



Southwark Highways Works Contract

Lot B - Projects Document B3b

Technical Specification Additional, Substitute and Cancelled Clauses

Table of Contents

PREAMBLE TO THE SPECIFICATION	7
Specification For Highway Works Schedule Of Pages And Relevant Publication Dates	9
Appendix 0/1: Contract-specific additional, substitute and cancelled clauses, tables and figures included in the contract	12
Additional clauses, tables and figures	12
Series 100 – Preliminaries	12
127AR The network and other assets	12
128AR Permits, Consents, Licences and the like	12
129AR Works in Private Land and <i>Client</i> -Owned Property	12
130AR <i>Contractor's</i> Vehicles	13
131AR <i>Contractor's</i> Communication System	13
132AR <i>Contractor's</i> Representative	14
134AR Supervision of Works	14
135AR Identification Cards for Operatives	14
136AR Qualifications of Supervisors and Operatives	15
137AR Employment of <i>Client's</i> Staff	15
138AR Normal Working Hours	15
139AR Accidents	16
140AR Maintenance Compounds/Depots	16
141AR Siting of workshops and depots on the network	16
142AR Storage of materials and plant on roads	16
143AR Stocks of <i>Contractor's</i> materials	17
144AR Pre-inspection/consultation and attendance on the <i>Client</i>	17
145AR Management of the site	17
146AR Considerate constructor's scheme (CCS)	19
147AR Temporary damming of water courses and water flow management	19
148AR Protection of the highway and apparatus	19
149AR Avoidance of traffic nuisance	20
150AR Prevention of fly tipping	20
151AR Accommodating for disabled persons	21
152AR Protection of private property	21
153AR Access to all frontages	21
154AR Possession of site / on-street parking	21
155AR Traffic management act 2004 (TMA)	24
156AR Pelican/toucan/puffin/zebra pedestrian crossings	25
157AR Temporary Traffic Signals	25
158AR Temporary crossing of footways	25
159AR Statutory authorities - supply of service & apparatus	25
160AR Records	25
161AR On-site monitoring	25
162AR Electronic management systems	26
163AR Progress meetings	27
164AR Environmental management	27
166AR Quality Management	31
167AR Advertisements And Graffiti	32
168AR Temporary Works	32
169AR Traffic Management For Special Events	33
170AR Civil Emergency	34
171AR Archaeological Artefacts And Historical Features	34

172AR	Access Equipment For The <i>Client</i>	34
174AR	Mobilisation	34
175AR	Demobilisation	35
176AR	Asset Management	36
177AR	Customer Services & Public Liaison	36
178AR	Fabrication Drawings	37
180AR	Traffic Management For Works Not Covered By The Specification And Price List	37
184AR	Temporary Diversions for Traffic	38
Series 200 – Site Clearance		39
205AR	Transfer Of Waste	39
206AR	Boundary Walls Of Demolition Sites	39
207AR	Removal Of Sign Posts	39
208AR	Removal Of Safety Fences And Gates	39
Series 300 - Fencing		40
313AR	Foundations For Permanent Fencing	40
314AR	Repairs To And Renewal Of Existing Fencing	40
315AR	Make-Safe Fencing	40
Series 400 – Road Restraint Systems		41
413AR	Protection Of Carriageway And Footway Surfaces	41
414AR	Repairs to and Renewal of Road Restraint Systems	41
415AR	De-tensioning and Re-tensioning Procedure for Repairs and Cyclic Maintenance of Wire Rope Road Restraint System	42
416AR	Removal of Road Restraint Systems	42
417AR	Repairs to and Renewal of Existing Pedestrian Guardrail	42
418AR	Painting Of Pedestrian Guardrails And Handrails	43
419AR	Maintenance Painting of Pedestrian Guardrails and Handrails	43
420AR	Site Welding of Damaged Guardrails and Handrails	43
421AR	Repairs to Parapets	43
422AR	De-Tensioning and Re-Tensioning Procedure for Repairs and Cyclical Maintenance of TCB and RHS Road Restraint System	44
Series 500 – Drainage and Service Ducts		46
522AR	Cleaning and Renewal of Filter Drains	46
523AR	Cleaning or Proving of Linear Drainage Block Systems, Combined Kerb and Drainage Block Systems, Subway Drainage Channels and Drainage Within a Highway Structure	46
524AR	Replacing, Raising Or Lowering Covers, Gratings And Frames On Existing Chambers, Gullies And Subway Surface Drains	47
525AR	Cleaning of Culverts	47
526AR	Pump Stations and Maintenance	47
528AR	Renovation of Highway Drainage – General Requirements	50
529AR	Renovation of Highway Drainage – Method and Material Options	52
578AR	Renovation of Highway Drainage - Design	54
530AR	Renovation of Highway Drainage - Design	54
531AR	Renovation of Highway Drainage - Installation	55
532AR	Renovation of Highway Drainage – Performance Requirements	55
533AR	Renovation of Highway Drainage – Type Testing	55
534AR	Renovation of Highway Drainage – Quality Control Tests	56
535AR	Renovation of Highway Drainage – Workmanship, Inspection and Certification	58
Series 600 – Earthworks		60
650AR	Requirements For Compost To Be Incorporated Into Soil Mixtures	60
651AR	Geo-Cellular System Assemblies	60
652AR	Requirements For Laboratories For Test Analysis	61
653AR	Requirements For Imported Topsoil Class 5B And 5C	61

654AR	Root Deflectors	66
Series 700 – Road Pavements - General		68
720AR	Delivery Tickets And Weighing	68
721AR	End Performance In Relation To HAPAS Approved And Other Proprietary Materials And Systems	68
722AR	Siding Out Of Carriageways	68
723AR	Confirming Materials to be Used for Pavement Patching and Minor Repair or Reinstatement Purposes	68
Series 800 - Unbound, Cement and other Hydraulically Bound Mixtures		70
883AR	Frost Protection for Cement Treated Pavements	71
Series 900 - Road Pavements – Bituminous Bound Materials		79
960AR	Stress Absorbing Membrane Interface (Sami)	81
961AR	Stress Absorbing Membrane	81
962AR	PSV Requirements Of Surface Course Asphalt	82
963AR	Removal Of Existing Asphalt Layers	82
964AR	Surface Preparation (Crack Filling)	82
965AR	Ironworks And Drainage	82
966AR	Compliance testing and audit testing	82
967AR	Stone mastic asphalt surface course	82
968AR	EME Surface Course	84
969AR	Warm Mix Asphalt Materials	84
Series 1100 - Kerbs, Footways and Block Paved Areas		90
1112AR	Natural Stone Kerbs, Channels, Quadrants, Angles And Edgings	90
1113AR	General Requirements For Pavements Surfaced With Precast Concrete, Clay Or Natural Stone Flag, Slab, Sett, Paver Or Block Paved Surfaces	91
1114AR	Quality Control Checking And Approval Of Modular Units	93
1116AR	Existing Natural Stone Modular Units Being Taken Up To Store Or Set Aside Area For Reuse	98
1117AR	Cleansing, Deep Cleansing, Re-Texturising And Amendment Of Existing Modular Units	99
1118AR	Quality Control Checking And Acceptance Of Second Hand Imported Natural Stone Kerb, Slab And Sett Modular Units	100
1119AR	Laying Or Relaying Natural Stone Sett Modular Units	100
1120AR	Laying Or Relaying Precast Concrete Flag Or Natural Stone Slab Modular Units	101
1121AR	Laying Or Relaying Precast Concrete Paving Blocks Or Clay Pavers	102
1122AR	Laying Or Relaying Yorkstone Slab Modular Units	102
1123AR	Handling Kerbs And Slabs – Reducing The Risks Of Musculoskeletal Disorders	102
1124AR	Bound Gravel Surfaces	103
1125AR	Working In Inclement Weather	103
1126AR	Siding Out	103
1127AR	Minor Repairs To Depressions In Modular Unit Surfaced Pavements	104
1128AR	Footbridges, Subways And Approach Ramps	104
1129AR	Metal Stud Demis And Parking Bay Delineation Markers	104
Series 1200 – Traffic Signs		105
1232AR	Temporary Variable Message Signs	105
Series 2000 - Waterproofing for Concrete Structures		106
2009AR	Repair of Areas of Defective Concrete	106
2010AR	Waterproofing With Spray Applied Systems	106
2011AR	Waterproofing Below Ground Concrete	107
Series 2300 - Bridge Expansion Joints and Sealing of Gaps		108
2305AR	Asphaltic Plug Joints	108
2306AR	Testing Of Asphaltic Plug Joint Materials	109

2307AR	Replacement of Bridge Deck Expansion Joints	109
Series 2400 - Brickwork, Blockwork and Stonework		111
2418AR	Re-Pointing	111
2419AR	Replacement of Precast Concrete Copings	111
2420AR	Rebedding Existing Precast Concrete Copings	111
2421AR	Foundations To Walls	111
Series 2600 - Miscellaneous		112
2608AR	Dayworks	112
2609AR	Polymer Modified Rendering	112
3208AR	Major Incidents	113
3209AR	Reporting	113
Series 3300 - Investigations & Surveys		114
3301AR	Rotary coring in carriageways	114
3302AR	Structural investigations	114
3303AR	Trial Holes In Paved Areas	117
3304AR	Closed Circuit Television Surveys Of Drainage Systems	118
3305AR	Topographical Surveys	120
Series 4000 Street Furniture		122
4001AR	General	122
4002AR	Removal	122
4003AR	Supply	123
4004AR	Installation	123
4005AR	Repair	123
Series 5000 Maintenance painting of steelwork		124
5016AR	Anti-Graffiti Coatings	124
Substitute Clauses, Tables and Figures		125
Series 100 - Preliminaries		125
109SR	Control Of Noise And Vibration	125
113SR	Programme Of Works	127
114SR	Payment Applications	128
116SR	Privately And Publicly Owned Services Or Supplies	128
117SR	Traffic Safety And Management	129
118SR	Temporary Diversions For Traffic	133
119SR	Routeing Of Vehicles	133
122SR	Progress Photographs	134
124SR	Health And Safety Restrictions, Precautions And Monitoring	134
Series 200 – Site Clearance		142
202SR	Existing trees, stumps and roots	142
Series 600 - Earthworks		143
607SR	Explosives and blasting for excavation	143
609SR	Geotextiles and geotextile-related products used to separate earthworks materials	143
618SR	Topsoiling	143
Series 700 Road Pavements – General		145
711SR:	Overband And Inlaid Crack Sealing System	145
Series 800 - Unbound, Cement and other Hydraulically Bound Mixtures		146
801SR	General Requirements For Unbound Mixtures	146

805SR	Type 3/40, Type 3/20 (Open Graded) Unbound Mixtures	149
Series 1100 - Kerbs, Footways and Block Paved Areas		151
1101SR	Precast Concrete Kerbs, Channels, Quadrants, Angles And Edgings	151
Series 1200 Traffic Signs		153
1202SR	General requirements for permanent traffic signs	153
1203SR	Foundations for permanent traffic signs and signals	153
1204SR	Posts for permanent traffic signs	153
1208SR	Location and erection of permanent traffic signs	154
1210SR	Permanent traffic bollards	154
1211SR	Permanent marker posts	155
1212SR	Road markings	155
1217SR	Traffic signals	159
1219SR	Controlled And Uncontrolled Crossings	160
Series 2000 Waterproofing for Concrete Structures		160
2008SR	Replacement Waterproofing and Repairs to Existing Waterproofing	160
Cancelled Clauses, Tables and Figures		162

Preamble to the specification

1. The Specification referred to in the Tender shall be the 'Specification for Highway Works', published by The Stationery Office (formerly HMSO) as Volume one of the Manual of Contract Documents for Highway Works, as modified and extended by the following:
 - a. Appendix 0/1: *Contract*-specific Additional, Substitute and Cancelled Clauses, Tables and Figures;
 - b. Appendix 0/2: *Contract*-specific minor alterations to existing Clauses, Tables and Figures;
 - c. Appendix 0/3: List of Numbered Appendices;
 - d. Appendix 0/4: List of Drawings.
2. The relevant publication date of each page of the Specification for Highway Works is given in the Schedule of Pages and Relevant Publication Dates.
3. An Additional Clause as indicated by a suffix 'AR' in Appendix 0/1 is a *Contract*-specific alteration.
4. A Substitute Clause as indicated by a suffix 'SR' in Appendix 0/1 is a *Contract*-specific alteration.
5. A Cancelled Clause indicated by a suffix 'CR' in Appendix 0/1 is a *Contract*-specific alteration.
6. Insofar as any of the Numbered Appendices may conflict or be inconsistent with any provision of the Specification for Highway Works the Numbered Appendices shall always prevail.
7. Any reference in the Contract to a Clause number or Appendix shall be deemed to refer to the corresponding Substitute Clause number or Appendix listed in Appendix 0/1 or 0/2.
8. Where a Clause is altered any original Table/Figure referred to in the Clause shall apply unless the Table/Figure is also altered. Where a Table/Figure is altered any reference in a Clause to the original Table/Figure shall apply to the altered Table/Figure.
9. Where a Clause in the Specification relates to work goods or Materials which are not required for the Task Order it shall be deemed not to apply.
10. Any Appendix referred to in the Specification which is Not Used shall be deemed not to apply.
11. Where a Clause in the Specification is prefixed by an # this indicates that this particular Clause has a substitute National Alteration for one or more of the *Clients* of Scotland, Wales or Northern Ireland. Substitute or additional National Clauses shall be used within countries to which they specifically apply, and they are deemed to replace corresponding Clauses in the main text of the Specification as appropriate. The substitute National Clauses are located at the end of the relevant Series together with the additional National Clauses of the *Client's*.
12. The roles and functions of the *Client* shall be undertaken by the Service Manager, or delegated deputies. Where the Specification requires the provision of documentation to the *Client* for statutory or type approval such documentation shall be provided to the Service Manager, or delegated deputies.
13. If the Specification is used in conjunction with a Contract under which the *Contractor* is responsible for the design of any part of the service, the delegation of the roles

and functions of the *Client* as stated in paragraph 12 above shall be amended as follows:

- a. If any agreement, consent or approval required to be obtained from the *Client* impacts on the health and safety of the general public, the environment or any property or Equipment not owned or operated by the *Contractor*, such agreement, consent, approval shall be obtained from Service Manager, or delegated deputies;
 - b. Where the Specification provides for the *Client* to require a test, waive the requirement for a test or alter testing frequency, the party to whom the *Client's* roles and functions have been ascribed by paragraph 12 above shall exercise such decisions in accordance with the requirements stated in the *Contract*.
14. Reference to drawings in the Specification shall apply to drawings incorporated into the Contract by reference in any given Task Order.
 15. Where Standards and other documents are incorporated into the Contract by reference the respective edition used shall be that which is current on the Contract Reference Document Date November 2017 unless otherwise stated in the Specification.

Specification For Highway Works Schedule Of Pages And Relevant Publication Dates

Series/Appendix	Page Number	Publication Date
000	1 to 3	May 2014
000	6 to 7F	February 2016
000	4 to 5	May 2018
100	1 to 2, 4 to 9, 12 to 29F, WF1, N2 to N11F	May 2014
100	3, 10 to 11, N1	December 2014
200	1 to 3F	February 2016
300	1	May 2001
300	4	November 2002
300	2, 3, 5 to 6F	May 2008
400	1 to 24F	May 2017
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
600	1 to 68, 70 to 77F, S1 to S4F, W1 to W4, N1 to N5F	February 2016
600	69	February 2017
700	1 to 36F, N1 to N6F	February 2016
800	1 to 31F	February 2016
900	1 to 77F	May 2018
1000	1 to 45F	February 2016
1100	N1F	November 2006
1100	3	August 2008
1100	1 to 2, 4 to 6F	February 2017
1200	5	May 2001

Series/Appendix	Page Number	Publication Date
1200	2, 3, W1F	August 2003
1200	1, 14 to 16F	May 2004
1200	4, 9 to 11, 13	May 2005
1200	12	November 2006
1200	6, 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	1 to 31F	February 2017
1600	1, 4 to 5, 9, 15, 17, 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	1 to 27F	December 2014
1800	1 to 35F	August 2014
1900	1 to 35F, S1 to S2F	August 2014
2000	1, 3 to 4F	May 2001
2000	2	November 2004
2100	1 to 2F	February 2016
2300	1	March 1998
2300	2 to 3F	May 2001
2400	1, 4, 7F	May 2005
2400	2	May 2006
2400	3, 5, 6	May 2008
2500	1	May 2001
2500	2, 8, 11F	November 2003
2500	10	November 2004

2500	6, 7, 9	May 2005
2500	5	May 2006
2500	3, 4	November 2006
2600	1	March 1998
2600	2 to 4	November 2003
2600	5	November 2004
2600	6	May 2005
2600	7F	November 2006
3000	4 to 7, 10, 12 to 17, 19, 22 to 27F	May 2001
3000	20	November 2004
3000	2, 3	May 2006
3000	8, 9, 11, 18, 21	May 2008
5000	1, 4 to 19F, S1F	May 2005
5000	2 to 3	November 2008
9000	all	November 2003
Appendix A	1 to 4F	May 2014
Appendix B	1 to 3F	May 2014
Appendix C	1 to 2F	May 2014
#Appendix D	1F	May 2014
Appendix D (NI)	N1F	May 2014
Appendix E	1F	May 2014
Appendix F	1 to 54F	May 2018
Appendix G	Not used	
Appendix H	1	May 2004
Appendix H	2	November 2005
Appendix H	3	November 2006
Appendix H	4 to 9F	November 2008

Appendix 0/1: Contract-specific additional, substitute and cancelled clauses, tables and figures included in the contract

Additional clauses, tables and figures

Series 100 – Preliminaries

127AR The network and other assets

1. The Network and Other Assets are as defined in the *Client's* Service Description document Southwark Highways Works Contract, Lot B Projects, Scope Document 5a, Service Description.
2. The *Contractor* shall become familiar with the Network and Other Assets from the date of notification of the award of the *contract*. Access to the Network and Other Assets will not, however, be given until the *starting date*. During this preparatory period the Current Providers and the *Client* will have possession of, and remain responsible for, the Network and Other Assets.

128AR Permits, Consents, Licences and the like

1. The *Contractor* shall be responsible for obtaining all permits (Work Permits, Parking and disabled parking suspensions, Section 58 notice, TFL bus stop suspension application, section 61 notice, TFL signals application, TTRO 14(1), TTRO 14 (2) etc), consents, licences, agreements, wayleaves and the like necessary for the efficient and effective undertaking of the works. The *Contractor* is to propose and provide alternative location for parking and disabled bays (when suspended) along with adequate signage.
2. The *Contractor* is also responsible for obtaining the necessary permits, consents, licences, agreements, wayleaves and the like for its sub-contractors. The *Contractor* shall set out, in each Task Order Response Form, from which organisation they will need to obtain necessary permits, consents, licences, agreements, wayleaves and the like for the works ordered.
3. The responsibility for sending all Traffic Management Plans, Works Activity Footprints, TMAN Notifications, section 58 applications and Street Manager Notifications (NRSWA and Permit Applications) to the relevant highway authority rests with the *Contractor*.
4. The *Contractor* shall ensure they are familiar with the special requirements of Statutory and Other Bodies.
5. The *Contractor* shall arrange for gaining access to boundary fences and adjacent areas from the Network. If access from the Network is impractical, then the *Contractor* will be notified of any licenses or easements which have been arranged to enable the works to be undertaken. Under no circumstances shall the *Contractor* gain access across private land without prior agreement of the landowner.

129AR Works in Private Land and *Client*-Owned Property

1. No work on private property shall start until the *Contractor* is in a position to proceed with that section of work through to completion. The *Contractor* shall give the *Client* and the Owners and Occupiers of the Land not less than 10 calendar days' notice of intention to begin work, except when directed otherwise by the *Client*. Once started, the work shall be carried out with due expedience and be given priority if necessary to ensure satisfactory progress.
2. The *Contractor* shall not encroach beyond the limits of the working and access areas and shall take all steps necessary to prevent entry to the works by unauthorised persons.
3. Across allotments, parks and gardens the *Contractor* shall take every precaution to

keep all excavated topsoil separate and to prevent undisturbed topsoil being pushed into the sub-soil beneath. The full depth of topsoil shall be replaced above the sub-soil and, should it be necessary to import any topsoil, it shall be, at the *Contractor's* expense and of a quality equal to the existing topsoil.

4. Across parks and lawns, any reinstatement shall be carried out with turf of a quality equal to the existing turf. Other grassed areas shall be reinstated with approved turf as directed by the *Client*. The *Contractor* shall cut all reinstated grassed areas throughout the Contract at the intervals as specified or as directed by the *Client*.

Works in Network Rail or London Underground

5. No work shall proceed until the *Contractor* has obtained all necessary approvals from the relevant track operator. The *Contractor* shall comply with the notice periods required by each track operator. Failure to do so may result in delays or additional costs. Any additional costs, either direct or incidental, as a result of not complying with the requirements of the track operator or giving adequate notice shall be borne by the *Contractor*.
6. It shall be noted that the approval times and notice requirements by the track operator shall be in addition and cumulative to any required by the *Client*.
7. The *Contractor* shall be responsible for all liaison with the relevant track operator required to organise access to operational land. This will include, but not be limited to, attending meetings on site and at other locations as required.
8. The *Contractor* shall keep the *Client* informed of the outcome of any liaison with the track operator and, in particular, if there are any difficulties in obtaining the necessary access.

130AR Contractor's Vehicles

1. So far as is practicable, all vehicles used by the *Contractor* and its Subcontractors in the execution of the Contract shall, while in use, bear on both sides and rear identity marks bearing the trading name of the *Contractor* or as otherwise specified by the *Client*. The identity marks shall be maintained by the *Contractor* throughout the *service period*. The *Client* will provide precise details of the logo to the *Contractor* prior to the start of the contract, and the *Contractor* shall ensure that each vehicle displays the logo at the *starting date*.
2. So far as is practicable, all vehicles used by the *Contractor* and its Subcontractors in the execution of the Contract shall, while in use, be equipped with a communications system to which the *Client* has continuous access, plus a GPS system with the ability to track the location of the vehicle, as an aid to incident management, and to provide continuous tachograph records. The *Contractor* shall make such records available to the *Client* upon request.
3. All vehicles shall be "Euro 6/VI compliant. Consideration shall be given to LPG or Electric powered vehicles
4. The *Contractor* shall select the most fuel efficient and lowest emissions vehicle that meets the operational requirement for each journey where a choice is available. Annual performance data shall be submitted to the Overseeing Organisation in the form of waste reused and recycled, carbon emissions from fuel usage, mileage and vehicle type.
5. See sub-Clauses 164AR.14 to 164AR.19 for requirements about the emission standards of vehicles.

131AR Contractor's Communication System

1. The *Contractor* shall establish, maintain and operate, to the approval of the *Client*, a

system of communications operating 24 hours of every day throughout the *service period*. This system shall enable key members of staff of both *Client* and *Contractor* to communicate with one another. So far as is practicable, all vehicles used by the *Contractor* and its Subcontractors in the execution of the Contract shall, while in use, be equipped with this same system.

132AR Contractor's Representative

1. The *Contractor* shall, whenever works or services are being carried out anywhere on the Network, have available a competent *Contractor's* Representative who shall be responsible for the execution of all works in accordance with the Contract and for attending (either personally or by engaging deputies) for emergencies or other matters of a similar nature relating to the works, as reasonably required by the *Client*, within a maximum period of 1 hour during Normal Working Hours. All orders, directions and notices given by the *Client* to such *Contractor's* Representative shall be acted upon expeditiously.
2. The *Contractor's* Representative shall attend meetings with the *Client* to discuss progress of the contract. The *Contractor's* Representative shall also attend meetings with Councillors and/or members of the public, which may take place during normal working hours, in evenings, or at weekends, where issues surrounding service quality are to be considered. The *Contractor* will normally be given reasonable notice of such meetings. The *Client* will normally discuss in advance with the *Contractor* the scope of such meetings. The *Contractor's* Representative may be required to speak on, or respond to, questions on any matter within the purview of the contract. The *Contractor's* Representative may delegate attendance at any such meeting to any suitable substitute, provided that specific approval to that delegation is given in advance by the *Client*. The *Contractor's* Representative, or approved substitute, shall at all times during such meetings maintain a "united front" with the *Client*. The *Contractor's* Representatives shall accept responsibility for all aspects of the works and be helpful, communicative and sympathetic with regard to matters pertaining to the impact of the works on the community.

134AR Supervision of Works

1. During the course of the works, the *Contractor* shall ensure that adequate site supervision is provided. One or more suitably qualified supervisors shall be nominated by the *Contractor* to be in attendance during the complete course of the works, unless otherwise agreed with the *Client*, and these supervisors shall direct on all points relating to the mode of carrying out the works, or to the nature and quality of materials used and workmanship executed, or on any other points relating to the execution of the works.
2. Structures site supervisors shall be present at a site at all times during periods of structural activity.
3. The *Client* shall be empowered to stop any operation that, in its opinion, constitutes a hazard to health or safety until such a time as the hazard has been remedied to its satisfaction. No claim for costs arising from such stoppage will be admitted.

135AR Identification Cards for Operatives

1. The *Contractor* shall issue to all personnel engaged upon the works, a form of identification card which shall be produced on demand in order to identify the said employee and verify its authenticity to enter and execute works in the *Client's* premises or upon the Network. The *Contractor* shall not on any account allow any member of its workforce to attempt to gain entry to any premises owned or leased by the *Client* without possession of the said identification card.

2. The personal details on the identification card shall include the following information:
 - a. A photograph of each person to a form and size approved by the *Client*.
 - b. The person's name.
 - c. The *Contractor's* name, address and telephone number

136AR Qualifications of Supervisors and Operatives

1. The *Contractor* shall ensure that all Supervisors and all Operatives on the Contract are qualified in accordance with the requirements of the Street Works (Qualifications of Supervisors and Operatives) Regulations 2016 (“the Regulations”). Supervisors and Operatives carrying out work outside the scope of the mandatory units of the Regulations shall also be qualified in the appropriate units covering the work that they are undertaking. All operatives working in the highway shall be qualified in '01' under Schedule 3 of the Regulations (Signing, Lighting and Guarding).
2. For works relating to highway structures, Supervisors shall have attained a minimum HNC/HND qualification in either structural or civil engineering (or be able to demonstrate equivalence) and experience within the past five years of undertaking or supervising similar activities.
3. Supervisors of works relating to structural investigations and special inspections shall be degree educated and a member of either the Institution of Structural Engineers or the Institution of Civil Engineers. They shall have relevant recent experience (within the last five years) of undertaking similar works and be able to interpret the findings and make decisions on site regarding the need for additional tests, investigations, etc and be able to direct Operatives accordingly.
4. When works are being carried out which fall under the ambit of the National Highway Sector Schemes (NHSS), then at least one Operative trained under the relevant Scheme shall be present on site at all times.
5. For any site where temporary traffic signals are to be set up, there shall be at least one person on site competent in the operation and adjustment of such apparatus.
6. All Supervisors and Operatives shall be holders of the relevant CSCS (Construction Skills Certification Scheme) card, as issued by the CITB.
7. The *Contractor* shall ensure that all Subcontractors comply with the above in respect of its own employees.
8. Copies of certificates held by all Supervisors and Operatives employed on the Contract shall be made available to the *Client*, on request, at the *starting date* and when new Operatives are employed during the *service period*.

137AR Employment of *Client's* Staff

1. No officer or employee in full time employment of the *Client* shall be employed by the *Contractor*.

138AR Normal Working Hours

1. Normal working hours shall be Monday to Friday between 0800hrs and 1800hrs, Saturday 0800hrs and 1800hrs (with noisy works restricted to 0900hrs and 1400hrs), with no working on Sunday or Public Holidays. The *Contractor* shall request formal agreement for any working outside the normal working hours set out within the Contract. Where working outside these hours is necessary, the Environment Protection Team may request further noise mitigation measures be taken to protect others from site noise. The consent for work outside these hours may be given after any necessary consultation and one week's notice is required from the *Contractor* when seeking such consent for maintenance activities and two (2) weeks' notice for

capital upgrade work.

2. The *Contractor* shall not work outside these normal working hours except in an emergency, when directed by the *Client*, or with the written permission of the *Client*. This does not, however, prevent the *Contractor* from carrying out “non-working” activities outside of these hours, including (but not limited to) office duties, mobilising staff and travelling to site. Also, the *Contractor* shall provide the *Client* with as much advance warning as possible of any emergency work that it is necessary to conduct outside of normal working hours.
3. On Strategic Routes and other traffic sensitive roads, any non-emergency works which require any reduction in carriageway width will not be allowed during the traffic sensitive times unless otherwise agreed in advance by the *Client’s* Network Management Team or *Service Manager*.
4. Unless otherwise agreed or instructed by the *Client*, no traffic management measures shall be allowed on the carriageway of a Strategic Route or other traffic sensitive road, or on a footway / pedestrian area in a retail area from 12 noon on the Friday prior to a Bank Holiday to 12 noon on the Tuesday following.
5. Further restrictions to working times for particular streets or activities might be imposed by the Police, local Environmental Health Departments, or the *Client* through the issuing of permits.

139AR Accidents

1. Details of all accidents resulting in injury to any person involved in works or services under this Contract shall be provided to the *Client* in accordance with Appendix 1/70.

140AR Maintenance Compounds/Depots

1. The maintenance and management of the Network shall be carried out from compounds/depots to be provided by the *Contractor*.
2. The location of the *Contractor’s* compounds/depots shall be in accordance with Appendix 1/71.

141AR Siting of workshops and depots on the network

1. The *Contractor* shall obtain the written approval of the *Client*, including streetworks permits and highways licences as required by the *Client*, prior to the temporary siting of any workshops, mixing plants and depots for the storage of plant or materials on the Network. Sites shall be reinstated to its original condition after use.

142AR Storage of materials and plant on roads

1. Should the *Contractor* wish to store plant, materials or temporary accommodation on the highway, they shall obtain in advance a streetworks permit or highways licence from the *Client* whilst providing its precise proposals. Storage areas shall be agreed with the *Client* for each work location. Materials shall be stored or stacked and kept in a neat and tidy fashion to reduce the space taken to a minimum and to cause the least interference possible to the public.
2. Storage of materials, plant and equipment on highway structures shall only be permitted with the prior approval of the *Client*. In certain circumstances, Southwark Network Management Team approval may be required in advance of the works or phase of the works commencing.
3. The *Contractor* shall accept full responsibility for any damage or accident caused. Under no circumstances shall any materials be left on carriageways or footways without adequate fencing and lighting.
4. All materials required to be disposed of shall be removed from site each day, unless

agreed otherwise.

143AR Stocks of Contractor's materials

1. From the *starting date* the *Contractor* shall have available stocks of materials as required to carry out the tasks as detailed on their programme and any additional stock that the *Contractor* considers necessary to comply with the Contract provisions.
2. From time to time, the *Client* may require additional materials to be brought into stock in the *Contractor's* compounds.
3. All materials required to be stored by the *Contractor* shall be stored at the *Contractor's* compounds unless specifically instructed otherwise. No materials shall be stored at the *Client's* compounds without the prior approval of the *Client*.
4. Combustible materials shall not be stored beneath any highway structure.
5. The *Contractor* shall, when requested by the *Client*, supply and, where requested, store '*Client specified*' equipment. The method for procurement of '*Client specified*' equipment shall normally be as (a) to (f) below:
 - a. The *Contractor* shall obtain up to three open tender quotations for the '*Client specified*' equipment requested;
 - b. The *Client* shall select and confirm equipment to be ordered;
 - c. The *Contractor* shall procure the materials requested. These shall be either taken direct to site for installation else, where required, taken into store;
 - d. The *Contractor* shall provide an updated list of all the '*Client specified*' equipment in stock;
 - e. Where the *Client* instructs the removal and use of an item of '*Client specified*' equipment held in stock then the *Contractor* shall provide an updated list of all the '*Client specified*' equipment in stock.

144AR Pre-inspection/consultation and attendance on the Client

1. When required by the *Client*, the *Contractor* shall attend the *Client* on site in normal working hours for the purposes of pre-inspection, providing consultation and advice, taking measurements, etc prior to the placement of any Task Order at its own cost.

145AR Management of the site

1. The *Contractor* 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.
2. The *Contractor* shall, during the whole time that works are in progress, keep the whole of the site clean and in a tidy condition, and shall remove all material to be disposed of on a daily basis unless agreed otherwise.
3. Particular care shall be taken to ensure that no materials enter drainage gullies. All water pumped from trenches or other excavations shall be confined to proper channels and shall not be permitted to flow across roads or footways. The attention of the *Contractor* is drawn to the likelihood of damage occurring to highway surfacing by oil deposits from stationary and standing plant. Any such damage shall be made good at the *Contractor's* expense to the satisfaction of the *Client*.
4. The *Contractor* shall keep all fire hydrants, stopcocks, manhole covers, electricity supply boxes and all other Public Services readily accessible and free from all obstruction.

5. The *Contractor* shall take all necessary steps to avoid creating a dust nuisance and shall ensure the works are carried out in accordance with the GLA and London Councils publication “The Control of Dust and Emissions during Construction and Demolition – Supplementary Planning Guidance” July 2014 and any revisions. If, in the opinion of the *Client*, the *Contractor* is not dealing adequately with the control of dust, the *Client* may instruct the *Contractor* to carry out such additional measures as the *Client* considers are necessary, at the *Contractor's* expense.
6. The *Contractor* shall keep all roads, private entrances, verges, paths, footways, drains and ditches free from mud, slurry or other material that is deposited through its operations. If mud or other droppings are deposited on the highway by vehicles used in connection with the *contract*, the *Contractor* shall forthwith cleanse the streets to the satisfaction of the *Client*. If necessary, the *Contractor* shall provide a wash down bay for vehicles. The *Client* shall have the authority to close any crossings and exits serving the works if any material deposited is not promptly removed by the *Contractor*. Any losses or expenses incurred as a result shall be borne by the *Contractor*.
7. Only such quantities of plant and materials as are necessary for the proper progress of the works shall be kept on a site at any one time. Plant and materials shall be placed only in such places as the *Client* may allow, and all materials shall be kept neatly stacked or trimmed to the *Client's* direction and satisfaction. The *Contractor* shall temporarily remove from site all plant and materials if circumstances arise which, in the opinion of the *Client*, make such removal necessary.
8. The *Contractor* shall obtain the approval of the *Client* to the siting of any huts, equipment, stacks or heaps within the highway. Such approval will only be given when the *Client* has satisfied himself that no danger or limitation to sight lines will be caused. On completion of the works, the huts, equipment, etc shall be removed and the site made good to the satisfaction of the *Client*.
9. Site lighting shall be kept at the minimum brightness necessary for adequate safety and security. Lighting shall be located and directed in such a way to reduce adverse impacts to residents and local wildlife (e.g. bat roosts and bird nesting areas).
10. The *Contractor* shall make its own arrangements, including applying for planning permission, with the owners, tenants and occupiers concerned for the use of any private land for plant, stores, working space, borrow pits or spoil dumps.
11. On completion of the works, and before departing, the *Contractor* shall clear the site of all rubbish, materials, etc and generally eliminate all signs of its presence on the site and leave it in a clean and tidy condition to the satisfaction of the *Client*. All areas used for the storage of materials and site offices shall be reinstated to the *Client's* satisfaction at the *Contractor's* expense. The burning of any type of waste shall be prohibited.
12. Existing traffic and pedestrian flows shall be maintained at all times except where allowed for in the Contract or agreed with the *Client*.
13. The *Client* shall be given 48 hours' notice of the *Contractor's* intention to switch traffic phases, and no diversions shall be implemented until the measures associated with the previous phase of work have been fully removed. For any road closures or diversions other than those specified, the *Contractor* shall give the periods of notice for Temporary Traffic Regulation Orders detailed in Appendix 1/7.
14. All temporary traffic routes and access arrangements shall be co-ordinated with the *Client*, the Police and the other Emergency Services.
15. Road closures and diversions shall be co-ordinated with bus operators. One week's notice of the timings of changes to traffic phasing and diversion routes shall be given

to allow bus operators to plan alternative routes. Existing bus stops shall remain operational at all times unless temporary stop positions are agreed. Safe pedestrian routes and crossing points shall be maintained to all permanent or temporary bus stops while these are in use.

16. Clearly defined pedestrian routes shall be maintained at all times. These routes shall be signed, fenced and lit. Pedestrian access shall be maintained to all adjacent properties at all times.

146AR Considerate constructor's scheme (CCS)

1. The CCS is a national initiative to improve the image of the industry by raising the standards of construction, design and management above statutory requirements. The CCS's emphasis is on improving relationships with the local community to minimise inconveniences and disruptions.
2. Outline details of the CCS are contained in Appendix 1/73 with which the *Contractor* shall adhere.
3. The *Contractor* shall register with the CCS by means of a single annual sum, as detailed in Appendix 1/73.

147AR Temporary damming of water courses and water flow management

1. Where works are to be carried out adjacent to or over watercourses requiring the flow of water to be temporarily abated or accommodated, the *Contractor* shall be responsible for all necessary measures. These measures shall include the design, provision, establishment, maintenance and removal of all temporary damming, earthworks, pumping, pipework, hoses, filters, linings, revetments and other associated items. The *Contractor* shall notify the *Client* in writing 14 calendar days in advance of its intention to start any part of any works affecting a watercourse and they shall ensure that written approval for all proposed measures is obtained from the Environment Agency. The *Contractor* shall obtain all necessary permits, consents, wayleaves, licenses and agreements to enable the works to proceed and allow sufficient time within its programming.
2. The *Contractor's* obligations with respect to the protection of watercourses, particularly against the effects of pollution, remain unaltered by the above Clause.
3. Flow in existing sewers shall be maintained at all times. Any proposals involving a sewer connection or the diversion of flow in sewers, and any proposed measures to maintain the flow in sewers shall, under all circumstances, be subject to the approval of the *Client*. The *Contractor* shall give to the *Client* a minimum of three calendar days' notice prior to carrying out any work affecting existing sewers. Temporary measures for carrying surface water or foul sewage flows shall provide no less capacity than the pre-existing arrangement.
4. The *Contractor* shall restore and make good any existing field drains, house drains or other drains, pipes, sewers or other existing sewerage facilities interfered with and which are not to be abandoned.

