter and depth of all casing used;
- (j) diameter and depth of hole at beginning and end of each working day/shift;
- (k) depth of each change of stratum;
- (l) rate of penetration;
- (m) details of any loss of flush;
- (n) occurrence of voided, soft or broken ground or packed waste;
- (o) delays, breakdowns and / or obstructions with accompanying reason;
- (p) details of underground services or drains located;
- (q) daily and cumulative length drilled;
- (r) details of any settlement or ground heave;
- (s) description, with identification of the stratum and whether it is broken or intact;
- (t) depth at which groundwater is encountered (if apparent);
- (u) depth / description of any contaminated material or groundwater encountered;
- (v) details of any emission of gas, water, foul air etc;
- (w) depth of completed hole; and
- (x) gas monitoring results.

14.3 Grouting records shall include:

- (a) location and borehole reference number;
- (b) contractors name;
- (c) date and times of grouting and grout crew details;

## **Appendix 6/11: Grouting Works (Swallow Holes and Other Naturally Occurring Cavities and Disused Mineworkings**

- (d) details of type of injection and grout line dimensions (e.g. tremmie injection through 5 millimetre diameter line);
- (e) grout materials employed;
- (f) grout pressures recorded, with the corresponding depths;
- (g) weight of grout mix accepted including the water / cement ratio and weights of the constituent components of the mix;
- (h) the accurate position, inclination and orientation of abandoned casing; and
- (i) delays and breakdowns with accompanying reason.

14.4 All daily drilling journals and grouting records shall be included in the as-constructed records.

14.5 The Company shall within three months of completion of the grouting works prepare typical drawings and sections to indicate where and how much grout was placed. He shall prepare a report on the grouting works outlining the conditions encountered and the final treatment carried out. A copy of this report shall be included in the as-constructed records.

## **15 Setting Out and Labelling**

15.1 For ease of reference, each borehole used in the grouting works shall be clearly marked on the Site with its reference number, depth and inclination. This labelling shall remain legible until the casing has been withdrawn and the bore is complete.

15.2 Setting out stations and reference lines used in the location of borehole positions shall be established on the O&M Works Site by means of permanent markers, clearly visible at all times.

15.3 A system shall be employed to record those boreholes which are completed and those which continue to accept grout. This system shall operate both at the borehole and in the Company's office.

## **16 Personnel for Grouting Works**

16.1 The Company, Designer and the Checker shall employ personnel who have relevant experience of grouting works.

16.2 The Company and the Designer shall have in charge of the grouting works a suitable number of engineer(s) experienced in the methods being employed and in underground mining conditions and the said engineer(s) shall be present at the Site at all times when drilling, grouting or testing is in progress.

## **17 Treatment of Abandoned Mineshafts / Adits**

17.1 The Company shall inform the Scottish Ministers immediately upon identification of any abandoned mineshaft or adit.

17.2 Abandoned mineshafts located beneath or within influencing distance of earthworks shall have a reinforced concrete cap constructed at rockhead level or as otherwise agreed with the Scottish Ministers. The cap shall be designed to accommodate all imposed loadings. Any open shafts shall be backfilled with granular material prior to capping. A description of the granular material shall be provided to the Scottish Ministers Representative.

### **Appendix 6/11: Grouting Works (Swallow Holes and Other Naturally Occurring Cavities and Disused Mineworkings)**

17.3 Abandoned mineshafts are potentially dangerous. Their infilling and the ground immediately surrounding the top of a shaft is liable to collapse without warning. They may contain noxious and inflammable gases. The Company shall take all necessary safety precautions to safeguard his machinery, employees and the public from all risks.

17.4 The Company shall erect safety barriers and warning signs where the public have access to the vicinity of the shaft works.

17.5 Any mineshaft which is either open or becomes open during the course of the O&M Works shall as a matter of urgency and as soon as is reasonably practicable be:

- (a) Covered over with a substantial cover of metal or timber or other suitable material so as to prevent any person or material from falling into the shaft.
- (b) Surrounded by a temporary (not less than 1.0 metre high) fence, the perimeter of which shall be not less than 5 metres from the edge of any ground settlement related to the shaft.
- (c) Provided with a warning notice board or boards erected not more than 1 metre inside the temporary surrounding fence.
- (d) The temporary fence, notice board and covering shall be maintained in good order at all times until permanent treatment works take place.

17.6 If any shaft is in close proximity to areas of normal public access, the area around the shaft shall be surrounded by a substantial fence not less than 1.8 metres high, the perimeter of which shall not be less than 5 metres from the edge of any ground settlement related to the shaft. Notices shall be placed around the fenced area warning of the presence of a mineshaft.

17.7 The Company shall not discharge nor permit to be discharged into any mineshaft water, effluent or other liquid matter and shall take all precaution necessary to prevent any such discharge from occurring from any other part of the Works.

17.8 Prior to infilling of any open shafts the Company shall ascertain the depth to solid bottom in the shaft, depth to standing water and if any water is contained therein. A copy of this information shall be provided to the Scottish Ministers Representative.

17.9 If material is discharged into the shaft directly from transport vehicles or by plant operating in close proximity to the shaft, the Company shall erect a suitable barrier around or adjacent to the shaft mouth delineating a "safe working zone" that is of sufficient size and strength and so positioned as to prevent vehicles and / or tipping equipment or other infilling plant from falling into the shaft or causing a collapse of the shaft mouth.

17.10 All filling materials placed within an open shaft from a depth of not less than 10 metres from the surrounding ground level up to the mouth of the shaft shall be self compacting.

17.11 Water raised in and / or displaced from a shaft by the placement of infilling shall be adequately drained away from the shaft mouth so as to maintain the shaft mouth and adjoining ground in a clean and dry condition.

17.12 As far as is practicable infilling shall be completed in one continuous operation. Where this is not possible, a temporary fence, cover and warning notice board, as specified above, shall be erected around and over the shaft mouth and maintained in good order at all times until works is resumed.

**Appendix 6/11: Grouting Works (Swallow Holes and Other Naturally Occurring Cavities and Disused Mineworkings)**

17.13 Upon completion of infilling a temporary fence and warning notice board shall be provided as specified above, and maintained in good order at all times until further treatment measures are carried out.

17.14 In the event of the infill settling in the shaft after completion of initial infilling and before further stabilisation measures are carried out, further filling shall be placed in the shaft. Any temporary fencing and / or warning notice boards removed or damaged either by the settlement of infilling or the placing of further infilling shall be reinstated or replaced upon completion.

17.15 The Company's attention is drawn in particular to the possibility of the collapse of fill material into the shaft or of the shaft itself whilst probe drilling operations are being carried out. During such operations a drilling platform must be used and where deemed necessary such a platform shall be anchored at a safe distance away from the shaft position.

17.16 The drilling platform or staging shall:

- be of overall dimensions not less than three times the diameter of the shaft;
- be of metal construction and be of sufficient strength to carry the full weight of the drilling rig in the event of a collapse of the shaft mouth or surrounding ground; and
- be suitably covered by planking or plating so as to provide a safe working platform for all personnel engaged in operating the drilling rig and ancillary equipment.

17.17 The ground for the reinforced concrete slab shall be prepared by excavating the shaft lining, shaft infill and surrounding soil down to firm rockhead, or, where this is impractical, to a suitable and stable horizon. The base of the excavation shall be prepared clean and level by hand prior to construction of the slab.

17.18 Excavation for shaft caps should normally be undertaken using a track mounted back acting excavator. Any works carried out by operatives within any excavations so formed – hand finishing of the excavation, fixing of shuttering or reinforcement, etc., should only be undertaken with appropriate safety considerations. A minimum requirement in this connection will be the provision and use of appropriate safety harnesses anchored outwith the zone of influence.

17.19 Excavations deeper than nominally 1.0 metre shall have the upper parts battered to a safe angle to ensure stability of the excavation.

17.20 The concreting of shaft caps shall be carried out in one continuous operation without interruption. Construction joints will not be permitted.

17.21 The method of infilling the excavation above the slab shall be as follows:

- batter the side excavation to a nominal gradient of 1 in 3 and replace excavated material or imported material under controlled conditions of spreading, in compacted layers of not exceeding 150 millimetres.

17.22 The Company shall maintain a record of all site works on a daily basis. The daily journal for the works included in this particular portion of the Specification shall include the following items using appropriate metric units where applicable:

**Requirement of Daily Journal – Capping of Mineshafts**

- Contractor's name;
- Contract name and location;

### **Appendix 6/11: Grouting Works (Swallow Holes and Other Naturally Occurring Cavities and Disused Mineworkings**

- (c) Shaft number and location;
- (d) Date of work;
- (e) Plant and equipment in use;
- (f) Crew employed;
- (g) Weather;
- (h) Hours of work;
- (i) Standing time or delays or breakdowns;
- (j) Dimensions of excavation;
- (k) Stability of excavation;
- (l) Brief description of strata;
- (m) Groundwater encountered and rate of flow;
- (n) Standing water level, at beginning and end of shift;
- (o) Gas monitoring results;
- (p) Details of services or drains encountered;
- (q) Dimensions of cap;
- (r) Construction of cap;
- (s) Quantity of steel, concrete placed etc.;
- (t) Details of backfilling;
- (u) Ground settlement or heave;
- (v) Materials delivered;
- (w) Equipment delivered;
- (x) Visitors to site and any instructions given;
- (y) Any other relevant remarks; and
- (z) Metric dimensions and units are to be used throughout.

17.23 The Company shall provide the Scottish Ministers with the recorded position of any treated shafts, including each corner of the shaft and cap reported as National Grid Co-ordinates and information on the condition, infilling and lining of any shaft encountered during the Works. The Contractor shall also provide plans showing the location of any shaft in relation to the Works, the ground level of the cap (mAOD) and the ground level of rockhead if encountered (mAOD).

### **18 Waste Management (Pulverised Fuel Ash)**

- 18.1 The Company is responsible for supplying appropriate grout constituent materials.
- 18.2 PFA, a typical constituent of grout, is now regarded by the Environment Agency to be a waste material and, accordingly, its use in these sorts of works comes under the various waste management regulations and legislation.
- 18.3 If the Company proposes to use PFA in the O&M Works then he will be responsible for discharging any liabilities and responsibilities in this respect and shall indemnify the Scottish Ministers against any associated claims.

**Appendix 6/11: Grouting Works (Swallow Holes and Other Naturally Occurring Cavities and Disused Mineworkings)**

- 18.4 Copies of relevant correspondence, licences, permits and similar that may be required to discharge these responsibilities are to be copied to the Scottish Ministers before use of PFA will be permitted.
- 18.5 As an alternative to using PFA, a suitable substitute material, or pre-bagged product may be used in the O&M Works, subject to approval by the Designer.

### **Appendix 7/1 Flexible Pavement Construction**

The Company's Appendix 7/1 submitted as part of his Tender for the New Works shall be deemed to be the applicable Specification Appendix 7/1 for the O&M Works unless otherwise agreed in writing by the Scottish Ministers.

## **Appendix 12/1: Traffic Signs: General**

### **1 General**

1.1 Sign schedules which detail the individual requirements for sign assemblies shall be prepared by the Company in accordance with the other provisions of this Agreement. These shall include:

- i) Sign face details, dimensions and location;
- ii) Mounting height;
- iii) Post details; and
- iv) Foundation details

### **2 Sign Faces**

2.1 Sign faces shall generally be constructed using Class 1 retroreflective material to BS 873-6.

2.2 The requirement for the use of microprismatic retroreflective material and non reflective material shall be determined by the Company in accordance with the other provisions of this Agreement.

2.3 Where determined by the Company in accordance with the other provisions of this Agreement, sign faces shall be protected with dew resistant sheeting as manufactured by 3M Scotchlite or equivalent.

### **3 Foundations**

3.1 Foundations for permanent traffic signs shall be in accordance with Clause 1203.

### **4 Sign Posts**

#### **4.1 Base Plates**

- i) Each post shall have a galvanised base plate.
- ii) This shall be fixed to the post in order to prevent any rotation of the post.
- iii) It shall be of square section with the side dimensions being at least twice the diameter of the post.

#### **4.2 Base Housings**

- i) The minimum diameter of base housings on tubular posts shall be 168 millimetres.
- ii) Rectangular posts requiring an electrical supply shall be fitted with an integral flush fitting door above ground level.
- iii) Detachable root boxes are not to be used.
- iv) The internal base housing shall contain
- v) A baseboard manufactured from marine plywood or hardwood with a minimum thickness of 15 millimetres and minimum dimensions of 100 millimetres x 380 millimetres.
- vi) It shall be mounted securely to the back of the compartment on which the electrical equipment shall be mounted.
- vii) The minimum distance from the face of the baseboard to the inside of the front of the housing shall be at least 100 millimetres.

## **Appendix 12/1: Traffic Signs: General**

- viii) A brass or stainless steel earthing screw or stud 8 millimetre diameter complete with two brass washers and a brass nut and locknut shall be provided on the housing in a suitable and easily accessible position.
- ix) A door aperture measuring not less than 110 x 400 millimetres.
- x) The lower edge of the door shall be positioned so that when the post shall be installed it shall not be less than 300 millimetres above ground level.
- xi) The door opening is to face away from oncoming traffic.

4.3 End Caps

- i) All posts shall be supplied complete with plastic end cap. End caps shall be shaped to shed water to the outside of the post and shall be the same colour as the post.

4.4 Protective Finish

- i) The protective finish to steel posts and brackets shall be as follows:-
  - a) Hot dip galvanised to BS EN ISO 1461 at the fabrication factory.
  - b) The post shall be covered in bitumen in accordance with BS EN 40-5 both outside and inside the post up to 150 millimetres above proposed ground level.

## **5 Permanent Bollards**

5.1 Internally illuminated bollards shall be base illuminated.

## **6 Sign Fix Clips**

6.1 Sign fix clips shall be made of stainless steel.

## **7 Ducting**

7.1 Ducting installed through the foundations of posts into which electrical equipment shall be installed shall be 50 millimetre diameter HDPE street lighting duct with a wall thickness of 5 millimetres, smooth bore.

## **8 Identification Numbers**

8.1 Identification numbers shall be as follows:

- i) Each sign shall be identified by a unique system of letters and numbers for maintenance and inspection purposes.
- ii) Letters and numbers shall be provided on both sides of sign located in the central reservation on all other signs the numbers shall face oncoming traffic.
- iii) Letters and numbers shall be black on a yellow background with characters 75 millimetres high at a minimum height of 1.5 metres and a maximum height of 2.5 metres above ground level.
- iv) Letters and numbers shall be screen printed onto reflective self adhesive vinyl mounted on 3 millimetres thick Foamex.
- v) The number shall be fixed to the sign by an appropriate adhesive.