148AR Protection of the highway and apparatus

1. All street furniture, signs, fences, trees, shrubs, greens, footpaths, footway and carriageway surfaces, etc adjoining or near a site shall be protected, and any damage arising out of operations under this Contract shall be made good at the expense of the *Contractor* and to the satisfaction of the *Client*. The *Contractor* shall inform the *Client* of any damages, and any rectification work shall be carried out within 7 calendar days or as specified by the *Client*.
2. The *Contractor* shall obtain approval from the *Client* prior to commencing any

excavation on, under or adjacent to any highway structure. The *Contractor* shall submit to the *Client* at least 28 calendar days in advance of the works any method statements, drawings and the like required by the *Client* to assess the effects of the works on the structure and to ensure that the safety of the structure and the public is not compromised. It should be noted that not all the required information may be available, and that trial holes and other investigations may be required prior to the works commencing. The *Contractor* shall allow for obtaining this information and the approval periods within its programme. Failure to do so may result in delays and additional costs which will be borne by the *Contractor*.

3. The *Contractor* shall locate buried cables by means of detection equipment which can record cable depth prior to any works within the area. The *Contractor* shall demonstrate, on request of the *Client*, its ability to locate and mark as necessary, and to maintain and remove its marking upon completion of the works.
4. Where necessary, the *Contractor* shall provide protection to existing cables, or install new diversionary cables, to maintain electrical supplies to lighting columns and lit signs. The *Contractor* shall give to the *Client* two weeks' notice of the proposed date of any changes to the cable network and shall not proceed until arrangements for the switchover from existing to temporary cables has been agreed.
5. The *Contractor* shall take all necessary precautions to prevent accumulation of water upon or adjacent to the works and shall remove such water as speedily as possible. Any damage caused by accumulation or percolation of water shall be made good at the *Contractor's* expense.
6. The *Contractor* shall take every possible precaution to avoid damage to trees and shrubs, including protective temporary fencing to guard as much of the canopy of a tree as possible, whilst not obstructing established footways and rights of way and visibility for the highway user. Such measures shall be maintained for the whole of the period that works are taking place in the vicinity of the trees and shrubs.
7. Trenching close to trees and shrubs, and work beneath the canopy of trees, shall include such measures as necessary to avoid root damage and severance and to avoid damage to the canopy and foliage. The *Contractor* shall, when working around and adjacent to the root systems of trees, shrubs and the like, fully comply with the requirements of the National Joint Utilities Group Publication Number 10 "Guidelines for the Planning, Installation and Maintenance of Utility Services in Proximity to Trees".
8. The lopping of branches of trees essential to the progress of the works, and any unavoidable removal of small trees and shrubs, shall only be carried out following approval from the *Client*.
9. The *Contractor* shall take all reasonable measures to avoid damage to roadside planting and grass verges. Areas of grass and planting damaged during the course of the works shall be reinstated to the approval of the *Client*.

149AR Avoidance of traffic nuisance

1. The *Contractor* shall at all times be under an obligation to minimise the effects of its operations on traffic. They shall, in general, seek to keep as short as possible operations within the highway, and shall seek to carry out such operations at times chosen so as to minimise disruption to traffic flows. They shall arrange the transport of plant and materials so that any additional traffic as arises shall be limited as far as is reasonably possible so as to cause no avoidable congestion.

150AR Prevention of fly tipping

1. The *Contractor* shall effectively ensure that no earth, soil, rubble, rubbish or other

waste material removed from a site in connection with the works by the *Contractor's* transport is deposited, dumped or fly-tipped in whole or in part on any land, street or premises whatsoever (except in the case of lawful disposal) without the previous consent, in writing, of the owner or occupier of the said land, street or premises. The *Contractor* shall make its employees and any permitted or nominated Subcontractor fully aware that dumping or fly tipping in any form or place is strictly prohibited and will render the *Contractor* liable to prosecution. The *Contractor* shall produce, whenever required, satisfactory evidence that each load carted away has been deposited only at an approved tip and the *Contractor* shall provide the *Client* with the name and address of any driver of any vehicle contravening this requirement.

2. Notwithstanding the above, the *Contractor* shall indemnify the *Client* against all claims, expense, or proceedings brought against the *Client* by reason of fly tipping by the *Contractor*, the *Contractor's* workforce or Subcontractors.

151AR Accommodating for disabled persons

1. The *Contractor* shall pay special attention to the needs of disabled persons. If there is a need to close a disabled person's parking bay, the *Contractor* shall agree with the *Client* to where it should be relocated. The *Contractor* shall not allow any of its vehicles to block dropped crossing points.
2. Following any planing/milling works, the *Contractor* shall install temporary ramps at all dropped crossings. The *Contractor* shall ensure that all excavations, works and materials in the highway are properly lit, signed and guarded so as to create the minimum inconvenience to disabled pedestrians, especially those with mobility difficulties or with impaired sight.

152AR Protection of private property

1. The *Contractor* shall take all necessary precautions to protect private property (e.g. forecourts, walls, gates, driveways, cellars, etc) from damage, and will be held responsible for making good any damage whatsoever at its expense to the satisfaction of the property owner. Any costs incurred by the *Client* as a result of damage attributable to the *Contractor*, including time and administrative costs, will be recovered from the *Contractor*.
2. The *Contractor* shall inspect each site prior to the commencement of its works, take photographs and report to the *Client* any existing defects or damage to private property. The *Contractor* shall, at its own cost, carry out such condition surveys as they consider necessary to protect its own interest. The *Contractor* shall not commence any work which they have good reason to believe will interfere with the integrity of adjacent property, irrespective of its state of repair, until the *Client* and the property owner have been advised of any problem.

153AR Access to all frontages

1. So far as is reasonably practical, access to all frontages, whether residential or commercial, shall be maintained at all times during the works. The *Contractor* shall engage with residents and business owners to agree temporary arrangements and to reduce inconvenience to a minimum. Emergency services shall always be granted access to and though a site.

154AR Possession of site / on-street parking

1. The *Contractor* will not be deemed to have sole possession of the site and shall allow full facilities to other contractors or Statutory Authorities engaged employed on the site or adjacent sites. The *Contractor* shall take into consideration the difficulty of parking in some locations and shall devise methods of working that avoid the parking of any vehicles or plant in a manner that contravenes any Traffic Regulation

Order. Parking difficulties shall not be in any way interpreted as a failure on the part of the *Client* to provide right of access. Only Vehicles that are essential to the works that are being carried out are to be given access to site.

2. The *Contractor* shall be responsible for ensuring that the site is free of obstruction caused by parked vehicles which may affect its planned progress of work. In this connection, the *Contractor* shall give adequate notice and shall liaise with the appropriate authorities to ensure that the necessary suspension of On-Street Parking, and/or arrangements for dealing with illegally parked vehicles, are made.
3. The *Contractor* shall not close any part of any street or public way, or occupy any land for materials, without first obtaining the permission of the *Client*, and shall not continue to keep closed such portion of any street or public way, or continue to occupy such land, beyond the time for which such permission has been given.
4. The *Contractor* shall indicate within its programme reasonable dates that they require individual roads to be closed or for “no waiting and loading” restrictions to be introduced in order to carry out its works. The *Contractor* shall allow a minimum of 12 weeks’ notice to the *Client* in order for the appropriate orders to be made. Approval of the programme should be considered as approval of the programme of road closures and waiting and loading restrictions.
5. One week prior to any road closure or temporary waiting and loading restrictions being brought into force, the *Contractor* shall erect warning signs indicating the time at which the restrictions will come into force, its duration, a brief indication of the purpose of the restrictions, the *Contractor’s* name and 24hr emergency number. The *Client* shall approve the wording and layout of the sign prior to fabrication.
6. The signs shall be attached to convenient lamp columns or sign posts. For a road closure 2 signs will be located at either end of the road or a section of the road to be closed, plus 2 at every junction with another road within the extent of the closure. For temporary waiting restrictions, one at each end of the extent of the restrictions, plus one at every 30 m between.
7. The *Contractor* shall, on the same day as the erection of the signs, distribute to every property, and attach to the windscreen of every vehicle parked within the extent of the road closure or temporary waiting and loading restrictions. The *Client* will supply the template to be utilised by the *Contractor*, with the final version to be submitted for *Client’s* approval 2 weeks of the notices being distributed.
8. On the day prior to the road closure or temporary waiting and loading restrictions, the *Contractor* shall attach to the windscreen of every vehicle within the extent of the road closure or temporary waiting and loading restriction The *Client* will supply the template to be utilised by the *Contractor*, with the final version to be submitted for *Client’s* approval 2 weeks of the notices being distributed. The *Contractor* shall also place ‘no waiting’ cones to deter parking.
9. Throughout the period of any closure, the *Contractor* shall provide, erect, maintain and subsequently remove such traffic signs, road markings, lamps, barriers and traffic control signals and such other measures as may be necessary to safely maintain the closure in accordance with the recommendations contained in Chapter 8 of the Traffic Signs Manual 1991.
10. When the *Contractor* encounters an obstruction that prevents it from carrying out works or services required by the *contract*, the *Contractor* shall make every effort to identify who is responsible for the obstruction, including the owners and drivers of vehicles. This shall include calling at all nearby residences, businesses and shops. In general, all addresses within 50 m of the obstruction shall be visited (although where a building outside this distance may reasonably contain owners/drivers such

premises shall also be visited). When the *Contractor*, using its best endeavours in accordance with the above requirements, fails to get an obstruction removed, they will then become responsible himself for removing the obstruction, assuming that it is physically possible to remove it.

11. Where the obstruction is caused by parked vehicles and the *Contractor*, having made its best endeavours to have the vehicles removed by its owners/drivers, and/or to carry out the works in the presence of the obstructing vehicle(s), they may elect to remove the vehicle(s) by means of an approved mechanical vehicle-lifter. The removal of vehicles by a lifter is viewed by the *Client* as very much a last resort, however approval to use a mechanical lifter will not be unreasonably withheld.
12. The *Contractor* shall give the *Client* notice before resorting to a mechanical vehicle-lifter. Two weeks before the vehicle-lifter is to be present at the site, the *Contractor* shall deliver letters to all addresses and place notices on all vehicles on and within 50m of the site. This will inform of the nature of the works, the exact location, the need for removal of parked vehicles and the attendance of the mechanical vehicle-lifter. At 7.00am on the morning of the works the *Contractor* shall place temporary signs saying "NO PARKING. ESSENTIAL HIGHWAY WORKS TODAY. OBSTRUCTING VEHICLES WILL BE REMOVED" immediately in advance of the works.
13. The selection and use of a vehicle removal firm will be at the approval of the *Client*. The chosen vehicle removal firm shall be aware of, and shall comply with, all the legal requirements associated with the removal and relocation of vehicles from the public highway. The *Contractor* shall ensure that all recovery vehicle operatives hold a current certificate, recognised by the Institute of the Motor Industry or the Motor Industry Training Standards Council, confirming that they have successfully completed training in the use of the vehicle removal equipment to be operated for the purposes of the *contract*. The *Contractor* shall submit to the *Client*, prior to commencement of vehicle recovery operations, copies of such certificates, together with copies of the driving licences of the operatives.
14. The *Contractor* shall ensure that all recovery equipment used for the vehicle relocation is operated in accordance with the recommendations of the "Code of Practice on Health and Safety for Vehicle Recovery Operators" published by the Association of Vehicle Recovery Operators, and that all vehicle relocation operations are conducted in accordance with the Network Health and Safety Plan.
15. On no account shall vehicles be moved by the *Contractor* without first obtaining the permission of the owner or its authorised agent, unless in the presence of and with the permission of a Police Officer. Removed vehicles shall be relocated to a suitable location, if possible within 30 metres of the works and in sight of the original location. Where possible the vehicle shall be replaced in its original location at the earliest possible opportunity. Any vehicle not returned to its original location shall be reported without delay to the national removed vehicles database "Trace". The *Contractor* shall leave a notice on a trestle (or other approved method) at the location of any removed vehicle not relocated within 30m of its original location informing owners that "Vehicles Obstructing Essential Road Works Have Been Removed" and giving the *Contractor's* name and a contact telephone number, to answer any enquiries.
16. The *Contractor* shall fully indemnify the *Client* against all claims and damages that may arise from the mechanical lifting of vehicles. The *Contractor* shall deal with all reports or allegations that vehicles have suffered damage. All such claims shall be dealt with professionally, promptly, and politely. In all cases where damage to a vehicle by the *Contractor* necessitates the said vehicle being unavailable to its owner/driver, the *Contractor* shall provide the said owner/driver with an equivalent

vehicle for the whole of that period at no cost to the owner/driver or to the *Client*.

17. Upon completion of the Task Order works the *Contractor* shall:
 - a. Remove all temporary parking suspension signs;
 - b. Notify the *Client* that works has been completed.
18. Correct installation and any damage caused during the erection and removal of the sign to the street lighting column or post will be the responsibility of the *Contractor*.
19. The *Contractor* shall retain details of all temporary parking suspensions including installation photographs for the full *service period* and retain these for a period of six years after the end of the *service period*.

155AR Traffic management act 2004 (TMA)

1. The *Contractor* shall comply with the following:
 - a. Traffic Management Act 2004 and associated updates
 - b. New Roads and Street Works Act 1991
 - c. Street Works (Registers, Notices, Directions and Designations) (England) Regulations 2007
 - d. Street Works (Charges for Unreasonably Prolonged Occupation of the Highway) (England) Regulations 2009
 - e. The Transport for London Lane Rental Scheme.
2. In addition to and notwithstanding the above, when undertaking works or services within an area in which the highway authority operates a permit scheme, the *Contractor* shall comply with the requirements of the London Permit Scheme for Road Works and Street Works.
3. For works classed in the Traffic Management Act 2004 as Immediate (Urgent or Emergency), the *Contractor* shall notify the *Client* within two hours of commencing work.
4. The responsibility for raising and issuing Provisional Advanced Authorisations, Permit Applications and Notices for Cyclic, Reactive and Scheme works rests with the *Contractor* in accordance with the London Permit Scheme, Traffic Management Act 2004 and the New Roads and Street Works Act 1991. Applications shall be made electronically via the Street Manager system.
5. The *Contractor* shall adhere to all notice/permit requirements and conditions.
6. The responsibility for sending all Traffic Management Plans, Works Activity Footprints, TMAN Notifications, and Street Manager Notifications (NRSWA and Permit Applications) to the relevant highway authority rests with the *Contractor*.
7. The *Contractor* shall check and reply to all Street Manager Comments and ensure all Web Service Transactions have been sent successfully.
8. The *Contractor* shall sign up to the Mayor's Code of Conduct for Street Works.
9. In addition to the above, highway authorities operating this Contract have powers under the Traffic Management Act 2004 to issue fixed penalty notices against promoters who commit offences. The Fixed Penalty Notice offences listed in the Regulations will have affect as though the *Contractor* were a statutory undertaker, and the charges/fees listed in those Regulations will therefore also apply as they would to a statutory undertaker. The relevant Regulations are specified above. The *Contractor* should assume that such charges/fees will be applied unless specifically stated in the *Client's* Service Description document Southwark Highways Works

Contract, Lot B Projects, Scope Document 5a, Service Description.

10. Failure to comply with the Acts or Regulations outlined above will lead to charges being imposed on the *Contractor* in line with the fines associated with the relevant legislation, e.g. The Street Works (Charges for Unreasonably Prolonged Occupation of the Highway) (England) Regulations 2009. The *Contractor* should assume that such charges/fees will be applied unless specifically stated in the *Client's* Service Description document Southwark Highways Works Contract, Lot B Projects, Scope Document 5a, Service Description.
11. The *Contractor* shall comply with the staff training, assessment and certification policy as required by the TMA. Qualifications of supervisors and operatives shall be as per the Street Works Act.

156AR Pelican/toucan/puffin/zebra pedestrian crossings

1. If any works are within 50 metres of pelican, toucan, puffin or zebra crossings, this should be brought to the attention of the *Client*. Upon the instruction of the *Client*, the *Contractor* shall ensure that the signal / Belisha head is suitably covered and signs indicating that the crossing is temporarily out of use shall be provided and maintained on both approaches to the crossing.

157AR Temporary Traffic Signals

1. Temporary traffic signals may be operated by a generator only during Normal Working Hours and at no time on Sundays or Bank holidays, except in emergencies. Outside these hours, traffic signals shall be operated by means of batteries with a reserve capacity of 24 hours from the time of the proposed expiry time. The *Contractor* shall provide information boards with a 24-hour per day call out number displayed at the temporary traffic signals.
2. Temporary traffic signals shall include a pedestrian phase wherever such facility is deemed necessary by the Network Management Team.

158AR Temporary crossing of footways

1. The *Contractor* shall provide one week's notification prior to commencing any works where it is necessary for lorries or heavy plant to be driven across the public footway. The *Contractor* shall, at its own expense, remove the existing kerb and surfacing, excavate as required and provide, lay and maintain a temporary crossing to the satisfaction of the *Client*. On completion of the works for which the access is required, it shall be permanently reinstated to its former construction, at the *Contractor's* expense.

159AR Statutory authorities - supply of service & apparatus

1. When so required, the *Contractor* shall make arrangements with one or more Statutory Undertakers for the supply of electricity, gas, water or telephone services for use in connection with the *contract*. The *Contractor* shall pay all fees and charges and comply with all requirements laid down by the respective Undertaker.

160AR Records

1. The *Contractor* shall keep records, as required in the Contract or by the *Client*, available for inspection. Copies of records shall be supplied to the *Client* at such intervals and times as they may require.

161AR On-site monitoring

1. Where confirmed by the *Client* that they propose to carry out on-site monitoring, the following arrangements shall apply.
2. Monitoring officers reporting to the *Client* may visit a sample of approximately 10%

of sites to observe work in progress during normal working hours. There will also be occasional, random, visits to sites outside normal working hours. During these visits, the monitoring officers will check all aspects of quality, safety and consideration to the public. The programme of monitoring will be decided on a random basis and the *Contractor* will be given no advance information or warning of visits.

3. In the event that the monitoring regime identifies non-conformance by the *Contractor* in any respect with the standard required by the *contract*, the *Client* will determine whether such non-conformance has also been identified as such by the *Contractor* and programmed for rectification. Should this not be the case, they will meet with the *Contractor* or its representative and seek to reach agreement on a joint programme of additional checks intended to either:
 - a. Restore the *Client's* confidence that the *Contractor* is in general performing to the standard required by the *Contract*, and that the non-conformance identified was exceptional; or
 - b. Identify any systemic problems in the *Contractor's* performance, with the aim of arriving at jointly agreed action to remedy these problems.
4. Such a programme of additional checks may include:
 - a. Full inspection and checks of any re-work of non-conformant work.
 - b. Additional monitoring visits to other contemporaneous works.
 - c. Additional materials tests.
5. Should agreement not be achieved between the *Client* and the *Contractor* on a joint programme of additional checks, the *Client* shall have power to implement a programme of checks designed to meet either of the above objectives. Full facilities shall be given to the *Contractor* to participate in such checks. The costs of such additional checks will be borne by the *Contractor* by deduction from accounts rendered.

162AR Electronic management systems

1. The *Contractor* shall be allowed access to the *Client's* Electronic Management System based on CONFIRM (Pitney Bowes Systems) in order to develop, test and maintain modules that will allow the following features (unless otherwise specified in the *Client's* Service Description document Southwark Highways Works Contract, Lot B Projects, Scope Document 5a, Service Description):
 - a. Recording and reporting of all incidents and defect and fault reports received from all sources, including safety and service inspections, the Client, the Police and the public;
 - b. Recording and reporting of all risk assessments and all actions undertaken in respect of the above (including before and after photographs) and issuing fault clearance reports;
 - c. Programming of maintenance activities;
 - d. Recording details of maintenance activities and the condition of elements of the Network; and
 - e. Provision of reports and inspection certificates to the Client.
2. The *Contractor* shall also develop, test and maintain modules in the *Client's* Electronic Management System to:
 - a. Prepare and submit all applications for payment;

- b. Produce receipts and measure for all Task Orders; and
- c. Process all completion and maintenance certificates.

163AR Progress meetings

1. The *Contractor* or its representative(s) shall attend regular progress meetings convened by the *Client* or its representative(s). The *Client* will notify all parties concerned of the date, time, venue and agenda of the before the scheduled meetings. The *Contractor* or its representative shall make a record of the meeting and distribute to all parties concerned within five calendar days.

164AR Environmental management

Environmental Objectives

1. The *Contractor* shall be aware of and contribute towards the following Environmental Objectives:
 - a. Reduce greenhouse gas emissions (CO₂)
 - b. Reduce pollutant emissions to the air (NOx and PM10)
 - c. Reduce transport related noise and vibration.
 - d. Maintain and, where possible, enhance the quality of London's built environment.
 - e. Maintain and, where possible, enhance the quality of London's natural environment.
 - f. Reduce resource consumption and improve green procurement.
 - g. Reduce the waste generated by applying the principles of "reduce, reuse and recycle".
 - h. Reduce water consumption.

Environmental management system/environmental advisor

2. The *Contractor* shall operate for the duration of the Contract an Environmental Management System. This shall be independently accredited to BS EN ISO14001: 2015 or equivalent within one year from the *starting date*. Additionally, at its own cost, the *Contractor* shall appoint an Environmental Advisor who is suitably experienced in ISO14001 to review and ensure the *Contractor's* activities are compliant with the principles of ISO14001. Prior to employment of the suitably experienced person, the *Client* shall be provided a copy of their CV and will have the right to reject the person on the grounds that they are not suitably qualified.

Identification, mitigation and recording of environmental impacts and risks

3. In addition to the requirements set under BS EN ISO 14001: 2015, the *Contractor* shall systematically identify the environmental impacts and risks of site-based works. The forms at Appendix 1/18 and 1/19 provide an appropriate auditable process for recording the identification and mitigation of environmental impacts and risks by both the *Client* and *Contractor* as follows:
 - a. For improvement projects and capital renewal works the form Appendix 1/18 "Environmental Evaluation Checklist for Improvement Projects and Capital Renewal Schemes" shall be used.
 - b. For revenue maintenance the form Appendix 1/19 "Environmental Best Practice and Legal Compliance Checklist for Revenue Maintenance" shall be used.

4. Wherever practicable, negative impacts shall be removed, designed out or avoided

and positive impacts maximised.

5. The *Contractor* shall ensure that emergency procedures for each site and work type are developed. The procedures shall be appropriate to the anticipated hazards and risks. Emergency procedures shall include emergency pollution control measures that shall take into account Environment Agency (EA) guidelines. Emergency procedures shall contain emergency phone numbers and the method of notifying local authorities and statutory authorities. Contact numbers for the key staff of the *Contractor* shall also be included. The *Contractor* shall report environmental incidents to the *Client* immediately.

Civil engineering environmental quality assessment and award scheme (CEEQUAL)

6. The *Client* may decide to use 'CEEQUAL for Term Contracts' to undertake formal verified assessments of scheme and maintenance works. To facilitate this, the *Contractor* may be asked to provide at *Clients* cost one CEEQUAL Term Contracts Assessor.

***Contractor's* environmental performance reporting**

7. The *Contractor* shall report the information listed below on a quarterly basis via templates supplied by the *Client*.

Environmental reporting information

Procurement

8. For each type of material the following amounts are to be reported:
 - a. Total material purchased (kg and £000s)
 - b. Virgin material purchased (kg and £000s)
 - c. Recycled material purchased (kg and £000s)
 - d. Certified as sustainably sourced material purchased (kg and £000s)
9. Types of material include:
 - a. Metal
 - b. Plastic
 - c. Wood
 - d. Sand
 - e. Bituminous materials
 - f. Cementitious materials
 - g. Unbound aggregate materials
 - h. Natural stone
 - i. Mulch
 - j. Topsoil

Waste

10. Amount of:
 - a. Construction and demolition waste generated (tonnes)
 - b. Construction and demolition waste reused (tonnes)
 - c. Construction and demolition waste recycled (tonnes)

- d. Hazardous waste generated (tonnes and litres)
 - e. Hazardous waste reused and recycled (tonnes and litres)
11. Construction and demolition waste includes the following excavated and non-excavated materials
- a. Concrete bound material
 - b. Bituminous material not containing tar
 - c. Soil, sand and stone
 - d. Bollard shells
 - e. Concrete based furniture
 - f. Duracast polyurethane street furniture (and any other plastic street furniture)
 - g. Wood (including timber-based street furniture)
 - h. Street cleaning residue
 - i. Green waste
 - j. Metal
12. The *Contractor* is responsible for managing and monitoring the environmental performance of its Subcontractors and ensuring that all proper controls are in place to ensure legal compliance and compliance with the Contract Agreement.
13. The *Contractor* is encouraged to suggest economically viable working methods and materials which may result in an improvement in environmental performance in the carrying out of the works or an improvement in environmental performance of the completed works.
14. The *Contractor* is expected to monitor and record water consumption at depots and offices.

Greenhouse gas (CO₂) and air quality (NO_x and PM₁₀)

15. Amount of:
- a. Energy used at depots
 - b. Energy used at office
16. The following information is to be collected for each vehicle:
- a. Make and model
 - b. Kilometres travelled
 - c. Volume of fuel used (litres)
 - d. Type of fuel used
 - e. Euro standard

Control of Vehicle and Plant Emissions

17. All *Contractor* and Subcontractors' vehicles shall be procured or leased in accordance with the following principles:
- a. Consider **CO₂**, air quality and noise impacts as part of the decision-making process when procuring and leasing vehicles.
 - b. Adopt a technology neutral approach in procurement and leasing of vehicles.
18. All *Contractor's* cars and vans shall meet the following **CO₂** limits and European

emission standards (Euro 6 standards).

19. All *Contractor's* heavy-duty road vehicles and non-road diesel engines shall meet the following Europeans emission standards (Euro VI standards).
20. European emission standards for engines used in new non-road mobile machinery (NRMM) should follow stage V regulation. The standards are effective from 2019 for engines below 56 kW and above 130 kW, and from 2020 for engines of 56-130 kW.
21. 18. If any road vehicles or non-road diesel engines become due for replacement during the period of the *contract*, the *Contractor* shall ensure that the replacement vehicle/engine meets the European emission standards and **CO₂** limits (if applicable) for that year in which it is introduced into the fleet. If vehicles to meet the requirements are not available by the specified deadline, then the *Client* will consider an alternative standard until such time as those vehicles become available. The *contractual* requirement to meet these standards does not apply to Subcontractors' vehicles.
22. In line with *Client's* environmental strategies and commitments to reduce carbon dioxide emissions, the *Contractor* is also encouraged to include zero or ultra-low carbon vehicles in its fleet, such as electric, plug-in hybrid or biomethane vehicles, where possible.
23. All members of the *Contractor's* staff who drive vehicles under this Contract shall undertake a fuel-efficient driver training course within three months of the *starting date*, if no previous training has been undertaken. The training course shall consist of theoretical training and practical implementation skills and shall be a minimum duration of one hour. Throughout the duration of the *contract*, any new staff employed by the *Contractor* who drive for work shall also be required to undertake fuel- efficient driver training. The *Contractor* shall encourage its Subcontractors to undertake similar fuel-efficient driver training. The *Client* may request evidence of the training from time to time.

Environmental Training and Communication

24. The *Contractor* shall supply to staff and Subcontractors appropriate environmental information and training necessary to undertake its role. The *Contractor* shall provide to the *Client* at the *starting date*, and shall maintain and keep current, details of training, certification and competencies for all staff involved in the works.

Protection of protected species

25. In the event that protected species are found on site during works, the *Contractor* shall stop work and only resume after approval from Defra is received. Only Defra licensed ecologists shall handle protected species. The *Client* shall be informed of the presence of protected species on site.

Protection of the Green Estate

26. Whilst carrying out works, the *Contractor* shall take full responsibility for the care and preservation of all green estate assets, including but not limited to trees, shrubs, hedges and grass.
27. Avoidable non-compliance that results in damage to Green Estate assets may result in the *Contractor* paying compensation to the *Client* equivalent to the full replacement cost of the current asset(s) which in the case of trees is the Capital Asset Valuation for Amenity Trees (CAVAT) value.

Protection of Watercourses

28. The *Contractor* shall ensure that works are carried out in accordance with the EA's note *PPG05: Works in near or liable to affect water courses* and CIRIA's report *C532: Control of water pollution from construction sites*.

Waste Management

29. The *Contractor* shall comply with the current legislation relating to the handling, storage, transfer and disposal of all waste materials, including requirements set by the Site Waste Management Plans Regulations 2013. The *Contractor* shall use the Site Waste Management Plan Template supplied and initiated by the *Client* unless otherwise agreed with the *Client*.
30. The *Contractor* shall seek to reduce the amount of waste generated. The *Contractor* shall aim to maximise the reuse and recycling of any demolition and excavation waste that is generated.

Procurement of Sustainable Materials

31. When procuring materials, the *Contractor* shall comply with the Mayor of London's Responsible Procurement Code and with any other *Client* specific procurement guidance. Particular attention is drawn to Clause 183AR – Sustainable Timber.

Environmental Action Plan

32. The *Contractor* shall produce an annual Environmental Action Plan. The actions contained within the Plan shall:
- a. Support the Environmental Objectives (sub-Clause 1 above);
 - b. Have challenging but achievable target dates assigned;
 - c. Be presented to and agreed by the *Client* during mobilisation to commence delivery from 1 April in Year 1; and then in subsequent years to be presented to and agreed by the *Client* during March to commence delivery 1 April;
 - d. Be completed, evidenced and approved by the *Client* before the end of each financial year; and
 - e. Include at least one action per financial year relating to collaborative working with others to deliver a pan-London environmental initiative or benefit.
33. Progress and approval of actions will be monitored via quarterly progress meetings with the *Client* in addition to the quarterly Environmental Managers' Forum. The *Contractor* might also wish to request additional meetings with the *Client* to discuss progress or to seek sign-off for completed actions.

166AR Quality Management

1. The *Contractor* and its personnel shall operate a comprehensive and effective quality management system which:-
- a. Shall include BS EN ISO 9000 quality assurance certification or incorporate its principles;
 - b. Focuses on the prevention rather than the detection of quality failures and leads to minimum faults and rectifications;
 - c. Has a flexible, adaptable and innovative approach to service delivery that incorporates changing customer/user/*Client* requirements;
 - d. Takes advantage of all opportunities for innovation and seeks continuous

- improvement;
- e. Incorporates an effective human resource management system which effectively achieves quality service delivery through people.
 2. The *Contractor* shall operate quality control procedures as part of this system and this system shall be open to inspection by the *Client*.
 3. The system shall ensure that all locations and processes involved in service delivery are well and properly maintained and that the Specification and Contract Conditions are complied with in all respects. Such a system shall include daily supervision, the carrying out of frequent inspections, and compliance with the instructions of the *Client*.
 4. In the event that any reasonable written recommendations concerning the improvement of such a system are made by the *Client* from time to time, such recommendations shall forthwith be implemented by the *Contractor*.
 5. Unless otherwise instructed by the *Client*, a scheme-specific Quality Plan shall be submitted for acceptance by the *Client* before any Scheme works are commenced. This Quality Plan shall, for the construction/works phase of the scheme, include a resourced Site Supervision Plan and quality control and testing proposals. The Quality Plan shall be reviewed and updated at suitable intervals during the works. All Quality Plans and Method Statements shall indicate "hold points" as follows:
 - a. *Contractor's* hold points where no further work shall proceed without the
 - b. Written approval of a designated person of the *Contractor's* management,
 - c. Who shall be named in the Quality Plan;
 - d. *Client's* hold points where no further work shall proceed without the written permission of a designated representative of the *Client*.

167AR Advertisements And Graffiti

1. No advertisements shall be erected within the site by the *Contractor* or by any Subcontractor without the prior consent of the *Client*. Should any advertisement be erected within the site without such consent, the *Client* may instruct the *Contractor* in writing to remove it within 24 hours. Should such an instruction not be carried out, the *Client* may remove the advertisement and charge the cost to the *Contractor*.
2. Any unauthorised fly-posting or graffiti appearing on any buildings, hoardings, fencing, etc at a Compound or the site of the works when possession is taken by the *Contractor*, shall be immediately removed by the *Contractor* at their own cost.

168AR Temporary Works

1. The *Contractor* shall, at its own expense, submit to the *Client* for checking and approval detailed drawings and calculations for all temporary works sufficiently in advance of the commencement of any such works. The *Contractor's* proposals shall be subject to any amendments required by the *Client*, and its consent may not be given before the expiry of 14 calendar days from the receipt of such drawings and calculations. Erection of any part of the temporary works shall not be commenced until the *Client's* consent for that part has been given. All temporary works shall be properly designed to carry all imposed loads. No agreement given or implied by the *Client* shall relieve the *Contractor* of its responsibilities under the Conditions of *Contract*.
2. For temporary works relating to highway structures, proposals shall be submitted to the *Client* in accordance with BD2. Temporary works designs shall follow a similar technical approval procedure as for permanent works and shall be accompanied by temporary works design and check certificates signed by the *Contractor's*

Representative. The *Contractor* shall discuss the requirements for temporary works with the *Client* and shall allow at least 28 calendar days within its programme for approval of each submission. Several iterations of the same submission may be required before approval is obtained.

3. Where temporary works require access to, or have the potential to affect, operational railways, the approval process for the specific track operator shall be followed. The *Contractor* shall make suitable allowance within its Programme for obtaining these approvals.
4. Where temporary works affect, or have the potential to affect, listed structures or statutory undertakers' equipment, the *Contractor* shall follow the approval process required by the statutory consultee. The *Contractor* shall make suitable allowance within its Programme for obtaining these approvals.
5. The erection of scaffolding and other temporary works shall comply with the Applicable Law and on completion shall be checked and examined by the *Contractor's* competent appointed person (Safety Officer) as required by law. Thereafter, checks shall be made by them to ensure that all safety provisions are being maintained.

169AR Traffic Management For Special Events

1. The *Contractor* may be required to set out traffic management for special events. Full details of each event and traffic management layout will be supplied to the *Contractor* by the *Client*. The *Contractor* may be required to provide and install traffic management (see Clause 190AR) or, alternatively, to collect *Client*-owned signs from the *Client's* store and to deliver to site, and to set up, the signs and any ancillary equipment as instructed. The *Contractor* shall maintain personnel and vehicles on site in order to maintain or modify the layout of the signs for the period instructed during the special event and shall remove from site the signs and return to the *Client's* stores on instruction from the *Client* or the Police.
2. Special events may take place at any time of year and on any day of the week.
3. The *Contractor* shall meet with the *Client's* Special Event Coordinator at the location specified by the *Client* to discuss and arrange any traffic management establishment for a special event following any reasonable request for such a meeting.
4. The *Contractor* shall take all reasonable care of the *Client's* equipment and signs and protect such equipment and signs from damage, scratches, dents and the like. The *Contractor* shall be responsible for replacing any equipment or signs that may have become damaged during the time that they are in the *Contractor's* custody. The *Contractor* shall check in and out all equipment utilised for special events and immediately report to the *Client's* Special Event Coordinator any loss or damage of signs or equipment.
5. When instructed by the *Client*, the *Contractor* shall be required to provide or to hire and deliver to site special equipment or signage.
6. The *Contractor* shall, prior to the commencement of the special event, propose the level of resources, works plan and equipment list to be used in delivering the requirements to the Special Event Coordinator for approval. The *Contractor* shall record all such resources utilised and its record sheet shall be signed as certified and correct by the Special Event Coordinator or its representative on the same day and immediately following the special event.
7. Throughout each special event the *Contractor* shall maintain an adequate system of watch, commensurate with the event requirements, of all signage and equipment in accordance with the Contract and any instruction from the *Client*.

170AR Civil Emergency

1. In the event of a major civil emergency affecting the Affected Property, the *Contractor* may be required to perform services as specified in the *contract*, or akin to those specified in the *contract*, with minimal or no notice.

171AR Archaeological Artefacts And Historical Features

1. In areas of archaeological importance, or near to listed buildings or structures, the *Contractor* shall identify the potential impact of the works on, and suitable control measures for the protection of, archaeological artefacts and historical features before starting work.
2. All old coins, statues, articles of virtue or antiquities of any description which may at any time be found during the performance of the works shall become the property of the *Client* and the *Contractor* shall, as soon as such articles are discovered, take proper precautions to prevent them being damaged or stolen or removed, and notify the *Client* of such find.
3. If, in the course of excavations, the *Contractor* shall uncover Roman or Medieval remains, the *Client* shall be notified and shall not excavate through or remove the spoil until the *Client* has given the authority to do so. In such cases English Heritage or the Museum of London Archaeological Unit may attend site, and the *Contractor* shall provide all necessary facilities to allow them to carry out its operations for location and recovery of artefacts.

172AR Access Equipment For The Client

1. When requested, the *Contractor* shall provide items of access equipment as set out in Appendix 1/75.

174AR Mobilisation

1. The *Contractor* shall commence Mobilisation as soon as is reasonably practicable after receiving notification from the *Client* that they are to be appointed, to ensure that they are fully ready and able to provide the required works and services from the *starting date*. The activities to be undertaken during Mobilisation shall include:
 - a. Establishing and testing all internal and external communication facilities and systems;
 - b. Establishing all administrative systems;
 - c. Preparing accommodation and equipment;
 - d. Developing a working relationship with the *Client* and its staff;
 - e. Establishing communication with the *Client's* Traffic Control Centre;
 - f. Establishing Emergency Response arrangements, where relevant, including a 24/7 Call Centre;
 - g. Establishing Winter Service arrangements, where relevant;
 - h. Developing incident management plans for a range of incident types such as fatalities, chemical spillages and lane closures;
 - i. Becoming familiar with the Network and all interfaces and boundaries;
 - j. Appraising the tasks carried out by the outgoing Service Providers and identifying any tasks required by the *Client* which have not been carried out by previous Service Providers;
 - k. Taking all reasonable steps to obtain from the outgoing Service Providers and the *Client* all records, programmes and other information necessary or

required for the carrying out of the duties under this *contract*;

- l. Identifying where these records, programmes and other information are incomplete or missing and making recommendations to the *Client* regarding actions necessary to complete them;
 - m. Carrying out design reviews of schemes designed by others to be implemented after the *starting date* and notifying the *Client* at the earliest opportunity of any design concerns so that changes in scope, specification and cost can be agreed and incorporated enabling the *Contractor* to accept the role of Designer under CDM without delaying programme delivery;
 - n. Ensuring that all necessary network access permits are applied for to enable programme delivery to commence on the *starting date*.
 - o. Establishing access to the *Client's* Asset Management System, where relevant, to ensure usage and management of the data stored from the *starting date*;
 - p. Attending training sessions organised by the *Client* in the use of the *Client's* Asset Management System and its component modules, where relevant;
 - q. Reviewing the results of any surveys, assessments or other investigations that have previously been carried out by others, where these are relevant to providing the service, and advising the *Client* as to its adequacy and the need for any further survey or other work;
 - r. Liaising, as appropriate, with the outgoing Service Providers and any others to ensure that the transitional arrangements operate smoothly;
 - s. Becoming familiar with any residual duties to be performed by the outgoing Service Providers and any ongoing work being performed on the Network;
 - t. Advising the *Client* of any addition to the service which the *Contractor* considers appropriate to be performed during Mobilisation;
 - u. Developing, finalising and submitting initial work programmes;
 - v. Developing, finalising and obtaining approval to the Quality Plan;
 - w. Developing, finalising and submitting initial Environmental Action Plan;
 - x. Developing, finalising and submitting initial Health and Safety Action Plan.
2. The *Contractor's* attention is drawn to the fact that, on the *starting date*, the condition of the highway network, and certain other aspects of it, may have changed from the condition it was in at tender stage.

175AR Demobilisation

1. The *Contractor* shall commence Demobilisation as soon as the *Client* confirms, in writing, the date of the end of the *contract*, or three months before expiry, whichever is the earlier. The activities undertaken during Demobilisation shall include:
 - a. Delivering to the *Client* all data as defined in the *Contract*
 - b. Providing all necessary facilities, advice and assistance to enable the incoming Service Provider to perform its duties equivalent to the *Contractor's* Mobilisation duties;
 - c. Handing back all materials and equipment provided by the *Client*, in good order;
 - d. Preparing and submitting to the *Client*, no later than three months before the end of the *contract*, a report on all outstanding defects and work in progress

and identifying Task Order work that the *Contractor* expects to be completed after the end of the *contract*.

176AR Asset Management

1. The *Contractor* shall, during Mobilisation and throughout the *service period*, assist the *Client* in establishing, developing and keeping updated all inventories and records that form part of the *Client's* Asset Management System. The *Client* may, or may not, instruct or allow the *Contractor* to undertake additional asset data collection services as a part of this contract. If such services are provided under this Contract they will be paid for under a Task Order and the requirements for such activities will be discussed with the *Contractor*.
2. The *Contractor* shall retain all asset data information that it collects, or is provided with by the *Client*, in good order for the duration of the Contract in such form as to be capable of audit (including electronic means) by the *Client*, and shall be compatible, where appropriate, with the *Client's* systems as described in the *Client's* Service Information. The *Contractor* shall make such records available for inspection by the *Client* at all reasonable times. The *Contractor* shall provide copies of any records as requested by the *Client*. Whenever records are created or maintained on a computer or other electronic storage device, the *Contractor* shall back up such records using a suitable procedure accepted by the *Client*. All such data remains the property of the *Client* as defined in the Contract.

177AR Customer Services & Public Liaison

1. The *Contractor* shall assist the *Client* and agents of the *Client*, in dealing with queries and complaints received relating to the *contract*, by providing detailed and accurate responses to requests for information within the period for reply set out in the *contract*.
2. The *Contractor* shall maintain close liaison with, and operate systems compatible with those used by, the *Client's* communication team. The *Contractor* shall deal promptly with any query or complaint referred to the *Contractor* as a result of an enquiry to the communication team, and on completion of the necessary action by the *Contractor* in relation to any such query or complaint, the *Contractor* shall inform the appropriate communication team personnel of the action taken in addition to any other register, record or report required under this *contract*.
3. The *Contractor* shall provide postal, telephone, facsimile and e-mail electronic transfer facilities for receipt and transmission of customer service enquiries and responses, as appropriate.
4. The *Contractor* shall provide any information that is needed to enable the *Client* to prepare statements or responses to questions or issues raised by or on behalf of any public organisation (including the United Kingdom parliament, any local authority or any member or representatives of the foregoing), within any time periods which may be imposed by the *Client* (acting reasonably having regard to the purpose of the provision of the information requested and to the nature and extent of the information requested) unless it is impossible for the *Contractor* to do so, in which case the *Contractor* shall immediately inform the *Client* setting out in full the reasons.
5. Where such questions or issues are raised with, or addressed to, the *Contractor*, they shall not communicate directly with such public organisations in respect thereof without having obtained the prior written approval from the *Client* to the form and terms of such communication, save to the extent that they are legally required to do otherwise.
6. The *Contractor* shall promptly inform the *Client* of any communications in connection

with the Contract from:

- a. MPs or MEPs;
 - b. Cabinet Members or Councillors;
 - c. Any public organisation; or
 - d. Any other third party.
7. Where the matters in question might reasonably be expected by the *Contractor* to have political significance or to be in the public interest, the *Contractor* shall promptly provide the *Client* with copies of all such written communications and shall reply directly only when factual information already in the public domain is involved. The *Contractor* shall refer all other issues to the *Client* for attention, after sending a holding reply.
 8. The *Contractor* shall provide the *Client* with the information necessary for the operation of the *Client's* information service specifically including, but not limited to, details of proposed lane closures and traffic safety and management measures.
 9. Where instructed to do so by the *Client*, the *Contractor* shall arrange for signs to be erected to inform users of planned road closures and/or lane closures at least 28 calendar days before implementation, giving the times and dates of the closure, to enable users to choose an alternative route.
 10. The *Client* will carry out public consultations and serve statutory and other formal notifications where needed. The *Contractor* shall, however, be responsible for notifying the public of forthcoming works and for all other communication and liaison with the public necessary to complete projects in a considerate and safe manner.
 11. The *Contractor* shall make recommendations to the *Client* on publicity arrangements for any work on the Network and, when requested by the *Client*, the *Contractor* shall prepare draft circular letters advising local residents of works that will affect them and shall submit such letters, with addresses, to the *Client* for approval. The *Contractor* shall deliver circular letters when requested by the *Client* and shall inform relevant authorities affected by any work.
 12. All costs incurred by the *Contractor* in carrying out any of the functions set out in this Clause shall be borne by the *Contractor*.

178AR Fabrication Drawings

1. Scheme specific requirements for fabrication drawings shall be as instructed by the *Client*.
2. Three copies of any detailed working and fabrication drawings, prepared by or on behalf of the *Contractor*, shall be submitted for the *Client's* approval. Such approval shall in no way relieve the *Contractor* of its responsibilities for the work under the *contract*. When the drawings have been approved, the *Contractor* shall provide both hard copy and electronic copy of the approved drawings to the *Client*.
3. The minimum period for submission of the drawings prior to commencement of the related works shall be 4 weeks.

180AR Traffic Management For Works Not Covered By The Specification And Price List

1. Whilst the *Contractor* is required to allow in all its schedules of rates for all traffic management, except diversion signing and temporary traffic signals they are also required to price a schedule of traffic management items under this Clause. These prices are only for use when there is a need to produce a rate for work which is not already covered by the Specification or Schedule of Rates. On no account shall

these rates be used for any other works or services, as traffic management is deemed to be included in the rates.

184AR Temporary Diversions for Traffic

1. The provisions of this Clause do not apply to any temporary access or accommodation works which the *Contractor* may construct for its sole use in the execution of the works.
2. Each temporary diversion for traffic shall be made operative in advance of any interference with the existing arrangements and shall be maintained in accordance with sub-Clause 6 below. The *Contractor* shall remove and reinstate each temporary diversion for traffic as soon as it is no longer required.
3. If the *Contractor* proposes to construct a temporary diversion for traffic as part of its intended traffic safety and management measures, they shall submit an outline of its proposals to the highway authority for its agreement and consultation with the Police.
4. The *Contractor* shall submit a formal application to the appropriate authority for any statutory orders required to be made or notices required to be published through the *Client*, allowing such time as is stated in Appendix 1/17 for the orders to be made and notices to be published.
5. The standard and siting of every temporary diversion for traffic shall be suitable in all respects for the class or classes of traffic using it, and its width shall be not less than that of the existing street.
6. Pedestrian access to public transport services and adequate facilities for bus queues shall be provided and maintained at all times. Routes for pedestrians shall be clearly defined and signposted and free from hazards and obstructions. The surfaces shall be firm, clean and even. Routes shall be of the shortest practicable length having regard to the circumstances, and the unobstructed width shall be not less than as existing, or 1.2 metres, whichever is the lesser. Changes of level shall be effected by ramps of gradient not steeper than 1 in 10.
7. Wherever changes of level occur between temporary and permanent carriageways they shall be effected by ramps of gradient not steeper than 1 in 3. Where temporary bridging is used it shall, where reasonably practicable, be constructed with the deck flush with the adjacent road surface. It shall be designed in accordance with BS EN 1990: 2002 and BS EN 1991-1-7:2006 and the relevant DfT BEs and BDs. The bridge deck shall have a surface of material to be approved by the *Client* and shall have a clear width of between 3.25m and 3.5m for one-way operation or a minimum of 6.75m for two-way traffic. All temporary bridging shall be fitted with sound-deadening packing and surfacing to the approval of the *Client*. The provisions of this Clause shall not apply to any temporary access or accommodation works which the *Contractor* may construct for its sole use in the execution of the works.

Series 200 – Site Clearance

205AR Transfer Of Waste

1. When required by the *Client*, a signed transfer note copy as referred to in the Waste (England and Wales) Regulations SI 2011/988 and Environmental Protection (Duty of Care) (Scotland) Regulations SSI 2014/4, together with a written description of load signed by the authorised person of the accepting licensed tip, shall be submitted.

206AR Boundary Walls Of Demolition Sites

1. The *Contractor* shall provide all hoardings, fences, fans, staging or other measures which may be necessary or which the *Client* may require for the protection of the public and adjoining property until the completion of the works. The *Contractor* shall be responsible for the making safe by shoring, or other means, any buildings which adjoin buildings which are to be demolished during the development. All demolition work shall be carried out in a proper, safe, clean and efficient manner and in accordance with BS 6187: 2011.
2. As a general principle, but subject to the specific requirements of the *Client*, where the sites of buildings which are to be demolished adjoin sites of demolition at a later date, the walls and fences which exist on the boundaries between the adjoining sites shall not be demolished and the walls of buildings to be demolished which could serve as boundary walls between the demolition sites shall be left standing to a height of 2 metres above ground level and shall be made good.

207AR Removal Of Sign Posts

1. Existing sign posts that are to be removed may, by agreement with the *Client*, be cut off level with the top surface of the concrete foundation and the surface reinstated.
2. If there is no foundation, the post shall be completely removed.
3. Before removal of sign posts carrying illuminated signs, the *Contractor* shall arrange with the for the disconnection of the electricity supply to the electrical Equipment

208AR Removal Of Safety Fences And Gates

1. Removal of safety fences shall include all the constituents of the part or complete fence instructed to be removed, including footings and anchorages, attachments, adjuster assemblies, fixings, closure pieces and stiffeners.
2. After removal of concrete footings and anchorages, the resulting holes shall be backfilled and compacted with material similar to, and to the profile of, the adjacent ground. Where this is filter drain material, it shall be of similar material and grading.

Series 300 - Fencing

313AR Foundations For Permanent Fencing

1. All foundations for fencing shall be ST3 (C12/15) concrete or above of minimum size 450 x 450 by 600mm deep.
2. Break out of hard surfaces and excavation for post holes shall be kept to the minimum practicable surface area, and the existing finished surface edges around post holes shall be cut to form a neat square to receive concrete surround. A permanent reinstatement to any posthole shall have all traces of concrete removed from grass surfaces, subsoil/topsoil (min. topsoil 150mm) compacted in the hole and the finish shall match the surrounding surface, making good with existing surfaces.

314AR Repairs To And Renewal Of Existing Fencing

1. Repairs to and renewal of existing fences shall comply with the appropriate Clauses in Series 200 and 300. If any posts, rails or lengths of fencing are removed to facilitate repairs or renewal of existing fences they shall be reinstated as soon as possible and in the meantime the gap in the fencing shall be patrolled or closed with temporary fencing so that no unauthorised entry onto the adjoining land takes place and no stock escapes from the adjoining land.

315AR Make-Safe Fencing

1. The *Contractor* shall erect make-safe fencing as follows: Type 3 fencing (Highway Construction Details Drawing. No H2); or Traffic or Pedestrian Barriers in accordance with the Code of Practice; Safety at Streetworks and Roadworks.

Series 400 – Road Restraint Systems

413AR Protection Of Carriageway And Footway Surfaces

1. All footway and carriageway surfaces shall be adequately protected from any damage or staining which may result from dismantling or erection works, including the mixing and storing of concrete or cement, when boards of an adequate size shall be used. Any damage or staining caused to a footway or carriageway surface shall be repaired or cleaned off to the *Clients* satisfaction, failing which, the *Client* may arrange for such work as is necessary to reinstate surfaces to its satisfaction and deduct the cost of any such work from any sums due to the *Contractor* under the *contract*.

414AR Repairs to and Renewal of Road Restraint Systems

1. The *Contractor* shall carry out works to road restraint systems of different types within the Area and shall comply with the relevant Clauses of Series 200 and 400, and with TD19/06 – Requirements for Road Restraint Systems.
2. Works to road restraint systems shall include work under the following generic headings:
 - a. repair of road restraint systems;
 - b. de-tensioning and re-tensioning of tensioned corrugated beams (TCB), rectangular hollow sections (RHS) and wire ropes;
 - c. removal of road restraint systems;
 - d. erection of new road restraint systems.
3. Work shall comprise the taking down of parts or sections of existing road restraint systems and the erection in their place of new parts or sections of road restraint systems following accident damage. The *Client* will instruct as required repairs or replacement of long-term deterioration of the road restraint systems.
4. All accident damage repairs shall be carried out using the same type of road restraint system and the same type of post as currently exists.
5. Where long driven posts have been damaged, they shall be replaced with similar long driven posts unless otherwise instructed by the *Client*.
6. Driven posts shall not be replaced where a damaged post has been withdrawn. The nearest adjacent post position shall be used. (This requirement is likely to incorporate one additional post in the repair.)
7. Where posts have been withdrawn and not replaced, the disturbed ground shall be properly reinstated to match existing.
8. Where existing posts and concrete are removed, and new posts and concrete footings are installed in the same location, any remaining voids shall be filled with concrete as directed by the *Client*. Concrete shall be Grade C25/30 in accordance with the relevant Clauses of the 1100 Series.
9. Existing bolts, nuts and washers shall not be re-used in the works.
10. In order to facilitate the rapid repair of road restraint systems when metal posts set in concrete are necessary, beams shall be fixed in position and be temporarily supported for a minimum period of 48 hours after placing of concrete. Temporary supports shall not remain in position for longer than 7 calendar days.
11. Where drilling, cutting or welding of beams or posts is accepted by the *Client*, cut or welded edges shall be coated with two coats of zinc rich paint to BS 4652:1995.

12. Where holding down bolts are to be renewed and rotary coring is instructed by the *Client*, the replacement anchor bolt shall be in accordance with Clause 403.
13. Displaced filter drain media shall be reinstated and the area in the vicinity of the repair generally made good.

415AR De-tensioning and Re-tensioning Procedure for Repairs and Cyclic Maintenance of Wire Rope Road Restraint System

1. The length of road restraint system to be de-tensioned and re-tensioned shall be the damaged length and the lengths at either side to the nearest undamaged rigging screw or anchorage.
2. The following procedure shall be used to de-tension and tension a road restraint system section which is to be repaired:
 - a. slacken off wire ropes which have previously been tightened to a tension as set out in accordance with BS 7669-3:1994;
 - b. starting at one end, slacken rigging screws to the nearest undamaged rigging screw or anchorage;
 - c. carry out repair;
 - d. re-tension as sub-Clause 3 below.
3. Re-tensioning
 - a. Wire Rope Safety Fence shall be re-tensioned in accordance with BS 7669-3:1994, Section 2.5 or equivalent.
 - b. Tensioning shall be undertaken only when the ambient temperature shall be between 30°C and – 10°C.
 - c. Before tensioning the ropes the ambient temperature shall be agreed by the *Client*.
 - d. The tension shall be measured using a tension indicating device accepted in writing by the *Client*.
 - e. Before putting the safety fence into service the tension in each rope shall be checked and it shall be re-tensioned if necessary.

416AR Removal of Road Restraint Systems

1. The items of road restraint systems ordered for removal shall be taken from within the Area to a licensed tip and shall include all the constituents of the part or complete system instructed to be removed, including attachments, adjuster assemblies, fixings, closure pieces and stiffeners.
2. After removal of concrete footings and anchorages, the resulting holes shall be backfilled and compacted with material similar to, and to the profile of, the adjacent ground. Where this is filter drain material it shall be of similar material and grading.

417AR Repairs to and Renewal of Existing Pedestrian Guardrail

1. Repairs to and renewal of existing pedestrian guardrail shall comply with Clause 411 and the following:
 - a. In general work will comprise the taking down of parts or sections of existing guardrail and the erection in their place of new parts or sections of guardrail following accident damage.
 - b. Where 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 or sub- base material as directed by the *Client*.

Concrete shall be ST2.

- c. Existing bolts, nuts and washers shall not be reused in the works.
- d. Pedestrian guardrails shall conform to the requirements of BS 7818:1995.
- e. Pedestrian guardrail shall be erected in accordance with the recommendations of the manufacturer.

418AR Painting Of Pedestrian Guardrails And Handrails

General

1. Where required in the *contract*, painting shall be carried out in accordance with Clause 5007.
2. All steel fabricated into units before delivery to the site shall be free of mill scale, rust and foreign matter when viewed by normal vision and painted without delay.
3. All other surfaces of iron and steel shall be rendered clean, dry and free from grease, rust or mill scale prior to priming.
4. Galvanised surfaces which have been exposed to atmospheric weathering for a period of 26 weeks or more shall be cleaned down and primed. Galvanised surfaces which have not been weathered for 26 weeks shall first be treated with an etching compound.
5. After etching and before priming, galvanised surfaces shall be thoroughly rinsed with clean water to remove chemical residues from the treatment and allowed to dry.
6. Aluminium surfaces shall be cleaned and thoroughly degreased with industrial methylated spirit prior to the application of a thin coat of proprietary etch primer applied in accordance with the manufacturer's instructions. The surfaces shall then be treated with an etching compound, Undercoat and Finish Coats.
7. All primed surfaces shall be painted with one coat of accepted undercoating of the colour appropriate to the colour of the finishing coat.
8. Two finishing coats of the colour and type as directed by the *Client* shall be applied.

419AR Maintenance Painting of Pedestrian Guardrails and Handrails

1. Maintenance painting of pedestrian guardrails and handrails shall be in accordance with Series 5000.

420AR Site Welding of Damaged Guardrails and Handrails

1. In some instances, where damaged pedestrian guardrails are to be cut out, the *Contractor* shall allow for welding back in place new sections of railing in order to affect a repair in accordance with Clause 414AR.

421AR Repairs to Parapets

1. In general, repair work to parapets shall comprise the removal and replacement of parts or sections of existing steel parapets following accident damage.
2. Prior to any works to replace or repair existing parapets, adequate protective measures including lighting and control of ambient conditions to progress the works shall be installed. A mobile "shield" which does not protrude below the soffit of the bridge and is fitted with adequate kentledge for stability may be used over live carriageways subject to the agreement of the *Client* and the Police. The protective measures shall prevent 'Weld Flash'.
3. Repairs to parapets shall comply with the appropriate clauses in Series 1800, this Series and with the following:-

- a. Damaged sections or elements of parapets shall be replaced with sections of equivalent properties which shall be welded in situ with full strength butt welds. All structural steel replacement sections shall be galvanised in accordance with Clause 1909 prior to erection. All welded repairs shall be carried out to comply with the requirements of the relevant standards.
 - b. Existing mesh shall be removed by unbolting or drilling out existing fixings.
 - c. Existing undamaged cover strips shall be retained. The new mesh shall be fixed using stainless steel self-tapping screws at existing fixing points in the rails. All new mesh shall be stainless steel or galvanised as instructed, with a mesh grid of 50mm and a minimum gauge of 6 S.W.G.
 - d. When new steel sections are to be installed they shall be galvanised in accordance with Clause 1909.
 - e. Where a metal coating has been damaged, the affected area shall be rubbed down to remove excessive roughness and shall be cleaned and made good by the application of an accepted zinc rich primer to a minimum dry film thickness of 100µm.
 - f. Existing expanding type anchors which are to be replaced shall be removed by diamond core drilling to a diameter of 48mm and a minimum depth of 250mm. The sides of the cored hole shall be roughened or ground and then thoroughly cleaned of all debris. The replacement anchor shall be a resin anchored stainless steel socket and the resin used shall have a suitably large filler to take account of the additional gap to be filled and limit the potential for creep.
4. Aluminium parapets shall not be painted unless otherwise specified.

422AR De-Tensioning and Re-Tensioning Procedure for Repairs and Cyclical Maintenance of TCB and RHS Road Restraint System

1. The *Contractor* shall re-tension all tensioned corrugated beam and rectangular hollow section road restraint systems as shown in the *Client's* asset management system.
2. The length of road restraint system to be de-tensioned and re-tensioned shall be the damaged length and the lengths at either side to the nearest undamaged adjuster assembly or anchorage.
3. The following procedure shall be used to de-tension a road restraint system section which is to be repaired:
 - a. on double sided installations, slacken off connecting strap screws and nuts;
 - b. slacken off post screws and nuts;
 - c. slacken each adjuster assembly or anchorage assembly either side of the damaged length;
 - d. carry out repair.
 - e. TCB road restraint system shall be re-tensioned in accordance with BS 7669-3:1994, Section 2.1 or equivalent. Tensioned RHS road restraint system shall be re-tensioned in accordance with BS 7669-3:1994, Section 2.4 or equivalent.
4. Tensioning between any two limits shall not proceed until each limit has been anchored sufficiently securely to resist the load effects due to tensioning.

5. Tensioning of TCB shall be undertaken only when the ambient temperature is between 20°C and -5°C. Tensioning of RHS shall be undertaken only when the ambient temperature is between 20°C and 10°C.
6. On completion of tensioning of TCB, the centre of each screw securing beams to posts shall not be closer than 25mm ± 2mm to the end of the slotted hole in the beam.

Series 500 – Drainage and Service Ducts

522AR Cleaning and Renewal of Filter Drains

Cleaning Filter Media

1. The filter media of filter drains shall be loosened by harrow and all weed growth removed.
2. The filter material shall be loosened to a depth of 250mm over the full width of the drain so as to minimise retention of water within this depth.
3. Weed killer shall be applied, to the surface of the filter drain.
4. Any build up of detritus between the edge of the carriageway and the filter drain shall be removed at the same time.

Renewal of Filter Media

5. Where possible, the *Contractor* shall recycle the material on site using machinery capable of lifting, segregating and dry cleaning the filter material to the full depth and returning the graded and cleaned material to the drain it came from. Where this is not possible, material removed from trenches shall be taken to Tip.
6. Filter drains shall be renewed to the full depth by replacing the filter media or the complete drain.
7. Where the filter media only is to be replaced, all or part of the existing material within the trench shall be removed to the depth directed by the *Client*. The trench shall then be back-filled up to previous level with like replacement material.
8. Where the complete drain is to be replaced, all existing filter media, the pipe and pipe bedding shall be removed down to the base of the original trench. The drain shall then be reconstructed as per Appendix 5/1 and back-filled up to the previous level with like materials
9. Where renewal of filter material has required opening or damage to any constructed pavement courses then these shall be reinstated as per Clause 706.

523AR Cleaning or Proving of Linear Drainage Block Systems, Combined Kerb and Drainage Block Systems, Subway Drainage Channels and Drainage Within a Highway Structure

1. Cleaning or proving of linear drainage block systems, combined kerb and drainage block systems, subway drainage channels and drainage within a highway structure shall be carried out by one or more of the following methods:
 - a. Rodding;
 - b. Drawing through a mandrel with a diameter 20mm less than the nominal diameter of the pipe or nominal minimum of the “waterway area” of the block;
 - c. High pressure water jetting (see Clause 3115AR). Special care shall be taken to ensure fittings with the structure are not affected by pressure;
 - d. Dye testing using food grade dyes approved by the Environment Agency.
2. All covers which have been removed for cleaning operations shall be replaced and evenly bedded. The *Contractor* shall leave the area surrounding the cover clean and tidy.
3. All arisings from the cleaning operations shall be taken to appropriately licensed tips.

4. The *Contractor* shall report any damage to the drainage system or components immediately to the *Client*.

524AR Replacing, Raising Or Lowering Covers, Gratings And Frames On Existing Chambers, Gullies And Subway Surface Drains

1. Where existing covers, gratings or frames have to be replaced, the *Contractor* shall carefully remove any damaged parts and clean any parts to be re-used. If necessary, any concrete or mortar bedding shall be broken out, the surface shall be prepared and the frame, grating or cover bedded or replaced to its original position. Quick setting epoxy mortar shall be used for rebedding the frame.
2. Where the levels of existing covers or gratings have to be adjusted, the *Contractor* shall carefully excavate for and remove the existing cover or grating and frame, which shall be cleaned to remove all adhering material. The underlying brickwork, concrete or mortar in bedding, chamber or shaft walls shall be adjusted to the required level and the surface prepared to receive new construction. Where necessary, reinforced concrete cover slabs shall be broken out. Precast concrete cover slabs shall be lifted off and cleaned ready for re-use, unless otherwise directed by the *Client*.
3. New construction in brickwork or concrete shall be built on the existing chamber or shaft and shall conform to the relevant requirements in any Task Order for new manholes, catchpits, gullies and the like. Unless otherwise directed by the *Client*, the existing precast concrete cover slabs and the existing covers, gratings and frames shall be re-used in the works. C25/30 concrete with sulphate resisting cement shall be used in concrete works and rapid hardening cement shall be used for cement mortar. Engineering bricks shall be used in all brickwork.
4. All new and replacement gully grates and frames shall be of "cycle friendly" type as agreed with the *Client*.

525AR Cleaning of Culverts

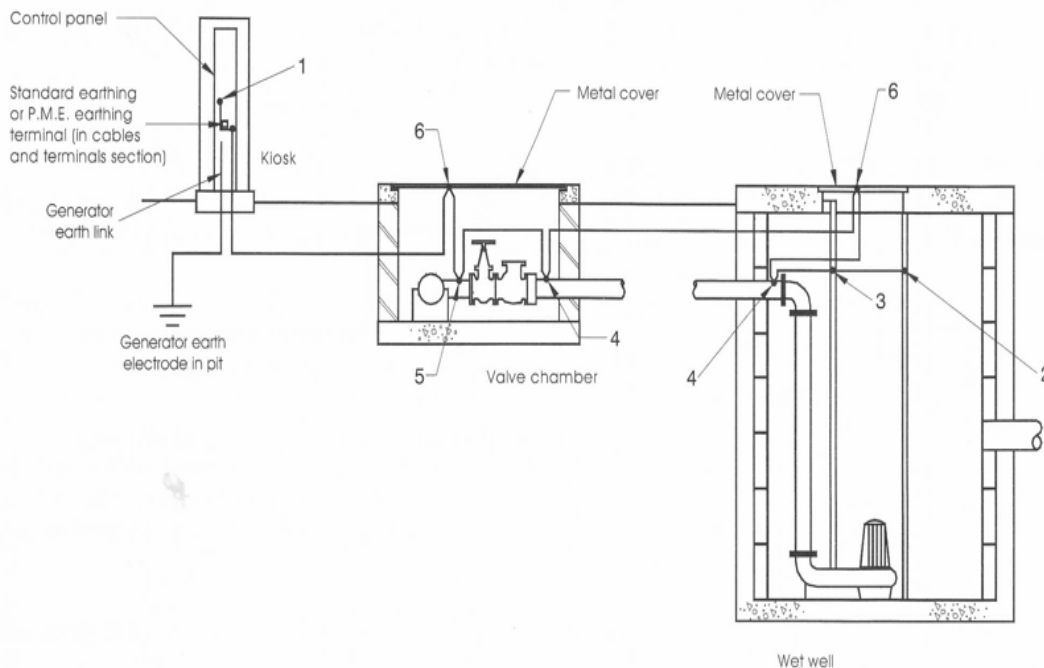
1. The *Contractor* shall clean the entire culvert, including 8 metres either side, headwalls, aprons, spillways and the culvert channel of all silt, sediment, debris and polluted water and ensure that each end of the culvert, including any ancillary drainage items, such as trash screens, watergates, grills and sluices, are free of vegetation and other obstructions, including any material disturbed during cleaning.
2. Where the invert of any culvert 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.
3. All collected sediment debris and polluted water shall be disposed of to a licensed Special Waste Management Facility, in accordance with the requirements of the Environment Agency, unless otherwise agreed with the Environment Agency.
4. Polluted water shall not be used to dislodge compacted materials.
5. The *Contractor* shall wash down each individual chamber of oil separators using high pressure water jetting and clear all debris, silt and detritus.

526AR Pump Stations and Maintenance

General

1. The *Contractor* shall keep and maintain a pump station Log Book on site, which records each visit made, and lists any occurrences which may affect the general functionality of the station. An up to date duplicate copy of this Log Book shall be kept electronically and accessible to the *Client*.

2. A working register shall be maintained recording the condition of the pump station assets and all tests/certification pertinent to the station. These will include lifting equipment, electrical apparatus, gas monitors and all critical apparatus located at the station. The information recorded should allow the *Client* to establish a predictive maintenance schedule, budget for station repair and/or replacement based on return on investment, establish a benchmark for the cost of maintaining a typical station, and compare the cost to operate and maintain different types of stations.
3. The key components of a pump station are:
 - a. Power supply;
 - b. Incoming pipework and valves;
 - c. Chambers; cable pits, and chamber covers;
 - d. Wetwell and accesses;
 - e. Pumps, chamber pumps, sump pumps, draw-pit pumps, and interceptor chamber pumps;
 - f. Control panel and control equipment;
 - g. Outgoing pipework, valves and chambers;
 - h. Monitoring apparatus (telemetry), float switches, ultrasonic or radio frequency probes, etc;
 - i. Access points;
 - j. Perimeter fencing; and
 - k. Health and Safety signage.



Maintenance

4. The *Contractor* shall ensure that the design, installation, maintenance and inspection and testing of all electrical equipment complies with BS 7671:2018 Requirements for Electrical Installations and other industry- accepted codes of safe and best practice.
5. The *Contractor* shall ensure that working practices comply with industry-accepted and recognised codes of safe and best practice, such as the implementation of permit-to-work procedures as detailed in the HSE's guidance Electricity at work – Safe working practices. <http://www.hse.gov.uk/pubns/priced/hsg85.pdf>
6. The *Contractor* shall ensure that no person without the appropriate training, technical knowledge and experience is permitted to undertake work on any electrical equipment. The *Contractor* shall be able to demonstrate the competency of any person undertaking work on any electrical equipment, as required by the *Client* (e.g. by a portfolio of evidence under the National Highway Sector Schemes). http://www.dft.gov.uk/ha/standards/mchw/vol1/pdfs/appendix_a.pdf
7. For all electrical equipment, the *Contractor* shall ensure compliance with all relevant regulations and codes of best/safe practice, such as the requirements of the Waste Electrical and Electronic Equipment Directive (WEEE Directive). <http://www.environment-agency.gov.uk/business/topics/waste/32084.aspx>
8. Submersible pumps are generally designed to be serviced and maintained on a twelve month, or hours-run, basis in accordance with manufacturer's Operation and Maintenance manual. If station control panels are fitted with pump-hours-run meters, and a working telemetry system, site visits can be reduced following a 6-monthly inspection, should maintenance costs need to be reduced, following written instruction from the *Client*.
9. To sustain pump station maintenance requirements, the *Client* will provide, and the *Contractor* shall hold, a full set of O & M manuals for each pump station, including control panel drawings and other key apparatus.

Testing and Test Periods

10. A working register shall record all tests carried out on the station. These will include lifting equipment, electrical apparatus, gas monitors, etc which will enable a good working practise to be established for the long term performance of the station. Tests shall be as follows:
 - a. Residual Current Devices (every 6 months);
 - b. Periodic electrical testing (every 5 years);
 - c. General pump station electrical safety test (every 12 months). The pump shall be lifted and examined for wear and functionality.
 - d. Portable Appliance Testing (every 12 months).
 - e. Lifting equipment (every 12 months).
 - f. Gas Monitors (in accordance with manufacturer's recommendations).
11. Test certificates for all equipment shall be retained on site, and a copy placed on file.

Catchment Areas and Drainage

12. Pumps are required to remove surface drainage water from the highway and pedestrian areas, to prevent flooding in those areas. The surface water is directed to the pump chamber via road gullies, pipes and drains, which can also carry road-grit, leaves and other deleterious material, which tend to cause blockages in the drainage system. While carrying out routine inspection, the *Contractor* shall ensure that all incoming and outgoing drainage systems are maintained to ensure there is no risk of blockages.

Generic Pump Maintenance

13. Removal of pumps for inspection commonly requires the use of a crane or similar equipment. All lifting equipment shall have current test certificates.
14. Pump duty cycling is usually provided by an electro-mechanical relay. Sump level monitoring equipment may comprise float switches, ultrasonic or radio frequency probes. At intervals, specified by the manufacturer, visual inspection for damage, corrosion, oil levels and condition, connections and earthing contacts shall be carried out and defects entered on the *Client's* asset management system.
15. Every 12 months, pumps shall be removed from the sump for limited internal inspection and overhaul. At that time, accumulated debris within the sump shall be removed and the sump washed down. Biodegradable oils shall be provided in pump units.
16. At intervals of 5 years, or in accordance with manufacturer's recommendations, pumps shall be removed to the manufacturer's workshop for full service and rebuild, as appropriate.
17. Sump level monitoring equipment shall be cleaned, checked and serviced in accordance with manufacturer's recommendations.
18. The maintenance requirements for control equipment, DOL and Star Delta starters are similar to those required for typical electrical distribution and control equipment.

528AR Renovation of Highway Drainage – General Requirements

1. The following design guidance relates to the use of liners and/or resin injection to renovate drainage systems, and is based on the Water Research Centre publication 'Sewerage Rehabilitation Manual' and EN ISO 11296-4, but is not intended as a replacement for any of these documents.
2. The *Contractor* shall utilise CCTV equipment with electronic sonde/transponder or equivalent to trace the location and depth of the pipework so that surveys are accurately determined and mapped at intervals as equipment travels through the pipe. See Clause 3304AR for further information. Where blockages are encountered, the locations of the blockages/defects shall be marked on the plan surveys and reports (GIS format). The *Contractor* shall make reasonable effort at the time of the visit to clear the blockages and minimise revisits and disruption. Severe blockages requiring special renovations shall be notified to the *Client* for further instruction. The data collected shall be stored in the *Client's* asset management system.
3. The *Contractor* shall ensure it deploys the most suitable equipment to carry out the works in minimum time and with minimum disruption.
4. Abortive works, and associated costs, due to defective or inappropriate equipment shall be the responsibility of the *Contractor*.
5. The *Contractor* shall ensure equipment generates low noise and is quick and efficient. Minimum wattage for 150mm diameter pipes shall be between 500 - 1000W; for 150 – 300mm diameter pipes 1000 - 1500W; and for 300mm diameter pipes and above 3000W.
6. The *Contractor* shall use equipment capable of producing a flow rate of 90 g/m and above. The *Contractor* shall take into consideration the age and condition of the asset when removing calcite deposits and take reasonable steps to ensure that the deployed systems do not damage the in-situ asset.
7. The *Contractor* shall make provision for over-pumping, as necessary, where renovations are to take place.