## **Appendix 12/2: Traffic Signs - Marker Posts**

### **1      Hazard Marker Posts**

- 1.1      Hazard marker posts shall be capable of being overrun by vehicles so that they deflect and spring back to an upright position without shattering in all weather conditions and with little or no vehicular damage.
- 1.2      Hazard marker posts shall be fitted with anti-removal tabs below the ground
- 1.3      The reflectors shall be of Class 1 retro reflective sheet material to comply with Diagram 561 of Traffic Signs Regulations and General Directions 1994. The retro reflective sheeting shall be protected from damage from over-running vehicles by raised edges or other acceptable methods.
- 1.4      The hazard marker post shall have the main body self-coloured black with a highly visible weather resistant white band to the sizes quoted in Figure 4.84 in Chapter 4 of the Traffic Signs Manual.
- 1.5      The top of the hazard marker post shall be installed so that the top of the post is 750mm-1000mm above ground level.

## **Appendix 12/3: Traffic Signs - Road Markings and Studs**

### **1 Road Markings**

- 1.1 The colour location and material type for permanent or temporary road markings shall be specified as part of an order for road marking.
- 1.2 Ribbed road markings shall be formed of hot applied thermoplastic formulated to allow the formation of transverse ribs. The transverse ribs shall not be less than 8mm and not greater than 10mm in depth and shall be at 500mm spacing except on slip roads where the spacing shall be reduced to 250mm.
- 1.3 All road markings shall provide a skid resistance level of 55.
- 1.4 Temporary road markings shall be laid in accordance with BSI document BD 6518 1985.
- 1.5 Where existing road markings shall be required to be covered over the cover application shall comply with BS 7962: 2000.

### **2 Road Studs**

#### **2.1 General Requirements**

- 2.1.1 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 as described in Clause 970AR.
- 2.1.2 Replacement road studs shall not be installed in old sockets. New road studs shall be placed in new sockets with a clearance of at least 300mm from the original sockets. Existing or refurbished road stud sockets may be re-used but in all cases shall be fitted with new inserts.
- 2.1.3 Road studs inserts shall be replaced when failing to meet the requirements of Schedule 2 to the Agreement.
- 2.1.4 Road studs to be used for this Agreement shall be as follows

#### **2.2 Red White and Green Studs**

- 2.2.1 All red white and green studs shall comply with Clause 1213.3. Red and green reflectors shall be uni-directional. White reflectors shall be bi-directional.
- 2.2.2 Where installation of road studs shall be the subject of a traffic regulation order at new locations Method No 1 as detailed in Paving Instruction 1984 Edition (Red) shall be used. This shall be Installation Method No 1.

#### **2.3 Amber Studs**

- 2.3.1 Amber studs shall be of the corner-cube reflection type and shall be fixed in accordance with the manufacturer's written recommendations. (Installation Method No 4)

#### **2.4 Temporary Road Marking Studs shall be either**

- 2.4.1 Hot melt adhesive type.
- 2.4.2 Self adhesive type.
- 2.4.3 Fixing of studs shall be in accordance with manufacturer's written recommendations with respect to whether the studs shall be fixed to existing or new surfacing.

### **Appendix 12/3: Traffic Signs - Road Markings and Studs**

#### **2.5 Existing metal CHART node studs**

2.5.1 Existing metal CHART node studs shall be removed to ensure minimum damage to carriageway. Reinstatement shall be carried out using filled bitumen or bituminous instant repair material.

#### **2.6 Cored thermoplastic road markers to be installed as CHART node points**

2.6.1 Cored thermoplastic road markers to be installed as CHART node points shall use the following method (Method No 5)

(i) a 100mm diameter x 20mm deep pocket shall be formed using a central pilot bit surrounded by an annular bit

(ii) the base of the pocket after breaking out the surfacing material shall be left jagged

2.6.2 the pocket shall be filled with hot thermoplastic material to the uppermost edge of the pocket projecting slightly above the road surface and the material allowed to cool and set to form a stud.

2.6.3 The material shall consist of a plastic resin with white filler and reflective glass particles to BS 3262.

## Appendix 12/5 Traffic Signals

### **1 Permanent Traffic Signals**

- 1.1 All traffic signal equipment supplied must be of a type approved by the Scottish Ministers and comply with the latest edition of the relevant British Standards, TR Specifications, The Traffic Signs Regulations and General Directions, The Zebra, Pelican and Puffin Pedestrian Crossing Regulations and General Directions and IEE Wiring and "Electricity at Work" Regulations. The Design and method of maintenance must meet the above regulations.
- 1.2 Statutory Approvals must be in place for all traffic signs and signals (including associated control equipment) and copies of letter of acceptance must be submitted to the Scottish Ministers prior to construction.
- 1.3 All lanterns, including nearside red man/green man lanterns, must be compatible with the proposed controller for fault monitoring, including full red lamp monitoring for installations with controlled pedestrian facilities.
- 1.4 Where required in the Contract to supply and install traffic signal heads and other traffic signal equipment, the Company shall provide equipment complying with the following requirements:

#### **1.5 Signal Heads**

- 1.5.1 Traffic Signal heads shall conform to TR2206 Specification of Road Traffic Signals, BS EN 12368 Traffic Control Equipment, Signal Heads, BS EN 50556 Road Traffic Signal Systems.

##### **1.5.2 LED Signal Heads**

Aspect Types:- 200 mm diameter red, yellow and green roundels. 200 mm green left, right and straight on arrows.

Signal heads shall comply with the following BS EN 12368 Classes:

Optical Characteristics:- Luminous Intensity Class 3/2

Luminous Distribution Table 4

Phantom Class 5

Colour (inc. combined Colour) Compliant

Luminance Uniformity =1:10

##### **1.5.3 LED Pedestrian Heads**

Aspect Types:- 200 mm diameter red and green pedestrian symbols.

Signal heads shall comply with the following BS EN 12368 Classes:

Optical Characteristics:- Luminous Intensity Class 3/2

Luminous Distribution Table 4

Phantom Class 5

Colour (inc. combined Colour) Compliant

Luminance Uniformity =1:10

##### **1.5.4 Push Button**

Operating Voltage:- All push buttons for pedestrian lights shall operate on a low voltage, 48 V, 40 W supply.

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Push Buttons shall incorporate a “tactile cone” indicator at the base of the unit. (A tactile cone indicator serves to assist visually impaired pedestrians in identifying when it is safe to use a pedestrian crossing, by rotating when the pedestrian phase is in operation)

### **1.6 Nearside Units for Puffin and Toucan & Demand Units**

- 1.6.1 Nearside units will comply with the latest version of TR2511 Performance specification for Nearside Signal and Demand Units.
- 1.6.2 All nearside and demand units must be installed in accordance with the manufacturers instructions.
- 1.6.3 Nearside and demand units will be aligned in accordance with the approved site specific traffic signal drawings.
- 1.6.4 Demand units shall incorporate a “tactile cone” indicator at the base of the unit. (A tactile cone indicator serves to assist visually impaired pedestrians in identifying when it is safe to use a pedestrian crossing, by rotating when the pedestrian phase is in operation).

### **1.7 Tactile Equipment**

- 1.7.1 Tactile cones and associated equipment will comply with the latest version of TR2508 Performance Specification for Tactile Equipment for use at Pedestrian Crossings.

### **1.8 Audible Equipment**

- 1.8.1 Where it is proposed to install Audible units they shall comply with the latest version of TR2509 Performance Specification for Audible Equipment for use at Pedestrian Crossings.

### **1.9 Traffic Signal Controller Cabinets**

- 1.9.1 Foundations for traffic signal controller cabinets shall be located in positions such that when the access doors of the installed cabinet are in the open position they cause minimal obstruction of the footway. It shall be possible to open the access doors fully and consideration must be given to the safety of operatives and Non Motorised Units during maintenance operations. If it is necessary to site the cabinet adjacent to the kerb then it shall not be possible for the access doors to be opened over the carriageway and the cabinet shall be sited at least 0.5m from the kerb edge.
- 1.9.2 The cabinet shall be positioned so that it does not obstruct the view of pedestrians waiting at traffic signal controlled crossings or motorists on their approach to the crossing. Where ever possible, the cabinet shall be sited at the downstream side of signal controlled pedestrian crossings. Cabinets shall be positioned such that a traffic engineer can view the operation of the signals whilst standing at the front of the cabinet.
- 1.9.3 Case root base cabinets shall have the root located on one or more paving slabs which are themselves securely bedded and properly levelled at the appropriate depth. A bed of ST4 concrete shall be laid over the base of the root and paving slab(s). The top of the bed, when finished, shall be 1/3 of the way up the legs of the root and the site of the bed smoothed. That part of the excavation within the case root shall be back filled with compacted dry fine sand or pea gravel and topped with dry fine sand after the ducting has been installed and the cables have been terminated. The remainder of the excavation around the cabinet is to be backfilled with cement bound material to base course level and the surrounding area reinstated in accordance with the requirements of Clause 706 of the Specification.
- 1.9.4 A layer of epoxy resin 6 mm thick is to be laid on top of the sand to prevent ingress of gas and moisture into the cabinet through the root and to provide a seal with the case.

## **Appendix 12/5 Traffic Signals**

1.9.5 Pole mounted cabinets are to be mounted on poles correctly aligned in vertical positions. The excavation shall be adequate to allow the pole to be planted to the depth recommended by the manufacturer, typically 650 mm. The bottom of the hole around the pole is to be filled with at least 300mm of ST4 concrete to the bottom of the cable entry slot. When cable laying and testing is complete, the remainder of the backfilling shall be completed. The cable entry to the cabinet shall be effectively sealed against ingress of moisture into the unit.

1.9.6 Once the electronic modules are installed in the cabinet, the door seals and locks shall be checked and the base sealed as soon as possible to stop any moisture ingress to the modules.

1.9.7 When a cabinet is mounted on a verge of unmade ground a concrete pad, which may consist of paving slabs, shall be laid around the controller to a minimum width of not less than one metre on those sides to which access to the equipment is required.

- (i) All controllers and auxiliary cabinets shall be supplied with a metal case with a hinged main access door, with locking facilities.
- (ii) Cabinets shall be IP55 rating.

### **1.10 Controller Equipment**

1.10.1 The Company shall ensure that all controllers are fully UTMC compliant allowing fault monitoring equipment such as an Outstation Monitoring Unit (O.M.U), Outstation Transmission Unit (O.T.U) or MOVA Unit to be supplied by any manufacturer.

1.10.2 The Company shall install an Outstation Monitoring Unit (OMU) or Outstation Transmission Unit (O.T.U) of a type approved by the Overseeing Organisation.

1.10.3 The Company will install a MOVA unit in the controller at locations agreed with the Overseeing Organisation.

1.10.4 ELV and LV controllers will conform to the latest version of TR2500 Specification for Traffic Signal Controller and BS EN 12675 Traffic Signal Controller Functional Safety Requirements.

### **1.11 Traffic Signal Poles**

1.11.1 The Company shall comply with DMRB Volume 8 Section 2 Part 2 TA 89/08 Use of Passively Safe Signposts, Lighting Columns and Traffic Signal Posts to BS EN 12767.

1.11.2 The Company shall be responsible for specifying which performance class is required.

1.11.3 All poles shall be installed in accordance with the manufacturer's recommendations, or as otherwise instructed by the Overseeing Organisation.

1.11.4 Poles shall NOT be supplied with pre drilled holes for nearside and demand units.

1.11.5 All poles shall be numbered in accordance with the numbering system used on the site specific drawings with appropriate labels, labels to be approved by the Overseeing Organisation.

1.11.6 All poles shall be numbered on the footway side at right angles to the traffic lantern brackets and immediately below the top cap; where all lantern fixings are allocated the numbering shall be placed below the bottom fixing bracket.

1.11.7 The areas of the pole on which the labels are to be impressed shall be cleaned/degreased before application.

1.11.8 The Company's proposed pole retention system shall be subject to the approval of the Overseeing Organisation. The retention system shall be of cast iron design and shall incorporate a pole locking system contained within an integral locking chamber. The

## **Appendix 12/5 Traffic Signals**

design shall allow the pole to be aligned in any orientation with the cable installed, prior to the locking device being activated. The design shall not allow signal poles to rotate once fixed in position. Sockets shall be installed flush with the final surface. Flush sealing plugs shall be available for use when the signal pole is not present. The proposed system shall be adaptable to allow for a minimum insertion depth of 300 mm. The design of the pole retention system shall incorporate appropriate features to accommodate easy installation and replacement of signal poles and cables. The sockets and poles shall be installed in accordance with the manufacturer's instructions.

### **1.12 Electrical Disconnection Equipment for Passively Safe Traffic Signal Poles**

- 1.12.1 The system must comply with BS EN12767 (Disconnection of Roadside Structures within 0.4ms of Impact).
- 1.12.2 The system shall be housed within a suitably sized cabinet to house all isolation equipment, such as circuit breakers and monitoring units. This cabinet will be located alongside the signal controller cabinet.
- 1.12.3 The system shall include a self checking system, with an output to indicate system malfunction.
- 1.12.4 In normal operation the system must give a visual indication that it is operational, heartbeat or similar.
- 1.12.5 If the system is activated it must provide a positive visual indication of this and also indicate the location.
- 1.12.6 The isolation will be so designed that on impact all LV and ELV live and neutral circuit conductors are disconnected from the signal pole, together with any sensor voltages.
- 1.12.7 It must not be possible to re-energise a circuit that has been tripped.
- 1.12.8 The system will provide outputs to indicate a) Activation by impact, b) Activation by signal equipment fault, c) Isolation system malfunction and d) Isolation system power failure.
- 1.12.9 The isolation system must also be capable of isolating a whole signal pole due to a signal equipment fault; this facility is to be switchable by pole.
- 1.12.10 The sensors are to be mounted by the most appropriate means, ideally behind the base door if available. The location shall be agreed with the Scottish Ministers before fitting.
- 1.12.11 The cabling to the sensors is to be run in separate ducts to LV cables, using orange PVC sheathed SWA 2 core 2.5mm cable, traffic signal loop feeder cable.
- 1.12.12 The sensor cable is to be terminated using a CET cable gland or equivalent, with the armouring being taken to Earth.
- 1.12.13 Sensors are to be IP64 rated for mounting in the structure. The sensor must provide a means of testing the system operation during commissioning and routine maintenance.

### **1.13 Duct Systems**

- 1.13.1 Duct links between chambers and individual signal poles or equipment cabinets shall provide the appropriate number of ducts to accommodate the number of cables required to service the item. The layout shall be such that any tactile paving area is kept free of inspection chambers.
- 1.13.2 All duct work provided by the Company between Traffic Signal controllers and Traffic Signal poles or other equipment shall form a continuous route.
- 1.13.3 Traffic signal, communication, power and loop detector ducts and duct accessories shall comply with the latest version of BS EN 61386 - 24 and be orange in colour. All ducts, unless otherwise specified, shall be thick walled (5mm) high density polyethylene. The

## Appendix 12/5 Traffic Signals

ducts shall be smooth walled (inner and outer) with a nominal internal diameter of 100mm unless otherwise stated and coloured orange with the words "Traffic Signals" printed in white along their length at intervals of not more than one metre. When laid, the wording shall be displayed uppermost. All lengths shall be jointed or sleeved. Spurs to signal poles shall generally be 100mm in diameter.