8. The *Contractor* shall carry out and submit calculations, to water industry standards, for the approval of the *Client*, for lining thicknesses and specifications.
9. The lining material shall have an asset life greater than 50 years. The lining material shall not be prone to shrinkage and shall be leak tight. Styrene based products will only be permitted in certain situations by the *Client*. The *Contractor* shall provide a log of the ambient temperatures and curing temperatures when lining is taking place. The *Contractor* shall have available equipment to raise curing temperature should it fall below the manufacturer's specified levels.
10. Water shall not be present whilst lining or patch work are taking place.
11. Liners used in bends shall not be prone to wrinkling.
12. The patch material shall have an asset life greater than 30 years.
13. Where lining is carried out, the *Contractor* shall include for the provision of samples for testing taken from the material installed at the time the works are executed. Samples shall be sent to a testing laboratory approved by the *Client* to establish the short-term and long-term flexural moduli, creep factor and failure strain. The *Contractor* shall submit to the *Client* the lining calculations to justify the suitability of the materials. Test samples taken after the works will require the specific approval of the *Client*.
14. Where lining samples are shown to be substandard, the *Contractor* shall remove and replace the defective lining at its own cost.
15. The *Contractor* shall provide copies of design calculations, for approval, to a testing laboratory approved by the *Client*. Work shall not commence until the design has been approved.
16. The *Contractor* shall perform a risk assessment to determine the potential for nuisance from styrene, specifically highlighting premises used for storage, preparation or serving food. It will circulate an advisory leaflet to premises likely to be affected and will confirm with the *Client* that the Local Authority Environmental Health Department has been informed. Installation crews shall carry a measuring device for use in investigating complaints.
17. Where the *Contractor* uses water to cure a polyester resin, the water shall not be discharged into the drainage system, foul or surface. The *Contractor* shall include in its prices for all necessary works for the removal of the contaminated water and material to a licensed tip.
18. The *Contractor* shall provide a lining system which attains a minimum of the short/long term moduli and strain at first break, as set out in Clause 536AR. Where the *Client* states that the working window is less than 6 hours from first cone placement, then the *Contractor* shall provide a system to enable installation and full cure according to the specification within the time period.
19. CCTV surveys of non-man entry sewers shall be carried out after cleaning and immediately following the reopening of lateral connections. Such CCTV surveys shall be undertaken using the most suitable equipment for the circumstances. A DVD video recording of the pre- and post-lining surveys shall be provided to the *Client* within 3 calendar days of completion.
20. Laterals in pipe sewers shall be cut round unless the *Client* agrees otherwise. Laterals in brick sewers may, if the lateral is recessed, be cut square at the *Client's* discretion. Care shall be taken not to damage the liner by drilling abortive pilot holes. In man-accessible drainage systems, the cut lateral and any damage to the liner shall be made good with an approved epoxy mortar. In linings above 300mm diameter, lateral connections shall be sealed by insertion of a "top hat" liner. The

lateral liner shall be capable of bonding to the inner surface of the lined sewer and suitable surface preparation shall be undertaken to ensure this occurs.

21. Once a cured-in-place lining has been installed, a sample shall be taken and forwarded to the testing laboratory approved by the *Client*. The cost associated with obtaining the sample shall be included in the *Contractor's* costs. A minimum of one sample per liner is required, but the *Client* may request additional samples. Samples shall be taken from the coolest end of the lining (which may be closest or furthest from the boiler, depending on the hot water pumping system employed), and the area from which the sample is removed shall be made good, using a method approved by the *Client*, prior to the return of the sewer to service.
22. The testing laboratory shall carry out tests in order to assess the quality of the lining and its compliance with the design. On completion of these tests, the results shall be reported to the *Client*.
 - a. If the acceptable values are achieved for lining thickness, short and long-term term moduli and strain at first break, the samples will be deemed to have 'passed'. In the case of a sample which has an isolated measurement marginally outside the specification for stress and or strain at first break, such a sample may, at the discretion of the *Client*, be deemed to have passed. Similarly, and provided the short-term modulus is sufficiently high, a sample may be deemed to have passed without the need for long-term testing.
 - b. In cases where the specified value of short-term modulus is not achieved, or the measured lining thickness is below the design value, a single specimen shall be subjected to long-term testing for 1000 hours, and a 50-year modulus value shall be determined. Provided that a factor of safety of 2 or more is achieved using this value of modulus and the measured sample thickness, the sample shall be deemed to have passed.
 - c. If the 50-year modulus is below the design value, a factor of safety will be calculated based on this value of modulus and the measured sample thickness (rather than the design thickness). If the factor of safety is less than 2, the *Client* may, at its discretion, accept the liner or, alternatively, require removal of the substandard lining section and a replacement liner placed. The total cost of such work will be borne entirely by the *Contractor*.
 - d. As an alternative to (c.), the *Contractor* may request that it provides a second sample of the lining for retesting. The total cost of such work will be borne entirely by the *Contractor*.
23. For patch repairs, samples for testing shall not be cut from the repair but made separately from the same batch of materials and cured in an identical manner to the actual repair. In the case of resin injection repairs, a test sample may be obtained from the resin feed to the repair. When the ambient temperature is 5 degrees or less, and the *Contractor* opts to carry out the work, it shall be required to take a further test sample of the liner to ensure its structural integrity, and an average reading of the test samples shall be used to determine the pass/fail criteria. The additional sample shall be at the *Contractor's* cost.

529AR Renovation of Highway Drainage – Method and Material Options

Cured-in-Place Lining Materials

1. Full length Cured-in-Place lining consists of four main stages:
 - a. Manufacture of a skinned bag containing a felt, fibreglass or combination carrier;

- b. Impregnation of the carrier with a polyester thermosetting resin;
 - c. Insertion and inversion of the bag containing uncured resin into
 - d. the drainage system; and
 - e. Curing of the resin to form a solid lining within the sewer.
2. The bag shall be manufactured under specialised factory conditions to accurate dimensions to suit the internal dimensions of the pipe and provide adequate support for the intended volume of resin. The external surface of the bag will eventually form the internal skin of the lining.
 3. Correct impregnation will result in a flat bag with consistent thickness throughout the length of lining and without areas of resin starvation within the lining. At this stage, the lining is easily damaged and premature cure (hardening) of the resin may occur if the lining is not stored correctly. The lining shall therefore be handled carefully and kept cool.
 4. After transportation to site, the lining shall be inverted and pushed into the sewer by pressure of water or by compressed air or pulled into place by mechanical means. In addition to pushing the entire length of lining into the pipe, the pressure also serves to press the lining into intimate contact with the original sewer wall.
 5. After insertion of the lining into the sewer, the resin shall be cured by either pumping through hot water, application of steam, or by ultra violet light. Both the temperature and time of cure are important to ensure that the mechanical properties of the lining are sufficient to satisfy the design requirements. It is also essential to achieve the correct thickness of resin and to minimise porosity of the lining by correct impregnation, handling and insertion.
 6. Variations to the technique include:
 - a. The use of glass fibres to partially or fully replace the felt in order to give better mechanical performance;
 - b. The use of different types of resin which cure at different
 - c. temperatures;
 - d. The use of filler compounded with the resin, to give improved mechanical performance.
 7. Some degree of care is required in relation to the latter item, as although the use of fillers can give higher values of short-term modulus, the values of strain at first break and long-term modulus may be adversely affected.

Short-Sleeve Localised Repairs (Patch Repairs)

8. Patch repairs are relatively short lengths of lining of the same general type as Cured-in-Place linings. Patch repairs consist of much the same materials as Cured-in-Place linings but the method of construction and insertion may be entirely different, for example the following stages may be involved. The list is not, however, intended to be exhaustive.
 - a. Dry carrier made to dimensions suitable for a given patch;
 - b. Carrier impregnated with resin;
 - c. Carrier folded and applied to inflatable cylindrical packer;
 - d. Packer positioned at site of repair and inflated;
 - e. Resin cured at ambient temperature;
 - f. After curing, packer deflated and removed.

9. A range of packer sizes is required for different pipe diameters and lengths of patch, although multiple patches may be overlapped to give longer lengths.

Resin Injection Repairs

10. Resin injection is a renovation method for relatively short-length repairs of pipes. The method is capable of repairing cracks, displaced joints, holes, voids and partial collapses. Although not subjected to the same design criteria as the other methods, resin injection repairs shall be capable of providing reliable sealing characteristics to prevent infiltration and exfiltration at the repair site.
11. The two-component resin system is supplied by umbilical lines to a remotely operated cylindrical packer. The packer is positioned at the defect and inflated, before the resin is injected into a small cavity between the packer and sewer wall. The resin cures at ambient temperature over a period of around 2 hours, after which the packer is removed. The exothermic curing reaction is monitored remotely using thermocouples within the curing resin.

578AR Renovation of Highway Drainage - Design

1. This section does not apply to resin injection techniques.
2. The liner shall be designed using the Type II design procedure specified in the Sewerage Rehabilitation Manual (SRM). The depth of the pipe, its dimensions and the degree of ovality shall be measured, and these values shall be used in all subsequent design calculations. A minimum value of ovality of 0.5% shall be adopted and all designs shall incorporate a factor of safety of 2.
3. The design property values of the liner shall be declared in advance by the supplier. These values shall have been substantiated by type testing. All design calculations shall be submitted to the *Client* prior to installation of the lining.
4. The 50-year creep modulus and liner thickness shall be determined from sample coupons cut from the installed liner. The 50-year modulus measured from these tests shall not be less than the minimum design value declared by the supplier.
5. A final design check using the properties measured from the installed liner will be carried out by the *Client*. On this basis, the "fitness for purpose" of the liner will be judged.

Circular Cured-in-Place Linings

6. The equation used for the design of circular Cured-in-Place linings shall be derived from the Sewerage Rehabilitation Manual and be approved by the *Client*

Non-circular Cured-in-Place Linings

7. Calculations for a non-circular (egg-shaped or oval) lining shall be derived from the Sewerage Rehabilitation Manual and be approved by the *Client*.

530AR Renovation of Highway Drainage - Design

1. This section does not apply to resin injection techniques.
2. The liner shall be designed using the Type II design procedure specified in the Sewerage Rehabilitation Manual (SRM). The depth of the pipe, its dimensions and the degree of ovality shall be measured, and these values shall be used in all subsequent design calculations. A minimum value of ovality of 0.5% shall be adopted and all designs shall incorporate a factor of safety of 2.
3. The design property values of the liner shall be declared in advance by the supplier. These values shall have been substantiated by type testing. All design calculations shall be submitted to the *Client* prior to installation of the lining.

4. The 50-year creep modulus and liner thickness shall be determined from sample coupons cut from the installed liner. The 50-year modulus measured from these tests shall not be less than the minimum design value declared by the supplier.
5. A final design check using the properties measured from the installed liner will be carried out by the *Client*. On this basis, the "fitness for purpose" of the liner will be judged.

531AR Renovation of Highway Drainage - Installation

Pre-liners

1. Except for resin injection, a suitable pre-liner shall be installed in all situations where uncured resin may be squeezed from the lining into apertures within the existing sewer, thereby reducing the thickness of the lining. In particular, a pre-liner shall be installed prior to installation of the lining in all brick pipes. In pipes with running infiltration, a pre-liner or external membrane shall be used to avoid contamination of the resin system by water entering the host pipe line.

Monitoring of cure temperature

2. The *Contractor* shall provide an automatic data logger (with GPS facility) to record temperature and time for the entire curing procedure. Both water (or steam, if applicable) and lining temperatures shall be recorded at least once every 6 minutes throughout the curing cycle. The data shall be provided to the *Client* within 3 calendar days of completion of the lining.

532AR Renovation of Highway Drainage – Performance Requirements

1. Unless alternative requirements are specified by the *Client*, the Cured-in-Place lining shall meet the minimum requirements given in table below when tested in accordance with the clauses indicated and the specification. The figures below are based on non-reinforced felt polyester hot cured linings. Where liners are reinforced with fibres, declared values shall be stated for design purposes. These values shall be substantiated from type test data.

Property	Minimum Requirement
Short-term flexural modulus (E_0)	2200 MPa
Flexural strain at first break (ϵ_f)	1 %
Flexural stress at first break (σ_f)	25 MPa
50-year flexural modulus (E_{50})	400 MPa
50-year failure stress	20 MPa

533AR Renovation of Highway Drainage – Type Testing

General

1. Before linings are approved according to the specification, the detailed type testing shall have been completed and the various criteria met. All combinations of constituent materials, material proportions, curing methods and wall thicknesses shall be tested. Should there be any modification to the material constituents, proportions or curing method, the tests shall be repeated.

2. Type testing is the responsibility of the lining manufacturer. Details and results of type tests relevant to each material composition and manufacturing process shall be made available to the *Client* on request.
3. Samples used for type tests shall be manufactured and cured in an identical manner to the linings with which they are to be identified. It is recommended that samples submitted for type testing are cut from a lining prepared in a plastic or ceramic host pipe.

Short Term Flexural Properties

3. The initial tangent flexural modulus, flexural stress and strain at first break (as indicated by the first discontinuity in the load vs displacement curve) shall be determined in accordance with the procedure described in EN ISO 11296-4 using a cross head displacement rate of 10 mm/min. Five specimens shall be tested and the mean value of each property shall be calculated.
4. Each specimen shall be tested with the internal surface of the lining in contact with the load bearing supports.
5. If the lining material type is considered isotropic, specimens for test purposes shall be taken from the longitudinal direction. If the lining material type is considered anisotropic, specimens for test purposes shall have a radius of curvature not less than 250 mm and shall be taken from the hoop (circumferential) direction. For linings where hoop specimens do not meet the curvature requirements, specimens may be taken from the longitudinal direction of the lining.

Flexural Creep Modulus

6. The lining material shall meet the requirements of the table in Clause 532AR when tested under aqueous conditions for 10,000 hours. Five specimens shall be tested.

Stress Corrosion Test

7. The general procedure shall be similar to that described for the determination of the flexural creep modulus, with the following differences:
 - a. Specimens shall be immersed in dilute sulphuric acid of pH = 2;
 - b. A minimum of 5 specimens shall be loaded to various stress levels with the aim of determining the time to failure of each specimen;
 - c. The levels of stress shall be chosen to give a range of failure times up to 10,000 hours;
 - d. From the results obtained, a value of failure stress at 50 years shall be determined.
8. Stress corrosion testing is not specified within EN ISO 11296-4.
9. However, as predicted 50-year failure stress is determined, and this value is used in the determination of the liner thickness, the test is considered of greater relevance than strain corrosion. However, where carrier materials do not consist entirely of PET fibres, strain corrosion may alternatively be specified.

534AR Renovation of Highway Drainage – Quality Control Tests

General

1. Quality control tests shall be carried out on each installed liner, unless otherwise agreed in writing with the *Client*.
2. The test requirements are necessary in order to demonstrate a continuing satisfactory level of manufacture and installation quality in day-to-day production.

Samples for Quality Control Tests

3. For long-sleeve liners, a sample shall be cut from the installed liner at the end which was coolest during the curing procedure. For hot water cured liners, depending on the water pumping system, this may be the manhole furthest or closest to the water tower and boiler. The sample shall be approximately square and its length shall be at least 25 times its thickness.
4. Sampling in manholes by use of a confining pipe or sleeve is generally practicable when lining a circular pipe up to 600mm in diameter. In other circumstances, samples shall preferably be taken from the actual pipe wall and the resulting hole in the liner made good with a suitable material and by a procedure approved by the *Client*.
5. Due to the nature of the short-sleeve (patch) repairs, quality control samples shall be cut from a sheet of identical construction and composition to that used in the pipe repair, but cured separately above ground. The cure conditions shall simulate those used for the installed liner.
6. All samples shall be marked so as to enable each sample to be identified with the original design. Marking shall include:
 - a. The name of the *Contractor*;
 - b. Scheme ID/Project Code for identification and recharge of testing costs;
 - c. The diameter, length and thickness of the liner installed;
 - d. The street name, with Northings and Eastings;
 - e. A plan marking the extent of lining start and stop positions, in relation to adjacent gullies, laterals and carrier pipes;
 - f. The numbers of the manholes between which the lining has been installed; and
 - g. The date on which the lining was installed.
7. The above information shall be in a format transferable to the ***Client's asset management system***.
8. All short- or long-sleeve liner samples shall be subjected to quality control testing. If all tests are passed then no further quality control tests shall be required, except for the separate verification of wall thickness.

Preliminary Examination

9. The cured liner or resin injection sample produced for quality control tests shall be inspected for air entrainment and voiding. A density measurement of the cured lining sample shall be carried out and the results recorded. In the case of linings containing polyester resin, a strong smell of styrene may possibly indicate under cure. details of this, and any other aspects which may affect lining quality, shall be recorded.
10. The installed liner shall be examined by CCTV and shall have a smooth internal surface free from significant wrinkles and other defects which might restrict flow or lead to blockages.

Wall Thickness

11. The minimum wall thickness measured at ten positions across the lining sample shall be recorded. The mean value shall be equal to or greater than the design thickness.

Specimen Preparation

12. From the supplied Cured-in-Place lining sample, at least five flexural test specimens shall be prepared. The length, width, thickness and mass of each specimen shall be determined. The density of each specimen and the mean density shall be calculated. The specimen whose density is nearest to the mean value will be set aside for long- term testing.
13. For resin injection samples, four specimens shall be prepared in a similar manner with one specimen retained for long-term testing.

Short Term Flexural Properties

14. For Cured-in-Place lining samples, five specimens shall be tested. The measured properties of each individual test piece shall be reported together with the mean value of each property.
15. Each test piece shall have properties which exceed the minimum values given in the table in Clause 532AR.

Flexural Creep Modulus

16. For long-term flexural testing, the specimen previously chosen shall be tested in accordance with sub-Clause 533AR.7. A 50-year modulus, based on data collected to 1000 hours, shall be determined. This value shall exceed the minimum requirement specified in the table in Clause 532AR and shall also exceed the design modulus specified by the *Contractor*.

535AR Renovation of Highway Drainage – Workmanship, Inspection and Certification

Workmanship

1. All raw materials shall be tested to ensure consistency and compliance with this document.
2. The *Contractor* shall adequately supervise all stages of production and keep records of the raw material batches used during each work shift. Raw materials shall be stored and used in accordance with manufacturers' recommendations.
3. The *Contractor* shall be familiar with the effects of changes in viscosity, gel time, etc which may occur during storage of the resin, and shall make appropriate allowances in the lining process.
4. During installation, the pressure in the lining shall exceed both the pressure due to the ground water head stated in the lining design sheet and any pressure due to water in laterals. The *Contractor* shall record the level of pressure with a data logger.

Inspection

5. The *Client* shall have access at all reasonable times to those parts of the works engaged on production and testing of linings, and to all relevant test records.

Site Testing of Cure

6. Evidence of adequate cure of the Cured-in-Place liner is provided by the combination of:
 - a. Boiler and wall sensor temperature records using a suitable logger (or equivalent, in cases where cure is initiated other than by heat);
 - b. Post-installation CCTV inspection;
 - c. Mechanical testing of site samples

Reconnection to the Drainage System

7. Prior to the commencement of cutting any lateral connections, the *Contractor* shall check that the sewer does not contain any gases in explosive concentrations. The opening in the Cured-in-Place liner shall be formed to restore the full opening of the lateral and shall have no irregularities, steps or burrs which could impede flows or cause snagging of fibrous matter either in the sewer or the lateral. In linings above 300mm diameter, lateral connections shall be sealed by insertion of a “top hat” liner. The lateral liner shall be capable of bonding to the inner surface of the lined pipe and suitable surface preparation shall be undertaken to ensure this occurs.
8. If the resin-fibre composite does not delaminate during the test to determine the flexural creep modulus, it is deemed to be durable. Where the resin-fibre composite does delaminate, then all cut surfaces shall be sealed with a compatible material, approved by the *Client*.

Certification

9. The *Contractor* shall provide copies of a signed certificate for each size and classification of lining, stating that the construction and testing of the lining supplied comply with the requirements of this document, and giving details of minimum performance parameters.
10. The lining shall be designed using the type II design procedure given in the Sewer Rehabilitation Manual. The 50-year creep modulus and lining thickness used in the design shall be that determined from the installed lining. The 50-year modulus declared from these tests shall not be less than 400 MPa and shall be equal or greater than the minimum design value declared by the supplier.
11. The design property values of the liner shall be declared in advance by the manufacturer. These values shall have been substantiated by type testing.

Series 600 – Earthworks

650AR Requirements For Compost To Be Incorporated Into Soil Mixtures

1. Where required to be in accordance with this clause then compost that is to be incorporated into soil mixtures as an organic amendment shall meet the following requirements.
2. The composting process and resulting composted product shall comply with the requirements for compost for use as an ingredient for manufactured topsoil within BSI PAS 100 or another equivalent quality standard proposed by the *Contractor* and accepted by the *Client*. Compliance with BSI PAS 100 or another equivalent quality standard accepted by the *Client* shall be independently verified on an annual basis by a suitably qualified third-party organisation satisfactory to the *Client* in its absolute discretion (e.g. The Composting Association). Compost for incorporation into topsoil shall:
 - a. Have been matured for a minimum of 8 weeks.
 - b. Achieve an overall compost maturity index rating of 7 or 8 and Ammonia Index Rating of 3 or 4 when tested using the Solvita Compost Maturity Test.

651AR Geo-Cellular System Assemblies

1. Geo-cellular system assemblies shall as per Appendix 6/16. Assemblies shall be transported, protected and assembled and installed strictly in accordance with the Manufacturer's requirements.
2. Supervision of installation works by the *Client* shall be agreed with the *Contractor* prior to any installation works with reference to the Supervision Plan recommendations of the Geotechnical Design Report to BS EN 1997-1:2004+A1:2013. No installation works shall commence until such agreement has been reached.
3. During works to install geo-cellular system assemblies in excavations the *Contractor* shall comply with Clause 602, paying particular regard to the need to ensure excavations remain free from water that may serve to float the assembly.

Trafficking of Geo-Cellular System Assemblies During the Works

4. Where geo-cellular system assemblies are to be incorporated into the Permanent Works, the *Contractor* shall not cause site vehicles to traffic assemblies without the consent of the *Client*. Consent shall be subject to a prior trafficking trial and geotechnical validation.

Trafficking Trial

5. The *Contractor* shall submit its proposals for the Trafficking Trial, including the extent of the Area, to the *Client* for approval a minimum of 10 days in advance of the proposed trial. The *Contractor* shall include a supporting Geotechnical Design Report to BS EN 1997-1:2004 that demonstrates considerations of the impact of such trafficking on the performance and acceptability of the structure. The Trafficking Trial shall not commence without the *Clients* approval.

Reporting and Acceptance of Trafficking Trial

6. The *Contractor* shall provide the *Client*, for acceptance, with a report on the Trafficking Trial, stating how trafficking of the geo-cellular system assembly was validated. The main construction of the Permanent Works shall not start until the Trafficking Trial area has been accepted by the *Client* within two working days of receiving the Trafficking Trial area report.

7. Any pavements or materials incorporated within the Trafficking Trial Area forming part of the Permanent Works shall be subject to replacement on instruction from the *Client*.

652AR Requirements For Laboratories For Test Analysis

1. Where required to be accordance with the clause then the following requirements shall be met.
2. Unless approved otherwise in writing by the *Client*, all Testing Laboratories shall be confirmed in advance with the *Client*.
3. Unless approved otherwise in writing by the *Client*, all Testing Laboratories shall be UKAS accredited. Where the test is covered by an MCERTS standard then the laboratory shall be MCERTS accredited.
4. Where an Interpretive Test Analysis Report is required for Soil samples, then any interpretative comments and recommendations in that Report shall be provided by a Member of the Institute of Professional Soil Scientists. Suitable evidence of Qualifications shall be provided in the Report.

653AR Requirements For Imported Topsoil Class 5B And 5C

Definitions

1. For the purpose of this clause the term topsoil is used to refer to both:
 - a. Topsoil that is in accordance with BS 3882:2015 (or where stripped from or left in situ on site, topsoil having similar qualities); and
 - b. Subsoil that is to be used as a horticultural rooting medium and which is required to have particular properties beyond the requirements of Class 4 landscape fill to Table 6/1. By conventional definition Subsoil differs principally from topsoil in that it has lower organic matter content and related biological and chemical properties.

Constituent Material Requirements

2. Imported Class 5B or 5C topsoil to Table 6/1 shall be natural topsoil or manufactured topsoil (natural topsoil preferred). Existing Class 5A topsoil to Table 6/1 shall only be incorporated into Class 5B or Class 5C materials with the *Client's* advance written consent.
3. The *Contractor* shall achieve the required pH, available nutrient and other chemical properties for Class 5B or Class 5C topsoil using either: a non-amended natural dug topsoil; or through a manufactured composite topsoil containing no fertilizer. However, subject to the recommendations of an Interpretative Test Analysis Report produced by a Testing Laboratory as per sub-Clause 11, fertilizers may be added to the topsoil in the quantities and proportions recommended by the Testing Laboratory for the purposes of further refining the pH or available nutrient values within the range or limits of the Specification. In the event that the pH value or available nutrient levels as tested are found to be outside of the Specified range or limits then the *Contractor* shall be responsible for sourcing an alternative constituent Soil meeting the Specification requirements and deficiencies may not be addressed through addition fertilizers.
4. Any fertilizers added to constituent Soil in accordance with Interpretative Test Analysis Report recommendations as per sub-Clause 11 shall be EEC fertilizers complying with the Fertilizer Regulations 1991. Agricultural lime, where permitted, shall be a ground agricultural limestone produced by a member of the Agricultural Limestone Association. Fertilizers shall be applied not less than 6 weeks prior to the proposed installation date of the Structural Soil. The *Client* shall be advised

immediately of any fertilizers so applied. Proof of product compliance with the Fertilizer Regulations 1991, membership of required professional associations, and general application compliance with the recommendations of the Interpretative Soil Test Analysis Report shall be provided.

5. The *Client* may at its discretion require to visit the source of the constituent Soil. Where this is the case then the *Contractor* shall arrange and facilitate the *Client's* attendance at such dates and times as are convenient to the *Client*. A representative of the Supplier shall be in attendance at the time.
6. Potential chemical contaminants of end-product Class 5B and Class 5C imported topsoil mixtures shall not exceed the values in Table 6/7.

Table 6/7 Limit values for potential contaminants in imported Class 5B and Class 5C topsoil

Potential Contaminant	Limit value
Metals and Semi-metals: Total Arsenic (As) Total Cadmium (Cd) Total Chromium (Cr) Chromium IV (hexavalent) Total Lead (Pb) Total Mercury (Hg) Total Selenium (Se)	<35 mg/kg <85 mg/kg <600 mg/kg <4.2 mg/kg <450 mg/kg <240 mg/kg <590 mg/kg
Polycyclic Aromatic Hydrocarbons: Benzo(a)pyrene Dibenz(a,h)anthracene Naphthalene	<1.0 mg/kg <1.0 mg/kg <19 mg/kg
Total Petroleum Hydrocarbons: TPH >C8-C10 TPH >C10-C35	<45 mg/kg <110 mg/kg
BTEX Compounds: Benzene Toluene Ethylbenzene Xylene	<0.49 mg/kg <1300 mg/kg <380 mg/kg <120 mg/kg
Other: Total Phenol Total Cyanide Asbestos	<420 mg/kg <3.4 mg/kg no bulk fibres present

7. End-product Class 5B and Class 5C shall be free from non-soil material, brick and other building materials and wastes, hydrocarbons, plant matter, roots of perennial weeds and any other foreign matter or material or substance that would render the topsoil unsuitable for use.
8. Where addition of compost to manufactured soils is necessary then, unless specified otherwise in Appendix 6/8 this shall comply with the following requirements.
 - a. The compost shall comply with the requirements of Clause 650AR.
 - b. The compost shall have a carbon: nitrogen ratio (c/n) of <15:1.
 - c. The compost shall have a compost grade of 0/10 or 0/5.
 - d. The compost shall have a pH value of between 6.5 and 8.7 pH units based on a 1:5 water extract.

- e. Electrical conductivity of the compost shall be a maximum of 300 mS based on a 1:5 water extract.
9. Unless required otherwise by the *Client* in the instructing Task Order, hydrogels, growth regulators and mycorrhizal inoculants shall not be added to topsoil mixtures.

Mixture testing and approval requirements

10. Where Class 5B material to Table 6/1 is required then, not less than 8 weeks prior to the start of the works, the *Contractor* shall submit to the *Client* for approval, the Supplier's declaration of compliance with BS 3882:2007 requirements as per Annex E to that standard. The texture analysis shall be expanded to include fine, medium and coarse sand fractions.
11. Where Class 5C material to Table 6/1 is required then, for each production run of a Class 5C material to meet a given specification provided by the *Client*, the *Contractor* shall comply with the mixture testing and approval requirements explained in (a) to (f) below.
- a. Not less than 8 weeks prior to the date of the start of the topsoiling works the *Contractor* shall submit to the *Client* for approval, manufacturer's literature and certificates for all constituent natural and bulk material products. The information included in this submission shall include:
 - i. Supplier's declarations and certification to BS 3882:2007 for any imported constituent topsoil(s) conforming to that Standard.
 - ii. Supplier's declarations and certification to BSI PAS 100 for any sub-constituent organic amendment/compost for manufactured Soil.

Where the end-product topsoil (or any constituent topsoil(s) to this) is not in accordance with BS 3882:2007, then the *Contractor* shall include in the submission the following source information for each:

 - iii. Soil source (location description including previous and current land use if natural soil, producer if manufactured soil):
 - iv. OS grid reference of natural soil source (minimum two letters, six figures).
 - b. Not less than 8 weeks prior to the date of the start of the topsoiling works the *Contractor* shall for submit in sealed, clean, polythene zip lock bags, 3kg samples of each of the following to the *Client* in the multiples stated.
 - c. Samples of the proposed end-product topsoil(s). As above, this shall include all necessary amendments, including organic amendment, agricultural lime and other fertilizers. Where quality is expected to vary across a mixture then the sample provided by the *Contractor* shall be a representative composite mixture of the expected range and the *Contractor* shall be responsible for replicating this mixture in related submissions and mixtures. For each Lot of 250m³ within a production run 3 no. samples shall be submitted.
 - d. Where the end-product topsoil is a manufactured soil, samples of each proposed constituent topsoil within. As above, this shall include all necessary amendments, including organic amendment, agricultural lime and other fertilizers. Where quality is expected to vary across a mixture then the sample provided by the *Contractor* shall be a representative composite mixture of the expected range and the *Contractor* shall be responsible for replicating this mixture in related submissions and mixtures. For each Lot of 250m³ of a given constituent topsoil produced in a production run, 2 no. samples shall be submitted.

- e. Submitted samples shall be clearly and individual labelled with the following information:
 - i. The material type;
 - ii. The name and (where relevant) reference or code for the material, clearly cross referenced to the materials submitted as per 'i' else;
 - iii. The name, full address, email and telephone number of the individual Supplier(s);
 - iv. The project name and the proposed location in the works;
 - v. The date of submission and submitters details;
 - vi. For the proposed end-product topsoil mixture - details of the percentage of each component in the mixture (by mass).

Samples will be reviewed and approved by the *Client* for appearance only. Compliance with all other requirements of the specification is the exclusive responsibility of the *Contractor*. Where they are approved then the *Client* shall retain the submitted end-product topsoil samples as Quality Control Specimens for latter compliance validation of the materials delivered to site and incorporated in the permanent works.

- f. Not less than 8 weeks in advance of the proposed start date for the topsoiling works, the *Contractor* shall submit to the *Client* an Interpretive Test Analysis Report from a Soil Testing Laboratory meeting the requirements of sub clause 652AR for:
 - i. The end-product topsoil where this is not a natural soil in accordance with BS 3882:2007 grading requirements.
 - ii. Each constituent topsoil to (a) where this is not a natural soil in accordance with BS 3882:2007 grading requirements. As above, constituent topsoil shall not include fertilizer amendment.
 - iii. Each constituent organic amendment where the end-product topsoil is not a natural dug topsoil.

Tests for (a) and (b) shall be undertaken on samples taken at the same time and from the same source materials and production Lots as those submitted to the *Client* in (ii) above. For a topsoil mixture to a given specification in Appendix 6/7, 3 samples of each of (a), (b) and (c) shall be submitted and analysed for the first production Lot of up to 250m³. Thereafter, for each subsequent Lot of 250m³ produced under the same Task Order, only 1 sample of each shall be submitted and analysed.

Notwithstanding whether the end-product topsoil(s) (or any constituent topsoil) meets the grading requirements of BS 3882:2007, the test analysis shall be to the requirements of BS 3882:2007 and shall report all test parameters required within this in addition to any further values required to prove compliance with the end-Product topsoil specification given in Appendix 6/7. Test results shall be reported using the supplier's declaration of compliance form provided as Annex E to BS 3882:2007. Where the end-product topsoil or any constituent topsoil does not comply with the BS 3882:2007 gradings then the Testing Laboratory shall strike out that section of the declaration on the form confirming this whilst leaving that part which confirms that the tests have been conducted in accordance with BS 3882:2007 requirements.

12. The Interpretive Test Analysis Report shall also include the following information:

- a. Appropriate test results to prove compliance of any organic amendment added to manufactured end-product topsoils with the requirements of sub-Clause 8.
 - b. The Soil Scientist's recommendations for any supplemental nutrient additions to the end-product topsoil in order to suit the plants specified, and an indication of how critical this is likely to be to the successful establishment and long-term health of those plants. Where the available plant nutrient levels of the mixture are outside of appropriate limits for the specified plant(s) then the Test Analysis Report shall highlight this and propose suitable modifications to amend this. This requirement does not absolve the *Contractor* of its responsibility to ensure that the nutrient levels of the mix submitted to the Soil Testing Laboratory achieve the requirements of the Specification and exist only to allow the Soil Testing Laboratory to advise upon possible improvements to that Specification.
 - c. Where for any reason the Soil Scientist considers that any submitted constituent material is unsuitable for use then they shall state this and provide brief explanation as to why.
 - d. Where required in Appendix 6/7 then the Soil Testing Laboratory shall provide a moisture density analysis to BS 1377-4 for the end-product topsoil. Samples shall be compacted with a 2.5kg rammer.
 - e. Where required in Appendix 6/7 then the Soil Testing Laboratory shall provide a permeability analysis of the end-product topsoil to BS 1377-5 or BS 1377-6 when compacted to 75, 80, 85 and 90% optimum density as determined by (g).
 - f. Where required in Appendix 6/7 then the Soil Testing Laboratory shall provide a CBR analysis to BS 1377-4 of the end-product topsoil. Samples shall be tested when compacted to 75, 80, 85 and 90% optimum density as determined by (g).
13. Upon receipt of the Interpretative Test Analysis Report, the *Client* shall confirm whether they require the proposed end-product topsoil to be amended by the *Contractor* to address the supplemental nutrient recommendations contained in the Report. Confirmation shall be in respect to this element of the materials only and conformity with all other specification requirements shall remain the sole responsibility of the *Contractor*. As above, where any chemical requirements, as reported, are found to be outside of the range or limits permitted in the Specification then the *Contractor* shall be responsible for sourcing and testing an alternative constituent soil which meets the specification requirements without instruction from the *Client*. Where the *Client* confirms that amendment is indeed required for any reason other than non-conformance of the test results with the Specification, then the *Contractor* shall be responsible for applying fertilizers and other amendments within 3 days of notification in accordance with the recommendations of the Testing Laboratory. This shall take place not less than 6 weeks prior to the proposed start date for Structural Soil installation works. The *Contractor* shall resubmit samples of the amended mixture and sub-constituents to the *Client* in accordance with (ii) for approval as Quality Control Specimens
14. During the works (including where those works are to deliver imported topsoil directly to Store for future use), the *Client* may attend to conduct visual and textural conformity testing of the end-product topsoil(s) against the Quality Control Specimens approved in (11). The *Contractor* shall ensure that all stock piles are clearly labelled to allow referencing against the approved Quality Control Specimens and related information for the respective lot. Where multiple end-product topsoils

are to be used then the *Contractor* shall keep such records as to show which of these were installed in different parts of the Permanent Works and shall not mix these. Where the *Client* deems there to be a significant difference in the delivered and/or installed materials compared with the Quality Control Specimens approved in (ii) then they may, at its complete discretion, require the *Contractor* to submit samples of the installed material for test analysis at a Testing Laboratory for such tests as they deem appropriate. The cost of additional test analysis shall be borne by the *Contractor* where the Test Analysis Report shows the material to have a significant difference from the approved samples and by the *Client* in other instances. Where subsequent Test Analysis Reports show the material to differ from the results for the previously tested materials as per (iii) for the respective Lot then the *Client* may require the *Contractor* to remove and replace the topsoil or to carry out other works to amend the mixture. In either instance the *Contractor* shall cover the full cost of the related works and materials.

Manufacturing of Topsoil Mixtures

15. Unless approved otherwise, all Class 5B and Class 5C imported topsoil mixtures to Table 6/1 shall be manufactured and blended off site by the topsoil supplier using a Soil Blending machine capable of delivering constituent materials into the blending chamber in the required proportions. Loaders shall not be used. Blending on site (including Blending using loaders) shall be subject to the advance written approval of the *Client* and shall require the submission of a method statement. This shall generally only be considered where those materials are to include Class 5A topsoil to Table 6/1 or other soil resources stripped from and temporarily stored on the site.
16. Imported Class 5B topsoil mixtures and any imported Class 5C mixtures that comply with BS 3882:2007 ranges (e.g. Multipurpose, Specific Purpose) shall be delivered to site with a completed Supplier's declaration of compliance with BS3882:2007 requirements using the form provided in Annex E of that Standard. Where either such materials are manufactured on site then the Supplier shall provide the same. All Supplier's declaration of compliance forms shall be retained by the *Contractor* for inspection by the *Client* upon request.

654AR Root Deflectors

1. Where required in the instructing Task Order, root deflectors shall be provided to the edge of the rooting zones of trees (or other locations) to direct roots away from vulnerable structures.
2. Root deflector materials shall be as required in the Task Order. Panels and sheets shall be transported, protected, assembled, positioned, formed to excavations, fixed, lapped and sealed in strict accordance with the manufacturer's recommendations. The *Contractor* shall take care to ensure that any ribs located on panels are orientated vertically and face inwards towards the tree. Root deflectors shall be arranged to create linear barriers or shaped into continuous surrounds as required in the instructing Task Order.
3. Root deflectors shall be protected at all times against mechanical or chemical damage. Those susceptible to damage by light shall not be uncovered between manufacture and incorporation in the Permanent Works. Temporary exposure shall not exceed 5 hours, or the value recommended by the manufacturer.
4. Unless required otherwise in the instructing Task Order, when installing root deflectors to the edges of new tree pits in hard surfaces, the *Contractor* shall backfill the pit to the inner facing side of the deflector with any of the following as they may choose appropriate to the materials available:
 - a. Class 6F1, 6F2, 6F3, 6F4, 6F5 or 6S material to Clause 601 and Table 6/1.