- 1.13.4 Telecommunication Service Provider's ducts and duct accessories shall comply with BS EN 61386 - 24 and be black in colour. Ducts shall comprise a high density polythene twin walled (inner wall smooth, outer wall corrugated) system with an internal diameter of 100mm and unit lengths of 6.0 metres. Every length shall be supplied with a push-fit coupler.
- 1.13.5 The Mechanical Properties of the ducts shall be that associated with "Normal Duty". For Resistance to Bending, both rigid and pliable ducts are acceptable provided that the ducting requirements of the particular installation are met and that the correct accessories are used. The category for Protection against Ingress shall be a minimum of IP 30 and the Resistance to Chemical Attack classification shall be "With Protection".
- 1.13.6 Yellow PVC marker tape, with the wording "CAUTION ELECTRICITY DUCT BELOW" printed along its full length so as to occupy not less than 75% of its available length and occurring at a minimum of 1.0 metre intervals, shall be laid 250mm above all duct-lines. The tape shall be a minimum of 150mm wide and 0.1mm thick.
- 1.13.7 Where normal cover to communication ducts for traffic signals cannot be obtained, e.g. on structures or due to underground obstructions such as concrete road foundation slabs, 32mm internal diameter galvanised steel pipes may be laid at shallow depth, with couplings and joints complying with the latest Version of BS 1387 Class H, all as directed by the Overseeing Organisation.
- 1.13.8 All service ducts shall be fitted with a draw rope in accordance with Clause 501.8. The rope shall extend at least 3.0 metres from each end of the duct and this length of rope shall be tidily looped and either tied to the draw rope of a parallel duct or secured to a marker block when no adjacent duct is available. In either case, unless ducts terminate at cabinets, mounting posts, columns or main duct chambers, their ends shall be marked with marker blocks or marker posts as detailed in HCD I1. Immediately after laying, ducts shall be sealed with removable split or solid plugs which can accommodate the specified draw rope.
- 1.13.9 A secondary draw cord shall be installed following any cable installation such that a serviceable cord is available at all times.

## **1.14 Access Chambers**

- 1.14.1 Access chambers, installed in footpaths and verges, shall comprise proprietary high density polyethylene segmental chambers with pre-formed "knockout" duct accesses. Chambers shall be twin walled, be capable of withstanding a 12.5 tonne wheel load and shall have a 150mm thick Class ST4 concrete surround. Chambers shall typically have a clear opening of 600 mm x 600 mm.
- 1.14.2 Chamber covers and frames shall comply with the requirements of BS EN 124:1994 and be Class B125 in footways and Class D400 in carriageways, hardshoulders and hard standings. Chamber covers for footways shall be manufactured from a high strength polyester composite material and shall be located in a 2.5mm thick galvanized steel frame which will allow height and tilt adjustment.
- 1.14.3 Chamber covers shall provide skid resistance greater than the minimum advisory limits.
- 1.14.4 Frames for chamber covers in footways shall be set in designation (i) cement mortar or a proprietary quick setting mortar of equivalent strength. The use of any quick setting

## **Appendix 12/5 Traffic Signals**

mortar shall be subject to the approval of the Overseeing Organisation prior to use. Frames for chamber covers in the carriageway shall be set in epoxy mortar. All new, adjusted and replaced chamber frames and covers shall be set flush with the surrounding surface in hard landscaped, footway and carriageway areas. In soft verge chamber cover level shall be 25 mm above finished level. The finished thickness of the mortar bed to the frame shall be between 10 and 25 mm. Any additional adjustments beyond this shall be achieved by modifying the chamber structure or by using a frame of a suitable depth in accordance with Clause 507.18 of the Specification.

- 1.14.5 Horizontal and vertical alignment of the ducts shall be such that cables may be pulled directly through the chambers.
- 1.14.6 Ends of ducts shall protrude 25 mm through the inside of the chamber wall.
- 1.14.7 Chamber covers shall be clearly identified by the legend of the Overseeing Organisation such as "GCC-TS" or "SLC-TS" as appropriate. The lettering shall be 25 mm high and shall be embossed on each cover.

### **1.15 Trench Reinstatements**

- 1.15.1 Reinstatements shall be made in accordance with the requirements of this document, Clause 706 of the Specification and those prescribed in the Highway Authorities and Utilities Committee (HAUC) "Specification for the Reinstatement of Openings in Highways" (ISBN 0 11 551143 1). Should there be any conflict then the requirements of this document shall take precedence.
- 1.15.2 The reinstatement method shall be an "All Permanent Reinstatement". The sub-base, base course and wearing course, or equivalent, shall be reinstated to a permanent standard at the first visit. In all cases the final surface of the reinstatement shall comply with the requirements given in Section S6.4.

### **1.16 Cables and Routes**

- 1.16.1 All traffic signal and paired feeder cables shall conform to BS6346/87.
- 1.16.2 All traffic signal cables for LV and ELV will be orange PVC/SWA multi-core 1.5mm CSA cable.
- 1.16.3 All traffic signal paired feeder cable will be orange PVC/SWA 1.5mm CSA one or two pair cable.
- 1.16.4 Multi-core and paired feeder Cables should be armoured and the outer sheath colour Orange PVC in accordance with NJUG Volume 1.
- 1.16.5 Cable routes and core allocations for traffic signals and associated equipment to be carried out by the Contractor.
- 1.16.6 Cables shall not be jointed throughout their length from origin to destination.
- 1.16.7 Approximately one metre of spare length for each cable run shall be coiled at the main duct chamber adjacent to the controller, in addition in intermediate chambers addition spare shall be provided where capacity permits.
- 1.16.8 Cable cores/pairs shall be neatly routed within the cabinet and its connection frame and tie-wrapped in looms, with due regard to accessibility of maintainable items.
- 1.16.9 All Spare cores including ELV should not be connected to Earth until Earth Impedance Tests have been completed.
- 1.16.10 All cables shall be run in ducts.
- 1.16.11 Traffic Signal Cable must be separately ducted from Utility, Communication and other Services Cable.

## **Appendix 12/5 Traffic Signals**

- 1.16.12 Mains cable between the controller and ETP will be black in colour in accordance with NJUG Volume 1 and comprise 3 cores 6mm sq csa SWA cable
- 1.16.13 The mains cable must be installed through ducting running directly from the ETP to the controller and not via the controller access chamber.
- 1.16.14 Cabling between poles will not be acceptable unless prior agreement has been received from the Overseeing Organisation.

### **1.17 Electrical Termination Pillar (ETP)**

- 1.17.1 The ETP shall house a double poled lockable fused isolator, fused appropriately which must comply with the latest edition of the IEE wiring regulations.
- 1.17.2 The base of the ETP shall be sealed with a layer of epoxy resin 6 mm thick which is to be laid on top of a sand base to prevent ingress of gas and moisture into the ETP.
- 1.17.3 The Contractor shall obtain approval of the proposed type of ETP from the Overseeing Organisation.

### **1.18 Detection**

- 1.18.1 All slot cutting shall be designed and equipment installed to meet the latest version of MCH1540 - Specification for the Installation of Detector Loops on Motorways and All Purpose Trunk Roads, MCE0108 – Siting of Inductive Loops for Vehicle Detecting Equipment at Permanent Road Traffic Signals and TR 2512 – Performance Specification for Below Ground Detection Equipment.
- 1.18.2 MOVA Loops shall be designed and installed to meet the latest Version of MCH1542 – Installation of MOVA.
- 1.18.3 All loop tails shall be labeled in the nearest loop box to identify the loop identity which must relate the site specific approved drawings. The labels must be marked with a permanent marker.
- 1.18.4 All loop feeder cable joints to be re-usable to IP68 Cat 1.
- 1.18.5 All above ground detector units must be installed, configured and aligned in accordance with the manufacturers instructions.
- 1.18.6 Above ground traffic detection will comply with the latest version of TR2505 – Performance Specification for Above Ground Vehicle Detector Systems for use at Permanent Traffic Signal Installations.
- 1.18.7 Kerbside Detectors will comply with the latest version of TR2507 – Performance Specification for Kerbside Detection Systems for Use with Nearside Signals and Demand Units.
- 1.18.8 On-Crossing Detectors will comply with the latest version of TR2506 - Performance Specification for Above Ground On-Crossing Pedestrian Detection System.

### **1.19 Factory Acceptance Testing (FAT)**

- 1.19.1 The Company will be responsible for the factory acceptance testing of the controller(s) with a representative of the Traffic Signal Contractor, the Scottish Ministers and the Overseeing Organisation.
- 1.19.2 The Company will give two weeks notice prior to the FAT to all attendees.
- 1.19.3 The Company shall provide a testing schedule for approval of the Scottish Ministers and Overseeing Organisation which shall cover all of the required testing to be undertaken during the FAT. This schedule will be generic and shall cover all modes of operation with a site specific schedule being developed if required.

## **Appendix 12/5 Traffic Signals**

### **1.20 Electrical testing**

- 1.20.1 The Scottish Ministers / Overseeing Organisation shall be given a minimum of seven days notice before commencement of all electrical tests preceding final site commissioning. These tests shall be witnessed by the Scottish Ministers / Overseeing Organisation at their discretion.
- 1.20.2 Electrical Testing is to be carried out by a Traffic Signal Contractor Engineer.
- 1.20.3 Earth Test Certificate to be provided before the Installation is Commissioned Electrical Testing to conform to BS7671 Requirements for electrical installations. IEE Wiring Regulations. Seventeenth edition.
- 1.20.4 The test certificate shall be handed to the Scottish Ministers / Overseeing Organisation prior to the commencement of the final site acceptance.
- 1.20.5 Electrical Completion Certificate and Test Results are to be provided before the Installation is Commissioned – BS7671 Regulation 741-01-01. This record shall be handed to the Employer / Overseeing Organisation at the commencement of the final site acceptance.
- 1.20.6 The Company shall only arrange the final commissioning/acceptance of the site when the installation is complete.
- 1.20.7 The Company shall be responsible for all aspects of achieving a working installation operating to the satisfaction of the Scottish Ministers / Overseeing Organisation.

### **1.21 Completion of the Installation**

- 1.21.1 The Company should supply 2 copies all the Documentation including a copy for site prior to the Switch On to confirm that the Traffic Signal Site meets all statutory requirements.
  - Controller Test Schedule
  - Controller Specification
  - MOVA dataset
  - MOVA Specification
  - Statutory Approvals and copies of letter of acceptance
  - Loop Test Schedule
  - Earth Test Certificate
  - Electrical Completion Certificate and Test Results (To be provided before the Installation is Commissioned – BS7671 Regulation 741-01-01)
  - As Installed Site Layout Diagram
  - As built Cable layout / Schedules inclusive of Electrical Isolation cabinets.
- 1.21.2 Prior to final acceptance of the installation;
  - (a) Where redundant traffic signal equipment still remains it must be removed and any old ducts abandoned. Any redundant duct runs must be blocked off at the duct end with expanding foam or similar to the approval of the Overseeing Organisation.
  - (b) All redundant equipments shall be recycled or disposed of as per the Environmental Management Plan.

### **1.22 Final Commissioning and Acceptance**

## **Appendix 12/5 Traffic Signals**

- 1.22.1 The Company will be responsible for organising the site acceptance testing of Controller(s) and the associated installation with a representative of the Traffic Signal Contractor, the Scottish Ministers and the Overseeing Organisation.
- 1.22.2 The Company shall give the Scottish Ministers / Overseeing Organisation two weeks notice of switch on of any new traffic signal installation so that the Scottish Ministers / Overseeing Organisation can complete its signal inspections and inform the Police and local representatives.
- 1.22.3 The Company shall liaise with the Scottish Ministers / Overseeing Organisation with respect to agreeing the methodology for bringing the site into operation.
- 1.22.4 Completion Certificate will be furnished by the Company duly made out and briefly describing the completed Works. There will be sufficient space for the Scottish Ministers / Overseeing Organisation comments and endorsements. A copy will be available to the Scottish Ministers / Overseeing Organisation for their records immediately following completion.
- 1.22.5 Any minor defects and/or omission, which do not prevent the Installation from functioning in a safe and efficient manner, shall be recorded on the Completion Certificate.
- 1.22.6 The Company will ensure a Traffic Signal Engineer will be in attendance during switch on and final commissioning. The Traffic Signal Engineer will assist the Traffic Signal Installation team if any problems arise during switch-on.
- 1.22.7 The Company will provide a specialist MOVA Engineer to validate and commission the MOVA operation to the satisfaction of the Scottish Ministers / Overseeing Organisation.
- 1.22.8 The Company shall give the Scottish Ministers and Overseeing Organisation two weeks notice of switch on of any new traffic signal installation so that the Scottish Ministers / Overseeing Organisation can complete its signal inspections and inform the relevant organisations such as Police and local representatives.

## **2 Temporary Traffic Signals**

- 2.1 The Company shall note the requirements of Appendix 1/17.
- 2.2 The use of Portable traffic signals used to control traffic shall comply with Department of Transport Specifications TR2502B Performance Specification for Portable Traffic Signal Control Equipment for Use at Road Works and TR 2405A Performance Specification for Vehicle Detection Equipment for Vehicle Actuated Portable Traffic Signals. In addition TR 2503B Performance Specification for Pedestrian Facilities at Temporary Stand Alone Traffic Signals shall comply where there is a requirement for pedestrians, the latest version of The Traffic Signs Regulations and General Directions, TAL 2/11 Portable Traffic Signals for the Control of Vehicular Traffic and TAL3/11 Signal Controlled Pedestrian Facilities at Portable Traffic Signals and Chapter 8 of the Traffic Signs Manual. Haul route crossings shall be in accordance with Chapter 8 of the Traffic Signs Manual.
- 2.3 The Company shall obtain the prior written consent of the Scottish Ministers for multiphase temporary traffic signals.
- 2.4 The Company shall provide to the Scottish Ministers a drawing to a scale of 1:500 with the position of the signals indicated by a dot and an arrow from the dot indicating the direction of the lights and a key to symbols used shall be shown. The position of signals shall be accurate to within 2 metres. The proposed stage arrangement, signal timings inclusive of all red periods together with location of the generator shall also be provided.

## **Appendix 12/5 Traffic Signals**

2.5 The Company shall consult and comply with the requirements of the emergency services (Fire, Ambulance and Police). Passenger transport operators shall also be informed if the Operations affect any of their routes.

### **3 Controlled and Uncontrolled Crossings**

3.1 Replacement of surfaces of controlled and uncontrolled crossings shall match that already existing unless otherwise the subject of a traffic regulation order.

### **4 General Safety**

4.1 Live cables may be present in the ducting system and at the pole tops and due care must therefore be taken at all times.

4.2 On new installations all primary, secondary signal heads shall be covered with an orange cover, approved by the Overseeing Organisation until the site is brought into service, to prevent any misunderstanding to the motorist.

4.3 On all new installations all Pedestrians push button panels or nearside demand units are to be covered with "Pedestrian Crossing Not In Use" sign approved by the Overseeing Organisation, until the site is brought into service.

4.4 Particular care to protect the work force and the general public shall be taken where duct chamber lids are removed and/or cables are being installed.

4.5 The attention of the Company is brought to the potential danger of gas build-up within duct and chamber systems.

4.6 Appropriate equipment and tools, including those recommended by the equipment manufacturer(s), shall be used.

4.7 Special care shall be taken to ensure the electrical integrity of any temporary works.

### **5 Controlled Crossings**

5.1 As per section 1 above.

### **6 Traffic Signal Assessments and Design**

#### **6.1 Traffic Signal Modelling**

6.1.1 The Company shall develop Linsig models utilising the latest version of software for the operation and performance all of the proposed traffic signal junctions and signalised roundabouts to assess the Practical Reserve Capacity and queues / delay for individual links. The models shall be based on the specimen design layout drawings.

6.1.2 Linsig models shall include AM, PM and an interpeak periods, the results for each periods are to be issued to the Scottish Ministers for approval prior to undertaking Paramics modelling in relation to Appendix F - Procedure for Demonstrating Compliance with the Junction Requirements and Junction Performance Indicators requirements & Appendix G – Contract Junction Compliance Traffic Models and Associated Instructions and Analysis Spreadsheet.

#### **6.2 Traffic Signal Design**

6.2.1 All Traffic Signal Designs shall be in compliance with the Scottish Government guidelines, Scotland Transport Cycling by Design 2010, The Design Manual for Roads and Bridges, Transport Scotland Disability Discrimination Act Good Practice Guide for Roads 2009, various National Standards and Advice. It is to be noted that some of standards and

## Appendix 12/5 Traffic Signals

advise listed below have within them reference to superseded documents. It is the designer's responsibility to verify and ensure that they are designing to the most current standards.

6.2.2 In addition works shall be carried out in accordance with TA 84/06 Volume 8, Section 1, Part 2 Code of Practice for Traffic Control and Information Systems for All-Purpose Roads and following relevant publications and legislation shall include, but not be limited to the following:

- Construction (Design and Management) Regulations – 2007
- The Traffic Signs (Amendment) (No 2) Regulations and General Directions 2011
- The Zebra, Pelican and Puffin Pedestrian Crossing Regulations and General Directions 1997.
- Design Manual for Roads and Bridges (DMRB)
- Department for Transport (DfT) Specifications (TD),
- Traffic Advisory Leaflets (TAL)
- Local Transport Notes (LTN)
- Puffin Good Practice Guide

6.2.3 The Company shall liaise with the Overseeing Organisations to establish whether or not local design criteria are relevant to the design process. The Company shall if applicable document local requirements and include them within the design for approval.

6.2.4 All designs must have a stage 1, 2, 3 and 4 Road Safety Audit (stages 1 and 2 can be combined for smaller installations). No works may commence until all items raised by the stage 2 safety audit have been addressed or a viable exception approved.

6.2.5 The Company shall provide the Scottish Ministers and Overseeing Organisation with traffic signal detailed design drawings, standard details, controller TR2500 forms and MOVA Datasets for all proposed installations.

6.2.6 Drawings shall be provided as follows inclusive of Key and Notes:

- (i) General Arrangement – to include but not limited to
  - Scale 1:500
  - Stage Arrangement
  - Road Markings
  - Cable Diagram to include Controller, Auxiliary cabinets, link cables for MOVA linking and RS232 communication cables as applicable and detection.
  - MOVA Loop Dimensions Schedule
  - Passive Pole Rating Schedule
  - Pole Numbers
  - Loop References
  - Chamber References
  - Cabinet References
  - Tactile paving
  - Advanced Cycle Stop Lines, if applicable.

## Appendix 12/5 Traffic Signals

- Detection
- Traffic Signal Controller and Auxiliary Cabinets
- Traffic Signal Poles
- Retention Sockets

(ii) Traffic Signal Layout – to include but not limited to

- Scale 1:200
- Stage Arrangement
- Road Markings
- Cable Diagram to include Controller, Auxiliary cabinets, link cables for MOVA linking and RS232 communication cables as applicable and detection
- Traffic Signal Equipment
- Passive Pole Rating Schedule.

(iii) Traffic Signal Ducting, Chambers and Detection Loops - to include but not limited to

- Scale 1:200
- All Chambers including Reference
- Carriageway Loop Boxes including Reference
- Ducting
- Retention Sockets
- Road Markings
- Loops including Reference
- Controller

(iv) Road Markings

- Scale 1:500
- Road Markings
- Permanent Traffic Signs required as part of the Traffic Signal Installation
- Temporary Traffic Signs required as part of the Traffic Signal Installation

6.2.7 In addition to the above, Company must provide details on special road surfacing, such as high friction road surfacing, proposed on approaches to stoplines and within controlled crossing areas.

6.2.8 All of the above drawings and documents shall be issued to the Scottish Ministers and Overseeing Organisation for approval. No works are to commence until FULL traffic signal approval has been obtained.

6.2.9 A safety case, including risk assessment/hazard checklists, must be submitted for each design/site. The safety case must include any departure from standards & specifications or use of non-prescribed traffic signs/ road markings and appropriate approvals must be in place for the same. It should also include any CDM, Environmental and DDA related departures and risks. This should be in addition to the independent Road Safety Audit, DDA audits and Independent Audit Review.

**Appendix 13/70 Maintenance of High Mast and Other Lighting Incorporating Hoists, Winches and Ropes**

**1 MAINTENANCE SCHEDULE A**

Six Monthly Intervals

- 1.1 A.1 Winch
  - 1.1.1 Remove any dirt or foreign matter that may have accumulated on top of winch or on wire ropes and thoroughly clean.
  - 1.1.2 Check oil bath level (check each time winch shall be used).
    - (i) Examine condition of oil and change it if excessively thick or dirty. (Compare it with fresh oil). Before draining run lantern down and up to heat oil.
    - (ii) The oil bath level in single double drum winches shall be correct when it shall be at the oil level hole.
    - (iii) The screw plug shall be removed to determine this and then replaced.
    - (iv) Oil shall be as recommended in writing by the manufacturer.
  - 1.1.3 All other bearing surfaces of winches have (self-lubricating) Oilite bushes or thrust washers.
    - (i) Additional lubrication may be added through the winch drum if required when the lantern shall be in the lowered position.
  - 1.1.4 Check security of bolts at end of first year of operation.
  - 1.1.5 Operate power drive through full length of travel of the lantern carriage and ensure that no undue wear shall be evident in the winch mechanism.
    - (i) The gear cover shall be removed to view the gear teeth.
  - 1.1.6 Cover entire winch with the cover provided removing it only when about to operate winch.
- 1.2 A.2 Wire Rope
  - 1.2.1 The very limited running use of the ropes coupled with high corrosion resistance shall ensure a long rope life.
    - (i) Check rope lay on winch and section of rope visible at mast door opening for frays kinks or corrosion.
    - (ii) Check anchorage point of winch rope at compensating pulley (if fitted).
    - (iii) Check winch rope throughout length for frays kinks or corrosion.
    - (iv) Check rope anchorage points on winch drum and lantern carriage.
    - (v) From the base of the mast observe ropes from lantern carriage in lowered position to mast head for any obvious defects.
- 1.3 A.3 Compensating Pulley (when fitted)
  - 1.3.1 Check for damage wear or corrosion.
  - 1.3.2 Lubricate if necessary.
- N.B During the operation of hoisting lanterns the ropes within the mast have a tendency to twist a little resulting in the compensator turning about 1/2 to 2 turns this untwists on the reverse journey and no harm results.
- 1.4 A.4 Luminaire Carriage

## Appendix 13/70 Maintenance of High Mast and Other Lighting Incorporating Hoists, Winches and Ropes

- 1.4.1 Check guide rollers (where fitted) lubricate and adjust if necessary.
- 1.4.2 Check interconnecting cables and junction boxes for damage.
- 1.4.3 Check electricity supply cable anchorage and check physical damage to cable.
- 1.4.4 Check and tighten if necessary all nuts and bolts.
- 1.4.5 Clean outer surface of photo-electric cell (where fitted).
- 1.5 A.5 Luminaires
  - 1.5.1 Clean all luminaire bowls and reflectors.
  - 1.5.2 Remove lamps from holders and check contact for arcing.
  - 1.5.3 Check all electrical connections and tighten where necessary.

NB Avoid use of abrasive materials in cleaning.
- 1.6 A.6 General
  - 1.6.1 With luminaires returned to mast head check that all lamps light.
  - 1.6.2 Check that details of rope and cable rigging (now visible in mast base) and lantern carriage docking shall be all correct.
  - 1.6.3 Check foundation bolts tighten nuts where necessary.

## **2 MAINTENANCE SCHEDULE B**

### Two Yearly Intervals

Maintain as Schedule A with the following additions.

- 2.1 B.1
  - 2.1.1 Test load the wire ropes with the maintenance cradle before maintenance cradle to carry personnel.
  - 2.1.2 Lower lantern carriage uncouple and attach maintenance cradle. Load maintenance cradle with a test load equal to safe working load shown on the safe working load plate on the side of the cradle. Using power drive hoist to head of mast and return to ground level. (This operation may also be used to install the independent safety rope if appropriate.) Remove test load.
- 2.2 B.2
  - 2.2.1 Ascend in cradle check for damaged galvanising paint deterioration and rust over length of mast make good as necessary.
  - 2.2.2 Check head pulleys split pins and the like for wear and corrosion and tighten all nuts and bolts. Pulleys have Oilite bushes which shall not be expected to require attention.
- 2.3 B.3
  - 2.3.1 Wire ropes shall be withdrawn for inspection.

## Appendix 14/71 Labour Requirements

### **1 General**

1.1 The Company shall appoint a supervisor specifically for electrical Operations. The Company supervisor or his nominated deputy shall be on the O&M Works Site at all times when electrical Operations are proceeding and shall be readily available to deal with all related matters.

1.2 The Company shall complete the form for competent persons detailed in Appendix 14/75. The criteria for competent persons are given in Electricity Council Engineering Recommendations G39 and shall be for the Supervisor Approved Electricians and Electricians. Forms shall also be completed for any personnel engaged on column erection or routine and non routine maintenance Operations in connection with electrical equipment.

**Appendix 14/73 Call out Report**

DATE ..... WEATHER CONDITIONS .....

TIME CALLED OUT ..... CALLED OUT BY .....

ROAD..... 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**

Appendix 14/75 Competent Persons Authorisation Certificate

CERTIFICATE NUMBER .....

CATEGORY OF AUTHORISATION .....

## Category 1

To supervise the erection of lighting columns and fittings in the vicinity of electricity company overhead lines.

## Category 2

To carry out all electrical duties including the following:

1. The testing of installations.
2. The wiring of installations to the outgoing side of the electricity company's cut-out.
3. The maintenance of installations.
4. The initial insertion removal or replacement of the electricity company's cut-out fuses subject to the company's discretion. (Public lighting fuses only.)

### Category 3

To work in the vicinity of the electricity company's overhead lines and to withdraw and replace the electricity company's cut-out fuse carriers for:

1. Lamp replacement and cleaning purposes
2. Painting of structures.

NAME OF COMPETENT PERSON (BLOCK LETTERS) .....

## CATEGORY OF AUTHORISATION

**NAME AND ADDRESS OF COMPANY**

APPROVED BY (Signature) ..... POSITION ..... DATE .....

RECEIVED (Signature) ..... DATE .....

THIS CERTIFICATE IS VALID UNTIL (DATE) .....

A copy of this Certificate shall be held by the competent person named above

**Appendix 28/1 – Supplies and Salt Spreading Rates**

**1 TABLE 1 Salt Stockpiles in Company's Maintenance Compounds**

1.1 Details that shall be provided by the Company

Location	Stock level at 1 <sup>st</sup> October	Minimum stock level prior to 1 <sup>st</sup> March

**2 TABLE 2 Salt Spreading Rates**

2.1 Details that shall be provided by the Company

Weather Conditions Road Surface	Air Temperature	Salt Spreading Rate (grams/square metre)

**Appendix 28/2 – Company's Vehicles and Plant**

**1 Table 1: Operational Spreading Vehicles**

Location	Vehicle Type	Snowplough	Capacity	Number

**2 Table 2: Reserve Spreading Vehicles**

Location	Vehicle Type	Snowplough	Capacity	Number

**3 Table 3: Tractor Loading Shovels**

Location	Type and Capacity	Number

**Appendix 28/2 – Company's Vehicles and Plant**

**4 Table 4 Other Mechanical Snow Clearance Plant**

Location	Type and Capacity	Number

**Appendix 30/1: Landscaping : General**

Action Number	Sub-Clause Reference	Specification Amendment
1	3001.2	<p>The Company shall give the Overseeing Organisation at least 48 hours notice of all items in sub-clause 3001.2 as well as for works in or adjacent to the following specific sites of nature conservation or archaeological interest.</p> <ul style="list-style-type: none"><li>(i) All water courses and otherwise;</li><li>(ii) All Scheduled Ancient Monuments and other sites of archaeological interest including site identified during the archaeological watching brief;</li><li>(iii) Sites of Special Scientific Interest; and</li><li>(iv) Sites designated for their nature conservation interest.</li></ul>
2	3001.13	Pesticides records forms as detailed in Appendix 30/2, detailing information as required in sub-clause 3001.12, shall be submitted to the Overseeing Organisation on a monthly basis.
3	3001.14	The bird nesting period for this Agreement shall be from March 31st to July 31 <sup>st</sup> inclusive, unless otherwise agreed in writing with SNH.
4	3001.15	<p>Inspection reports on a form as detailed in this Appendix 30/1 shall be submitted to the Overseeing Organisation for the activities carried out under Clauses 3007, 3009 and 3010 at the following intervals:</p> <ul style="list-style-type: none"><li>(a) In the case of activities carried out under Clause 3007 and 3010 once per year.</li><li>(b) In the case of activities carried out under Clause 3009<ul style="list-style-type: none"><li>(i) Six times per year in the first year of the Establishment Period;</li><li>(ii) Four times per year in the second year of the Establishment Period;</li><li>(iii) Three times per year for the remainder of the Establishment Period.</li></ul></li></ul>

**Appendix 30/1: Landscaping : General**

<b>LANDSCAPE WORKS - INSPECTION REPORT</b>	
<b>Date of visit: .. / .. / .. (minimum one record / day)</b>	
<b>Name of Company/Contractor:</b> no:	<b>Company/Contractor's telephone</b>
<b>Operations carried out</b>	<b>Locations of Operations</b>
<b>Names of operatives on site:</b> ..... .....	
..... Company observations on damage by others, additional work required or general condition of the works: ..... .....	
..... Observations of Scottish Ministers on standard of workmanship, additional work required or general condition of the works: ..... .....	
..... This maintenance visit has been satisfactorily completed. SIGNED (for Company) ..... NAME: ..... DATE: .. / .. / .. SIGNED (for Scottish Ministers) ..... NAME: ..... DATE: .. / .. / ..	