- b. Type 1 unbound granular mixture to Clause 801SR and 803.
 - c. Type 2 unbound granular mixture to Clause 801SR and 804.
 - d. Type 3/40 unbound granular mixture to Clause 801 and 805SR.
 - e. Structural Soil to Clause 882AR
6. Levels of backfill to either side of the deflector should be developed equal to one another. Final installation of planting soil within the pit shall normally take place by others and shall typically involve excavation of the Class 6 material.
5. Where required in the instructing Task Order, root deflectors shall be backed with a minimum 100mm thickness of ST3 concrete or stronger to clause 2602 to the full height of the sheet or panel or such other height as is instructed. This backing shall be located on the side(s) of the deflector that face(s) away from the tree.

Series 700 – Road Pavements – General

NOTE: Materials and options for bituminous layers are derived directly from the London Asphalt Specification dated January 2016.

720AR Delivery Tickets And Weighing

1. The *Contractor* shall produce for the *Client* all weight tickets for material delivered to and used in the works and shall supply the *Client* with one copy of each ticket.
2. When so directed, the *Contractor* shall weigh any part load unused or re-weigh any load as delivered on a public weighbridge in the presence of the *Client's* representative. All costs of such weighing shall be borne by the *Contractor* unless a re-weighing agrees with the weight stated on the delivery ticket, in which case the costs of re-weighing shall be borne by the *Client*.

721AR End Performance In Relation To HAPAS Approved And Other Proprietary Materials And Systems

1. On receiving notification of works involving the use of HAPAS Approved or other proprietary materials or systems, the *Contractor* shall visit the site, satisfy himself as to the current surface condition and assess it for introduction of a thin or high friction surface system. Thereafter, the *Contractor* shall establish the most appropriate system and materials for the site, subject to compliance with the *Client's* overall requirements.
2. Before commencing works on a site, the *Contractor* shall provide the *Client* with a written undertaking that the selected surface treatment is the best suited to the conditions of the site. In the event that the *Client* determines that works at any particular site have not fully met with the end performance requirements of the various material clauses, it will not be acceptable for the *Contractor* to rely on the inadequacy of the chosen surface treatment system to avoid remedial works.
3. Remedial works shall be carried out to areas of surface treatment which fail to comply with the specification end performance requirements. Such works shall be undertaken wholly at the *Contractor's* expense, within 28 calendar days of notification of the defect by the *Client* in writing. In the event of any remedial work not being successful in achieving compliance with the specification, the *Client* may require the *Contractor* to undertake further remedial works, at the *Contractor's* expense. Ultimately, where remedial action is inappropriate or unsuccessful, then the *Contractor* shall reimburse the *Client* the full cost paid to it for works at the failed site or sites.

722AR Siding Out Of Carriageways

1. The specification for the siding out of carriageways is at Clause 1126AR.

723AR Confirming Materials to be Used for Pavement Patching and Minor Repair or Reinstatement Purposes

1. Where an existing pavement was constructed by the *Contractor* under a previous Task Order and the *Client* instructs Patching or Minor Repair works as per Clause 706 or Reinstatement works as per Clause 946 to this, then the *Contractor* shall be responsible for confirming to the *Client* the existing construction specification and materials from their records a minimum of 3 working days prior to the commencement of the works. Unless instructed otherwise by the *Client* in writing this construction shall then be used for the works and any replacement materials brought in to make up the existing shall match those previously used. Where it is found upon inspection by the *Client* that the *Contractor* has carried out the works

using a non specification or non matching replacement materials then the *Contractor* shall be responsible for taking up and replacing these at their own cost. Where the *Client* has previously instructed materials to be set aside to Store for future use, then the *Contractor* shall obtain the *Client's* advance written approval before using these for the works. The *Contractor* shall reimburse the *Client* for the Cost of the materials removed from Store else replace these.

2. Where an existing pavement was not constructed by the *Contractor* under a previous Task Order and the *Client* instructs Patching or Minor Repair works as per Clause 706 or Reinstatement works as per Clause 946 to this then, if not already specified in the Task Order, the *Contractor* shall liaise with the *Client* to agree a minimum of 3 working days prior to the commencement of the works the appropriate specification to be used and the appropriate materials to be used should making up of any existing be necessary.
3. When matching existing materials for the purposes of making these up for works as per sub-Clauses 2 or 3, the *Contractor* shall not be limited to the use of materials included in the Specification for Highway Works and related Appendices. Where the existing materials to be replaced or made up are not as per the Specification for Highway Works and related Appendices then the *Contractor* shall be responsible for sourcing and using those materials irrespective unless instructed otherwise in writing by the *Client*.

Series 800 - Unbound, Cement and other Hydraulically Bound Mixtures

Structural Soil

1. Structural Soil shall be a proprietary mixture approved by the *Client*. Unless approved otherwise in writing by the *Client*, the proprietary mixture shall have at least 10 years evidence of previous successful use as a load bearing growing medium for trees used beneath paved surfaces.

End-Product Mixture Requirements

2. Structural Soil shall be a uniformly blended mixture of the components and limiting proportions given in Table 8/15. The initial mixture design shall be determined by adjusting the ratio between the Aggregate and Soil constituent materials to achieve the required CBR value as per sub-Clause 3 below.
3. Structural Soil mixture shall achieve a soaked CBR > 50 when determined in accordance with sub-Clause 26.
4. When compacted to peak dry density, determined as per sub-Clause 25, the mixture shall achieve a voids content of 23-30% determined in accordance with sub-Clause 27.
5. Unless required otherwise in the instructing Task Order, the pH value of the mixture shall be between 6.0 and 6.5 when determined in accordance with sub-Clause 28.

Table 8/1 – Mixture proportions for Structural Soil

Constituent Material	Unit of Weight
Aggregate	70-80 units dry weight (as determined by testing of the mixture and successful previous use)
Soil (screened)	Approximate 20-30 units dry weight (as determined by testing of the mixture and successful previous use)
Hydrogel	As determined by testing of the mixture and successful previous use, but not to exceed dry weight 0.75 units/100 units Aggregate.
Total Moisture	Peak moisture content as determined in accordance with sub-Clause 20 (to include moisture in the Soil and Hydrogel slurry)

Constituent Material Requirements - Aggregate

6. Aggregate shall comply with BS EN 13242 and, unless approved otherwise by the *Client* the requirements of Table 8/16. The grading requirements for the Aggregate mixture is summarised in Table 8/17. Approval for use of alternative gradings and other aggregate requirements shall be subject to demonstration of a history of previous successful use as part of a load bearing growing medium for street trees.
7. Aggregate shall be made from igneous crushed rock. Use of limestone may be acceptable subject to prior written approval by the *Client*.
8. Evidence of satisfactory performance in similar mixtures shall be provided when aggregates with a value of Los Angeles coefficient greater than 30 are used.
9. The size fraction of the Aggregate mixture passing the 0.425 mm size test sieve shall be non-plastic as defined by BS 1377-2 and tested in compliance therewith.

883AR Frost Protection for Cement Treated Pavements

- Where there is a danger of frost affecting the materials used in any cement treated Pavement course, the *Contractor* shall, in addition to curing, protect the material by covering it with a 150 mm layer of dry straw or other insulating material held firmly in position with waterproof sheeting.

Table 8/2– Grading and Physical Category Requirements for Aggregate for Structural Soil Mixtures

Property	Requirements
Standard	BS EN 13242:2002 Categories for unbound mixture properties
Grading requirement categories - Designation - Maximum fines - General grading category - Mid-sieve size	20/40 f_4 G _C 85-15 GT _C 25/15. The Supplier shall state the typical grading passing.
Crushed, or broken and totally rounded particles	C _{90/3}
Resistance to fragmentation - Los Angeles test	LA ₄₀ (see also sub-Clause 7)
Resistance to wear - micro-Deval test	M _{DE} NR (no requirement). The supplier shall state the value for the aggregate used.
Resistance to freezing and thawing magnesium sulphate soundness	MS35
Water soluble sulphate content	SS _{0,2}
Total sulphur content	S ₁
Water absorption	WA _{DE} NR (no requirement). The supplier shall state the value for the aggregate used.
Volume stability of blast furnace slags	Not permitted.
Volume stability of steel (BOF and EAF) slags	Not permitted.
All other BS EN 13242 aggregate requirements	Category _{NR} (no requirement)

Table 8/3: Summary Grading Requirements for Aggregate for Structural Soil Mixtures

Sieve size, mm	Percentage by mass passing	
	Overall grading range – See NOTE 1	Tolerance on the supplier declared value at mid-sieve size
80	100	-
63	98 - 100	-
40	85 – 99	-
31,5 (32)	25 - 80	± 15
20	0 – 15	-
10	0 – 5	-
0.063	0 - 4	-

Constituent Material Requirements - Soil

2. Soil shall be a natural soil. Existing Class 5A topsoil to Table 6/1 or other topsoil extracted from the site shall not be used.
3. Soil properties shall be as per the requirements of Table 8/18.

Table 8/4: Requirements For Constituent Soil For Structural Soil Mixtures

Property	Test Method	Requirement
Soil texture Coarse fragments (>2mm) Sand (0.05-2mm) Silt (0.002-0.05mm) Clay (< 0.002mm)	BS 7755-5.4:1998	<5% m/m 20-45% m/m 20-50% m/m 20-40% m/m
Maximum coarse fragment content >2 mm >20 mm >50 mm	BS 3882:2007	<5% m/m <0% m/m <0% m/m
Organic matter content	Modified Walkley Black as BS 3882:2007	>2.75% but ≤4.75%
Soil pH value (1:5 water extract)	BS ISO 10390:2005	6.0-7.5 unless required otherwise in the instructing Task Order.
Carbon: Nitrogen ratio	BS 3882:2007	<20:1
Soil electrical conductivity (1:2.5 water extract)	BS 3882:2007	100-1500uS/cm.
Exchangeable sodium percentage	BS 3882:2007	<15%
Available plant nutrient levels Total Nitrogen Extractable Phosphorus Extractable Magnesium Extractable Magnesium	BS 3882:2007	≥0.2% m/m >45 mg/l >240 mg/l >80 mg/l
Chemical contaminants	Potential chemical contaminants shall not exceed the values given in Clause 653AR, Table 6/7.	
Visible contaminants	As BS 3882:2007, Table 1	
Other	Free from plants and its roots.	

4. The *Contractor* shall achieve the required properties for the constituent Soil by sourcing of a suitable dug natural soil. Screened composite manufactured soils shall not be used. Subject to the recommendations of the Interpretative Test Analysis Report produced by the Testing Laboratory as per sub-Clause 20, fertilizers may be added to the soil in the quantities and proportions recommended by the Testing Laboratory for the purposes of further refining the pH or available nutrient values within the range or limits of the Specification. In the event that the pH value or available nutrient levels as tested are found to be outside of the Specified range or limits then the *Contractor* shall be responsible for sourcing an alternative constituent

Soil meeting the Specification requirements and deficiencies may not be addressed through addition of fertilizers.

5. Any fertilizers added to constituent Soil in accordance with Interpretative Test Analysis Report recommendations as per sub-Clause 20 shall be EEC fertilizers complying with the Fertilizer Regulations 1991. Agricultural lime, where permitted, shall be a ground agricultural limestone produced by a member of the Agricultural Limestone Association. Fertilizers shall be applied not less than 6 weeks prior to the proposed installation date of the Structural Soil. The *Client* shall be advised immediately of any fertilizers so applied. Proof of product compliance with the Fertilizer Regulations 1991, membership of required professional associations, and general application compliance with the recommendations of the Interpretative Soil Test Analysis Report shall be provided.
6. The *Client* may at its discretion require to visit the source of the constituent Soil. Where this is the case then the *Contractor* shall arrange and facilitate the *Client's* attendance at such dates and times as are convenient to the *Client*. A representative of the Supplier shall be in attendance at the time.

Constituent Material Requirements - Hydrogel

7. Hydrogel shall be a potassium propanoate-propenamide copolymer Hydrogel or equivalent approved by the *Client* with a history of previous successful use in such mixtures.

Constituent Material Requirements – Water

8. Water shall be free from impurities.

Testing and approval of mix design

9. For each Lot of 400 cubic metres or less of Structural Soil mixture produced within a single production run to meet a given Specification provided by the *Client*, the *Contractor* shall comply with the mixture testing and approval requirements explained in the remaining sub-Clauses in this section. As above, submittals of constituent Soil shall be natural dug Soil only and shall not contain mineral, organic, fertilizer or other amendment.
10. Not less than 6 weeks prior to the date of the start of the Structural Soil installation works the *Contractor* shall submit to the *Client* for approval, manufacturers literature and certificates for all constituent natural and bulk material products. The information included in this submission shall include:
 - a. For any constituent Soil conforming to BS 3882:2007 - supplier's declarations and certification in accordance with that Standard.
 - b. For constituent Aggregate - CE labelling and any other Supplier's information and Test Analysis Reports necessary to demonstrate compliance with specification requirements.

In addition:

- c. Where the constituent Soil is not in accordance with BS 3882:2007, then the *Contractor* shall include in the submission the following source information for each:
 - i. Soil source (location description including previous and current land use).
 - ii. OS grid reference of soil source (minimum two letters, six figures).
- d. Where the producer of the proposed Hydrogel requires users of its product to be licensed, the *Contractor* shall include in its submission evidence of:

- i. The Manufacturing *Contractor's* Licence from the proprietary Specification Holder to mix and supply the material.
 - ii. The proposed Installing *Contractor's* Licence from the proprietary Specification Holder to install the material.
- 11. Not less than 6 weeks prior to the date of the start of the Structural Soil installation works the *Contractor* shall submit samples of each of the following to the *Client* in the quantities, multiples and containers stated.
 - a. 2 x 3 litre samples of the proposed end-product Structural Soil mixture (or 'mixtures' where more than one is proposed for any reason). Samples shall be submitted in pre-approved, clean, air tight containers.
 - b. 2 x 1 kg samples of the proposed constituent Soil (or constituent 'Soils' where more than one mixture is being proposed for any reason). Samples shall be composite samples composed of a mixture prepared from not less than 10-20 samples, combined in even proportions. Constituent samples shall be taken at a range of depths across the site on an evenly spaced grid. Soil shall not be sampled after recent addition of fertilizer or other chemical amendment. Care shall be taken not to mix darker top soil with lighter subsoil. The *Contractor* shall be responsible for replicating this mixture in related submissions and mixtures. Samples shall be submitted in a clean polythene zip-loc bags.
 - c. 1 x 2 litre sample of proposed constituent Aggregate. This shall be submitted in a pre-approved, clean, air-tight container.
- 12. Submitted samples shall be clearly and individual labelled with the following information:
 - a. The material type.
 - b. The name and (where relevant) reference or code for the material, clearly cross referenced to the materials submitted as per sub-Clause 18.
 - c. The name, full address, email and telephone number of the individual Supplier(s).
 - d. The project name and the proposed location in the works.
 - e. The date of submission and submitters details.
 - f. For the proposed end-product Structural Soil mixture(s) - details of the percentage of each component in the mixture (by mass) and details of the Optimum moisture content.
- 13. Samples shall be reviewed and approved by the *Client* for appearance and texture only. This will include reviewing to ensure non-separation of the Aggregate and Soil constituents. Compliance with all other requirements of the specification is the exclusive responsibility of the *Contractor*. Where they are approved then the *Client* shall retain the submitted Structural Soil mixture samples as Quality Control Specimens for latter compliance validation of the delivered and/or installed materials.
- 14. Where the constituent Soil is not in accordance with BS 3882:2015 then, not less than 6 weeks in advance of the proposed start date for the Structural Soil installation works, the *Contractor* shall submit to the *Client* an Interpretative Test Analysis Report from a Soil Testing Laboratory meeting the requirements of Clause 652AR for that Soil.

15. Tests shall be undertaken on samples taken at the same time and from the same source materials and mixtures as those submitted to the *Client* in accordance with sub-Clause 19 above.
16. Tests shall be undertaken to demonstrate conformance with the requirements in Table 8-18. The test analysis shall be to the requirements of BS 3882:2015 and shall report all test parameters required within this in addition to any required in Table 8-18. Test results shall be reported using the supplier's declaration of compliance form provided as Annex E to BS 3882:2015. The Testing Laboratory shall strike out that section of the declaration on the form confirming this the Soil complies with BS 3882:2015 gradings whilst leaving that part which confirms that the tests have been conducted in accordance with BS 3882:2015 requirements.
17. The Interpretative Test Analysis Report shall also include the following information:
 - a. The pH value of the end-product Structural Soil mixture when determined in accordance with BS 1377-3:2018.
 - b. Recommendations for any pH amendments or supplemental nutrient additions to the constituent Soil and suitable fertilizers (and quantities thereof) to achieve this in order to suit the plants specified. The Soil Scientist preparing those recommendations shall have regard to the likely impact of its recommendations on the overall suitability of the end-product Structural Soil mixture as a growing medium. They shall also advise as to how critical its recommended amendments are likely to be to the successful establishment of the proposed plants. This requirement does not absolve the *Contractor* of its responsibility to ensure that the nutrient levels of the mix submitted to the Soil Testing Laboratory achieve the requirements of the Specification and exist only to allow the Soil Testing Laboratory to advise upon possible improvements to that Specification.
18. Upon receipt of the Interpretative Test Analysis Report produced in accordance with sub-Clause 20, the *Client* shall confirm whether they require the proposed end-product Structural Soil mixture to be amended by the *Contractor* to address any supplemental nutrient recommendations. Confirmation shall be in respect to this element of the materials only and conformity with all other specification requirements shall remain the sole responsibility of the *Contractor*. As above, where any chemical requirements, as reported, are found to be outside of the range or limits permitted in the Specification then the *Contractor* shall be responsible for sourcing and testing an alternative constituent soil which meets specification requirements without instruction from the *Client*. Where the *Client* confirms that amendment is indeed required for any reason other than non-conformance of the test results with the Specification, then the *Contractor* shall be responsible for applying fertilizers and other amendments within 3 days of notification in accordance with the recommendations of the Testing Laboratory. This shall take place not less than 6 weeks prior to the proposed start date for Structural Soil installation works. The *Contractor* shall resubmit samples of the amended mixture and sub-constituents to the *Client* in accordance with sub-Clause 19 for approval as Quality Control Specimens
19. Not less than 6 weeks in advance of the proposed start date for the Structural Soil installation works, the *Contractor* shall submit to the *Client* a Test Analysis Report from a Testing Laboratory meeting the requirements of clause 672AR confirming that the end-product Structural Soil mixture achieves:
 - a. The soaked CBR value required in sub-Clause 3.
 - b. The voids content required in sub-Clause 4.

- c. The pH value required in sub-Clause 5.
20. The moisture/density relationship curve as per sub-Clause 25 shall also be provided. The Testing Laboratory will ideally be the same as that used for Soil Analysis as per sub-Clause 20 such that the various analysis can be undertaken and reported in a composite report but may be a separate report from another Testing Laboratory.

Tests shall be undertaken on samples taken at the same time and from the same source materials and mixtures as those submitted to the *Client* in compliance with sub-Clause 19 above.

21. During the works, the *Client* may attend to conduct visual and textural conformity testing of the Structural Soil mixture(s) at any time against the Quality Control Specimens approved in compliance with sub-Clause 19. The *Contractor* shall ensure that all stock piles are clearly labelled to allow referencing against the approved Quality Control Specimens and related information for the respective Lot. Where multiple Structural Soil mixtures are to be used then the *Contractor* shall keep such records as to show which of the mixtures were installed in different parts of the Permanent Works and shall not mix these. Where the *Client* deems there to be a significant difference in the delivered and/or installed materials compared with the Quality Control specimens approved in compliance with sub-Clause 19 then they may, at its complete discretion, require the *Contractor* to submit samples of the installed material for test analysis at a Testing Laboratory for such tests as they deem appropriate. The cost of additional test analysis shall be borne by the *Contractor* where the Test Analysis Report shows the material to have a significant difference from the approved samples and by the *Client* in other instances. Where subsequent Test Analysis Reports show the material to differ from the results for the previously tested materials as per sub-Clause 20 or 22 for the respective Lot then the *Client* may require the *Contractor* to remove and replace the Structural Soil mixture or to carry out other works to amend the mixture. In either instance the *Contractor* shall cover the full cost of the related works and materials. The following shall not be deemed to constitute significant differences when reported in a Laboratory Test Analysis Report:
- a. A difference in pH value of the specimen of ± 0.25 pH units.
 - b. A difference in voids content of the compacted specimen of $\pm 2\%$.
 - c. A difference in Aggregate content as a proportion of the mixture of $\pm 2\%$.
22. Should the *Contractor*/Mixing Contractor find it necessary in a later submission to modify or replace any constituent material or sub-constituent material for a given Lot already submitted or tested then they shall contact the *Client* via the *Contractor* for instruction before doing so. The *Client* may permit the modification or replacement without retesting or require the *Contractor*/Mixing Contractor to resubmit all previous information for that Lot using the modified or replacement materials. Where resubmission is required then all costs shall be borne by the *Contractor*. Replacement or modification of the Structural Soil mixture or any constituent or sub-constituent materials without *Client* approval after the submission of any test analysis results or other required information shall constitute non-compliance with this clause.
23. The moisture/density relationship curve for Structural Soil mixtures shall be determined by testing to clause 3.4.4.1 of BS 1377-4 with the following modifications:
- a. The mixture shall be tested without removal of oversize aggregate. The sample placed in the CBR mould shall be a representative sample of the overall mixture in respect to aggregate grading, selected so as to fill the mould

as fully as possible.

24. The CBR value of Structural Soil mixtures submitted for Laboratory Testing and approval shall be tested in accordance with clause 7 of BS 1377-4 using a soaked sample prepared and compacted to optimum dry density in a CBR mould as per sub-Clause 25.
25. The Air Voids content of Structural Soil mixtures submitted for Laboratory Testing and approval shall be determined using the formula provided in clause 3.3.5.5 of BS 1377-4 using a sample prepared and compacted to optimum dry density in a CBR mould as per sub-Clause 25.
26. The pH value of Structural Soil mixtures submitted for Laboratory Testing and approval shall be determined in accordance with the electrometric method as per BS 1377-3 using a 2:1 water to soil extract.

Construction methods – mixing, quality control and compaction

27. Structural Soil mixtures shall be mixed using front-end loaders only. Appropriate soil measuring and shredding equipment of sufficient capacity and capability to assure proper quality control and consistent mix ratios shall also be employed. No mixing of Structural Soil at the project site shall be permitted unless a large paved area is available for mixing and the site has been pre-approved for use by the *Client*. The sequential mixing procedure using front end-loaders shall be as follows:
 - a. A 20-30cm layer of Aggregate for incorporation into the mixture shall be spread on a clean, flat bituminous mixture or concrete paved surface;
 - b. The specified proportional amount of dry Hydrogel for incorporation into the mixture shall be spread evenly over the Aggregate. The Hydrogel shall be watered before adding the topsoil;
 - c. The specified proportional amount of topsoil shall be spread over the Aggregate and Hydrogel;
 - d. The components shall be blended by turning using a front-end loader or other suitable equipment until a consistent blend is produced;
 - e. Moisture shall be added gradually and evenly during the blending and turning operation as required to achieve the required moisture content, accounting for the moisture included within the hydrogel slurry. Application shall be delayed for 10 minutes prior to successive applications. Once established, mixing should produce a material within 1% of the optimum moisture level for compaction.
28. The *Contractor* shall maintain adequate moisture content during the mixing process. Soils and mix components shall easily shred and break down without clumping. Any soil clods shall breakdown into a fine crumbly texture. Soils shall not be overly wet or dry. The *Contractor* shall measure and monitor the amount of soil moisture at the mixing site periodically during the mixing process. The end texture should be such that the aggregate is uniformly coated with soil without separation and such that voids are evident within the mixture between the coated aggregate particles.
29. Where the producer of the Hydrogel constituent of the Structural Soil mixture requires those producing mixtures incorporating its product to be licensed, then such Structural Soil mixtures shall be mixed only by a licensee. Proof of the *Contractor's* license shall be provided to the *Client*.
30. The *Contractor* shall provide sufficient quantity in advance of the time the material is needed at the site to allow adequate time for the required quality control testing. No storage pile shall exceed 400 cubic metres. Each storage pile shall be numbered for

identification and quality control purposes to allow comparison by the *Client* against Quality Control Specimens approved as per sub-Clause 19. The height of storage piles and other care shall be in accordance with the Proprietary Specification Holder's Quality Management System.

31. Other than for any differing requirements in the Sub-Clauses below, Structural Soil mixtures shall be installed in accordance with Clause 802.
32. Structural Soil mixture shall be protected from excess water absorption and erosion at all times. Materials shall not be stored unprotected from rainfall, nor shall excess water be permitted to enter the site prior to compaction. If water is introduced into the material after grading, the *Contractor* shall allow the material to drain to optimal compaction water content.
33. No Structural Soil mixture shall be mixed or placed in air temperatures below 5°C or delivered or placed in frozen, wet, or muddy conditions. Material shall be delivered at or near the optimal moisture content for peak dry density, determined as per sub-Clause 25 and stated in Laboratory Test Analysis Reports included in approval submittals. No material shall be delivered or placed in an excessively moist condition, beyond two percent (2%) above the aforementioned optimal moisture content.
34. Where the producer of the Hydrogel constituent of the Structural Soil mixture requires users to be licensed to install mixtures containing its product, then such Structural Soil mixtures shall be installed only by a licensee. Proof of the *Contractor's* license shall be provided to the *Client*.
35. Structural Soil mixtures shall be installed in 150mm maximum lifts. Each lift shall be compacted to not less than 95% of peak dry density as determined following testing in accordance with sub-Clause 25 and stated in Laboratory Test Analysis Reports included in approval submittals for the mixture. No compaction shall occur when moisture content exceeds the optimum listed therein. Compaction shall be delayed by at least 24 hours if moisture content exceeds the optimum allowable. During delays in compaction the mixture shall be protected by plastic sheeting or plywood.
36. Structural Soil mixtures shall be placed and compacted without segregation of the mixture.
37. Structural Soil mixtures shall only be installed after the installation of all walls, kerbs, footings, and utility work in the area has been completed. For site elements dependent on the Structural Soil mixture for foundation support, installation shall be postponed until immediately after the installation of the Structural Soil mixture.

Series 900 - Road Pavements – Bituminous Bound Materials

NOTE: Materials and options for bituminous layers are derived directly from the London Asphalt Specification dated January 2016.

Resin Based Coloured Surface Treatment

1. Proprietary resin based coloured surface treatment shall comply generally with the requirements of Clause 924 (High Friction Surfaces) except that the maximum aggregate size and grading shall be in accordance with the manufacturer's instructions and the polished stone value (PSV), aggregate type and finished colour shall comply with the requirements of this Clause.
2. Any existing High Friction Surfacing shall be removed by grinding or other method approved by the *Client* before application.
3. The material shall be machine laid, unless otherwise authorised by the *Client* for small areas as specified in Appendix 7/2.
4. Areas to receive resin based coloured surface treatment are shown on the Contract drawings but are typically bus lanes, cycle advance stop reservoirs, cycle lanes, cycle tracks, toucan crossings and pedestrian crossings. The individual requirements for these areas are as follows:
 - a. Bus lanes, where high skid resistant surface treatment has been specified for the adjacent section of carriageway, typically extending for a distance of 50 metres in advance of the stop line at a signal-controlled junction:
Minimum PSV: 70
Aggregate Type: Chinese Bauxite
Finished Colour: Venetian Red (No 445, BS381C:1966)
 - b. Bus lanes, where high skid resistant surface treatment has not been specified for the adjacent section of carriageway:
Minimum PSV: 50
Aggregate Type Chinese Bauxite
Finished Colour: Natural Red – e.g. Harden Red
 - c. Cycle advance stop reservoirs, toucan crossings and cycle lanes, where a high skid resistant surface treatment has been specified for the adjacent section of carriageway:
Minimum PSV: 70
Aggregate Type Guyanan Bauxite
Finished Colour: Deep Chrome Green (No 267, BS381C:1996)
 - d. Pedestrian crossings, where a high skid resistant surface treatment has been specified for the adjacent section of carriageway:
Minimum PSV: 70
Aggregate Type: Chinese Bauxite
Finished Colour: Bold Red (No 564, BS381C:1966)
 - e. Cycle tracks and cycle lanes not forming part of the adjacent traffic lane, where there is no requirement for high skid resistant treatment of the

adjacent carriageway surface, the requirements are as for (iii) above, except that the minimum PSV shall be 50 and the aggregate type may be proposed by the manufacturer.

- f. Cycle tracks and cycle lanes which are shared and form part of the adjacent traffic lane, the requirements are as for (d) above, except that the minimum PSV shall be determined by the minimum PSV required on the adjacent traffic lane, as defined by the Skid Resistance Policy of the *Client*, or in lieu of an organisation specific policy, the requirements contained within CD 236. The aggregate type may be proposed by the manufacturer.
- g. Cycle lanes forming part of the blue *Cycle Superhighway* network where high skid resistance is required:
 - i. The material shall be a binder and broadcast aggregate-based system with HAPAS type 1 certification. This shall include laboratory testing to meet the criteria specified in HAPAS Guideline Table 1 of SG1.
 - ii. Finished Colour: Sky Blue (RAL 5015) L 42±8, a* -12±3, b* -22±10 (CIE 1979 LAB system)
 - iii. The colour change shall be a maximum of: $\Delta E < 7$ following 2000 hours under BBA HAPAS Guideline SG9 conditions; $\Delta E < 10$ following 100,000 wheel passes under the Wear Test of Guideline SG1 (March 2008) Appendix D; and $\Delta E < 10$ following MAAV testing under Guidelines SG10/05/050 Appendix F.
- h. Cycle lanes forming part of the blue *Cycle Superhighway* network not requiring a high friction surface, but the cycle lane is shared with the left-hand wheel path of the associated traffic lane:
 - i. The material shall have undergone a series of testing to demonstrate compliance with the requirements set out in this specification. The manufacturer shall be accredited to ISO9001 and ISO14001 standards.
 - ii. Samples shall be prepared in accordance with HAPAS Guideline SG1.
 - iii. The material shall give a starting SRV >60 and minimum texture depth of 1.0mm.
 - iv. The material colour shall be to the Finished Colour as in 4(vii)b above.
 - v. The colour change shall be a maximum of $\Delta E < 7$ following 2000 hours under HAPAS Guideline SG9 conditions.
 - vi. The material shall give an SRV value >60 with a minimum texture depth of 0.8mm following 100,000 wheel passes under the Wear Test of HAPAS Guideline SG1 (March 2008) Appendix D.
 - vii. The material shall give an SRV value of >60 with a minimum texture depth of 0.8mm following 150 revolutions of the lap wheel of the MAAV test under HAPAS Guidelines SG10/05/050 Appendix F.
 - viii. The erosion and tensile adhesion shall be as standard for HAPAS Type 1 materials.
 - ix. The material, when laid, shall have a minimum SCRIM value of 0.45.

- x. The material shall come with a guarantee for both the material and workmanship for a period of two years.
- i. Cycle tracks, off-carriageway cycle lanes and shared areas forming part of the blue *Cycle Superhighway* network:
 - i. The material shall have undergone a series of testing to demonstrate compliance with the requirements set out in this specification. The manufacturer shall be accredited to ISO9001 and ISO14001 standards.
 - ii. Samples shall be prepared in accordance with HAPAS Guideline SG1.
 - iii. The material shall give a starting SRV>60 and minimum texture depth of 1.0mm.
 - iv. Finished Colour as in 4(vii)b above.
 - v. The erosion index and tensile adhesion should be as standard for HAPAS Type 3 materials.
 - vi. The colour change shall be a maximum of $\Delta E < 7$ following 2000 hours under BBA HAPAS Guideline Appendix F SG9 conditions.
 - vii. The material shall give an SRV value >50 with a minimum texture depth of 0.8mm following 60,000 wheel passes under the Wear Test of HAPAS Guideline SG1 (March 2008) Appendix D.
 - viii. The material shall give an SRV value of >50 with a minimum texture depth of 0.8mm following 150 revolutions of the lap wheel of the MAAV test under HAPAS Guidelines SG10/05/050 Appendix F.
 - ix. The material, when laid shall have a minimum SCRIM value of 0.40.
 - x. The material shall come with a guarantee for both the material and workmanship for a period of two years.
- 5. For each different coloured surface treatment, a sample shall be submitted to the *Client* for approval not less than 14 calendar days prior to work commencing on site. The treatment shall be machine laid unless authorised by the *Client* but may be hand laid for small areas as described in Appendix 7/2.

960AR Stress Absorbing Membrane Interface (Sami)

- 1. Stress absorbing membrane interfaces shall comply with Appendix 7/1. They shall be installed in accordance with the manufacturer's instructions unless otherwise instructed by the *Client*.

961AR Stress Absorbing Membrane

- 1. Where a stress absorbing membrane bituminous seal is required on a milled surface prior to the placement of the surface course or binder course asphalt, for the purposes of providing increased flexibility and crack retardation, it shall comprise a spray applied SBS-modified bituminous binder with a British Board of Agrément HAPAS Roads and Bridges Certificate. In the event that no such certificates have been issued, modified bituminous products shall have the approval of the *Client*.
- 2. The modified binder shall be installed in accordance with the manufacturer's instructions unless otherwise instructed by the *Client*.
- 3. Where chippings are used to prevent bitumen pick up on vehicle tyres, they shall consist of hard, clean aggregate 2/4 mm or 2/6 mm Gc 85/35. The rate of application of aggregate shall be the minimum necessary and shall be distributed by

metered mechanical means. The bituminous seal shall be visible after aggregate application to ensure bond is still achieved between the pavement layers.

962AR PSV Requirements Of Surface Course Asphalt

1. If the *Client* has an organisation-specific skid resistance management policy, the requirements of that policy shall be met when determining the frictional properties of the proposed surface course asphalt. In the absence of an organisation-specific policy, the friction properties of the surface course asphalt shall be determined in accordance with the guidance in HD 28/15 and CD 236.
2. Where the *Client* has assessed and determined the Site Category and respective Investigatory Levels, this information shall be used by the *Contractor* to determine the PSV requirements in accordance with the requirements of CD 236, except in cases where the road use/configuration has changed requiring updating of the Site Category and Investigatory Level.

963AR Removal Of Existing Asphalt Layers

1. Where the existing surface course is to be removed, the removal shall be undertaken such that no damage is caused to the underlying binder course or base course.
2. Upon removal of required material, to the approved depth, the *Contractor* shall inspect the surface. Where the existing surface is not adhered firmly to the layer directly beneath it, or where a failed utility trench reinstatement is exposed, the *Contractor* shall remove the additional material and replace it with regulating material. The *Contractor* shall provide photographic evidence and materials quantity information to the *Client*.
3. The *Contractor* shall remove all loose material from the carriageway surface by sweeping, vacuum suction or other approved method prior to application of the bond coat.

964AR Surface Preparation (Crack Filling)

1. Following milling and cleaning of the surface, but prior to the application of the bond coat, the *Contractor* shall undertake a visual inspection of the surface. All cracks greater than 2mm in width shall be cleaned and filled prior to the application of the body coat. Cracks shall be filled level with the surrounding surface using a polymer modified bituminous sealant.

965AR Ironworks And Drainage

1. Any failed or misaligned ironworks or drainage gullies shall be repaired, reset and re-levelled in conjunction with resurfacing works, by a method approved by the *Client*. The method selected shall include a rapid set material (unless otherwise approved by the *Client*) to ensure the repair can withstand, and is not damaged by, construction traffic and regular traffic when the road is reopened to traffic.
2. The *Contractor* shall take all measures necessary to ensure that all surface water from the highway can freely flow to all road gullies.

966AR Compliance testing and audit testing

1. The surface of any asphalt layer shall have a uniform and homogenous appearance and shall contain no cracked, segregated, corrugated, bony or fatty sections. If, in the opinion of the *Client*, a non-homogeneous surface is unlikely to provide expected asset performance, it shall be classified as a Defect.

967AR Stone mastic asphalt surface course

General

1. Stone Mastic Asphalt shall comply with the general requirements of BS EN13108-5 and those specified in appendix 7-1. The mixture designation shall be one of the following:
 - a. SMA14 surf
 - b. SMA 10 surf
2. Mixes shall be HAPAS approved or mix producers shall register its mixes for approval by a NAMAS approved laboratory and such approval shall be maintained until the mix constituents or characteristics change.
3. The target aggregate grading and target binder content proposed for the mixture shall fall within the limits given in Table 9/X, unless agreed otherwise by the NAMAS approved laboratory identified by the *Client*.

TABLE 9/1 – Target Aggregate Grading and Binder Content

BS Sieve	% by mass of total aggregate passing	
	Designation	
	0/14mm	0/10mm
20mm	100	-
14mm	90 - 100	100
10mm	35 - 60	90 – 100
6.3mm	23 - 35	30 – 50
4mm	-	-
2mm	18 - 30	22 – 32
0.063mm	8 - 13	8 – 13
% Binder (min)	6.3	6.7

4. The *Contractor* shall demonstrate the properties of the proposed mixture, at the target composition, by preparing loose mixture and compacted specimens in accordance with the general requirements of BS 598: Part 107.
5. When tested at target composition, the loose mixture shall demonstrate not more than 0.3 percent binder drainage, by total mass of mixture, at a temperature of 17oC, in accordance with BS DD 232.
6. The design void content shall be as per table 9/2 below

TABLE 9/2 – Air Void Contents of Compacted Materials

Material	Mean of 6 Cores
----------	-----------------

	Min %	Max %
14mm SMA – to achieve 1.5mm texture depth	2	5
10mm SMA – to achieve 1.0mm texture depth	2	5

7. 14mm SMA material is to achieve a minimum texture depth 1.5mm (Clause 921)
8. 10mm SMA material is to achieve a minimum texture depth 1.0mm (Clause 921)
9. Thickness tolerance shall be nominal layer thickness less 5mm.

968AR EME Surface Course

General

1. Enrobe a Module Élevé (EME) surface course shall conform to BS EN13108-1, the requirements of this Clause and those specified in Appendix 7/1. The mixture designation shall be one of the following:
 - a. AC EME10 surf
 - b. AC EME14 surf
 - c. AC EME20 surf
2. EME surface course shall have a minimum binder content shown of $B_{act}5.5\%$ for EME10 surf, $B_{act} 5.3\%$ for EME14 surf and $B_{act}5.1\%$ for EME20 surf.
3. The water sensitivity shall be as specified in Appendix 7/1. The water sensitivity of mixtures conforming with BS EN 13108 Parts 1, 2 and 5 shall conform to, at least, category ITSR_{min}90.
4. The design void content shall be $V_{min}2$ to $V_{max}6\%$.
5. The thickness of the system shall be as stated below:

Table 9/3 EME Surface Thickness

Material description	Nominal target layer thickness (mm)	Minimum compacted thickness at any point (mm)
EME10 surf	60 – 100	50
EME14 surf	70 – 130	60
EME20 surf	90 – 150	80

6. EME surface course shall achieve a minimum Noise Level 2.
7. Caution must be taken when laying these materials with regards to longitudinal joints, ride quality and compaction .

969AR Warm Mix Asphalt Materials

General

1. A warm mix asphalt is an asphalt in which the aggregate particles are continuously graded or gap-graded to form an interlocking structure that is mixed and laid at temperatures at least 30 °C below conventional hot mix asphalt mixtures but still above 100 °C.

Scope

2. This Specification sets out requirements for mixtures of warm mix asphalt for use on roads, airfields and other trafficked areas. It includes requirements for the selection of the constituent materials. Warm mix asphalt can be used for surface courses, binder courses, regulating courses and bases.

Normative references

3. This Specification incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this Specification only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies (including amendments).
 - a. BS 594987, *Asphalt for roads and other paved areas. Specification for transport, laying, compaction and type testing protocols*
 - b. BS EN 12697-13, *Bituminous mixtures Test methods for hot mix asphalt Part 13: Temperature measurement*
 - c. BS EN 13108-1, *Bituminous mixtures - Material specifications - Part 1: Asphalt concrete*
 - d. BS EN 13108-2, *Bituminous mixtures - Material specifications Part 2: Very thin layer asphalt concrete*
 - e. BS EN 13108-4, *Bituminous mixtures - Material specifications - Part 4: Hot rolled asphalt*
 - f. BS EN 13108-5, *Bituminous mixtures - Material specifications - Part 5: Stone mastic asphalt*
 - g. BS EN 13108-7, *Bituminous mixtures - Material specifications - Part 7: Porous asphalt*
 - h. BS EN 13108-20, *Bituminous mixtures - Material specifications - Part 20: Type testing of asphalt mixes*
 - i. BS EN 13108-21, *Bituminous mixtures - Material specifications - Part 21: Factory production control*

Terms and definitions

4. For the purposes of this Appendix, the terms and definitions given in BS EN 13108-1 together with the following apply:

Asphalt

5. Homogenous mixture of coarse and fine aggregates, filler aggregate and bituminous binder which is used in the construction of flexible pavement layers

NOTE: The asphalt may include one or more additives to enhance the laying characteristics, performance or appearance of the mixture. Natural asphalt is defined in BS EN 13108-4.

Moisture content in the mix

6. Water content expressed in per cent of the dry aggregate mass

Symbols and abbreviations

WMA General designation for a warm mix asphalt.

7. XX *D* WMA Designation of mixture type followed by an indication of *D*, the upper sieve size of the aggregate in the mixture, in millimetres (mm), and the general designation for warm mix asphalt.

EXAMPLE: AC 14 WMA is a warm mix asphalt concrete with an upper sieve size of the aggregate of 14 mm.

Requirements for constituent materials

General

8. As in BS EN 13108-1 for warm mix asphalt concrete; BS EN 13108-2 for warm mix very thin layer asphalt concrete; BS EN 13108-4 for warm mix hot rolled asphalt;
9. BS EN 13108-5 for warm mix stone mastic asphalt; or BS EN 13108-7 for warm mix porous asphalt.

Binder

General

10. As in BS EN 13108-1 for warm mix asphalt concrete; BS EN 13108-2 for warm mix very thin layer asphalt concrete; BS EN 13108-4 for warm mix hot rolled asphalt; BS EN 13108-5 for warm mix stone mastic asphalt; or BS EN 13108-7 for warm mix porous asphalt.

Selection of binder

11. As in BS EN 13108-1 for warm mix asphalt concrete; BS EN 13108-2 for warm mix very thin layer asphalt concrete; BS EN 13108-4 for warm mix hot rolled asphalt; BS EN 13108-5 for warm mix stone mastic asphalt; or BS EN 13108-7 for warm mix porous asphalt.

NOTE: The ageing of binder during the mixing and placement of hot mix asphalt, particularly when using batch mixers, in terms of the binder penetration is generally a reduction of the order of 33 %, or one binder grade, which does not occur to the same extent for warm mix asphalt. Consideration should be given to reducing the required binder penetration where equivalence is intended with hot mix asphalt.

Surface courses with reclaimed asphalt

12. As in BS EN 13108-1 for warm mix asphalt concrete; BS EN 13108-2 for warm mix very thin layer asphalt concrete; BS EN 13108-4 for warm mix hot rolled asphalt; BS EN 13108-5 for warm mix stone mastic asphalt; or BS EN 13108-7 for warm mix porous asphalt.

Regulating courses, binder courses and bases with reclaimed asphalt

13. As in BS EN 13108-1 for warm mix asphalt concrete; BS EN 13108-4 for warm mix hot rolled asphalt; or BS EN 13108-5 for warm mix stone mastic asphalt.

NOTE: Not applicable for warm mix very thin layer asphalt concrete or warm mix porous asphalt.

Aggregates

14. As in BS EN 13108-1 for warm mix asphalt concrete; BS EN 13108-2 for warm mix very thin layer asphalt concrete; BS EN 13108-4 for warm mix hot rolled asphalt; BS EN 13108-5 for warm mix stone mastic asphalt; or BS EN 13108-7 for warm mix porous asphalt.

Reclaimed asphalt

15. As with hot mix asphalt, reclaimed asphalt containing tar shall not be used.
16. As in BS EN 13108-1 for warm mix asphalt concrete; BS EN 13108-2 for warm mix very thin layer asphalt concrete; BS EN 13108-4 for warm mix hot rolled asphalt; BS EN 13108-5 for warm mix stone mastic asphalt; or BS EN 13108-7 for warm mix porous asphalt.

Additives

17. As in BS EN 13108-1 for warm mix asphalt concrete; BS EN 13108-2 for warm mix very thin layer asphalt concrete; BS EN 13108-4 for warm mix hot rolled asphalt; BS EN 13108-5 for warm mix stone mastic asphalt; or BS EN 13108-7 for warm mix porous asphalt.

Requirements for the warm mix asphalt mixture

General

18. The target composition of the mixture in terms of its constituent materials, the proportions (in per cent) passing the specified sieves, the target binder content and where relevant the binder from natural asphalt and the proportion(s) of additive(s) shall be declared and documented. The target grading curve shall be declared for the sieve 1.4 *D* and the sieves as called up in A.5.2.
19. At the target composition, the mixture shall conform to the specified requirements in accordance with this specification.
20. The test results shall be made available.

Composition and grading

21. As in BS EN 13108-1 for warm mix asphalt concrete; BS EN 13108-2 for warm mix very thin layer asphalt concrete; BS EN 13108-4 for warm mix hot rolled asphalt; BS EN 13108-5 for warm mix stone mastic asphalt; or BS EN 13108-7 for warm mix porous asphalt.

NOTE: Coated chippings to BS EN 13108-4 are not included because they are not suitable for rolling into hot rolled asphalt at warm mix asphalt temperatures.

Binder content

22. As in BS EN 13108-1 for warm mix asphalt concrete; BS EN 13108-2 for warm mix very thin layer asphalt concrete; BS EN 13108-4 for warm mix hot rolled asphalt; BS EN 13108-5 for warm mix stone mastic asphalt; or BS EN 13108-7 for warm mix porous asphalt.

Additives

23. As in BS EN 13108-1 for warm mix asphalt concrete; BS EN 13108-2 for warm mix very thin layer asphalt concrete; BS EN 13108-4 for warm mix hot rolled asphalt; BS EN 13108-5 for warm mix stone mastic asphalt; or BS EN 13108-7 for warm mix porous asphalt.

Properties

Specimens

24. For application of this Specification, specimens shall be manufactured in accordance with clause 6.2 of BS EN 13108-20:2014 except for the temperature at which they are mixed and compacted.
25. The temperature at which samples shall be mixed and compacted shall be at the standard temperature for each operation less the difference between the temperature at which the warm asphalt will be prepared on site and the temperature at which hot asphalt will be prepared on site.

26. When testing a sample of warm asphalt for refusal density, the sample shall be heated to the same temperature as an equivalent hot mix asphalt before compaction.
27. The relevant technology that allows the asphalt to be mixed and laid at a reduced temperature shall be employed in the manufacture of samples used to demonstrate the properties of the asphalt mixture. If the technology cannot be replicated in the laboratory, plant-produced samples shall be used for type testing and factory production control.

Standard properties

28. As in BS EN 13108-1 for warm mix asphalt concrete; BS EN 13108-2 for warm mix very thin layer asphalt concrete; BS EN 13108-4 for warm mix hot rolled asphalt; BS EN 13108-5 for warm mix stone mastic asphalt; or BS EN 13108-7 for warm mix porous asphalt.

NOTE: The ageing of binder during the mixing and placement of hot mix asphalt, particular when using batch mixers, in terms of the binder penetration is generally a reduction of the order of 33 %, or one binder grade, which does not occur to the same extent. Where equivalence is intended with hot mix asphalt and the binder grade selected has been adjusted, the selected categories of the standard mechanical properties may need to be adjusted when laboratory prepared mixtures are used to assess the performance.

Temperature of the mixture

29. The maximum temperature requirements apply at any place in the plant and shall be declared.
30. The minimum temperature of the mixture at delivery shall be declared.
31. Depending on local conditions and for specific application the minimum temperature, measured according to EN 12697-13, may be specified.
32. When using paving grade binder, the maximum temperature of a warm mix asphalt, measured according to BS EN 12697-13, shall target less than 140 °C (grades 20/30 to 70/100), less than 130 °C (grades 100/150 to 70/100) or less than 130 °C (grades 250/330 and 330/430).
33. When using modified bitumen or hard grade bitumen, additives or premix bitumen, different temperatures may be applicable. These shall then be documented and declared.

Dangerous substances

34. As in BS EN 13108-1 for warm mix asphalt concrete; BS EN 13108-2 for warm mix very thin layer asphalt concrete; BS EN 13108-4 for warm mix hot rolled asphalt; BS EN 13108-5 for warm mix stone mastic asphalt; or BS EN 13108-7 for warm mix porous asphalt.

Conflicting specifications

35. As in BS EN 13108-1 for warm mix asphalt concrete; BS EN 13108-2 for warm mix very thin layer asphalt concrete; BS EN 13108-4 for warm mix hot rolled asphalt; BS EN 13108-5 for warm mix stone mastic asphalt; or BS EN 13108-7 for warm mix porous asphalt.

Identification

36. The delivery ticket shall contain at least the following information relating to identification:
 - a. the manufacturer and mixing plant;

- b. designation of the mixture: *AC/BBTM/HRA/SMA/PA D surf/base/bin Binder WMA*

where:

AC is Asphalt Concrete;

BBTM is asphalt concrete for very thin layers;

HRA is Hot Rolled Asphalt;

SMA is Stone Mastic Asphalt;

PA is Porous Asphalt;

D is the upper sieve size;

surf is the surface course;

base is the base course;

bin is the binder course;

binder is the designation of binder used;

WMA is warm mix asphalt.

NOTE: Example: *SMA 14 base 40/60 WMA* (in which 40/60 is the binder used and not the equivalent properties for hot mix asphalt).

Transport, laying and compaction

37. This clause gives general requirements for the transport, placing and compaction of bituminous mixtures, which are complementary and additional to the requirements of BS 594987. These requirements and the requirements of BS 594987 shall apply to all warm mix asphalt mixtures, unless otherwise specified in paragraph 40 of this Appendix.
38. Minimum delivery and rolling temperatures for warm mix asphalt mixtures shall be declared by the supplier with evidence to support its suitability.

Compliance

39. Compliance with the requirements for mixture composition and properties (A.4 and A.5) shall be by type testing and factory production control. The factory production control shall be in accordance with the principles and frequencies of BS EN 13108-21. A certificate defining compliance supported by test reports shall be made available for inspection.
40. Audit checking to confirm that the mixture composition and properties claimed are those of the mixture delivered to site may be undertaken.
41. Compliance with the requirements for transporting, laying and compacting the asphalt (A.7) shall be monitored against the requirements of BS 594987 and test reports demonstrating compliance shall be made available for inspection.

Series 1100 - Kerbs, Footways and Block Paved Areas

1112AR Natural Stone Kerbs, Channels, Quadrants, Angles And Edgings

1. Natural stone kerbs, channels, quadrants, angles and edgings shall be one of the following, as required:
 - a. LBS Standard Units as per one or more Type Designations given in Appendix 11/1.
 - b. Unlisted Units. These shall be '*Client* Specified' equipment as Clause 143AR.
2. Natural stone kerbs, channels, quadrants, angles and edgings shall be taken up and reused when instructed and supplemented by recycled components from a source approved by the *Client*. Taken up and reused Units shall be Cleansed in accordance with Clause 1117AR and, where required in the instructing Task Order, Deep Cleansed or Re-texturised in accordance with Clause 1117AR.
3. Natural stone kerbs, channels, quadrants, angles and edgings shall be laid and bedded in accordance with the requirements of Clause 1101SR, with the following amendments:
 - a. Where Units are to be bonded to the pavement surface then all requirements shall be as per the instructing Task Order.
 - b. Where the *Client* requires an up stand or top face of a Unit to be cropped, then the deviation on the longitudinal surface regularity to that face shall not deviate from the design level more than \pm the specified crop tolerance for the Unit plus an additional 2mm in 3m when checked with a 3m straight edge. Horizontal alignment to any such faces shall be comply with Clause 702 except that the tolerance shall be \pm 15mm. The surface level of Units shall not deviate from the design level by more than the following:
 - i. For sides of Units required to present an up stand of $<30\text{mm}$ - \pm 6mm or the specified crop tolerance for that face plus a further 2mm, whichever is the greater.
 - ii. For sides of Units required to present an upstand of $\leq 25\text{ mm}$ or to be flush with a neighbouring surface - + 6mm / - 3mm or the specified crop tolerance for that face plus a further 2mm, whichever is the greater. The difference in height between two adjoining Units at any joint shall not exceed 6mm at any point.
 - c. Where the *Client* requires the reuse of existing natural stone kerbs, channels, quadrants, angles and edgings or the use of second-hand imported Units of such types then, where the adjoining pavement surface is to be an unbound modular surface and where required in the instructing Task Order, the *Contractor* shall apply a variable 5-35mm wide mortar screed to those vertical faces of units above backing height that will bound modular surfaces in order to present a straight laying face to receive units. This shall be applied prior to installation of base course or laying course. Where required then mortar for these purposes shall be as specified in the instructing Task Order from amongst the options given in Appendix 11/1.
 - d. Where the *Client* requires the reuse of existing natural stone kerbs, channels, quadrants, angles and edgings or the use of second-hand imported Units of such types then the longitudinal surface regularity shall not deviate by more than 5mm in 3m when checked with a 3m straight edge. All other requirements shall be as per 'b' above.

- e. Where natural stone kerbs, channels, quadrants, angles and edgings are specified with variable lengths then the *Contractor* shall be responsible for selecting Units of appropriate lengths to fit any gap greater than or equal to the minimum specified length of Units plus the minimum specified joint width so as to avoid cutting.

1113AR General Requirements For Pavements Surfaced With Precast Concrete, Clay Or Natural Stone Flag, Slab, Sett, Paver Or Block Paved Surfaces

Surface Course Materials

1. Modular Units shall be one of the following as required by the *Client* in the instructing Task Order:
 - a. LBS Standard Units as per one or more Type Designations given in Appendix 11/1.
 - b. Unlisted Units. These shall be '*Client* Specified' equipment as per Clause 143AR.
2. Where additional materials are required for Minor Patching and Repair as per Clause 946 or Reinstatement as per Clause 706 - a Modular Unit matching the existing materials to be repaired or reinstated in accordance with Clause 723AR.

Construction Standards

3. Except where required otherwise in the instructing Task Order or Appendix 11/1, all pavements shall be constructed in all respects in compliance with the recommendations of the relevant parts of BS 7533 these being:
 - a. For precast concrete flag and natural stone slab Modular Unit surfaced pavement: BS 7533-4:2006.
 - b. For unbound precast concrete block or clay paver Modular Unit surfaced pavement: BS 7533-3:2005+A1:2009.
 - c. For bound clay paver Modular Unit surfaced pavement: BS 7533-9:2010.
 - d. For bound precast concrete block Modular Unit surfaced pavement: BS 7533-10:2010.
 - e. For bound or unbound natural stone sett Modular Unit surfaced pavement: BS 7533-10:2010.

Compliance with the recommendations of these standards includes, amongst other things, conformity with requirements for levels and other tolerances for pavement courses and for construction in inclement weather.

Materials and Construction for Other Pavement Courses

4. Materials for pavement subbase, base course (where required) laying course, jointing material and geotextile inter-layers shall be as specified in Appendix 11/1.
5. Unless required otherwise in the instructing Task Order, jointing materials shall be of the colour and appearance required as per Appendix 11/1. Jointing materials of other colours shall not be used, and the *Contractor* shall be responsible for correcting any installations of non-confirming materials within the Permanent Works at full cost to them.
6. Where coarse or fine aggregate laying course materials are required then the moisture content of the material shall be maintained within a range that ensures consistent compaction of the laying course to the tolerances in this standard. The materials should be moist without being saturated and should not yield any moisture

when tightly squeezed by hand. If the prepared laying course is saturated prior to the laying of paving units, it shall be allowed to dry to acceptable moisture content before laying commences or resumes. Stock pile moisture content shall be controlled through covering with a waterproof material such as a tarpaulin or polyethylene sheet. Stock piles shall not be located where materials could become saturated by overland surface flow.

Laying of Modular Units

7. Where it is required to use and lay cropped natural stone setts (and other Modular Units with variable dimensions) then the *Contractor* shall be responsible for sorting these units in advance of laying to achieve the required bonding pattern and joint width. This includes when laying variable sized natural stone setts (and other similar Modular Units) to arc bonding patterns.
8. Modular Units shall be laid in the bond pattern nominated by the *Client* in the Contract Drawings. Where Laying Arrangement Drawings are included in the Contract Drawings then units shall be cut and laid in accordance with these. The *Contractor* shall not deviate from such information without either the receipt of revised Contract Drawings or the written agreement of the *Client* during the works.
9. Irrespective of the area to be paved, successive Modular Units shall be selected randomly from a minimum of three (3) open packs at any time in order to avoid veining, except where the following applies:
 - a. The surface requires two or more Modular Unit types from different packs to be laid in a mixture with one another, with the least accounting for a minimum of 30% where there are two types and 20% where there are 3 types. In such circumstances, each type of Modular Unit may be selected from a single pack at a time.
 - b. The surface requires two or more Modular Unit types that are premixed in the same pack to be laid in a mixture with one another, with the least accounting for a minimum of 30% where there are two types and 20% where there are 3 types. In such circumstances, the Modular Units may be selected from a single pack at a time.
 - c. The Task is for Minor Patching or Repair as per Clause 946 wherein Modular Units may be selected from a single pack at a time.
 - d. The Task is for Reinstatement as per Clause 706 of an opening not greater than 15m² wherein Modular Units may be selected from a single pack at a time.
10. The *Contractor* shall be responsible for using string lines and other guides for the purposes of maintaining required bond patterns and alignments. The *Contractor* shall not be due any additional payment for this.
11. Other than as permitted in sub-clause 12, the *Contractor* shall not cut, split or lay any Modular Units to dimensions outside of those recommended in the relevant part of BS 7533 as per sub-Clause 2 above unless instructed by the *Client* via either:
 - a. Laying Arrangement Drawings included in the Contract Drawings;
 - b. Written instruction during the works.
12. The *Contractor* shall be responsible for any such Modular Units laid in absence of the above and shall, where instructed by the *Client*, lift and replace those units at cost of the *Contractor*.
13. Unless required otherwise by the instructing Task Order or instructed otherwise on Site by the *Client*, Modular Units being laid as infill to recess tray covers shall be

cut/split and laid such that the bond pattern of neighbouring pavement surfaces is maintained without visual interruption across the cover. For this purpose only, units may be cut or split to dimensions not according with those recommended in the relevant part of BS 7533 as per sub-Clause 2.

14. Modular Units shall be carefully cut-in to iron work and other obstructions to maintain the required joint widths. Where instructed by the *Client* (but not in any other circumstances) gaps between Modular Units that exceed required joint widths shall be filled with either a C35 air entrained concrete or a 3:1 coarse aggregate and mortar mix as per clause 5.6 of BS 7533-4:2006.
15. Where cutting and laying around the bases of items of street furniture then the paving detailed used around bases shall be one of the type designations given in Appendix 11/1.
16. Where use of mortar jointing and laying course materials is required then the *Contractor* shall be responsible for cleaning the pavement of any mortar stains that result from the laying works using suitable cleansing methods and materials.
17. Any Modular Units which, as a result of mishandling, cleansing or unsatisfactory dressing and squaring, are considered by the *Client* as unsuitable for re-use shall be replaced with new Modular Units at the cost of the *Contractor*.

1114AR Quality Control Checking And Approval Of Modular Units

New Precast Concrete Block and Flag and Clay Paver Modular Units

1. Except for where new precast concrete block or flag or clay paver Modular Units are to be used for:
 - a. Patching and Minor Repair as per Clause 946; or
 - b. Reinstatement as per Clause 706.then for any product they wish to offer for immediate or future use to meet a Specification for a particular Modular Unit (defined as per sub-Clause 18) the *Contractor* shall submit for the written approval of the *Client* a Sample Set and associated Product Report as per sub-Clause 2. Where the offered product is approved by the *Client* then the Sample Set shall be used as Quality Control Specimens for subsequent checking of that product where incorporated into the Permanent Works under subsequent Task Orders.
2. Sample Sets submitted for *Client* approval shall consist of three (3) samples. All shall be rectangular in plan. Where these are precast concrete blocks or clay pavers then each sample shall be a full sized Modular Unit. When they are precast concrete flags then samples shall be 200-300 x 300mm and shall include at least two uncut sides. Each of the samples in a set submitted for approval shall be individually labelled with the following information:
 - a. The manufacturer's details.
 - b. The product name and reference.
 - c. The name and address of the production facility.
 - d. The date of manufacture.
 - e. The name, position and company of the submitting individual.
 - f. The reference for the supporting Product Report.
3. Sample Sets shall be submitted with a bound Product Report. This shall include:
 - a. A cover sheet including the name of the product, the name date and company of the submitting individual, and a unique reference number for the report.

- b. At least one photo of the product.
 - c. All labelling information required as per BS EN 1338, BS EN 1339 or BS EN 1344 (as appropriate).
 - d. All testing results and certification necessary to demonstrate conformance with the Specification.
 - e. Approval of Quality Control Specimens in accordance with this sub-Clause shall not constitute approval of materials delivered to site or store or incorporated into the Works.
4. Unless approved otherwise by the *Client*, all products approved as meeting the Specification for a Modular Unit that are subsequently incorporated into the permanent works must match its *Client* approved Quality Control Specimen in all respects. The *Contractor* shall be liable for replacing at its own cost any non-conforming Modular Units identified by the *Client* in any Permanent Works where that product is to be supplied.
 5. Where the *Client* has approved more than one product as meeting the Specification for a Modular Unit then, unless approved in advance in writing by the *Client* for that specific Task Order, the *Contractor* shall not mix different approved products within the same surface.
 6. Where a product approved by the *Client* has been approved as matching a Type designation Specification for an LBS Standard Unit as per Appendix 11/1 then, where required by the *Client* (but not otherwise), the *Contractor* shall resubmit a fresh Sample Set and Product Report for that product after a period of not less than 18 months, irrespective of whether or not that product has been subsequently used in any works. The *Contractor* should take this opportunity to check with the manufacturer to confirm whether there are any pending changes to the specification for the product.
 7. It is the *Contractor's* responsibility to inform the *Client* in writing of any potential pending changes in the form, appearance, method, composition or other attribute of products previously approved by the *Client* and to agree appropriate action with them. This may include checking of the manufacturer's amended product to approve new Quality Control Specimens, identification of alternative products, or agreeing an order to commit a quantity of the soon to be superseded product to store for future use.

New Natural Stone Slab or Sett Modular Units

8. Except for where natural stone slab or sett modular units are to be used for:
 - a. Patching and Minor Repair as per Clause 946; or
 - b. Reinstatement as per Clause 706.

then any product that the *Contractor* wishes to offer for immediate or future use as meeting a Specification (defined as per sub-Clause 18) shall be checked and approved in accordance with the procedure described in sub-Clauses 8, 9 and 10 below.
9. For each product that they wish to offer for immediate or future use as meeting the Specification for a new natural stone sett or slab the *Contractor* shall submit to the *Client* for its written approval a Sample Set and accompanying Product Report as per the requirements of sub-Clause 9.
10. Submitted Sample Sets shall comply with the requirements of Table 11/1. Individual samples in the set shall be clearly labelled with the following information:

- a. The place and date of quarrying.
 - b. The place of finishing (where different from that of quarrying).
 - c. The date of submission.
 - d. The name, position and company of the submitting individual.
 - e. The reference for the supporting information pack/report.
 - f. A cover sheet including the name of the product, the name of the quarry and finisher, the name of the supplier (where different), the name date and company of the submitting individual, and a unique reference number for the report;
 - g. At least one photo of the product;
 - h. All labelling information required as per BS EN 1341 or BS EN 1342 (as appropriate); and
 - i. All testing results and certification necessary to demonstrate conformance with the item specification.
11. Where a product from a proposed Quarry/Finisher is approved by the *Client* then the Sample Set shall be used by the *Client* as Quality Control Specimens for checking of materials subsequently supplied from that Quarry/Finisher in all respects under future Task Orders. Approval of Quality Control Specimens in accordance with this sub-Clause shall not constitute approval of materials subsequently delivered to site or store or incorporated into the Works.
12. Where this sub-Clause applies then, except for in the circumstances described in sub-Clause 11, notwithstanding previous approval as per sub-Clause 9 of the product of a Quarry/Finisher as meeting a Specification for a Modular Unit, where the *Client* requires the subsequent supply of that product as part of a Task Order then (subject to timely instruction by the *Client*) a minimum of three weeks prior to the commencement of the works to install the product and prior to placing any order, the *Contractor* shall submit to the *Client* for its written approval a further set of Appearance Pre-Order samples for the Units in question. These shall be supplied by the previously approved Quarry/Finisher from materials quarried and finished in the last 12 weeks in order to confirm that appearance of the product from the quarried vein remains fundamental the same as that of the previously approved stone in the Quality Control Specimens. Samples shall include all information required under BS EN 1341 or BS EN 1342 as appropriate and shall be clearly labelled with the place and date of quarrying and place of finishing. The samples shall be verified and approved by the *Client* against the previously agreed Quality Control specimens as per sub-Clause 9. Any materials ordered in advance of approval of Appearance Pre-Order samples shall be at the *Contractor's* risk. By submitting materials, the *Contractor* guarantees that they meet the physical and mechanical properties of the previously approved product. Approval of Appearance Pre-Order Samples in accordance with this sub-Clause shall not constitute approval of materials subsequently delivered to site or store or incorporated into the Works.
13. Where any of the following circumstances apply then further appearance submission and *Client* approval of Appearance Pre-Order Samples as per sub-Clause 10 shall not be required:
- a. Where the supply of a product approved as meeting a Specification is required by Task Order within 16 weeks of initial approval of that product as per sub-Clause 9.
 - b. Where the product is an Unlisted Unit being '*Client* Specified Equipment'

- c. Where the product was supplied directly to Store by the *Contractor* under a previous Task Order and is latterly required by a further Task Order to be removed to site for use in works.
14. During the works the *Client* shall inspect the laid materials for consistency with the approved Quality Control Specimens for that product (or the Appearance Pre-Order samples where they confirm so in its written approval as per (ii)). Any laid Modular Units deviating from the approved samples shall be lifted, replaced and reinstated at cost to the *Contractor*.
15. *Table 11/1 Sampling Requirements For Natural Stone Slabs, Setts and Kerbs*

Unit type	No of samples to be provided per submitted set	Dimensions and other requirements for individual samples with set
Natural stone setts	3 x representative samples – see note 1.	a. Where units are required to have nominal upper face dimensions less than or equal to 200x100 then samples of a full plan size shall be provided. b. Where units are required to have upper face dimensions of greater than 200x100mm then the plan size of each sample shall not be less than 200x100mm or 2/3 the required area of the upper face, whichever is the greater. c. All samples shall have a thickness of 15-40mm. All samples shall include arris' finished to the required specification for the unit to at least 2 x sides of the upper face. d. All samples shall be rectangular in plan.
Natural stone slabs		a. All samples shall be 200-300x300mm and shall have a thickness of 15-40mm. b. All samples shall include arris' finished to the required specification for the unit to at least 2 x sides of the upper face. c. All samples shall be rectangular in plan.
Natural stone kerbs and other edge restraints		a. All samples shall be 200x150x75mm. b. All samples shall include arris' finished to the required specification for the unit to at least 2 x sides of the upper face.
<p style="text-align: center;"><u>Note</u></p> 1. Samples shall represent the natural variation in colour and appearance of the stone in the proportion that will be present when laid. 2. All samples shall include at least one substantial face finished to specification requirements. In addition: <ul style="list-style-type: none"> a. At least one of the 3 submitted samples shall include a further substantial face that has been sawn without further texturization (e.g. polished, fine picked, rough punched or flamed). b. At least one of the 3 submitted samples shall include a further substantial face that has been cropped/hewn without further texturization. 		

16. Where the *Client* approves as per sub-Clause 12 the product of a Quarry/Finisher offered by the *Contractor* as meeting the required Specification for a natural stone slab or sett Modular Unit then:
- a. Where the Specification in question is a Type designation Specification for an LBS Standard Unit as per Appendix 11/1 then, until such time as the *Client* approves alternative supplying Quarries/Finishers as per sub-Clause 12, the *Contractor* shall supply only material from the approved Quarry/Finisher to meet that Type designation Specification. Normally the *Client* shall approve only one supplying Quarry/Finisher per natural stone sett or slab Type designation Specification at a time. The *Client* is under no obligation to approve latter alternative products proposed by the *Contractor* from other Quarries/Finishers. The *Client* may at its discretion approve products from more than one Quarry/Finisher as meeting a natural stone sett or slab Type Designation Specification or require the *Contractor* to submit further products from other Quarries/Finishers for approval as additional acceptable products meeting that Type Designation Specification. The *Client* may revoke its approval of any Quarry/Finisher at any time, where after the *Contractor* shall be required to propose a new source of supply for approval from a new Quarry/Finisher. Where the *Client* revokes its approval of any Quarry/Finisher where the *Contractor* has placed an order for its materials having completed step 'ii' below then, should the *Client* instruct the units received from that order not be used in the Task Order, the *Client* shall be liable for the costs of those units.
 - b. Where the Specification is for an Unlisted Unit then the approval as per sub-Clause 12 shall be deemed to apply to that one order for '*Client* Specified' equipment only. The *Client* may at its discretion allow it to be used again where the *Client* proposes to use the same product and Quarry/Finisher in future.
17. Where the *Client* has approved more than one product as meeting the Specification for a natural stone slab or sett Modular Unit then, unless approved in advance in writing by the *Client* for that specific Task Order, the *Contractor* shall not mix different approved products within the same surface.

Additional Requirements for Dimensional Checking and Approval of New Natural Stone Setts Intended for Laying as Part of an Unbound Surface

18. Where natural stone sett Modular Units are to be laid as part of an unbound surface then, subject to timely instruction by the *Client* via Task Order, the *Contractor* shall arrange for the delivery of the materials to its store a minimum of 8 weeks prior to the commencement of the laying works. This is in order to allow Checking by the *Client* of the Units received from the supplier for conformity with the dimensional and other requirements of the Contract Specification for those Modular Units.
19. Checking shall be conducted at the *Contractor's* yard. Exceptionally, where late delivery of the ordered Units is unavoidable then it may be conducted on Site, but only with the advance agreement of the *Client* in writing. The *Contractor* shall assist the *Client* in selecting at random a minimum of 3 Units per palette and checking these against the Contract Specification requirements. Setts may be selected from any location in the palette. At least 3 palettes shall be selected at random and checked in this manner per order. Where a proportion of Units deemed to be significant by the *Client* is found not to conform with the Contract Specification requirements then the *Client* may reject the entire or part of the delivery. The *Contractor* shall be responsible for returning and replacing rejected Units or order at its own cost. Where the delivery is accepted then the *Contractor* shall be responsible for repackaging any Units removed from palettes for delivery to site.

New Natural Stone Kerbs And Other Edge Restraints

20. Except for where new natural stone Kerbs and other Edge Restraints are to be used for:
- a. Patching and Minor Repair as per Clause 946; or
 - b. Reinstatement as per Clause 706.

then for each product that they wish to offer for immediate or future use as meeting the Specification(s) (defined as sub-Clause 18), the *Contractor* shall submit to the *Client* for its written approval a Sample Set and accompanying Product Report as per the requirements of sub-Clause 9. Further submission and approval of Appearance Pre-Order Samples as sub-Clause 10 shall not be required. However, unless expressly directed otherwise, every 18 months following approval, the *Contractor* shall re-submit samples of each previously approved product to confirm that this continues to be as previously approved. The requirements of sub-clauses 12, 13 and 14 shall also apply with the exception that comparison with previously approved specimens as per sub-Clause 12 shall be with the Quality Control Specimens approved as per sub-Clause 9.

Definitions

21. Specifications for Modular Units (including Kerbs and other Edge Restraints) may be either:
- a. A Type designation Specification for an LBS Standard Unit as per Appendix 11/1.
 - b. A Specification for an Unlisted Unit being '*Client Specified*' equipment as per Clause 143AR.

1116AR Existing Natural Stone Modular Units Being Taken Up To Store Or Set Aside Area For Reuse

1. With the exception of Patching and Minor Repair works to Clause 946 then, unless instructed otherwise by the *Client* in writing, prior to commencing works to take up existing natural stone slab or kerb Modular Units to store or set aside area, the *Contractor* shall make a photographic Condition Record of the surface to be taken up, individually marking/highlighting at close distance through physical non-permanent means any existing damaged slabs or setts. The *Client* shall be invited at least three working days in advance to attend during the undertaking of this record. The Condition Record shall be submitted to the *Client* for its approval to confirm the extent of damaged slabs, setts or kerbs. The *Client* shall approve the Condition Record and confirm in writing what action shall be taken in respect to damaged slabs, setts or kerbs. The *Client* may instruct these to be:
 - a. Reused as they are.
 - b. Replaced with matching materials to be sourced by the *Contractor*.
 - c. Modified through retexturing, cutting out of damaged sections or similar as per Clause 1117AR.
2. Where the *Contractor* commences work in advance of obtaining the *Client's* approval of the Condition Record and instruction on the action to be taken with damaged slabs or setts then they shall be deemed responsible for damage subsequently identified by the *Client* on the taken up Modular Units. Where the *Client* instructs the reuse of any damaged slabs or setts then this shall be confirmed in writing with details provided of the quantity and condition of such Modular Units and, where possible, cross reference made to the Condition Record. This may be

provided by marking up with its instructions and signing photos in a copy of the Condition Record, identifying such slabs, setts or kerbs as 'damaged yet suitable for reuse' and submitting this to the *Contractor*. Before committing such 'damaged yet suitable for reuse' slabs, setts or kerbs to store or set aside area, the *Contractor* shall clearly mark these with an individual reference that can be related back by them to the original Condition Record to confirm the *Client's* acceptance to its reuse.

3. Where it is found upon later removal from store or set aside area of natural stone slab, sett or kerb Modular Units previously taken up as per sub-Clause 1 that any are damaged then, except where it can be demonstrated via reference to previous Approved Condition Records and associated markings that these were approved by the *Client* as 'damaged yet suitable for reuse' then this damage shall be deemed to have been caused by the *Contractor*. The *Contractor* shall then be responsible for replacing those damaged natural stone slabs, setts or kerbs at full cost to them.