**Appendix 30/2: Weed Control**

Action Number	Sub-Clause	Specification Amendment
1	3002.1	<p>Weed control for all injurious weed species, including those listed in sub-Clause 3002.1 with the addition of Oil Seed Rape, Rosebay Willowherb and Marestail, shall be carried out throughout the O&amp;M Works at sufficient frequency to restrict their growth and prevent their spread until the end of the Services Period.</p> <p>In locations where effective weed control shall be possible and practicable by other means allowed within this Agreement there shall be a presumption against the use of chemical herbicides.</p>
2	3002.3	<p>Total weed control shall apply to the following locations:</p> <ul style="list-style-type: none"> <li>(i) Bases of road restraint systems;</li> <li>(ii) Around structures, columns, posts and signs;</li> <li>(iii) All paved areas, kerbs, hardstandings, filter drains and gravel areas (including but not limited to gravelled central reservations); and</li> <li>(iv) Otherwise.</li> </ul> <p>The Company shall apply herbicides at sufficient frequency to eliminate weed growth throughout the until the end of the Services Period.</p>
3	3002.4	<p>Total weed control by non-residual herbicide shall apply to the following locations:</p> <ul style="list-style-type: none"> <li>(i) All areas to be seeded and all planting beds prior to seeding or planting so as to be in a weed free condition;</li> <li>(ii) All stockpiles of topsoil which shall be maintained in a weed free condition;</li> <li>(iii) All planted beds; and</li> <li>(iv) Otherwise.</li> </ul>
4	3002.5	<p>A translocated herbicide approved by the Scottish Environment Protection Agency or their successors for use in or near water shall be used for weed control in all open ditches, lagoons, watercourses and filter drains. Control shall be at sufficient frequency to eliminate weed growth throughout until the end of the Services Period.</p>
5	3002.6	<p>Selective weed control using translocated herbicide shall be applied in all non-hardened verges, central reserves, planted areas and other grassed areas as and when necessary to restrict growth and prevent the spread of broadleaf weed species.</p>

**Appendix 30/2: Weed Control**

<b>LANDSCAPE WORKS - PESTICIDES RECORD</b>		
<b>Date of visit: .. / .. / .. (minimum one record / day)</b>		
<b>Contract Name:</b>		
<b>Name of Company:</b>	<b>Company's telephone no:</b>	
<b>Operations carried out</b>	<b>Pesticide used</b>	<b>Locations of Operations</b>
Total weed control		
Weed control in any waterbody		
Selective herbicide to areas of grass		
Herbicide to cultivated plant beds		
Total herbicide around individual plants in grass		
Other (state purpose)		
<b>Names of operatives on site: Qualifications of operatives named:</b>		
<b>Supervisor</b> .....		
<b>Storeman</b> .....		
<b>Application by</b> .....		
<b>Signed (for Company)</b> .....		
<b>Company's observations on damage by others or any incidents:</b> ..... .....		

**Appendix 30/2: Weed Control**

Action Number.	Sub-Clause	Specification Amendment
6	3002.7	<p>Where weed control shall be by spot application translocated herbicide shall be applied as necessary to control weed species listed in Sub Clause 3002.1, and in any case no less than twice a year during periods of active growth until the end of the Services Period at the following locations:</p> <ul style="list-style-type: none"><li>(i) For control of injurious weeds in grass and wildflower areas;</li><li>(ii) All woodland and planted areas;</li><li>(iii) All hedgerow planting areas; and</li><li>(iv) Otherwise.</li></ul> <p>Spot treatment shall typically be via controlled droplet application of a type appropriate to the herbicide, the species being treated and the location.</p>
7	3002.8	<p>Weed control by hand weeding shall be carried out as necessary, and in any case no less than twice a year until the end of the Services Period at the following locations:</p> <ul style="list-style-type: none"><li>(i) All woodland and other planting areas where spot application may cause damage;</li><li>(ii) Hedgerow planting where spot application may cause damage;</li><li>(iii) Wildflower areas and areas densely populated with desirable broadleaf species where spot application may cause damage;</li><li>(iv) Within plant protectors and tree/shrub shelters;</li><li>(v) Around planting stations in existing woodland; and</li><li>(vi) Otherwise.</li></ul>
8	3002.9	Weed control by cutting shall be carried out as necessary in areas where the extent of growth or type of weed is not effectively controlled by herbicide application or hand weeding.
9	3002.10	The Company shall remove all arisings in accordance with sub-clause 3002.10 from weed control operations that involve hand weeding and cutting.

**Appendix 30/3: Control of Rabbits and Deer**

Action Number	Sub-Clause	Specification Amendment
1	3003.1	The Company shall carry out rabbit, hare and deer control in all planting and seeding areas as necessary to ensure successful establishment until the end of the Services Period. The Company shall only cut areas of brambles and herbage that shall interfere with the control of rabbits and deer. The arisings shall be used to form habitat piles in locations where they are no likely to become visual intrusive or interfere with access or maintenance. No clearance of brambles or herbage shall be undertaken during the bird nesting season.
2	3003.8	The Company shall ensure effective rabbit control for the duration of the until the end of the Services Period and shall be responsible for contacting adjacent landowners regarding their obligation to control infestations on their own land.
3	3003.9	The Overseeing Organisation shall request an inspection of the site with a representative of the Company at monthly intervals to ensure effective control has been achieved.
4	3003.12	The Company shall keep planting enclosures free of rabbits, rabbit burrows including exit/entry holes and deer until such time that planting has become fully established and is of sufficient size and maturity so as to be no longer vulnerable to significant damage but not earlier than the end of the Establishment Period.
5	3003.14	The Company shall replace damaged plants annually (towards the end of the planting season); and maintain them until the end of the Services Period. All Works to be undertaken in accordance with the Specification and O&M Works Requirements.

**Appendix 30/4: Ground Preparation**

Action Number	Sub-Clause	Specification Amendment
1	3004.1	Within areas of proposed planting or seeding, all existing grass and herbaceous vegetation shall be cut, in accordance with sub-clause 3004.1.
2	3004.2	All areas which shall be planted shall be treated with translocated herbicide between 21 and 25 days prior to planting in accordance with sub-clause 3002.4, with the exception of areas to be planted in existing woodland, rock cuttings, areas to be planted in inverted turfs and within areas of undisturbed ground.
3	3004.5	Subsoil in planting areas, excluding areas which shall be planted in inverted turfs within areas of undisturbed ground, shall be raked to a minimum depth of 450 millimetres prior to spreading of topsoil. Areas in existing arable or pasture land which shall be planted shall be raked to a minimum depth of 600 millimetre to ensure the breaking up of any subsoil compaction.
4	3004.6	Spacing between the tine furrows shall be in accordance with sub-clause 3004.6.
5	3004.7	The requirements of sub-clauses 3004.8 - 3004.11 shall apply to all subsoil to be seeded or topsoil spread under the Agreement except where otherwise stated in Appendix 30/4.
6	3004.8	All undesirable material brought to the surface including but not limited to stones, roots, tufts of grass and foreign matter larger than the sizes specified below shall be removed off Site unless otherwise agreed with the Overseeing Organisation.  The size of the stones / debris which shall be removed relates to the proposed vegetation cover, the maximum stone / debris size permitted for each, is as follows :  (i) Grass verges and visibility splays: 25 millimetre protruding stone after topsoil has been firmed / rolled; (ii) All other grassland and wildflower grassland: 75 millimetre; (iii) Planted areas except amenity / ornamental shrub planting: 100 millimetre; and (iv) Amenity / ornamental shrub planting: 75 millimetre.  The above stone removal shall apply to the full depth of topsoil required for the proposed vegetation cover.  The overall stone content by percentage volume shall not be greater than that of the adjacent soils.  Stones brought to the surface during final preparation of soils shall be retained on site and used to form habitat piles in locations that are not visually intrusive and shall not interfere with access or the maintenance of the O&M Works Site. All non-organic foreign matter shall be removed off site.

**Appendix 30/5: Grass Seeding, Wildflower Seeding and Turfing**

Action Number	Sub-Clause	Specification Amendment
1	3005.1	Grass seed shall be sown as per sub-clause 3005.1. Wildflower seed shall be sown in early spring or autumn at the same time as grass unless otherwise recommended by the supplier.
2	3005.2	All areas to be seeded or turfed shall be cultivated as per sub-clause 3005.2, with the exception of rock faces. A 250 millimetre radius shall be left clear of seeding around each new tree and shrub.
3	3005.3	All areas to be seeded with grass shall have fertiliser and or other soil ameliorants incorporated into the upper 50 millimetre of soil at a rate(s) considered necessary for successful establishment. The rate of application and composition of fertilizer and other ameliorants shall be based upon the topsoil test results.
4	3005.4	<p>Grass seed mixes shall be as follows;</p> <ul style="list-style-type: none"> <li>(i) A general purpose grass seed mix shall be used in road verges, embankments and cuttings not planted or where other grassland is required. The seed mix(es) shall provide a rapidly establishing sward to provide an appearance and habitat which reflects adjacent and surrounding grassland communities. The mix(es) shall reflect the diversity of grassland communities along the route as described in the Environmental Assessment Documents;</li> <li>(ii) Wildflower grassland shall be flora and grassland of very low fertility created to enhance the amenity and nature conservation value of the road corridor. The proposed mix(es) shall match the adjacent and surrounding grassland communities of greatest nature conservation value. Short growing grasslands of low fertility in which the growth of wild flowers shall be encouraged. For wildflower grassland mixes the ratio of grass seed to wildflowers shall be 80%:20% respectively. No single species of wildflower shall be less than 10% by number of the wildflower component with the exception of Oxeye Daisy (<i>Leucanthemum vulgare</i>) which, if specified, shall be limited to not more than 3% of the wildflower component.;</li> <li>(iii) Productive grassland shall be sown where grassland is to be returned to agricultural use for pasture. The Company shall consult with relevant landowners with regard to species mixes and sowing density on land to be returned to pasture;</li> <li>(iv) Areas to be returned to arable use shall be seeded with nitrogen fixing species. The Company shall consult with relevant landowners with regard to species mixes and sowing density on land to be returned to arable use;</li> <li>(v) All new woodland and native scrub planting areas shall be seeded with a low-maintenance grass mix capable of suppressing weed growth in planting areas until a full canopy of trees and shrubs has developed.</li> </ul> <p>Consideration shall be given to use of grass and wildflower species which are unpalatable to deer where there is a risk that deer will be attracted to areas close to the scheme roads.</p>
5	Inserted Clause	All seed shall be delivered to the Site in bags sealed by the supplier. A label shall be attached to each bag giving details of species and

**Appendix 30/5: Grass Seeding, Wildflower Seeding and Turfing**

Action Number	Sub-Clause	Specification Amendment
		percentage breakdown. The same details shall be enclosed within each bag. Each bag shall be numbered uniquely and relate to the label and documents within the bag. The documents shall be submitted to the Overseeing Organisation prior to sowing.
6	3005.7	<p>Wildflower mixes shall be of UK native origin selected and procured in accordance with Appendix 1 of 'Cost Effective Landscape: Learning from Nature'</p> <p>The Company shall complete and submit to the Overseeing Organisation a wildflower seed Provenance Certificate in accordance with the Certification Procedure.</p> <p>Wildflower seed mixes shall contain only species occurring in the National Vegetation Classification category appropriate to the location.</p> <p>Local provenance seed shall be supplied by either harvesting from the approved sites or from nursery propagation to the approval of Scottish Natural Heritage. If nursery propagated seed shall be used the Company shall allow sufficient time in their programme to ensure that the seed is available when required for sowing.</p> <p>All wildflower seed shall be tested by an independent organisation such as the Scottish Agricultural Science Agency (SASA) to verify purity of seed (percentage of seed / inert material), species composition, and percentage germination. The test certificates shall be made available to the Overseeing Organisation for consent prior to sowing.</p> <p>The wildflower seed mixes shall contain a minimum percentage of:</p> <ul style="list-style-type: none"> <li>i) 95% pure seed, not inert material (% by weight); and</li> <li>ii) a percentage of flora rather than grass seed species which matches the percentage of flora species in the surrounding plant communities of greatest nature conservation value.</li> </ul> <p>Seeds within the wildflower seed mixes shall have a minimum germination rate of 80%.</p>
7	3005.8	<p>Sowing of seed shall be carried out at the rate specified below: The sowing of seed shall be carried out as soon as practicable in order to benefit soils stabilisation.</p> <p>Grass seed shall be sown at a rate of not less than 20g/m<sup>2</sup> for verges and side slopes of cuttings and embankments and 15g/m<sup>2</sup> elsewhere.</p> <p>Wildflower grassland areas shall be sown at a rate of not less than 5g/m<sup>2</sup></p>
8	3005.14	Any turf imported shall comply with sub-clause 3005.14 and shall contain a grass and/or herb mixture which reflects adjacent and surrounding grassland communities.
9	3005.25	Turf shall be secured using either galvanised wire pins or softwood pegs as per sub-clause 3005.25.
10	3005.26	Newly laid turf laid shall be watered as per sub-clause 3005.26.

**Appendix 30/5: Grass Seeding, Wildflower Seeding and Turfing**

Action Number	Sub-Clause	Specification Amendment
13	3005.29	A minimum of two establishment cuts shall be undertaken; with further cuts undertaken as necessary to achieve a coverage as stated in sub-clause 3005.11 and one cut subsequent to the required sward coverage being achieved.
14	3005.30	All areas shall be left clear of grass clippings following each mowing by raking or other suitable method except where grass height is less than 200mm at the time of cutting in which case grass cuttings may be left in situ.

**Appendix 30/6: Planting**

Action Number	Sub-Clause	Specification Amendment
1	3006.3	Plant stock and sizes shall be as Tables 30/6.1, 30/6.2, 30/6.3 and 30/6.4. Species, varieties and plant spacings shall be in accordance with the O&M Works Requirements.

**Table 30/6.1 Extra Heavy Standard and Heavy Standard Rootballed Trees**

Type	Girth at 1 metre Above Ground Level (centimetres)	Clear Stems from Ground Level (metres)	Minimum Height from Ground Level (metres)	Maximum Height from Ground Level (metres)
Extra heavy standard	14-20	1.8	4.25	6.0
Heavy standard	12-14	1.8	3.5	4.25
Large rootballed specimens	-	-	1.5	1.75

**Table 30/6.2 Feathered Trees, Transplants, Container Grown and Cell Grown Stock**

Type	Minimum Age	Minimum Height Above Ground Level	Minimum Container Size
Transplants whips (broadleaves only)	2+1 years	450 millimetres	-
Transplant in tree shelters (broadleaves only)	1+1 years	400 millimetres	-
Container grown evergreens	2+1 years	300 millimetres	2 litres
Feathered Trees	as B.S.	1.5-2.5 metres	-

**Table 30/6.3: Cell Grown Stock**

Type	Approximate Height (cm)	Minimum Cell Volume (ml)	Minimum Root Collar Diameter (millimetres)
Conifers	20-40	150	5
	20-40	350	8
Broadleaves	40-60	150	6
	40-75	350	8
Holly	20-40	150	7
Shrubs	20-40	150	5
At least 25% of plants shall be supplied in the larger size range. Plants in 35ml cells shall not be more than 3 years old. All other plants shall not be more than 2 years old.			

**Appendix 30/6: Planting**

**Table 30/6.4 Shrubs, Conifers, Hedge Plants, Climbers and Ground Cover Plants**

Type	Minimum Age	Column A Acceptable Height	Column B Minimum Height for Small/Slow Growing Plants not Readily Available to Sizes Shown in Column A
Bare root/Hedge plants	2+1 years	400-600 millimetres	-
Transplants in shrub shelters	1+1 years	400-600 millimetres	-
Container grown shrubs and conifers	2+1 years	450-600 millimetres	300-450 millimetres
Container grown climbers	3 years	600-900 millimetres	400-600 millimetres
Ground cover plants	3 years	300-450 millimetres	150-200 millimetres
Rooted Cuttings	2 years	400-600 millimetres	

**Appendix 30/6: Planting**

Action Number	Sub-Clause	Specification Amendment
2	3006.6	<p>The Company shall provide written confirmation that United Kingdom native plant species have been sourced from the highest available preference for selecting plant material contained within Appendix 1 of 'Cost Effective Landscape: Learning from Nature' prior to commencement of planting Works. The Company shall submit Provenance Certificates in accordance with the Certification Procedure accompanied by certification from the supplying nurseries in respect of the provenance of plant material in accordance with the Certification Procedure. Where there is a choice of form or size of plant material, the most local provenance shall be selected.</p>
3	3006.12	<p>Topsoil for backfilling of tree pits may be site won where it is of suitable quality for successful establishment of the newly planted trees. Imported topsoil shall be general purpose grade conforming to BS 3882.</p>
4	3006.13	<p>Where plants shall be pit planted compost shall be incorporated into the soil during pit preparation and backfilling. Where plants shall be notch planted compost and fertiliser at a rate based on the results of the soil tests shall be deposited over planting areas for incorporation into the soil during ground cultivation. Slow release fertilizer with a Nitrogen: Potassium: Phosphorus: Magnesium ratio of 14:8:13:2 shall be incorporated into the backfill of tree pits/planting areas as follows:</p> <ul style="list-style-type: none"><li>(i) Standard trees: 20g</li><li>(ii) Heavy Standard trees: 40g</li><li>(iii) Extra Heavy Standard trees 100g; and</li><li>(iv) Ornamental planting beds into the top 75mm of planting bed soil at a rate of 100g per square metre.</li></ul>

**Appendix 30/6: Planting**

Action Number	Sub-Clause	Specification Amendment
5	3006.14	Compost pH, conductivity and nutrient composition shall be decided in compliance with the Company's Quality Plan and associated method statements based on the results of topsoil tests.
6	3006.15	Slow release fertiliser shall be incorporated into backfill, into the top 75 millimetres of planting bed soil, in accordance with sub-clause 3006.15 and at a rate based on the results of the soil tests.
7	3006.16	Root dips shall be applied to all bare root plants and anti-desiccant sprays shall be applied to all conifers at the following times: i) At the time of lifting from the nursery ii) On arrival at site iii) Immediately prior to planting
8	3006.17	All bare rooted, rootballed and cell grown stock shall be planted whilst the plants are dormant between the beginning of November and the end of March. All evergreen species shall be planted in either March or November.
9	3006.23	Bare root whips, transplants and cell grown plants may be notch planted into areas of cultivated or existing topsoil of minimum 300 millimetres depth in accordance with methods (i) and (ii) of sub-clause 3006.23 or the inverted turf method in areas of proposed planting in undisturbed ground.
10	3006.24	Pits for whips, transplants and shrubs shall be dug in accordance with sub-clause 3006.24 in locations where topsoil depths are less than 300 millimetres. All container grown plants shall be pit planted. Trenches for hedges shall be dug in locations where there is less than 300 millimetres depth of topsoil. Arisings from planting pits and trenches shall be retained on the O&M Works Site and deposited within proposed landscape earthworks.
11	3006.28	Hedge trenches excavated in accordance with Table 30/1 shall be backfilled with a mixture of 80% topsoil and 20% compost with slow release fertiliser added as required to make up for any nutrient deficiencies identified in the soil test results.
12	3006.29	All areas with spread or existing topsoil shall be cultivated in accordance with sub-clause 3006.29 prior to planting. Soil ameliorants and slow release fertiliser shall be incorporated to make up any nutrient deficiencies identified from the soil test results.
13	3006.30	A 600mm wide strip along all hedgelines except those that have been backfilled shall be cultivated in accordance with sub-clause 3006.30.
14	3006.33	The soil shall be watered to field capacity immediately after planting if there is a risk to plants of water stress or wilting.
17	3006.38	Root barriers shall be required where the clearances required for underground services and drainage infrastructure or the integrity of structures would otherwise be adversely affected by plant roots or where required by the Relevant Authorities.

**Appendix 30/6: Planting**

Action Number	Sub-Clause	Specification Amendment
18	3006.41	The minimum length of tree stakes for heavy standard and extra heavy standard trees shall be 2 m and the minimum width 75 millimetres. Tree stake sizes for other tree forms shall be in accordance with sub-Clause 3006.41.
19	3006.42	Where planting on a slope stakes may be driven at an angle mid way between the slope and the vertical tree stem.
20	3006.43	Heavy and extra heavy standard trees shall be double staked with the vertical stakes unless planting on a slope where stakes may be driven at an angle mid way between the slope and the vertical tree stem.
21	3006.45	Semi-mature trees shall be planted as shown on Drawing Number K5 to Volume 3 of the MCHW in compliance with the Company's Quality Plan and associated method statements and consented to by the Overseeing Organisation.
22	3006.49	All extra heavy standard, heavy standard and standard trees shall be watered to field capacity immediately following planting. All other tree and shrub plants shall be watered to field capacity immediately after planting if there is a risk to plants of water stress or wilting.
23	Additional Clause	All container grown, cell grown and root balled plants shall be watered to field capacity immediately before planting.
24	3006.52	<p>Plant protectors shall be provided for all two year old transplants, cell grown plants, shrubs and conifers.</p> <ul style="list-style-type: none"> <li>(i) Tree shelters shall be a minimum of 750 millimetres height and 80-120 millimetres diameter. Shrub shelters shall be a minimum of 750 millimetres height and 100-150 millimetres diameter.</li> <li>(ii) Where the species shall be <i>Fagus</i>, base ventilation shall be provided.</li> <li>(iii) Shelters shall be installed with timber stakes and adjustable ties according to the manufacturer's specification.</li> <li>(iv) Stakes shall be a minimum of 1500 millimetres in length.</li> </ul>
25	3006.53	All planting shall be watered to field capacity, as required, prior to the application of mulch.
26	3006.54	Mulch shall be applied in compliance with the Company's Quality Plan and associated method statements except where slopes shall exceed a gradient of 1 in 2 in accordance with sub-Clause 3006.55, (ii).

**Appendix 30/6: Planting**

Action Number	Sub-Clause	Specification Amendment												
27	3006.55	<p>Bulbs shall be planted at the following rates per square metre:</p> <table> <tr><td>Bluebell</td><td>150</td></tr> <tr><td>Crocus</td><td>100</td></tr> <tr><td>Tulip</td><td>50</td></tr> <tr><td>Narcissus (large)</td><td>40</td></tr> <tr><td>Narcissus (medium)</td><td>60</td></tr> <tr><td>Narcissus (small)</td><td>100</td></tr> </table> <p>Other species shall be planted at a suitable rate dependant on species in compliance with the Company's Quality Plan and associated method statements.</p>	Bluebell	150	Crocus	100	Tulip	50	Narcissus (large)	40	Narcissus (medium)	60	Narcissus (small)	100
Bluebell	150													
Crocus	100													
Tulip	50													
Narcissus (large)	40													
Narcissus (medium)	60													
Narcissus (small)	100													
28	3006.67	Bulbs shall be planted with the base at the depth in accordance with good horticultural practice and in compliance with the Company's Quality Plan and associated method statements.												
29	3006.73	Reeds, rushes, marginal and aquatic plants shall be planted around the margins of wet pond drainage features in accordance with the O&M Works Requirements the Company's Quality Plan and associated method statements.												
30	3006.77	Excavated material from sub-clause 3006.77 operations shall be spread throughout the planting area.												
31	3006.87	The Company shall replace all plants found to be defective or vandalised annually until the end of the Services Period.												
32	3006.91	All replacement extra heavy standard, heavy standard, standard and rootballed evergreen stock shall be watered to field capacity following planting. All other tree and shrub plants shall be watered to field capacity immediately after planting if there is a risk to plants of water stress or wilting.												
33	3006.92	The Company shall carry out maintenance of new planting in accordance with clauses 3007 and 3009 until the end of the Services Period.												

**Appendix 30/7: Grass, Bulbs and Wildflower Maintenance**

Action Number	Sub-Clause	Specification Amendment
1	3007.1	All grass and wildflower areas within the boundary of the O&M Works Site shall be maintained in accordance with Clause 3007.
2	3007.5	No cutting shall be carried out within 250 millimetres of unprotected trees and shrubs.
3	3007.17	<p>Low frequency grass cutting shall be undertaken in accordance with sub-Clause 3007.17 in the following areas:</p> <ul style="list-style-type: none"> <li>(i) A 1.2 metre swathe width measured from the back edge of the carriageway or hard strip. The width of cut shall be increased accordingly where the remaining grass between the 1.2 metre area and any adjacent boundary (such as a wall, fence or planting bed) is less than 2 metres;</li> <li>(ii) Grassed areas within visibility splays;</li> <li>(iii) Where there are footpaths remote from the carriageway edge where grass between the road and footpath receives a low frequency cut, the outside edge of the footpath shall be subject to the same regime for a width of 1m.</li> </ul> <p>Additional selective cuts shall be undertaken as necessary to maintain visibility. The areas subject to additional selective cuts shall be extended beyond the minimum area required to maintain visibility in order that they appear naturalistic with smoothly curving edges, avoiding straight lines and abrupt angles.</p>
4	3007.18	All grass areas not cut at medium or low frequency shall be cut at a 'minimal frequency' in accordance with sub-Clauses 3007.18-21.
5	3007.20	Additional selective cuts shall be undertaken if required to maintain visibility of road signs. The areas subject to additional selective cuts shall be extended beyond the minimum area required to maintain visibility in order that they appear naturalistic with smoothly curving edges, avoiding straight lines and abrupt angles.
6	3007.22	All banks and ditches shall be cut in accordance with sub-clause 3007.22. All arisings shall be dispersed over the sward avoiding the blocking of drains and ditches.
7	3007.23	All grass cutting in planting areas shall be cut in accordance with sub-Clause 3007.23. The cutting shall include bramble but exclude naturally regenerated tree and shrub seedlings, the retention of which would be consistent with the overall management objectives for the planting area and in compliance with the Company's Quality Plan and associated method statements.
8	3007.26 - 3007.27	All areas seeded with wildflower shall be cut according to the most appropriate regime detailed in sub-clause 3007.26 and according to sub-clause 3007.27. Regime to be in compliance with the Company's Quality Plan and associated method statements to suit the wildflower mix.
9	3007.28	The ground shall be scarified only where necessary for wildflower colonisation in compliance with the Company's Quality Plan and associated method statements.

**Appendix 30/7: Grass, Bulbs and Wildflower Maintenance**

Action Number	Sub-Clause	Specification Amendment
10	3007.29	<p>Spot herbicide treatment in accordance with sub-Clause 3007.29 shall be carried out at an appropriate frequency in all wildflower areas to eliminate undesirable broadleaf weed species.</p> <p>Areas of self-seeding broadleaf plants considered to be desirable for nature conservation shall be retained. These areas shall be identified by the Company to the Overseeing Organisation.</p>
11	3007.30	Areas of wildflower seeding that cannot be effectively controlled by chemical means without risk to of damage to wildflowers shall be hand weeded to eliminate undesirable broadleaf weed species.
12	Additional Clause	All damaged or failed sward shall be reinstated with seed to match the surrounding area.

**Appendix 30/8: Watering**

Action Number	Sub-Clause	Specification Amendment
1	3008.6	The Company shall water all planting for the Establishment Period at a frequency necessary to ensure establishment and survival.
2	3008.7	Additional watering in accordance with sub-Clause 3008.7 may be required for all planting and seeding in periods of abnormally dry conditions.

**Appendix 30/9: Establishment Maintenance for Planting**

Action Number	Sub-Clause	Specification Amendment
1	3009.1	All planting and planting areas shall be maintained for the Establishment Period in accordance with sub-clauses 3009.2 to 3009.25.
2	3009.4	Tree stakes, tubes, guards and ties that are no longer required shall be offered to the Overseeing Organisation for re-use. Where the Overseeing Organisation declines the offer the Company shall dispose of them to a licensed disposal facility.
3	3009.9	Delete sub-Clause 9 and insert:  Plant circles shall be defined as the area within 250 millimetres radius of an individual tree or shrub, within which weed control operations shall be carried out.
3	3009.10	Translocated herbicide shall be applied at a frequency as necessary to keep plant circles in all woodland and scrub planting areas weed free, whilst protecting trees and shrubs from the herbicide. Hand weeding shall be undertaken to remove weeds from within tree and shrub shelters and guards.
4	3009.11	Where alternative means of weed control prove ineffective residual herbicide shall be applied at a frequency as necessary to keep plant circles in all woodland and scrub planting areas weed free in accordance with sub-Clause 3009.11.
5	3009.12	Mulch shall be maintained in accordance with sub-clause 3009.12 in amenity / ornamental shrub planting areas.
6	3009.18	Mulch shall be maintained in accordance with sub-clause 3009.18 in all cultivated beds.
7	3009.20	All hedge bases shall be maintained weed free for the duration of the Establishment Period in accordance with sub-clause 3009.20.
8	3009.25	All extra heavy standard and heavy standard trees and rootballed conifer trees shall be inspected and maintained annually in accordance with sub clause 3009.25.
10	Additional Clause	During the first 2 years after planting, hedge plants shall be pruned once each year between 1 <sup>st</sup> September and 31 <sup>st</sup> January to encourage formation of a vigorous, compact, uniform hedge. The current year's growth of prominent new shoots shall be reduced in length by one third.

**Appendix 30/10: Maintenance of Established Trees and Shrubs**

Action No.	Sub-Clause	Specification Amendment
1	3010.1	All established trees and shrubs within the O&M Works Site not maintained under Clause 3009 shall be maintained until the end of the Services Period in accordance with sub-clauses 3010.2 - 3010.71.
2	3010.4	Healthy risings shall be dealt with in accordance with one or more of items (iv) to (ix) of sub-Clause 3010.4 in compliance with the Company's Quality Plan and associated method statements.
4	3010.8	Shrubs grown for coloured stems shall be pruned once every two years in accordance with sub-Clause 3010.8 paragraph (i). Overgrown shrubs to be coppiced back in accordance with sub-Clause 3010.8 paragraph (vii).
5	3010.12	Hedges shall be cut once a year in accordance between September and January.
6	3010.20	If any hedge laying shall be required it shall be undertaken in an appropriate style in order to reflect the adjacent or local appearance.
7	3010.22	Mixed hedgerows shall be laid in an appropriate style in order to reflect the adjacent or local appearance.
8	3010.31	New hedge plants to infill significant gaps in hedges after they have been laid or cut shall be of size, species, and planting density to match the existing hedgerow.
9	3010.45	Tree size categories shall be in compliance with the Company's Quality Plan and associated method statements.
10	3010.54	Crown lifting shall be in compliance with the Company's Quality Plan and associated method statements.
11	3010.55	Crown thinning shall be in compliance with the Company's Quality Plan and associated method statements.
12	3010.56	Crown reduction or reshaping shall be in compliance with the Company's Quality Plan and associated method statements.
13	3010.57	Straight felling shall be in compliance with the Company's Quality Plan and associated method statements.
14	3010.58	Sectional felling shall be in compliance with the Company's Quality Plan and associated method statements.
15	3010.59	Stumps shall be cut as close to the ground as possible or where the tree is growing in a hedge the stump shall be left level with the top of the hedge.
16	3010.60	Stump treatment shall be in compliance with the Company's Quality Plan and associated method statements.
17	3010.62	Stump removal shall be in compliance with the Company's Quality Plan and associated method statements.
18	3010.63	All risings shall be disposed of off the O&M Works Site or placed within woodland areas as log piles and or windrows where this is consistent with the management objectives for the woodland and the Company's Quality Plan and associated method statements.