1117AR Cleansing, Deep Cleansing, Re-Texturising And Amendment Of Existing Modular Units

1. Where the *Client* instructs any Modular Unit (including flags, slabs, blocks, setts, pavers, kerbs, channels, quadrants, angles and edgings) to be taken up to store or set aside area then the *Contractor* shall be responsible for Cleansing the following from the faces of units back to parent stone at no additional cost:
 - a. Any dirt unbound granular material or stabilised granular material such that they are ready for relaying on instruction;
 - b. Any mortar residue, other bound adhesive, bituminous mixture or hydraulically bound mixture that can be removed through reasonable efforts, including striking, quick brushing with a stiff headed brush and non-high-pressure water cleansing.
2. Where the *Contractor* is unable to reasonably clean Modular Units back to parent material without onerous effort of damage to the Units then they will be required to demonstrate this to the satisfaction of the *Client*. Where it is agreed that the methods required would be onerous and that more substantial Deep Cleansing is required then the *Contractor* shall be due additional payment. The *Contractor* shall propose methods to the *Client* for its written approval prior to the commencement of Deep Cleansing operations. The *Contractor* shall not undertake Deep Cleansing of Modular Units unless approved in writing by the *Client*.
3. Where the *Client* instructs existing natural stone kerbs, slab or sett Modular Units that have been taken up to store or set aside area or which remain in situ to be Re-texturised (e.g. re-flamed, dolly point, rough punched or fine picked) then the *Contractor* shall propose suitable methods to the *Client* for its approval. Units shall not be Re-texturised unless instructed by the *Client*.
4. Where second-hand imported natural stone kerb, slab or sett Modular Units are to be imported to site for incorporation into the Permanent Works then the *Contractor* shall be responsible for Cleansing or Deep Cleansing these as per sub-Clause 1 ready for laying where necessary at no extra cost to the *Client*.
5. The *Contractor* will not be entitled to any payment in respect of any Modular Units that are broken or damaged during Cleansing, Deep Cleansing or Re-texturising works or during lifting or relaying (including in any transport to and from store) except where it can be demonstrated that such damage was unavoidable.

1118AR Quality Control Checking And Acceptance Of Second Hand Imported Natural Stone Kerb, Slab And Sett Modular Units

1. Imported second-hand imported natural stone kerb, slab and sett Modular Units shall only be used where instructed by the *Client*. Where these are required then the specification shall be as per the instructing Task Order. All such Modular Units shall be guaranteed by the *Contractor* as free from lanolin or other deep impregnated stains that may be only seasonally apparent with changing temperature. All such Modular Units shall be supplied Cleansed or Deep Cleansed back to parent stone in compliance with sub-Clause 1117AR at no extra cost to the *Client*, ready for laying.
2. Prior to placing any order to supply second hand imported natural stone, kerb, slab or sett Modular Units, the *Contractor* shall submit a set of samples to the *Client* for inspection and approval as Quality Control Specimens along with any testing information or other certification to demonstrate compliance with the Specification. Submitted sample sets shall be as Table 11/1.
3. Approved Quality Control Specimens shall be used for appearance and other attribute checking of the delivered materials. Only materials matching the approved Quality Control Samples shall be accepted in the Permanent Works. Approval of Quality Control Specimens shall not be deemed as constituting acceptance of materials subsequently ordered. Where Quality Control Specimens have been approved then, subject to timely instruction by the *Client* via Task Order, the *Contractor* shall arrange for the delivery of the materials to its store a minimum of 3 weeks prior to the commencement of the laying works. This is in order to allow checking and approval by the *Client* of the materials received from the supplier for conformity against the Quality Control Specimens and other Specification requirements. The Check shall be conducted at the *Contractor's* yard. Exceptionally, where late delivery is unavoidable then it may be conducted on Site, but only with the advance agreement of the *Client* in writing. The *Contractor* shall assist the *Client* with selecting and removing at random a minimum of 3 Modular Units per palette and checking these against the Specification requirements and Quality Control Specimens. Such units may be selected from any location in a palette. At least 3 palettes shall be selected at random and checked in this manner per order. Where satisfied then the *Client* shall provide its written notice of approval of the delivered materials. Where a proportion of the delivered Modular Units deemed to be significant by the *Client* is found not to confirm with the Quality Control Specimens or other Specification requirements then the *Client* may reject the entire or part of the delivery. The *Contractor* shall be responsible for returning and replacing rejected Modular Units or deliveries at its own Cost. Where the delivery is accepted then the *Contractor* shall be responsible for repackaging any Modular Units removed from palettes for delivery to site.
4. The *Client's* written notice of approval of the delivered materials shall not constitute approval of any Modular Units within this that are damaged or substandard in any Specification respect - except where such Modular Units are expressly noted as being approved within that approval. Where damaged or substandard Modular Units are subsequently identified through inspection by the *Client* during or after the works then the *Contractor* shall be responsible for replacing these at full cost.

1119AR Laying Or Relaying Natural Stone Sett Modular Units

1. Existing natural stone sett Modular Units may be re-used with the approval of the *Client* provided that they are undamaged and cleaned on all faces, back to parent stone before being re-laid in accordance with Clause 1117AR.

2. Imported second hand natural stone sett Modular Units shall be used only where instructed by the *Client* and shall be in accordance with the requirements of Clause 1118AR.

1120AR Laying Or Relaying Precast Concrete Flag Or Natural Stone Slab Modular Units

1. Existing natural stone slab Modular Units may be re-used with the approval of the *Client* provided that they are undamaged and cleaned on all faces, back to parent stone, before being re-laid in accordance with Clause 1117AR.
2. Imported second hand natural stone slabs shall be used only where instructed by the *Client* and shall be in accordance with the requirements of Clause 1118AR.
3. The *Contractor* shall, before starting work in any area of existing precast concrete flag or natural stone slab surfaced pavement, notify the *Client* of the number of units in that area that require placement.
4. Where appropriate, the *Contractor* shall carefully lift the existing paving and set aside. If this paving is not permanently re-laid on the same day as lifted, the *Contractor* shall stack them in neat piles.
5. Where the Contract requires the use of different precast concrete flags to different parts of a pavement which - whilst visually matching in respect to its surface specification - vary in depth, mechanical performance or some other non-visual attribute, then the *Contractor* shall only use products from the same supplier and product range and which were manufactured at the same plant within 6 months of one another. This is in order to avoid subtle visual difference between the two unit types owing to variation in mix design and manufacture. The *Contractor* shall retain delivery tickets, product labels and other information in order to be able to demonstrate this to the *Client* upon request. Where no such information is retained or where it is found to be unsatisfactory by the *Client* upon inspection, then the *Contractor* shall replace the materials where instructed to do so by the *Client*. All works and materials shall be at full cost to the *Contractor*.
6. Where it is required to cut flag or slab Modular Units that are to be laid in stretcher bond to fan splays at corners or other curves in the pavement then units shall be cut symmetrically to opposing sides.
7. When instructed by the *Client* to lay flags or slabs in a stretcher bond perpendicular or parallel to the kerb then, unless directed otherwise by the *Client* (including through Laying Arrangement Drawings included in the Task Order) the *Contractor* shall lay a full, uncut slab or flag against the rear of the kerb at the carriageway edge of the footway to every other row. Flags or slabs laid to the rear of kerb to interspacing rows shall be cut or selected in order to set up the required bond overlap dimension. The *Contractor* shall take care to ensure that the size of units cut or selected and laid in this location is maximised to present the squarest unit possible. For instance, where the units to be used to the surface are 600x600mm flags which are to be bonded by 150mm then these should be cut and laid as 450x600mm units in order to set up the bond – not 150x600mm which less square and therefore inherently much weaker. For precast concrete flags, as an alternative to cutting, where the required precast concrete product is available from the same producer within the same product range in a number of modular sizes then – irrespective of whether units of these alternative sizes have been approved for use by the *Client* – the *Contractor* may utilise units within that range of an alternative size in place of cut units. For instance, where 600x600mm flags specified by the *Client* to be used to the surface then 450x600mm alternative size units may be used to every other row to the front and/or rear of the footway for the purpose of setting up

the bond. However, the alternative size units shall match the appearance and performance of the required unit specification in all other respects whilst the units must have been produced at the same production facility as the specified units within 6 months of these. The *Contractor* shall retain delivery tickets, product labels and other information in order to be able to demonstrate this to the *Client* upon request. Where no such information is retained or where it is found to be unsatisfactory by the *Client* upon inspection, then the *Contractor* shall replace the materials where instructed to do so by the *Client*. All works and materials shall be at full cost to the *Contractor*.

8. Where the *Contractor* encounters any small areas of precast concrete block, in-situ concrete or mortar infill within flag or slab surfaced footway pavements around ironwork work, street furniture, at kerb edges or at changes in bond direction, then, unless instructed otherwise by the *Client*, these shall be removed and replaced with slabs or flags matching the adjoining surfaces cut in accurately to the obstructions, restraint or threshold.

1121AR Laying Or Relaying Precast Concrete Paving Blocks Or Clay Pavers

1. When laying areas of precast concrete block or clay paver surface then the *Contractor* shall only install rows of units laid in solid course up against and parallel to enclosing edge restraints in variance to the main bonding pattern when instructed to do so by the *Client*.

1122AR Laying Or Relaying Yorkstone Slab Modular Units

1. Existing Yorkstone slab Modular Units shall be relayed to match existing bonds and courses, including flush or stencil hand pointing in a lime/cement/sand mortar “struck” where appropriate. Sand type in pointing shall be to match surrounding pointing and stone. Staining of the stone by inappropriate methods of joint filling will not be accepted. In general, existing Yorkstone will vary in thickness between 63mm and 100mm.
2. Where large areas of Yorkstone slab Modular Units are to be relayed then, unless instructed otherwise by the *Client*, imported stone required to make up any shortage due to unusable stone, patches of temporary materials and other loss created by “closing up” the existing stone shall be laid together in rational bays or areas (i.e. avoiding mixing old with new).

1123AR Handling Kerbs And Slabs – Reducing The Risks Of Musculoskeletal Disorders

1. The *Client's* designers will endeavour to eliminate, or at least reduce, the need for manual handling of kerb and heavy slab or flag Modular Units through good design practice. If the *Contractor* considers that any design that they are instructed to construct can be amended to further reduce the need for manual handling of such heavy Modular Units, they shall bring the matter to the immediate attention of the *Client*. The *Contractor* shall assess and plan kerb and flag or slab Modular Unit handling processes to ensure that they are mechanised wherever practicable and that manual handling is only undertaken in rare cases. Such assessments shall include consideration of:
 - a. Maximising the efficiency of laying operations.
 - b. Ensuring safe storage and secure transport arrangements.
 - c. Avoiding double handling by laying from delivery rather than “laying out ready to lay”.
 - d. The most appropriate type of handling equipment for the job in hand.

- e. The type and extent of operative training required.
 - f. The possible use of alternative processes.
2. The *Contractor* shall not be entitled to any increase in payment owing to the use of mechanically assisted or machine lifting and laying of any Modular Units.

1124AR Bound Gravel Surfaces

1. Resin bound gravel, self-binding gravel and stabilised self-binding gravel surfaces shall be used only when instructed by the *Client*.
2. Materials for resin bound gravel, self-binding gravel and stabilised self-binding gravel surfaces shall be as required in Appendix 11/1. Materials shall be transported, laid and compacted and maintained strictly in accordance with the manufacturer's requirements unless specified otherwise by in Appendix 11/1.
3. All bound gravel surfacing materials to be used in the carriageway shall have a British Board of Agrément (HAPAS) Roads and Bridges Certificate.

1125AR Working In Inclement Weather

1. No frozen material shall be used in any works, nor shall material be laid on frozen or frost covered sub-bases or bedding materials.
2. Stockpiled materials shall be protected at all times. Saturated sand or other fine unbound jointing and laying course materials shall not be used in the work.
3. Uncompacted areas of paving shall be protected from heavy rainfall.
4. Mortar jointing materials shall not be used outside of the environmental precipitation and temperature ranges stated by the Supplier.

1126AR Siding Out

General

1. Siding out shall normally be carried out at the edges of footways, cycleways and carriageways but may, where instructed by the *Client*, be extended to more general areas for the breaking up and removal of excessive or hardened dirt, weeds or any other undesirable material on the footway or carriageway surface.
2. Siding out of footways and cycleways shall be carried out as directed by the *Client* and shall be carried out prior to any other operation required at the site.
3. Footways, cycleways and carriageways may be sided out either manually or mechanically. However, the *Contractor* shall ensure that any siding out machine they employ does not cause damage to the existing footway, cycleway or carriageway surface.
4. Arisings shall be disposed of by spreading and levelling on the adjacent verge unless the *Client* instructs its disposal at a licensed tip.

Footways and Cycleways

5. Footways and cycleways shall be sided out up to and including any existing footway or cycleway edging or to a width specified by the *Client*.
6. Sided out edges shall be trimmed to a neat line and, where they do not generally exceed a height of 75mm above the existing surface, they may be trimmed with a vertical face. Where they generally exceed a height of 75mm above the existing surface, they shall be trimmed with an approximately 45-degree battered face.

1127AR Minor Repairs To Depressions In Modular Unit Surfaced Pavements

1. Depressions to Modular Unit Surfaced Pavements shall be excavated and reinstated in accordance with Clause 706.

1128AR Footbridges, Subways And Approach Ramps

1. Footbridges, subways and approach ramps shall be surfaced in mastic asphalt or granolithic surfacing as detailed in Appendix 11/2.

1129AR Metal Stud Demis And Parking Bay Delineation Markers

1. Metal studs for installation into other pavement surfaces to define demis boundaries shall be either 'Topgrip' or 'LZ20, combed finish' stainless steel studs by Urban Finish, or similar approved by the *Client*, as required in the instructing Task Order. Installation and fixing adhesives shall be as per the manufacturer's recommendations. Studs shall be located at a consistent even spacing of between 300-600mm selected to allow insertion into the centre of Modular Units to avoid risk of spalling of fracture.
2. Metal studs for installation into other pavement surfaces to define parking bays shall be either 'Baymarker 50, combed finish' or 'Baymarker 125, combed finish' by Urban Finish, or similar approved by the *Client*, as required in the instructing Task Order. Installation and fixing adhesives shall be as per the manufacturer's recommendations. Placement shall be as required in the instructing Task Order.

Series 1200 – Traffic Signs

1232AR Temporary Variable Message Signs

1. When instructed by the *Client*, the *Contractor* shall supply temporary, trailer-mounted variable message signs to alert road users to forthcoming works or to provide road users with information during works. Such signs shall be in accordance with the *Client's* requirements for the particular location.
2. Temporary Variable Message Signs shall be positioned in accordance with the *Client's* instructions. If site constraints do not allow the *Contractor* to comply fully with these instructions, the *Client* shall be notified as a matter of urgency. The positioning of these signs shall be such as to ensure that they do not impede the flow of traffic (unless the *Client* specifies otherwise) or the movement of pedestrians, that they do not create a hazard to traffic or pedestrians, and that they do not cause damage to vegetation.
3. Once in place, each sign shall be visited at intervals of not less than once every 24 hours in order to check on cleanliness, positioning and security.

Series 2000 - Waterproofing for Concrete Structures

2009AR Repair of Areas of Defective Concrete

Removal of Defective Concrete

1. When preparation of the concrete surfaces to receive the waterproofing system is complete, the *Client* will inspect the prepared surfaces and define the concrete which is defective. Defective concrete shall be broken out by mechanical means to sound concrete. The edges of the broken out areas shall be cut at right angles to the surface, trimmed by grinder, and within these edges all concrete shall be removed to the minimum depth specified by the manufacturer of the repair material to be used or 15mm whichever is the greater. Where reinforcing bars are exposed before work begins, or become exposed as concrete is broken out, all concrete shall be removed to a depth behind the bars specified by the manufacturer of the repair material or to such greater depth as may be necessary to remove all defective concrete.

Preparation of Exposed Surfaces

2. The exposed surfaces of the sound concrete and of the reinforcing bars within the areas of broken out concrete shall be prepared as follows:
 - a. Reinforcing Bars: All exposed surfaces shall be blast cleaned to remove rust, mill scale and foreign matter to the extent and surface finish as specified by the manufacturer of the repair materials, and then treated with such primers, bonding agents and the like as are recommended by the manufacturer of the repair materials. The treatment is to occur immediately after the removal process. Badly corroded areas shall be removed and replaced as instructed by the *Client*.
 - b. Concrete: All loose material and residues from the blast cleaning process shall be removed and the surfaces, once suitably keyed, shall be treated with such bonding agents and the like as are recommended by the manufacturer of the repair material.

Repairs

3. Repair materials shall be chosen from those recommended or accepted by the manufacturer of the waterproofing membrane and accepted by the *Client*. Guarantees are to be sought, for acceptance by the *Client*, to confirm the suitability of the repair medium with the waterproofing membrane.
4. Repairs shall be carried out in accordance with Clauses 1728AR to 1731AR and the instructions of the manufacturer of the repair materials.

2010AR Waterproofing With Spray Applied Systems

1. Testing of spray applied waterproofing systems shall be as detailed in Appendix 20/1.
2. Waterproofing of bridge decks and fixed bridge joints using a proprietary spray applied membrane system shall be carried out strictly in accordance with the manufacturer's instructions.
3. The *Contractor* shall furnish the *Client* with 3 copies of the P.W.S. Data Sheet.
4. Joints in the membrane shall be formed with laps and the use of adhesion promoters as recommended by the manufacturer.

5. Except where the waterproofing membrane is to receive protective coating against ultra violet light, a tack coat shall be applied as required by the manufacturer of the waterproofing membrane to bond it to the protective layer.
6. The strength of the bond shall be sufficient to prevent a shear failure, due to horizontal forces, from occurring along the interface of the waterproofing and the protective layer.
7. Where detailed on the Task Order, the waterproofing membrane shall have a protective coating, recommended by the manufacturer of the membrane, to protect it against ultra violet light.
8. Waterproofing shall be applied only when the ambient temperature is 4°C and rising or above 4°C.

2011AR Waterproofing Below Ground Concrete

1. Waterproofing material shall be at least two coats single part bitumen latex emulsion applied in accordance with the manufacturer's instructions.
2. The waterproofing system, in accordance with Clause 2004, shall be applied to:
 - a. The buried rear surfaces of the structure down to a level 150mm below the construction joint;
 - b. The buried rear surfaces of end diaphragms of integral decks down to a level 200mm below the soffit of the deck slab or construction joint, whichever is lower; and
 - c. Other areas as shown on any structure-specific and general detail drawings.

Series 2300 - Bridge Expansion Joints and Sealing of Gaps

2305AR Asphaltic Plug Joints

1. It shall be noted that clause 1708, Concrete Surface Finish, sub-Clause 4(ii), states the requirements for new structures. Where asphaltic plug joints are to be renewed the *Contractor* shall not expect the concrete surface finish of the existing deck to be the same standard as for the new structures, but rather an unsmooth, non-uniform, unformed finish with defects and blemishes.
2. Each joint in carriageways shall be laid to within a tolerance in level of $\pm 3\text{mm}$ across its width on comparison with the two adjacent road surfaces. Each joint shall exhibit no cracks or gaps between the joint material and adjacent asphalt wearing course nor shall it lead to deterioration of the adjacent wearing surface due to lack of passive support.
3. When checked near the end of the Period of Maintenance the total depression at any point over the surface area of a joint shall not exceed 6mm. The surface level of the joint shall be measured by using a straight edge 500mm wider than the nominal joint width placed parallel to the direction of traffic thereby spanning the joint and resting on the asphalt or concrete on each side of the joint. Where any depression exceeds 6mm the joint material shall be broken out to a depth of at least 40mm and new material laid in accordance with the Specification.
4. Prior to the application of the binder/stone matrix, all concrete surfaces shall be clean, dry, free from dust, loose friable material, cement laitance, oil bitumen and other contaminants. The finish of the prepared concrete surface shall be compatible with the joint sealing material to be applied.
5. Asphaltic plug joints shall be installed strictly in accordance with the manufacturer's instructions.
6. All joints shall be installed only by a *Contractor* who has a valid certificate of Type Approval for asphaltic plug joints.
7. All exposed surfaces within the joints shall be primed with neat hot poured binder after cleaning. Priming shall also be applied underneath the position of any sub-surface drainage installed within the joint. However, the primer shall not cover the inlet surfaces for such drainage.
8. Where a hot compressed air lance is subsequently used to drive off moisture due to rain or leakage from the surface or to remove small amounts of combustible debris from within the joint, care shall be taken not to overheat the priming material. If this occurs the bond with the deck surface may be impaired. In such situations any flaking or poorly bonded material shall be removed and the affected area reprimed.
9. The *Contractor* shall ensure that all the aggregate is coated with binder and voids filled.
10. The binder shall be heated to the manufacturer's recommended pouring temperature. At no time shall the manufacturer's recommended safe heating temperature be exceeded. The *Contractor* shall provide suitable equipment for the heating and application of the binder. Direct heating of the binder shall not be used. Positive temperature control, mechanical agitation, and recirculating pumps shall be provided by the *Contractor*.
11. The aggregate shall be clean and dry and shall be delivered to site pre-bagged to avoid contamination. The aggregate shall be a crushed igneous rock exhibiting resistance to crushing, impact abrasion, polishing and flakiness. It shall have a minimum polished stone value of 60 and a maximum flakiness index of 25. It shall have consistent grading to ensure that the binder aggregate ratio is maintained.

Where the proposed depth of joint is known to be less than 100mm, reduced sizes of aggregate shall be used. In no case shall the nominal size of the aggregate exceed 25% of the depth of the joint.

12. The stone shall be heated in a rotating drum using a hot compressed air lance to a temperature approximately equal to that of the binder. The temperature of the stone when applied to the joint shall be within $\pm 30^{\circ}\text{C}$ of the recommended pouring temperature of the binder and not more than 200°C . The temperature shall be monitored using an infra-red radiation thermometer.
13. Compaction of the binder/stone matrix shall be carried out as soon as possible using suitable equipment. Where a vibrating plate or roller is used for compaction, at least 4 No passes shall be carried out and the joint rendered flush with the existing road surface.
14. Stone chippings, to improve skid resistance, shall be applied to the carriageway joint surface, except within 300mm of kerb faces.
15. The *Contractor* shall supply and install the joint sub-surface drainage duct system making connections to the existing drainage system.
16. The *Contractor* shall provide the *Client* with as-built record drawings of the work carried out. The records shall include the depth and width of the waterproofing and joint sealing system provided at each joint location and details of the sub-surface drainage system installed.

2306AR Testing Of Asphaltic Plug Joint Materials

1. The *Contractor* shall provide to the *Client* with all batches of materials delivered to site a Certificate of Compliance in accordance with BD 33/94 "Expansion Joints for Use in Highway Bridge Decks".
2. When required by the *Client*, the *Contractor* shall obtain a sample not less than 4.5kg from each batch of binder material and test for penetration, flow and bond in accordance with ASTM Specification D1191 at a QA accredited laboratory accepted by the *Client*. The *Contractor* shall issue certified copies of the results of all tests for the *Client*.
3. When required by the *Client*, the *Contractor* shall take 100mm diameter cores for testing through the completed asphalt plug joint at positions accepted by the *Client*. The holes where cores have been taken shall be repaired using asphalt plug material such that the joint becomes watertight.
4. The *Contractor* shall provide the *Client* with records of the specific type and density of aggregate/stone used in the asphaltic plug matrix.
5. The *Contractor* shall provide the *Client* with records of the quantities and weights of binder and aggregate used at each joint location.

2307AR Replacement of Bridge Deck Expansion Joints

1. Replacement, repair and alterations to expansion joints shall be as instructed by the *Client*. Such work shall comply with the requirements of Clauses 2301 to 2304 and Standards BD33 and BA26.
2. Locations and details of expansion joint repair, alterations and replacement work will be shown on scheme specific drawings.
3. The *Contractor* shall submit a method statement for the replacement of expansion joints to the *Client* for acceptance before the associated work operations commence.
4. All waterproofing systems shall be compatible with the existing system.
5. All waterproofing shall be carried out in accordance with Series 2000.

6. The waterproofing joint detail shall be capable of accommodating movements of ± 10 mm.
7. Existing joints (including transition strips) shall be carefully broken out or unbolted and removed. The adjacent carriageway, hard shoulder, hardened verges and central reservations shall be saw cut to provide neat vertical edges. The location of any existing services or ducts shall be determined prior to breaking out or saw cutting and measures shall be taken to protect them.
8. Existing flashings and sealants shall be removed. Where instructed by the *Client*, existing intact waterbars may be retained.
9. Existing galvanised plates in buried joints shall be set aside for possible re-use.
10. The existing surfacing and additional protective layer adjacent to the expansion joint shall be removed to expose the waterproofing membrane. The membrane shall then be removed by scraping, scabbling and/or vacuum abrasive blast cleaning to prepare the existing concrete.
11. Existing holding down bolts shall be protected if required for installation of the proposed replacement joint. If they are not required they shall be removed or ground flush with the surface of the deck concrete.
12. The concrete substrate shall be examined by the *Client* for defects. Where required, testing shall be carried out and concrete repairs undertaken in accordance with Series 1700.
13. If the joint is not to be completely replaced, material and components shall form the same system as the existing joint or be compatible and form a watertight interface.
14. Where instructed vertical drain holes shall be installed adjacent to expansion joints. The drain holes shall comprise a down pipe fixed into holes cored through the superstructure of minimum internal diameter 40 mm and a conical entry funnel with cap to allow water to enter the funnel but prevent blocking of the waterway by the surfacing. The cap and funnel shall be covered with a sheet of permeable membrane prior to surfacing.
15. All debris arising from the works shall be removed off site within the same working shift.

Series 2400 - Brickwork, Blockwork and Stonework

2418AR Re-Pointing

1. Joints to be re-pointed shall be raked out to a minimum depth of 20mm to provide an adequate key. If unsound mortar exists beyond this depth it shall also be raked out until sound material is encountered. Apparatus used for grinding out shall be fitted with a depth gauge to allow control of rake out depth. Injection techniques shall be used for re-pointing. The stability of the structure shall be maintained at all times.
2. All lichen, moss and other deposits shall be removed without damage to the exposed faces.
3. All dust and debris left in the joints after raking out shall be removed by low pressure water jetting. All arisings from re-pointing shall be taken to a licensed tip.
4. A trial panel of defective brickwork or stonework, minimum area 1.0m², shall be re-pointed employing the labour, materials and equipment to be used for the work. Further re-pointing shall not proceed until the satisfactory completion of the trial panel, which shall be used for comparative purposes.
5. When re-pointing, the brickwork or stonework shall be in a damp condition achieved by wetting the raked out joints with clean water. The brickwork or stonework shall not be soaked.
6. The sequence of re-pointing shall ensure that previous re-pointing is not damaged by the work in hand.

2419AR Replacement of Precast Concrete Copings

1. Broken precast concrete copings shall be removed together with the old mortar bed and any loose and friable mortar in the joints of the brickwork below the coping. All debris shall be removed off site.
2. New precast concrete copings shall be laid on a mortar designation (see Clause 2404) bed to a line and level to match existing copings.

2420AR Rebedding Existing Precast Concrete Copings

1. Precast concrete copings shall be removed and stored for re-use.
2. The existing mortar bed shall be completely removed together with any loose and friable mortar in brickwork joints below the coping. All debris shall be removed off site.
3. Copings shall be re-laid on a mortar designation (i) (see Clause 2404) bed to lines and levels to match existing.

2421AR Foundations To Walls

1. Generally foundations to walls shall be 225mm thick and 400mm wider than the lowest course of the wall and shall be constructed in C15P concrete. Where stepping occurs, the foundations shall overlap by 225mm. Generally, the top of the foundations shall be 525mm below the finished surface level of the surrounding ground unless required to match existing.

Series 2600 - Miscellaneous

2608AR Dayworks

1. Dayworks shall be works specifically ordered by the *Client* in writing to be carried out either in conjunction with works ordered in accordance with the Schedule of Rates or where they are sole works. They will only be used where there are no suitable items in the Schedule of Rates, it is impracticable to evaluate or fully specify the works, or the works are unlikely to reoccur and the cost of negotiating additional schedule items and rates is disproportionate to the value.
2. Dayworks shall be valued on the basis of records agreed and signed by the *Client*.

2609AR Polymer Modified Rendering

1. High impact polymer modified rendering shall be applied in two layers: basecoat 8 to 12mm thick and final coat 6 to 10mm thick. The substrate shall be prepared to provide an adequate key. A suitable bonding agent may be used.
2. Depending on the situation and size of the area to be rendered, beading, joints and/or mesh reinforcement may be necessary and are deemed to be included in item rates.
3. The basecoat shall be completed with a comb finish. The final coat shall be completed with a plain floated finish.
4. All materials shall have BBA certification and be for external use. Rendering shall comply with BS 5262. Workmanship shall comply with BS 8000.

3208AR Major Incidents

1. A Major Incident is as defined in the London Emergency Services Liaison Panel (LESLP) Major Incident Procedure Manual. It is any emergency that requires the implementation of special arrangements by one or all of the emergency services and will generally include the involvement, either directly or indirectly, of large numbers of people, for example the rescue, transportation and care of a large number of casualties.
2. A Major Incident can be declared by any member of one of the emergency services or, in exceptional circumstances (eg flooding), by a local authority. All the emergency services will attend with an appropriate pre-determined response. The *Client* will act in a support role in any Major Incident in accordance with the London Resilience Strategic Emergency Plan, and the *Contractor* may be required to support the work of the emergency services through the provision of personnel, plant and machinery throughout the Incident and the recovery stage thereafter.
3. The *Contractor* shall develop procedures for escalating levels of service. For example, the next level of service beyond the deployment of an Emergency Response Unit would be the mobilisation of all the *Contractor's* available resources.
Beyond that, the *Contractor* shall be prepared to request (or authorise) support from (or to) a neighbouring Area. The general philosophy shall be that the *Contractor* is able to immediately mobilise and clear an incident as soon as the Police hand over to it.
4. The *Contractor* shall be prepared to provide qualified and experienced personnel on a 24-hours-a-day basis to act as the first point of contact and to receive instructions from the emergency services. The *Contractor* shall provide contingency arrangements to ensure that these individuals can manage and deploy the resources required to carry out the instructions. The *Contractor* shall provide the *Client* with a contact list of all those individuals who are to be contacted in the event of a Major Incident; this contact list is to be kept up to date throughout the contract. The *Contractor* shall set out its proposed arrangements for Major Incident response in its Quality Plan.

3209AR Reporting

1. The *Contractor* shall provide a daily report for each day of the week giving details of all emergencies attended, including details of originator, date, time of call, time of response, precise location, nature of emergency, material used and works undertaken, including photographic evidence. Each report shall be submitted to the *Client* by noon on the next working day. A nil return is required for days on which there is no emergency occurrence. Where the *Contractor* is called out to attend locations where flooding has occurred, a supplementary report providing details shall be submitted within 48 hours of attendance to the Lead Local Flood Authority.
2. Where the *Contractor* is called out to make safe hazards which can be attributed to other parties, e.g. builder's skips, building materials, vehicles involved in road traffic accidents, the *Contractor* shall, as well as making the highway safe, record information about the other parties and include it in the daily report.

Series 3300 - Investigations & Surveys

3301AR Rotary coring in carriageways

1. Cores shall be 100mm or 150mm nominal diameter as directed by the *Client*.
2. They shall be taken in the positions and to the depths directed by the *Client*.
3. The cores shall generally be cut to prove the bituminous and concrete layers only, but the *Contractor* shall allow for the coring entering lean mix road base and cement bound or granular sub-base. The cores shall be cut in accordance with BS 598:Part 5 and using a coring machine which complies with BS 4019:Part 3.
4. The holes from which core samples have been cut shall be reinstated as described in Appendix 33/1.
5. The cores shall be handled carefully to prevent damage and shall be delivered to the *Client*. They shall be indelibly marked to indicate the location and date of coring and they shall be stored for a period of up to twelve months on purpose-built racks supplied by the *Contractor*.

3302AR Structural investigations

General

1. Structural investigations for bridges and other highway structures may comprise, but not be limited to, the following:
 - a. Taking cores in concrete, reinforced concrete, brickwork, blockwork, stonework and the like.
 - b. Concrete testing including, but not limited to:
 - i. Chloride sampling and testing
 - ii. Half-cell potential testing
 - iii. Cover meter surveys resistivity tests
 - iv. Sulphate sampling and testing
 - v. Cement content determination
 - vi. Carbonation determination
 - vii. Water/cement ratio determination
 - viii. Tensile strength testing of reinforcement and other metallic components
 - ix. Compressive strength testing
 - x. Silane impregnation testing
 - c. Excavating trial holes on bridge decks and other areas.
 - d. Breaking out concrete to expose reinforcement.
 - e. CCTV surveys.
 - f. Inspection by borescope or endoscope.
2. All sampling and testing shall be carried out by specialist testing firms or laboratories approved by the National Measurements Accreditation System (NAMAS) for laboratory testing, or by equivalent accreditation bodies of European member states.
3. All on-site sampling and testing shall be supervised by a member of the *Contractor's* staff. The supervisor shall be a Chartered Engineer with previous experience of

specifying and supervising similar investigations. Specialist testing contractors and other subcontractors shall not be allowed to work unsupervised at any time.

4. Sampling and testing shall generally be undertaken in accordance with BA35 as amended by Appendix 33/2.
5. The location and extent of any sampling and testing shall be as described in Appendix 33/2 - to be completed by the *Contractor*. Cores in concrete, reinforced concrete, brickwork, blockwork, stonework and the like
6. Cores may vary in size from 25mm up to a maximum of 100mm and vary in depth. They shall be cut using a rotary coring machine which complies with BS4019 Pt 3.
7. Core samples shall be clearly labelled with an indelible marker and given a unique reference. In the case of fragmented samples, the individual parts shall also be referenced sequentially. Core samples shall be kept in air-tight containers which are clearly labelled.
8. Unless specifically indicated in Appendix 33/2, cores shall be taken at locations which do not damage reinforcement, post tensioning tendons and the like. The *Contractor* shall be responsible for locating reinforcement prior to the commencement of coring operations.
9. Location of the reinforcement shall be marked on the surface using a removable marker in order that indication of rebar position is present throughout the course of investigations.
10. All core holes shall be reinstated in accordance with the requirements of Appendix 33/2.
11. Drawings shall be provided showing the following:
 - a. Location of cores
 - b. Date core taken
 - c. Unique reference for each core
 - d. Length of core and core fragments. Concrete testing
12. The nature, location and extent of concrete sampling and testing shall be as described in Appendix 33/2.

Trial holes

13. The *Contractor* may be required to excavate trial holes on bridge decks and other areas to facilitate inspection and investigation and inform design decisions.
14. The location and extent of trial holes shall be given in Appendix 33/2.
15. Where trial holes are required in bridge decks to expose the waterproofing membrane, the *Contractor* shall take care to ensure that the waterproofing membrane is not damaged. If the waterproofing membrane is damaged the *Client* shall be immediately informed and given the opportunity to inspect. Any damage to the waterproofing membrane shall be repaired to the satisfaction of the *Client* at the *Contractor's* expense.
16. Trail holes shall be reinstated to the satisfaction of the *Client* and in accordance with the requirements set out in Appendix 33/2.

Concrete Breakout Areas

17. The location and extent of any concrete breakout areas shall be given in Appendix 33/2.
18. Areas for breakout shall be identified and marked up by the *Contractor's* supervisor.

19. Breakout areas shall have straight square edges. The extent of the breakout area shall first be saw cut to a minimum depth of 10mm. Feather edges shall not be permitted.
20. Where reinforcement is to be exposed, the depth of breakout behind the reinforcement shall be the greater of:
 - a. 30mm;
 - b. Sufficient depth to facilitate full inspection of the rear face of the reinforcement; or
 - c. As required by the manufacturer of the repair mortar to guarantee the repair.
21. Concrete repairs shall be carried out in accordance with the requirements of Series 1700.

Sampling and Testing of Existing Corrosion Protection Systems

22. The nature and extent of sampling and testing shall be given in Appendix 33/2.

Recording and labelling of samples

23. Each sample shall be given a unique reference and labelled with the following details:
 - a. Site;
 - b. Sample Number;
 - c. Date Taken;
 - d. Date Delivered;
 - e. Source;
 - f. Location;
 - g. Name Of Person Who Took The Sample;
 - h. Name Of Company Undertaking The Sampling.
24. The samples shall be accompanied by a location plan showing:
 - a. The location of each sample
 - b. Reference of each sample.

Evaluation of Test Results

25. All the information relevant to the problem under investigation shall be assembled before attempting to evaluate the results of testing. The information to hand shall include details of the structure and results of inspections and any previous testing.

The Testing Process

26. Some tests provide factual data, e.g. properties of materials taken from the structure, depth of cover to reinforcement and paint thickness. Other tests require specialist interpretation, e.g. electrode potential measurements or the results of radar surveys. The specialists making the interpretation are to be provided with any additional information that may assist them, e.g. structural drawings showing the layout of the reinforcement helps the interpretation of radar surveys.
27. When specialists are employed to carry out testing, either on site or in the laboratory, they may be best placed to also provide a practical interpretation of the results. However, the ultimate responsibility for the interpretation of tests and any consequent maintenance action remains with the *Contractor*, as the final assessment requires knowledge of other factors, e.g. local factors and maintenance history.

28. It may sometimes appear desirable to undertake further testing before coming to a decision on what action to take. Careful consideration shall be given as to whether additional testing will be of benefit. Testing does not always provide quantitative information on structural condition and the interpretation nearly always includes an element of engineering judgment.

Reporting

29. Detailed factual and interpretive reports shall accompany the on-site testing and investigations. The requirements for reporting are given in Appendix 33/2.
30. A photograph for each of the following shall be provided in the factual report where appropriate:
- a. each sample location clearly showing the unique sample reference; and
 - b. each sample (other than dust samples).

A reference scale shall be included in each photograph.

Method Statements

31. The *Contractor* shall provide detailed method statements covering all aspects of the investigation and testing work. Method statements shall be submitted to the *Client* for comment at least 28 calendar days prior to the commencement of works on site.
32. Separate method statements shall be provided for each task. Method statements shall contain two sections: one dealing with Health & Safety issues, the other detailing how the testing will be undertaken and the sequence of events.
33. Method statements shall be given a unique reference number, title and revision. Inspection by the *Client*
34. The *Contractor* shall notify the *Client* at least 7 calendar days in advance of any testing or investigation works commencing to allow it sufficient time to organise site visits to witness the tasks being carried out.