**Appendix 30/10: Maintenance of Established Trees and Shrubs**

Action Number	Sub- Clause	Specification Amendment
19	3010.65	Thinning and coppicing shall be carried out in areas of establishing and maturing woodland in accordance with Table 30/10.1 and where identified as being required by the Company's regular inspections.
20	3010.68	Undesirable scrub species shall be controlled in accordance with Table 30/10.1 and where identified as being required by the Company's regular inspections.
21	3010.69	Undesirable scrub tree and shrub species that shall be controlled shall typically have a stem diameter of 0-75 millimetres and a height of 0.75-2.5 metres.
22	Additional Clause	Undesirable scrub species shall be cut down to 50mm above ground level and plants allowed to re-grow. The Company shall then apply translocated herbicide during the first year of active growth after cutting at a suitable time to maximize the effectiveness of the herbicide.
23	3010.71	Operations in accordance with sub-clause 3010.71 shall be carried out in compliance with Table 30/10.1 and the Company's Quality Plan and associated method statements.

### Appendix 30/11: Management of Waterbodies

Action Number	Sub-Clause	Specification Amendment
1	3011.1	The management operations under Clause 3011 shall take place in all waterbodies and open ditches within the O&M Works Site.
2	3011.3	All inlets and outlets that shall be part of the road drainage system within the O&M Works Site shall be inspected in accordance with sub-Clause 3011.3.
3	3011.4	The Company shall eliminate weeds as listed in Clause 3002 from within or adjacent to water bodies.
4	3011.6	Injurious weeds on the banks of water courses and within the O&M Works Site shall be removed by hand in accordance with sub-clause 3002.8.
6	3011.8	Silt shall be removed from waterbodies that are part of the road drainage system as required to maintain their functional requirements in accordance with sub-Clause 3011.8. The Company shall be responsible for consulting with SEPA and any other relevant bodies prior to undertaking any operations affecting a water body.
7	3011.9	All reedbeds and marginal plants shall be inspected twice a year in early February and October in accordance to sub-clause 3011.9.
8	Additional Clause	All marginal aquatic plants shall be maintained by the Company for the duration of the Services Period with any failed or defective plants replaced annually in accordance with Clause 3006.

**Appendix 30/12: Special Ecological Measures**

Action Number	Sub-Clause	Specification Amendment
1	3012.1	Special ecological measures shall be maintained until the end of the Services Period.
2	3012.2	Special ecological measures works shall be carried out in seasons to be agreed with SNH and any other relevant consultees.
3	3012.3	Tunnels, ledges, fencing and underpasses and any other mitigation measures for wildlife shall be designed, located and installed in accordance with the requirements of SNH and any other relevant consultees. If there is any discrepancy between SNH's requirements and Clause 3012, SNH's requirements shall prevail.
		<p>The location and extent of fencing for protected fauna shall be consistent with the requirements of the Environmental Assessment Documents, SNH and any other relevant consultees.</p> <p>All badger and otter fencing shall be completed to the approval of the Company's ecological specialist who shall oversee installation. Fencing shall be completed in advance of opening the road to vehicular traffic.</p> <p>Where there is the requirement for badger or otter fencing along the same line as other fence types (e.g a permanent boundary of stock proof fencing or deer fencing) a single fence which combines the specifications and functions of both types of shall be used.</p>
		<p>Badger fencing shall be in accordance with the following specification:</p> <p>Post and mesh fences in accordance with British Standard BS 1722 part 2: 1989 "Specification for rectangular wire mesh and hexagonal wire netting fences" with a rectangular steel wire mesh having maximum openings of 25mm X 50 mm and wires of not less than 3 mm diameter in accordance with British Standard BS 4102: 1990 "Specification for steel wire and wire products for fences" and galvanised to British Standard BS 729: 1971 (1994). "A specification for hot dip galvanised coatings for iron and steel articles". The mesh shall be securely stapled to the posts and (where present) rails of the highway boundary fences installed along the scheme roads. Where the highway boundary fence is post and wire, stobs shall be spaced no more than 1.8 metres apart. The mesh shall extend a minimum of 1.0 metre above ground level and be buried vertically to between 300 millimetres and 500 millimetres below ground and turned at right angles from the bottom of the buried section towards the direction from which badgers are expected to approach for a further 300 millimetres. The return shall consist of a separate roll of mesh attached with clips to the bottom of the vertical mesh. The vertical mesh shall be secured at ground level by a galvanised wire not less than 5 millimetres in diameter and a galvanised barbed wire shall be securely stapled to the posts of the fence 25 millimetres above the top of the mesh. Fixings for attachment to Structures shall use a resin fixed replaceable bolt system.</p>

**Appendix 30/12: Special Ecological Measures**

Action Number	Sub-Clause	Specification Amendment
		Badger Gates shall be constructed in accordance with the RSPCA publication 'Problems with Badgers?' All badger gates shall incorporate concrete sills to prevent digging or erosion.
		Otter Fencing shall be in accordance with the following specification:  Post and mesh fences in accordance with British Standard BS 1722 part 2: 1989 "Specification for rectangular wire mesh and hexagonal wire netting fences" with a rectangular steel wire mesh having maximum openings of 50 millimetres X 100 millimetres and wires of not less than 3 millimetres diameter in accordance with British Standard BS 4102: 1990 "Specification for steel wire and wire products for fences" and galvanised to British Standard BS 729: 1971 (1994). "A specification for hot dip galvanised coatings for iron and steel articles". The mesh shall be securely stapled to the posts and (where present) rails of the highway boundary fences installed along the scheme roads. Where the highway boundary fence is post and wire, stobs shall be spaced no more than 1.8 metres apart. The mesh shall extend a minimum of 1.2 metre above ground level and be buried vertically to a depth of not less than 300 millimetres, or 100 millimetres with a horizontal lap turned at right angles from the bottom of the buried section towards the direction from which otters are expected to approach for a further 300 to 450 millimetres. The return shall consist of a separate roll of mesh attached with clips to the bottom of the vertical mesh. The vertical mesh shall be secured at ground level by a galvanised wire not less than 5 millimetres in diameter and a galvanised barbed wire shall be securely stapled to the posts of the fence 25 millimetres above the top of the mesh. Fixings for attachment to Structures shall use a resin fixed replaceable bolt system.
		Tunnels, ledges and underpasses shall be installed in a manner and at locations recommended by the Company's ecological specialist as follows:  Free-draining tunnels with a minimum diameter of 600 millimetres and a gradient not exceeding 1 in 3 shall be provided. The openings of the tunnels under the road shall be within the O&M Works Site. Within the available land and where practicable, a wooden post and 5 rail fence in accordance with drawing H3 of Volume 3 of the MCHW shall be erected not less than 1.5 metres in front of the tunnel openings and shall be angled to meet the posts of the O&M Works boundary fence. The overall length of the fence shall be not less than 4.8 metres. Alternative types of tunnel entrance shall be in accordance with the guidance given in the RSPCA publication "Problems with Badgers?".  Bridges, structures and culverts designed to carry water shall incorporate a ledge or platform not less than 150 millimetres above the highest flood level, not less than 600 millimetres wide and allowing headroom of not less than 600 mm over the full width of the ledge or platform. Access ramps with a minimum width of 300 millimetres and a maximum gradient of 1 in 2 from the ledge or platform to the adjacent banks of the watercourse and to the normal water level shall be provided at each end.
4	3012.4	Wildlife grilles shall be designed and located in accordance with the requirements of SNH and any other relevant consultees.

**Appendix 30/12: Special Ecological Measures**

Action Number	Sub-Clause	Specification Amendment
5	3012.5	In February and October of each year the Company shall inspect all wildlife fencing, gates, tunnels and underpasses and report their condition to the Overseeing Organisation.
6	3012.6	Reflectors shall be designed and located in accordance with the requirements of SNH and any other relevant consultees.
7	3012.7	Reflectors shall be inspected monthly in accordance with the sub-Clause 3012.7.
8	3012.8	Bat boxes, dormice or bird nesting boxes and roosting perches shall be installed in accordance with the requirements of SNH and any other relevant consultees.
9	3012.9	Bat boxes, dormice or bird nesting boxes and roosting perches shall be inspected and their condition reported to the Overseeing Organisation in accordance with the requirements of SNH and any other relevant consultees.
10	3012.11	Other habitat creation measures shall be inspected annually and their condition reported to the Scottish Ministers. The Company shall consult and comply with the requirements of SNH and any other relevant consultees in respect of Works likely to impact upon or affect any protected species or area.
11	3012.13	The Company shall obtain licenses or use only licensed operatives for all works in the vicinity of protected species.

## Appendix 32/1: Incident Response

### 1 INCIDENT RESPONSE TIME

- 1.1.1 The response time for attendance at an Incident shall be defined as the time taken from receipt of notification of the Incident by the Company to commencement of appropriate action at the site of the Incident.
- 1.1.2 Response times shall always be as short as practicable but in any event shall not exceed the maximum times stated in Tables 1.1 and 1.2 of this Appendix.
- 1.1.3 The strategic trunk road routes within the Project Roads are M8, M73, M74, A8 and A725.
- 1.1.4 The response times for strategic trunk road routes are stated in table 1.1. At times outside those stated the response times shall be as stated in table 1.2.

**TABLE 1.1 – TRISS RESPONSE TIMES FOR STRATEGIC TRUNK ROAD ROUTES**

Road Type	Operational Hours	Maximum initial response time	Maximum secondary response time
Designated Strategic Trunk Road Routes	06.00 to 19.30	20mins	20mins

**TABLE 1.2 - RESPONSE TIMES FOR OTHER ROUTES OUTSIDE TIMES STATED IN TABLE 1.1**

Road Type	Operational Hours	Maximum initial response time	Maximum secondary response time	Maximum Back-Up response time
Motorways and Dual Carriageways	07.00 to 19.00	1 hour	1 hours	24 hours
	19.00 to 07.00	1½ hours	2 hours	24 hours
Other Trunk Roads	07.00 to 19.00	1 hours	1 hours	24 hours
	19.00 to 07.00	1½ hours	2 hours	24 hours

## 2 TRUNK ROAD INCIDENT SUPPORT VEHICLES

### 2.1 Vehicle Types

2.1.1 The primary vehicles that are used by the Company for all initial Incident response operations by the Trunk Road Incident Support Service and Incident Support Units shall be as described in Table 2.1 of this Appendix.

2.1.2 The general vehicle liveries shall be as given in Appendix 1/75.

2.1.3 The TRISS vehicles shall, in addition, have:

- Class 1 Red Microprismatic diagonal markings alternating with yellow reflective diamond grade stripes on the rear of the vehicle,
- 600mm long 300mm wide alternating Yellow and Black Rectangular 'Battenburg' Pattern in retro-reflective material on the sides of the vehicle, and
- 'TRUNK ROADS INCIDENT SUPPORT' in black capital letters on the sides and rear of the vehicle with the mirror image on the front of vehicle

**TABLE 2.1 VEHICLES FOR TRUNK ROAD INCIDENT SUPPORT SERVICE AND INCIDENT SUPPORT UNITS**

Description	Minimum Equipment Requirements for each vehicle
2 wheel drive high roof van powered by a Euro 5 compliant engine with a minimum power of 129PS with automatic transmission and ABS. Gross vehicle weight 3500kg, capable of carrying the equipment detailed in Table 3.1 and performing the duties set out in the Contract.  Unglazed rear and nearside loading door, shelving and full height steel bulkhead.  Dual passenger seat with three point inertia seat belts.  Driver and passengers' air bags. Air conditioning. Drop pin/50mm ball towing equipment. Access steps and grab handles. Reversing beeper. Handwash station	1 No. mobile CCTV Camera system of a type compliant with the specification contained within Appendix 1/77  mobile VMS of a type compliant with the specification contained within Appendix 1/78  appropriate type of built-in hands-free kit  fire extinguisher and first aid kit.  global positioning tracking system (The Company shall supply map based software to monitor vehicle locations, and record dates and times and movements of vehicles. The Company will supply the relevant Network Operations provider with a live feed to this data)  two light bars with corner lights, 8 rear lights and eight front lights and twin grill mounted yellow strobes connected into the vehicle electrics to remain functional when the vehicle ignition is off with an internal warning light fitted to indicate when the light bar is operational

### 3 INCIDENT RESPONSE RESOURCES

#### 3.1 General

3.1.1 The Company shall provide the Incident Response Resource specified in Table 3.1 of this Appendix.

**TABLE 3.1 EQUIPMENT TO BE CARRIED IN TRUNK ROAD INCIDENT SUPPORT SERVICE AND INCIDENT SUPPORT UNIT VEHICLES**

Equipment	Minimum Quantity
Electronic language translator	1 no.
Tow rope	1 no.
2 Stroke oil	2 x 1 litre bottles
Rigger Gloves	5 pairs
Lube oil spray	1 no. 400 ml tin
Hard hat	2 no.
Diesel Fuel	5 litres in container
Petrol	5 litres in container
Fence Nails & Staples	Sufficient
Face Dust Masks	12 no.
Paper Towels	Sufficient
De-icer	2 x 500ml
Animal Carcass Bags	10 no.
Handwipes	Sufficient
Absorbent Granules	6 no. x 2kg bags
Powered debris blower	1 no.
Digital Camera	1 no.
Reflective waterproof jackets for use by stranded motorists	2 no.
Reflective long sleeved vests for use by stranded motorists	-
Drain Rods	1 set
Claw hammer	1 no.
Pointing Trowel	1 no.
Manhole Lifting Keys	1 set
Handsaw	1 no.
Wire Brush	1 no.
Floating Trowel	1 no.
Power Saw	1 no.
Stone Cutting Discs	6 no.
Metal Cutting Discs	6 no.
Shovels	2 no.
Stiff Brush	1 no.
Soft Brush	1 no.
Spirit Level	1 no.
Chainsaw with PPE	1 no.

Equipment	Minimum Quantity
Punner	1 no.
Pickaxe	1 no.
Bow Saw	1 no.
Foam Ear Plugs	5 sets
Safety Goggles	2 pairs
Paper Coveralls	4 pairs
Large torch	2 no.
Spare batteries for torches	24 no.
14lb Sledge hammer	1 no.
Stilson wrench	1 no.
Galvanised fence wire	1 roll
Temporary fence with support	1 roll
Sequential road studs with charger and case	2 no. x set of 6
750 mm traffic cones	30 no.
Cone lights	16 no.
Spare batteries for cone light	16 no.
Men at Work Signs	2 no.
Road Narrows Signs	2 no.
610 Arrows Signs	2 no.
Road Closed Signs	4 no.
Flooding Signs	4 no.
Diverted Traffic Signs	5 no.
Traffic Lights Inoperable Signs	4 no.
Pedestrian Demand Unit Covers	8 no.

### 3.2 Emergency Equipment

3.2.1 The company shall as a minimum also have available the equipment stated in Table 3.2. The supply of this equipment may be arranged from other sources but shall be available and deployed as required within the times stated

**TABLE 3.2 EMERGENCY EQUIPMENT**

Equipment	Available on site within
Temporary barrier approved for use on Trunk roads and Motorways. Minimum containment N2 and working width W4.	24 hours
Temporary flood lighting and suitable generator	4 hours
Equipment required for structures as stated in Schedule 4 Part 1 Clause 32.17.	24 hours.

3.2.2 The company shall complete the following table 3.3 identifying it's proposals for the Constructional Plant and equipment that shall be supplied to deal with incidents. This information shall be included in the Quality System and Quality Plan and the Emergency Response Plan.

Table 3.3 **EMERGENCY PLANT AND EQUIPMENT PROPOSALS**

Type of Plant and Equipment	Location of Depot	Number that shall be available

## **Appendix 33/1 Structural Investigations Test requirements**

### **1 Test Requirements**

#### **1.1 Types of Tests:**

##### **1.1.1 Site Surveys/Tests:**

- i) half cell potential survey;
- ii) cover survey;
- iii) delamination/soundness survey;
- iv) exposing reinforcement;
- v) depth of carbonation;
- vi) resistivity measurement;
- vii) Initial surface absorption;
- viii) ultrasonic pulse velocity survey; and
- ix) borescope or endoscope survey;

##### **1.1.2 Chemical Tests:**

- i) acid soluble chloride content;
- ii) water soluble chloride content;
- iii) cement content/sulphate content/mix proportion;
- iv) water/cement ratio;
- v) alkali content; and
- vi) Alkali silica reaction samples;

##### **1.1.3 Physical Tests:**

- i) visual examination of cores;
- ii) density and compressive strength;
- iii) permeability;
- iv) aggregate grading;
- v) petrographic examination;
- vi) micro cracking assessment; and
- vii) electron microscope examination.

### **1.2 Details of Site Tests**

#### **1.2.1 Potential Measurements**

- (ii) Half cell measurements shall be taken to areas proposed by the Company and consented to in writing by the Scottish Ministers at 500 millimetres x 500 millimetres grid centres.
- (iii) The equipment shall be saturated copper sulphate (or suitable equivalent) half cell placed on the concrete surface and connected via a high-impedance voltmeter to the reinforcement.
- (iv) The tests shall be carried out in accordance with American Society for Testing Materials C876-80. Two readings shall be taken at each node of the grid and the mean value used.
  - (a) Where the readings differ by more than 20 mV a third reading shall be

### **Appendix 33/1 Structural Investigations Test requirements**

taken and the mean of the two closest readings used.

Ambient conditions and concrete surface temperature shall be recorded together with details of the type of half cell and its most recent calibration check.

- (b) Excavation to expose reinforcement for electrical connections shall be made good in accordance with the requirements of Series 1700.
- (c) Where appropriate permanent connections shall be made to the reinforcement to facilitate future monitoring of changes in potential.
- (d) The results shall be presented as a grid of values marked on projected plans or elevations of the areas measured at a scale of 1:50.

Potential contours shall also be plotted with colour coding at a scale of 1:50 with a contour interval of 50 mV.

Colour block diagrams shall not be an acceptable alternative to colour contours.

#### **1.2.2 Cover Survey**

- (i) Cover surveys shall be carried out using an instrument complying with the requirements of and in the manner described in BS 1881-204:1988 Testing concrete. Recommendations on the use of electromagnetic covermeters.
- (ii) The lowest cover detected in each grid rectangle shall be recorded.

#### **1.2.3 Delamination/Soundness Survey**

- (i) Delamination / soundness surveys shall be carried out in the following manner
  - (a) A visual survey shall be carried out and concrete defects such as spalling, cracking, crazing, honeycombing, surface deterioration and staining together with patching or remedial operations shall be recorded.
  - (b) Parts of the concrete which shall be suspected of being delaminated shall be tested by sounding with a light hammer.
  - (c) The affected area shall be recorded and the results presented with the final report.
  - (d) Photographic records of typical defects shall be taken for the report.

#### **1.2.4 Exposing Bars**

- (i) Reinforcing bars shall be exposed in areas to be proposed by the Company and consented to in writing by the Scottish Ministers when the results of the potential tests shall be made available.
- (ii) The cut-out shall not be greater than 100 millimetres diameter.
- (iii) The cover to the bars and the condition of the reinforcement shall be recorded.
- (iv) A photograph shall be taken of each bar and caliper measurements taken to establish the residual cross sectional area.
- (v) The removal of concrete shall be carried out carefully such that no damage shall be caused to the reinforcement and overbreak shall be minimised.

#### **1.2.5 Carbonation Tests**

- (i) Tests for depth of carbonation using a phenolphthalein indicator as detailed in Building Research Establishment Information paper IP/6/81 shall be carried out on core samples, drill holes and where concrete shall be broken out either to

### **Appendix 33/1 Structural Investigations Test requirements**

examine the bars or connect the potential measuring apparatus to the reinforcement.

#### **1.2.6 Resistivity Survey**

- (i) Resistivity measurements shall be taken at locations and orientations usually where the half cell potential test has indicated that corrosion of reinforcing steel is most likely.
- (ii) The test procedure shall be similar to that used for measuring soil resistivity using four electrodes temporarily attached to the concrete across which measurements of voltage and current are taken.
- (iii) Details of the proposed testing equipment and method shall be proposed by the Company and consented to in writing by the Scottish Ministers prior to commencing the tests.

#### **1.2.7 Initial Surface Absorption**

- (i) To be carried out in accordance with BS 1881-5:1970 Testing concrete. Methods of testing hardened concrete for other than strength.

#### **1.2.8 Ultrasonic Pulse Velocity Survey**

- (i) Ultrasonic pulse velocity surveys shall be carried out using equipment and procedures complying with BS 1881-203:1986 Testing Concrete; Recommendations for Measurement of Velocity of Ultrasonic Pulses in Concrete.
- (ii) The purpose of this testing is the detection of defects and estimation of the depth of surface cracks using semi-direct or indirect transmission at grid centres not exceeding 150 millimetres.
- (iii) The testing shall be carried out by well-qualified personnel with previous experience in the interpretation of the survey results.
- (iv) A water-soluble non-staining couplant shall be used and subsequently removed by power washing.

#### **1.2.9 Borescope Survey**

- (i) A borescope and suitably experienced operative shall be made available on the O&M Works Site to carry out borescope investigation in holes.
- (ii) The borescope shall be of a type and with sufficient length to be suitable for the purpose intended.
- (iii) The borescope shall also be fitted with a measuring graticule and a camera attachment. Photographs shall be taken of typical defects.

#### **1.2.10 Endoscope Survey**

- (i) An endoscope and suitably experienced operative shall be made available to carry out an endoscope survey.
- (ii) The endoscope shall be of a type and with sufficient length of fibrescope to be suitable for the purpose intended.
- (iii) The endoscope shall be fitted with a camera attachment and photographs shall be taken of typical defects.

### **1.3 Chemical Tests**

#### **1.3.1 Chloride content acid and water soluble tests shall be carried out in the following manner:**

### **Appendix 33/1 Structural Investigations Test requirements**

(i) Dust samples shall be reinforced from concrete members using a 20 to 25 millimetres diameter drill bit and the dust collected by a method described in TRRL Company Report 32 or other suitable method.

(ii) Dust samples from the chloride drillings shall be taken at different depths into the concrete and shall be collected and stored in different containers for each depth range clearly labelled with the location depth range date and name of operator.

The depth ranges shall be 0 to 30 millimetres, 30 to 60 millimetres, 60 to 90 millimetres and 90 to 120 millimetres.

Sufficient dust shall be collected at each depth range to enable both acid soluble and water soluble analysis to be carried out.

(iii) Chloride content shall be determined in accordance with BS 1881-124:1988 Testing Concrete; Methods for Analysis of Hardened Concrete.

Samples from each depth range from each set of drillings shall be analysed for the 'total' chloride content using the acid extraction method.

One sample from the 90 to 120 millimetres depth range for each set of drillings shall be analysed for the 'free' chloride content using the water extraction method.

Where the sample from the 90 to 120 millimetres depth range shall be insufficient or unsuitable the 'free' chloride analysis may be carried out on a sample obtained from one of the other depth ranges from the same set.

(iv) Results shall be given in terms of chloride ion by % cement content.

The average cement and sulfate content shall be measured from the analysis of 10% of the drilling samples.

The location of the drillings shall be determined when the potential measurement plots are available.

The exact position should be determined to avoid reinforcing steel by locating the steel with a cover meter.

1.3.2 Cement content sulfate content mix proportions water/cement ratio and alkali content shall be determined in accordance with BS 1881-124:1988 Testing Concrete; Methods for Analysis of Hardened Concrete, on Samples Obtained from Cores.

1.3.3 Alkali Silica Reaction Samples

(i) Cores shall be drilled at locations proposed by the Company and consented to in writing by the Scottish Ministers.

The cores shall be 75 millimetres diameter drilled to a depth of 400 millimetres.

Intact cores at least 300 millimetres long are required.

(ii) Samples taken from the cores shall be tested for susceptibility of the coarse and fine aggregates to alkali silica reaction.

(iii) The equivalent sodium oxide content shall also be determined for each core. Petrographic examination shall also be carried out as described in the Appendix and

(iv) If alkali silica reaction shall be suspected the Company may propose for the written consent of the Scottish Ministers that the cores be subject to accelerated expansion tests in accordance with Appendix H of the report on 'The Diagnosis of Alkali Silica Reaction' published by the British Cement

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Association in 1988 reprinted 1992 (The Palmer Report) measurements to be continued up to 1 year with interim reports at 3 monthly intervals.

### **1.4 Physical Test**

#### **1.4.1 Examination of Cores Density and Compressive Strength**

(i) Examination of cores density tests and compressive strength tests shall be carried out in accordance with BS 1881-120:1983 Testing concrete. Method for determination of the compressive strength of concrete cores.

Visual examinations are to be carried out on all core samples before preparing the samples for testing.

Density and compressive strength tests are to be carried out on 100 millimetres diameter cores.

(ii) Permeability shall be determined by means of the capillary absorption test in accordance with BS 1881-5:1970 Testing Concrete; Methods of Testing Hardened Concrete for Other Than Strength, on Samples From Cores.

(iii) Aggregate Grading shall be determined in accordance with BS 1881-124:1988 Testing Concrete; Methods for Analysis of Hardened Concrete, on Samples Obtained From Cores.

(iv) Petrographic Examination shall be carried out in the following manner:

(a) Petrographic examination shall be carried out in accordance with ASTM C856-77 on sections obtained from 75 millimetres diameter cores.

(b) The sections shall be obtained from the cores taken for expansion tests for alkali-silica reaction.

(c) Constituent materials shall be identified and a description of the specimen given together with a photograph typically at a magnification of 50X Constituent materials shall be identified and a description of the specimen given together with a photograph typically at a magnification of 50X.

(v) Microcracking Assessment shall be carried out in the following manner:

(a) Selected core samples shall be cleaned of any extraneous debris and air dried in the laboratory.

(b) They shall then be sprayed with a fluorescent penetrant solution (a dispersion of fluorescent particles in an organic liquid).

(c) When the excess solution has drained from the surface the core samples shall be viewed under ultra-violet light.

(vi) Electron Microscope Examination shall be carried out in the following manner:

(a) Where examination of a sample for microcracking alkali silica reaction susceptibility petrographic analysis or any other purpose indicates that some form of deleterious reaction may be present in the concrete the Scottish Ministers may instruct examination by electron microscope.

(b) Where the Scottish Ministers requires examination the following procedure shall be adopted.

(c) Appropriate pieces of the sample which may take the form of thin sections finely ground sections off cuts or freshly broken surfaces shall be explored with the electron microscope to confirm the

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presence of the constituents or products of deleterious reactions and to identify them wherever possible.

(d) A written report shall be submitted with electron micrographs (typically at a magnification of 3500 to 5000X) and results of analysis of the matrix with the microprobe.

## **2 Report Requirements**

### **2.1 Interim Reports shall comply with the following**

2.1.1 An interim report shall be to be submitted for each part of a structure to be investigated within one week of completion of site testing showing the results of all surveys and tests carried out on the O&M Works Site.

2.1.2 Copies of field measurements with suitable explanatory notes shall be adequate.

(i) Chloride content analysis shall be presented within fourteen days of sampling.

(ii) Three copies of each interim report are required.

### **2.2 Final Reports shall comply with the following:**

2.2.1 Irrespective of size which shall dictate the number of volumes the Final Report shall be submitted in two sections.

2.2.2 Section 1 of the final report shall be to be submitted within three weeks of completion of O&M Works Site work and shall contain the following information where applicable.

(i) A description of the testing programme and tests carried out a presentation of the results in the form outlined below and a summary of the results.

(ii) The results shall be presented as follows plotted to a scale of 1:50 unless otherwise instructed

(iii)

(A) half cell potential/ cover	(1)	tabular
	(2)	colour coded contour plans/ elevations to indicate chloride content distribution of results with a contour interval of 50mV
(B) delamination/ soundness	(1)	plan/elevation marked with suspect areas
	(2)	colour print of major defects
(C) petrographic	(1)	colour prints of each section
	(2)	detailed description of section with particular reference or otherwise to alkali silica reaction
(C) ultrasonic pulse	(1)	typical graphs/computer output to demonstrate velocity and interpretation of results
	(2)	plans/elevations/cross sections to show defects detected
(D) electron microscope	(1)	electron micrographs
	(2)	detailed description of section together with results of microprobe analysis

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(E) borescope	(1)	developed elevations of internal surface of holes examined
	(2)	enlarged colour prints of typical defects
(F) endoscope	(1)	plans/elevations/cross sections to show location of fibroscope and direction of view for photographs
	(2)	enlarged colour prints of typical defects and other photographs

(iv) All results shall be presented in tabular form and histograms shall be produced where appropriate.

(a) Section 2 of the final report shall contain a written discussion and interpretation of the results of the survey and testing with recommendations for remedial work.

2.2.2.1.1 A draft copy of the final report shall be submitted for approval before production of the final report.

**2.3 Addendum Reports shall comply with the following:**

2.3.1 The results of the alkali silica reaction expansion test shall be reported on a 3 monthly basis.

2.3.2 An Addendum Report shall be produced to cover all the expansion test results.