Variations

35. It should be noted that because of the complicated nature of highway structures, and the fact that as-constructed information will not always be available, conditions on site may vary from those anticipated at the time the testing or investigations were planned. As a result, the *Contractor* shall anticipate this and be flexible in its approach. It may be necessary to vary the location, extent or position, etc of a test area to suit actual conditions found on site and to make the most of road space and equipment available at the time.

3303AR Trial Holes In Paved Areas

1. The location and dimensions of trial holes, and the depths of different types of materials, are to be recorded, and these details reported to the *Client*.
2. The *Contractor* shall excavate trial holes by hand or machine to permit inspection or sampling of unbound or bitumen bound materials. The size of the trial hole shall be instructed by the *Client*.
3. The *Contractor* shall excavate trial holes by hand to locate utilities' services in footways with slabbed or modular paving. Trial holes in these areas shall be permanently reinstated in accordance with Clause 1104.
4. Trial holes in non-slabbed areas shall be reinstated:
 - a. to the top of sub-base level with granular Type 1 sub-base material; then
 - b. to within 25mm of the surface with dense bitumen macadam base to Clause

903; then

- c. to the surface with accepted instant road repair material.
5. All material shall be compacted in accordance with the Specification and, on completion, shall be at the same level as the adjacent surface.

3304AR Closed Circuit Television Surveys Of Drainage Systems

Extent of Survey and Method to be used

1. The survey shall be of any of the drains within the Area as instructed by the *Client*. For the purposes of this Clause, the word 'drain' is deemed to include sewers, drains, filter drains, ducts, piped grips and combined kerb block drainage.
2. The drains shall be inspected by closed circuit television so that all cracks, blemishes, encrustations, open joints, silt, debris, collapsed sections, roots, vermin and alignment can be clearly observed.
3. Surveys shall be carried out by trained and experienced personnel accepted by the *Client*. The *Contractor* shall submit evidence to the *Client* that the personnel, including any subcontractors, proposed to carry out the surveys have the expertise and resources to carry out the work.
4. Television cameras shall be drawn by cables and winches, self-propelled tractor driven, or affixed to rods, as appropriate to the type of drain and method of working required by site conditions.
5. All drains shall be cleaned by high pressure water jetting in accordance with sub-Clause 3115AR prior to the survey commencing, and any obstruction that cannot be removed by jetting immediately reported to the *Client*. Where the survey of a drain length is stopped by an obstruction not previously identified during jetting, the drain shall be surveyed from the other direction. The blockage shall be reported to the *Client*, and no further work shall be carried out. Any subsequent jetting, cleaning or remedial work shall be ordered separately.
6. It is desirable to record during dry weather. The *Contractor* shall minimize, or temporarily stop, discharge into the system while recording.

Picture Quality

7. The electronic systems, television camera and monitor shall be capable of providing a picture of not less than 350 lines definition with 5 shades of grey.
8. Horizontal and vertical linearity shall be better than 10% positional error over the whole TV monitor screen (central circle only).
9. The adjustment of focus shall give a focus range from 150mm to infinity.
10. The combination of illumination of the object and light sensitivity of the camera shall be adequate to obtain an effective picture of the structure of the drains to be surveyed, including cracks and fractures and its severity.
11. The camera lens shall be kept clean and clear. Any fogging due to oil, grease or debris that obscures the lens shall be cleaned off before proceeding.
12. The *Contractor* shall provide on the site a suitable test device which enables it to demonstrate that the definition of shades of grey and linearity comply with the above requirement by use of the Marconi Resolution Chart No. 1 (central circle only). A test shall be carried out using this equipment as frequently as may be required.

Linear Measurement

13. The monitor display shall incorporate an automatically updated record of the metreage of the camera position along the drain, accurate to plus or minus 2%.

14. The *Contractor* shall provide a suitable metering device which enables the cable length to be accurately measured.
15. When requested by the *Client*, at any time during the course of the survey, the *Contractor* shall demonstrate that the above tolerance is being complied with using one or both of the following methods as the *Client* shall select:
 - a. use of a cable calibration device;
 - b. tape measurement on the surface between chambers.

DVDs

16. The *Contractor* shall provide facilities for DVD recording of all drain lengths surveyed. When instructed to record the survey by the *Client*, the *Contractor* shall provide a recording which shows a continuous record of data displayed automatically on the monitor screen containing the following information:
 - a. automatic update of the camera's metreage position in the drain line;
 - b. date of survey;
 - c. direction of survey;
 - d. pipe dimensions; and
 - e. length/location reference.
17. DVD-R discs shall be used and shall become the property of the *Client*. Photographs
18. Photographs shall be taken, when instructed by the *Client*, of continuing and point defects and samples of average condition.
19. Where colour in-line photography is the specified option, the photographs shall not exceed 5 metres apart.
20. Photographs shall be provided in digital format on CD, each of size between 500kB to 1MB, unless otherwise agreed with the *Client*. They shall be clearly identified in relation to the metreage of the place taken and shall show clear definition and accurately reflect what is shown on the monitor which shall be in proper adjustment.
21. Photographs shall become the property of the *Client*. Control Photographs and DVDs
22. The *Contractor* shall supply two photographs and a DVD-R as a sample of recently executed drain survey work for acceptance by the *Client*. The samples shall be held by the *Client* and be used as a control against which the *Contractor's* performance shall be measured. If, in the opinion of the *Client*, any photographs or DVD recordings provided under the Contract fall significantly below the standard of the accepted samples the work in question shall be re-executed by the *Contractor*.

Camera Speed

23. The speed of the camera in the drain shall be limited to 0.10m/s for drains of diameter less than 200mm, 0.15m/s for diameters exceeding 200mm but not exceeding 300mm, and 0.20m/s for those exceeding 300mm, or such other agreed speed as shall enable all details to be extracted.

Reports

24. Reports shall be presented in accordance with the format laid down in the 'Manual of Sewer Condition Classification' Fifth Edition published by The Federation of Water Regulators WRC, Dec 2003.
25. The *Client* may instruct that different sections of the survey be grouped together in separate reports. Each chamber length shall be recorded on a separate sheet except for buried chambers which may be included within a length.

26. Photographs shall be mounted and shall follow the relevant page of the report.
27. All dimensions shall be in metric units.
28. The report shall include the depth measured from cover level to invert for every drain in each chamber.
29. One copy of the report shall be provided to the *Client* within 14 calendar days of completion of each section of the survey.

3305AR Topographical Surveys

Details

1. Topographical surveys shall be conducted in strict accordance with the Royal Institute of Chartered Surveyors standard "Surveys of Land, Buildings and Utility Services at Scales of 1:500 and Larger.
2. A topographical survey shall include the following details, where relevant:
 - a. Bollards (indicate if illuminated)
 - b. Boundaries
 - c. Building lines & steps, ramps, fire escapes
 - d. Bus stops, flags & shelters
 - e. Changes in surface (to include surface type)
 - f. Gates, fences, walls (indicate height)
 - g. Guard rail
 - h. Safety fencing
 - i. Gullies
 - j. Kerbs & dropped kerbs
 - k. Lighting columns
 - l. Road markings
 - m. Road signs and sign posts (indicate if illuminated or wall-mounted)
 - n. Service covers (where visible indicate type)
 - o. Traffic signal poles
 - p. Tree pits, trees, edge of vegetation
 - q. Any street furniture within the survey boundary (benches, CCTV cameras, controller boxes, electrical poles, litter bins, parking meters, planters, post boxes, telegraph poles, telephone boxes, etc).
3. Road markings shall include line types, e.g. double/single, red/yellow/white lines, studs, centre line & lane markings, stop lines in its exact position. Text markings on the road shall also be surveyed accurately.
4. Road signs shall include the relevant TSRGD Diagram Number.
5. The extents of various paving surfaces shall be recorded, e.g. tactile paving, setts, slabs, etc, including colour and material. The extent and type of any surfacing treatment should also be indicated, e.g. grey/buff skid resistant, green, red, etc. Covers or lights to cellars shall also be recorded.
6. Building supports, and overhangs shall be shown.

7. Tree locations shall be accurate with text added to indicate the diameter of the trunk measured 1.0m above ground. Species, height and extent of spread shall also be shown.
8. Survey control shall be established on site using road nails or similar to define coordinated survey station points. The survey grid shall be orientated to the National Grid OSGB32. The individual survey control points shall be fixed by means of a closed loop traverse where possible. If this is not possible, then GPS derived control points shall be established at either end of a Service area to allow the accuracy of the control information to be determined.

Levels

9. Level information shall be collected at 2.0m chainage intervals within 20m of a junction and at 5.0m chainage intervals outside these areas unless otherwise required by the *Client*. At each interval, levels shall be collected at the back of footway, tops and bottoms of kerbs, channels, and carriageway centre line within the area shown on the drawings.
10. Spot levels shall be shown on the Final Drawings to two decimal places at the following locations:
 - a. along the carriageway centre line, channels, gullies, tops and bottoms of kerbs of all roads, at road intersections and at changes in directions of falls;
 - b. back of footways and at points of changes in directions of falls of footways.
11. The *Contractor* shall take additional levels as required in order to accurately reflect the nature of the highway layout and topography within the highway where there are any unusual changes in profile, banks, a central reserve or islands, road humps or where there is a large area of carriageway or paved area.
12. In addition to the above, if the footway is over 4.0m wide or has a drainage channel incorporated as part of its construction, then an additional longitudinal line of levels shall be provided on the centre line of the footway or on the drainage channel. If the footway is less than 4.0m wide and has a drainage channel, then the intermediate level shall be provided on the drainage channel. If the footway is over 12.0m wide, levels shall be provided on a 4.0m grid. Levels shall be shown on the plans in metres relative to Ordnance Datum (Newlyn) to two decimal places and also provided as three-dimensional strings for all survey areas.

Presentation

13. The survey shall be produced in AutoCAD at a scale of 1:200 and delivered by e-mail.
14. All plan data surveyed shall be gathered and related to the Ordnance Survey National Grid. The supplied data shall be able to be inserted in the relevant tile in the correct orientation with no rotation or alignment of the data required (with an insertion point of 0,0,0). An indicative north arrow shall be shown. Layers shall be separate and clear to facilitate turning data on and off.

Series 4000 Street Furniture

4001AR General

1. The *Contractor* is required under this Contract to supply, install, repair and remove street furniture.
2. Street Furniture covered by this 4000 Series includes:
 - a. Non-mains-illuminated normal bollards, including bollard and rail combinations.
 - b. Non-mains illuminated traffic bollards and guide posts.
 - c. Street name plates and post assemblies.
 - d. Tree grills.
 - e. Pedal cycle and motorcycle stands.
 - f. Stone and precast concrete spheres cubes and plinths.
 - g. Benches and other seats.
 - h. Litter bins and dog bins.
 - i. Notice boards.
 - j. Parking meters.
 - k. Pedestrian direction signs.
 - l. Safety mirrors.
 - m. Salt bins.
 - n. CCTV camera poles.
3. Street Furniture dealt with elsewhere in this Specification is as follows:
 - a. Traffic signs and associated posts, brackets and lighting units (1200 Series)
 - b. Pedestrian guardrail (0400 Series).
 - c. Fencing (0300 Series).
 - d. Road studs and markers (1200 Series).
4. Street Furniture not listed above is not covered by this contract, for example telephone boxes, utility company cabinets, and advertising panels.

4002AR Removal

1. Existing street furniture which has subsurface foundations may, by agreement with the *Client*, be cut off level with the top surface of the concrete foundation and the surface reinstated as per Clause 706. Such action shall only be undertaken by the *Contractor* where agreed in writing by the *Client* for that specific Task Order.
2. If there is no foundation, the item of street furniture shall be completely removed and the surface reinstated as per Clause 706.
3. Any item of street furniture which is attached to something else (e.g. a wall, fence or lighting column) shall be completely removed and the surface of the host returned to match existing.

4003AR **Supply**

1. All Street Furniture shall be '*Client* Specified' equipment as Clause 143AR. The *Contractor's* procurement and handling overhead for each order shall be added to relevant Supply to Site or Supply into Store items under the Price List Schedule of Rates.
2. Street Furniture shall only be supplied with retroreflective tape, bands or other surfaces where instructed by the *Client*.

4004AR **Installation**

1. All Street Furniture shall be installed in strict accordance with the manufacturer's recommendations for the particular service conditions encountered. Where installation is to be into an existing pavement then, unless required otherwise in the instructing Task Order, the surrounding pavement shall be reinstated as Clause 706. The surface finish detail to be used around the base of items shall be as required in Appendix 11/1. The *Contractor* shall not be entitled for additional payment in respect to different fixing and foundation details or surface finish details around the bases of items other than as permitted within the Price List Schedule of Rates.
2. To reduce street clutter, street nameplates shall be mounted on walls or other boundary structures at the back edge of the footway, wherever possible. However, the *Contractor* shall check with the *Client* before fixing a street nameplate to private property since prior notification will have to have been given to the property owner by the *Client*.

4005AR **Repair**

1. There might be circumstances where a damaged item of street furniture can be suitably repaired. If the *Contractor* believes this to be the case, it shall submit its proposals to the *Client* for approval. In most cases, however, it is expected that damaged street furniture will need to be replaced in accordance with Clauses 4003AR and 4004AR.

Series 5000 Maintenance painting of steelwork

5016AR Anti-Graffiti Coatings

1. 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. Care shall be taken to feather back the edges of all loose or flaking paint work to a second edge. A suitable sealer/primer, as recommended by the manufacturer, shall be applied to bare areas and areas of graffiti which resist cleaning and may present a problem with “pigment bleed”.
2. The anti-graffiti coating shall be of the sacrificial type and shall be capable of being cleaned a minimum of twice before re-coating is necessary.
3. The coating shall be applied strictly in accordance with the manufacturer’s recommendations.
4. The application of the coating system shall not change the appearance or colour of the substrata, unless agreed otherwise with the *Client*.
5. The *Contractor* shall submit its proposals for protection of the general public during the application to the *Client* for its acceptance prior to commencing the work.
6. The subsequent cleaning of the coating and/or removal of graffiti, posters and encrusted deposits shall not have any detrimental effect on the substrate. Grit blasting and the use of chemical cleaning agents likely to cause long term effects on the substrata will not be acceptable.

2.

Substitute Clauses, Tables and Figures

Series 100 - Preliminaries

109SR Control Of Noise And Vibration

General

1. The *Contractor* shall consult with, and furnish such information as may be required by, Local Environmental Health Officers in relation to noise levels emitted by plant or equipment used or installed on the site or which the *Contractor* intends to use or install on the site, and also afford all reasonable facilities to enable such Officers to carry out such noise monitoring as they may deem necessary.
2. The *Client* shall have the right to instruct the *Contractor* to cease using any items of plant insufficiently silenced or generating noise levels in excess of those specified. In such circumstances, the *Contractor* shall change the method of performing the works at its own cost and shall have no claim against the *Client* in this matter.
3. Compliance with these conditions and the other requirements of the Contract will not of itself constitute any grounds of defence against any proceedings instituted under Section 61 of the Control of Pollution Act 1974 (whereby any occupier of premises may complain to a Magistrate's Court of a noise nuisance).
4. The *Contractor* shall indemnify the *Client* from and against any liability for damages arising from noise and/or vibration and from and against any claims, demands, proceedings, damages, costs, charges and expenses whatsoever in regard, or in relation, to such liability.

Noise Control

5. Best Practicable Means (BPM) as defined in Section 72 of the Control of Pollution Act 1974 shall be employed at all times to reduce noise and vibration to a minimum.
6. The *Contractor* shall employ the Best Practical Means (BPM) to minimise noise and vibration produced by its operations and shall have regard to the recommendations in BS 5228-1:2009+A1:2014 (Noise Control on Construction and Open sites) and any similar British Standard or Code of Practice which may be considered relevant.
7. As far as practicable, all sources of noise from plant such as generators and compressors shall be enclosed and adequately insulated. All vehicles, plant and machinery shall be fitted with effective and efficient exhaust silencers. If necessary, advice from manufacturers shall be obtained to ensure that adequate ventilation is provided by the enclosures.
8. Whenever possible, quieter techniques or machinery shall be used, e.g. the use of an electric pump rather than diesel pump, or the use of a white noise warning mechanism for reversing vehicles.
9. All pneumatic tools shall be in good mechanical order and fitted with mufflers or silencers of a type recommended by the manufacturer to give the greatest possible reduction of noise. Prior approval of the *Client* shall be sought before use is made of a vehicle-mounted type concrete breaker. Electrically powered equipment shall be used in sensitive locations when instructed by the *Client*.
10. Machines that may be in intermittent use shall be shut down between work periods or shall be throttled down to a minimum. Machines shall not be left running unnecessarily.
11. Acoustic screens or barriers shall be used to shield noisy operations wherever possible. For maximum effectiveness, the barrier shall be brought as close as

possible to either the noise source or the receiving positions. The maximum height of barriers shall be such that no part of the noise source shall be visible from the receiving positions. Barriers shall be marked clearly with the words 'Noise Barrier' on the face visible to the public.

12. Good relations with people living and working in the vicinity of the works are important. Unless otherwise approved or instructed by the *Client*, no breakers shall be used between 2230hrs and 0800hrs. People likely to be affected by noise shall be informed, by letter drop or other appropriate means, of any works to be carried out between 1800 and 0800 hours and on Sundays and Public Holidays. Notification to the public shall take place at least one week prior to the commencement of the works.
13. Where the works are located in noise sensitive areas, such as close to residential properties, hospitals, schools or offices, then the *Contractor* shall supply the following information to the *Client*:
 - a. Details of the plant and equipment to be used and its locations.
 - b. Predicted noise levels at façades of the nearest affected properties. The noise levels provided shall be expressed in terms of both a 5-minute and 15-minute LAeq measurement which represents both the noisier operations and also more typical day to day operations.
 - c. Where night-time work is envisaged, then it shall be necessary for a background noise level survey to be carried out prior to the commencement of the works.
 - d. Where it is not possible for the works to be complete by midnight, the *Contractor* shall provide acoustic screens or barriers such that the 5-minute LAeq noise level measured one metre from the façade of the affected buildings does not exceed the ambient level by 3dbA (5-minute LAeq).
14. Where piling works are required, the *Contractor* shall comply with BS 5228-1:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open sites - Part 1 Noise. The *Contractor* shall demonstrate that they have used the best practicable means in selecting the quietest piling rig suitable for the work. Extensive guidance on noise levels is given in the British Standard.
15. The installation of sheet piling with a diesel or air driven impact or drop hammer in noise sensitive areas shall be avoided. Whenever practicable, hydraulically operated or vibratory hammers shall be used to drive and extract sheet piling, provided the soil strata are suitable for such equipment.
16. Where practicable, rotary drills and bursters actuated by hydraulic or electrical power shall be used for excavating hard material in noise sensitive areas.
17. The *Client* shall have the right to order the *Contractor* to cease using any item of equipment insufficiently silenced or generating noise levels in excess of those specified.

Vibration Control

18. Although not specifically requested the *Contractor* shall also normally limit vibration levels arising from site activities at any residential buildings to a peak particle velocity of 1.5mm/sec in the vertical direction. Where detectable vibration is permitted from work on site in such buildings at any other time outside normal working hours prior approval must be sought from the pollution team. In addition to this, equipment producing noise or vibration at frequencies less than 10hz and between 20hz to 30hz shall not normally be permitted to operate within six (6) metres of buildings. Conventional sheet piling shall not normally be permitted within twenty metres of buildings unless specified in the Task Order and tracked equipment shall be

prohibited within six metres of buildings. Where vibration occurs, reference shall be made to ISO 2631 - whole body vibration, BS 6472-1 & 2:2008 evaluations of human exposure to vibration in buildings (1hz-80hz). Any vibration monitoring carried out shall also be in compliance with BS6472-1 & 2:2008.

19. Explosive demolition shall not be permitted.
20. No machine shall be permitted which uses a system of dropping a heavy weight, whether power assisted or by gravity, for the purpose of breaking up paving without the *Client's* prior written consent to the use of such equipment.

Dust Control

21. The *Contractor* shall ensure that adequate provision is made to damp down areas where activities are likely to create dust. Measures shall include the spraying by pressure hoses to suppress dust and also the provision of bowsers where appropriate.
22. Equipment shall be sited and screened where necessary to minimise dust emission to adjoining areas.
23. All stockpiles shall be covered to prevent the generation of dust.
24. The *Contractor* shall ensure that off-site observations and monitoring of dust takes place to confirm that steps are successful in minimising dust release from site.
25. The *Contractor* shall take all measures necessary to prevent spillage onto roads or footways adjoining the site and in wet weather shall prevent mud from the site being carried onto the highway.
26. If spillages and pollution occur immediate steps need to be taken to manage the clean-up.

Waste Disposal

27. Under the Environmental Protection Act 1990 all those who produce carry keep or dispose of waste have a duty of care to ensure that waste is properly disposed of.
28. The *Contractor* shall ensure that all its waste carriers are registered with the appropriate waste regulation authority. A registered waste carrier needs to be communicated to the contact above.
29. The burning of any type of waste on the site is prohibited.

113SR Programme Of Works

General

1. The *Contractor* shall submit to the *Client* programmes of work, having consulted the *Client*, TfL, London Buses, the Police, the *Client's* Network Management Team and any other relevant organisation or statutory consultee. Programmes shall include future Schemes / Tasks notified or already instructed by the *Client*.
2. All programmes are subject to change by the *Client* to accommodate the work of others on the Network or to deal with changing circumstances, emergencies and the like. A *Contractor's* representative is to meet or co-locate with the *Client's* Network Management Team twice a week (or as necessary) to ensure adherence to programme and permitting applications as well as coordination of works.
3. The *Contractor* shall, at its own expense, comply with any reasonable instructions of the *Client* and/or the Police to re-programme work. For the avoidance of doubt, additional costs associated with carrying out re- programmed work will not be reimbursable to the *Contractor*.

Twelve Month Programme

4. The *Contractor* shall submit a twelve-month programme each year, including one to cover the first twelve months of the *service period*. The programme shall identify the order and timing, including constraints, of the activities which the *Contractor* plans to do in order to carry out the works. The programme shall be submitted at least five working days before the first day of the period that the programme covers

One Month Programme

5. The *Contractor* shall submit a one-month detailed programme each month, including one to cover the first one month of the *service period*. The programme shall identify the order and timing, including constraints, of the activities which the *Contractor* plans to do in order to carry out the works. The programme shall be submitted at least one working day before the first day of the period that the programme covers.

Daily Programme

6. The *Contractor* shall submit a daily programme for the next 24-hour period, commencing at 0800 hours, by 1600 hours the previous working day, or such earlier time as may be directed, detailing any changes to the work shown in the one-month programme.

114SR Payment Applications

1. Applications for payment shall be submitted monthly in accordance with the requirements of Appendix 1/14 and the Contract.
2. The *Client* currently uses a CONFIRM (Pitney Bowes Systems) based electronic management system. The *Contractor* shall deliver the following functions:
 - a. the preparation and submission of all monthly applications in accordance with the requirements of Appendix 1/14 and the Contract;
 - b. the receipt and measurement of all Task Orders, Service or Scheme Instructions;
 - c. the processing of all completion and maintenance certificates;
 - d. Updating of Asset Management System.
3. The *Contractor* will require the approval of the *Client* at each development stage. The *Client* will arrange for access to the electronic management system as may be required.

116SR Privately And Publicly Owned Services Or Supplies

1. The *Contractor* shall obtain up to date location plans from each Statutory Undertaker of their equipment in advance of planned works as required by the relevant guidance documents. The *Contractor* shall submit copies to the *Client*.
2. The *Contractor* shall satisfy himself as to the exact position and nature of Statutory Undertaker and other publicly and privately-owned services or supplies affected by the works and the depth, size and gradient thereof, by hand digging and electro-location, as necessary. Repairs to Statutory Undertakers' plant and services damaged by the *Contractor* during the course of the works shall be paid for by the *Contractor*.
3. The *Contractor* shall closely liaise with Statutory Undertakers prior to undertaking any excavation in the highway and comply with the guidance contained in 'Avoidance of Danger From Overhead Electrical Lines' (GS6) and 'Avoiding Danger From Underground Services' (HSG47), both published by the Health and Safety Executive.
4. Should any underground apparatus be exposed, the *Contractor* shall notify the Statutory Undertaker or owner concerned, as well as the *Client*, and protect the

apparatus according to the requirements of that Undertaker or owner. Should any leakages or damage be discovered, the *Contractor* shall at once notify the *Client* and the Statutory Undertaker or owner concerned, and the *Contractor* shall afford every facility for the repair or replacement of the apparatus affected.

5. The *Contractor* shall, during the progress of the works, take all measures required by any Statutory Undertaker, or the owner of other public or private services or supplies, for the support and full protection of all such services or supplies.
6. Where privately or publicly owned services or supplies affected by the works are subject to alteration, removal or diversion, the *Contractor* shall be responsible for all arrangements with the owners and/or its agents for the execution and phasing of such works in accordance with its Programme.
7. The *Contractor* shall make arrangements with Statutory Undertakers and others concerned for the co-ordination of its work with all other work which needs to be done by it or its contractors concurrently with the works. The *Contractor* will need to ascertain the period of notice to be given in each and every instance.
8. Private Services to individual properties will not generally be listed or shown on drawings. The *Contractor* shall make arrangements with the Statutory Undertaker and others concerned for the phasing of all necessary disconnections and diversions of private services affected by the works.
9. The *Client* shall not be responsible for any costs resulting from delay to the *Contractor* as a result of a Statutory Undertaker not carrying out its works as agreed. The *Client* may, however, at its discretion, allow extensions of time in such circumstances.
10. The *Client* will, where appropriate, issue instructions for any permanent diversion or protection of existing private services required in the works. Disconnected apparatus shall be removed by the *Contractor* only with the prior acceptance of the authority or owner concerned.
11. No services or supplies shall be interrupted without the written consent of the appropriate authority or owner, and the *Contractor* shall provide a satisfactory alternative before interrupting any existing service or supply.
12. The *Contractor* shall immediately report to the *Client* any damage done to any underground plant, equipment, apparatus or works and, where so ordered by the *Client*, and without cost to the *Client*, the *Contractor* shall perform or arrange repairs without delay. Should the owner of the damaged plant, equipment, apparatus or works carry out the repair, the *Contractor* shall supply immediately any facilities or assistance necessary and repay to the owner the full cost of the remedial work.
13. The *Contractor* shall ensure that all Statutory Undertakers' manholes, boxes, inspection chambers, fire hydrants and the like, within the limits of the site, are kept completely unobstructed at all times and have free access for the Undertaker concerned. Instructions to this effect shall be given by the *Contractor* to all site staff.
14. The use of Water Company hydrants within London is based on a licensing system. It shall be the responsibility of the *Contractor* to ensure that they hold an appropriate annual licence for the use of such hydrants.
15. The names, addresses and telephone numbers of the major authorities will be supplied by the *Client* before the *starting date*.

117SR Traffic Safety And Management

1. When planning and undertaking work on highways open to traffic, the *Contractor* shall take account of the Quality Management Sector Schemes detailed in SHW Appendix A and the recommendations contained in all relevant Codes of Practice and Guidance Notes, including:

- a. "Guidance for Safer Temporary Traffic Management" published jointly by the Highways Agency, CSS, and the Health and Safety Executive;
 - b. "Chapter 8 of the Traffic Signs Manual"; and
 - c. "Safety at Street Works and Road Works" published jointly by the
 - d. Department for Transport (DfT), the Highway Authorities and Utilities Committee, and the Health and Safety Executive.
2. When planning traffic safety and management measures the *Contractor* shall take into account the information contained in Appendix 1/17.
 3. The *Contractor* shall, unless otherwise stated in Appendix 1/17, after consultation with any statutory, Police or other authority concerned, prepare and submit traffic safety and management proposals for the approval of the *Client*. These shall show the proposed traffic safety and management measures, including provision of safety zones, which they propose for carrying out the works. The cost of developing traffic and pedestrian safety and management proposals, and any associated drawings, shall be included in works item rates and lump sums.
 4. The *Contractor* shall submit a formal application, as described in Appendix 1/17, to the appropriate authority for any statutory orders required to be made or notices required to be published in connection with its traffic safety and management proposals.
 5. The *Contractor* shall provide, erect, maintain, reposition, cover and uncover, and finally remove temporary traffic signs as required by the works. In so doing, such other measures shall be taken by the *Contractor* as may be necessitated by the works in accordance with any special requirements in Appendix 1/17, or recommendations in the Codes of Practice and Guidance Notes referred to in sub-Clause 1 above. Where the circumstances of any particular situation are not covered by the recommendations or described in Appendix 1/17, the *Contractor* shall submit proposals for dealing with that situation for the approval of the *Client*.
 6. Where a temporary speed limit at roadworks has been imposed and the works have been temporarily terminated, with the removal of traffic management measures, the *Contractor* shall ensure that the temporary speed limit signs are covered or taken down for the duration of the cessation of the works. Where the temporary speed limit signs are covered, the covering material shall be of a glare-resistant type and securely fastened.
 7. Temporary traffic signs shall comply with the appropriate Clauses in Series 1200. The *Contractor* shall keep traffic signs clean, secure and legible and ensure that all signs required to be lit, whether by external or internal lighting, are so lit during periods when road vehicles are required to display lights.
 8. Where the Contract provides that the *Contractor* shall erect, maintain or reposition temporary traffic signs for works required under a Task Order, the *Contractor* shall not change in any manner the permanent or temporary traffic signs without instruction from the *Client*.
 9. All traffic safety and management measures necessitated by the works shall be fully operational before the *Contractor* commences any work which affects the public highway or the use of it.
 10. Any area of highway which has been closed because of the works shall not be re-opened until all appropriate traffic safety and management measures have been completed and the highway is in a suitable condition for public use.
 11. Where work is carried out on, or adjacent to, a highway open to traffic the *Contractor* shall ensure that vehicles and mobile plant under its control operating frequently or

regularly on or adjacent to that highway in the execution of the works shall comply with Section 0.5 Chapter 8 (Part 2 Operations) of the Traffic Signs Manual.

12. Temporary lighting shall be provided in accordance with Clause 1405 where required by Appendix 1/17, or by the *Contractor* in the execution of the works.
13. The *Contractor* shall provide and suitably sign points of entry to and exit from the site for vehicles and plant engaged on the works. The *Contractor* shall ensure that when any vehicle or item of plant is reversing within the site on or adjacent to a highway open to traffic, it does so only under the supervision of a person designated for the purpose of regulating traffic within the site who shall be readily distinguishable from the remainder of the work force.
14. Where work is carried out on or adjacent to a highway open to traffic, the *Contractor* shall ensure that the workforce and the site supervisory staff at all times wear high visibility clothing complying with BS EN 471. Clothing shall be to Table 1, Class 2 or 3 (Class 3 on high speed roads) and shall comply with the requirements of para 4.2.3(b). In addition, on high speed roads, full length sleeves meeting the requirements of para 4.2.4 shall be provided for coveralls and jackets. The colour of the clothing shall be “fluorescent yellow” complying with Table 2. The retroreflective material used shall be to Class 2 as defined at Table 5. Clothing complying with other specifications may be used where it offers equivalent levels of performance consistent with the basic health and safety requirements set out in Annex 2 of the Personal Protective Equipment Directive (89/686/EEC). The *Contractor* shall ensure that the person in charge of the workforce is readily distinguishable from the person designated in sub- Clause 15 below and from the remainder of the workforce.
15. When required by the *Client*, the *Contractor* shall appoint a suitably qualified Traffic Safety and Control Officer (TSCO) who shall make all arrangements necessary for traffic safety and control.
16. The TSCO shall be experienced in the control of temporary traffic management operations and shall possess a National Highway Sector Scheme (NHSS) 12 Traffic Safety and Control Officer (2009) Registration Card.
17. The *Contractor* shall provide the *Client* with the names and contact details of the TSCO and any nominated deputies. When required by the *Client*, the TSCO or a nominated deputy shall be on the site at all times when traffic management is in operation and shall be readily available to deal with matters related to traffic safety and control (including breakdown recovery vehicles).
18. Without prejudice to sub-Clause 14 above, whilst within the limits of a temporary traffic management scheme, the TSCO shall manage any traffic management related requests given by a Police Officer. Elsewhere, the TSCO shall liaise with the *Client*'s Network Management Team on traffic management related matters, and deal with requests and instructions.
19. If an accident or breakdown occurs on a carriageway or hard shoulder open to traffic within or in the vicinity of the site, the *Contractor* shall act as requested by Police Officers acting under its statutory powers.
20. Where required in Appendix 1/17, the *Contractor* shall provide, erect, maintain and remove Driver Information Signs in accordance with sub-Clauses 22 to 29 below.
21. Sign face layouts shall be in accordance with Signs 7004 and 7005 of the Traffic Signs Regulations and General Directions 2016, or as subsequently revised.
22. Legends shall be selected, as appropriate, from Appendix 1/17.
23. Sign 7004 shall describe the work activity taking place and shall be positioned at locations agreed with the *Client*.

24. Sign 7005 shall indicate how long delays are possible. It shall be sited as agreed with *Client's* Network Management Team. At the commencement of works the legend shall read, for example "... until September 2019". At least ten calendar days before the end of carriageway restrictions the date shall be specified more precisely, for example "... until 30 September 2019". This date shall be further updated, if necessary, until the restrictions are removed.
25. Driver Information Signs shall be located within roadworks when part of the road is coned off, and the reason for this is not apparent from the carriageway, for any period exceeding 30 minutes, or one hour if road capacity is maintained.
26. Signs located within roadworks shall only be used where they can be located at least 50 metres beyond the downstream end of a lead-in taper and in a position which does not prejudice traffic safety.
27. If needed, Driver Information Signs shall be sited at the beginning and at one-kilometre intervals through the works. They shall not be placed where they may distract drivers negotiating traffic management arrangements such as lane changes.
28. Signs shall either be sited for the duration of the works, where it is safe and appropriate to do so, or provision made to enable its use at short notice.
29. The *Contractor* shall provide adequate storage facilities clear of any safety zone. Storage within the central reserve or in front of safety barriers shall not be permitted.
30. Driver Information Signs shall only be displayed within roadworks where they accurately reflect the reason for the inactivity.
 - a. All signs shall be sited in accordance with the Traffic Signs Manual and the NRSWA Code of Practice "Safety at Street Works and Road Works", unless otherwise directed, so that they are clearly visible to approaching traffic. Signs erected over the footway shall provide clear headroom of not less than 2.1m.
 - b. Signs erected above cycle lanes or cycle tracks shall have clear headroom of not less than 2.5m. All signs shall have a minimum of 600mm between the edge of sign and edge of carriageway.
 - c. Signs whose messages no longer apply shall be covered or removed as soon as the hazard to which they refer no longer exists.
 - d. The *Client* shall be given 48 hours' notice of the *Contractor's* intention to switch traffic phases, and no diversions shall be implemented until the measures associated with the previous phase of work have been fully removed. For any road closures or diversions other than those already agreed, the *Contractor* shall give the periods of notice for Temporary Traffic Regulation Orders detailed in Appendix 1/17.
 - e. Stocks of materials or equipment, temporary buildings, plant, parked vehicles and the like shall on no account be permitted to obstruct sight lines.
 - f. Traffic barriers shall be continuous, at least 900mm high, portable, stable under adverse weather conditions and appear to be substantial, but not so substantial as to cause excessive damage to a vehicle should it be struck.
31. All temporary traffic signs at roadwork sites shall be reflectorised. In addition, where vehicle headlamps are not normally used, the signs shall be provided with direct lighting.
32. Continuously operated yellow warning lamps supplemented by traffic cones shall be used to delineate the works. All Traffic Management equipment shall be checked

daily, including at weekends. High-intensity flashing amber beacons may be used sparingly on the approaches to roadwork sites to draw attention to the hazard.

33. Obstructions and excavations shall be adequately fenced and guarded at all times for the protection of all persons whose use of the highway is reasonably foreseeable. Where footways are obstructed, suitable diversions shall be provided in accordance with sub-Clause 1 above.

118SR Temporary Diversions For Traffic

1. The provisions of this Clause do not apply to any temporary access or accommodation works which the *Contractor* may construct for its sole use in the execution of the works.
2. Each temporary diversion for traffic shall be made operative in advance of any interference with the existing arrangements and shall be maintained in accordance with sub-Clause 6 below. The *Contractor* shall remove and reinstate each temporary diversion for traffic as soon as it is no longer required.
3. If the *Contractor* proposes to construct a temporary diversion for traffic as part of its intended traffic safety and management measures, they shall submit an outline of its proposals to the highway authority for its agreement and consultation with the Police.
4. The *Contractor* shall submit a formal application to the appropriate authority for any statutory orders required to be made or notices required to be published through the *Client*, allowing such time as is stated in Appendix 1/17 for the orders to be made and notices to be published.
5. The standard and siting of every temporary diversion for traffic shall be suitable in all respects for the class or classes of traffic using it, and its width shall be not less than that of the existing street.
6. Pedestrian access to public transport services and adequate facilities for bus queues shall be provided and maintained at all times. Routes for pedestrians shall be clearly defined and signposted and free from hazards and obstructions. The surfaces shall be firm, clean and even. Routes shall be of the shortest practicable length having regard to the circumstances, and the unobstructed width shall be not less than as existing, or 1.2 metres, whichever is the lesser. Changes of level shall be affected by ramps of gradient not steeper than 1 in 10.
7. Wherever changes of level occur between temporary and permanent carriageways they shall be affected by ramps of gradient not steeper than 1 in 3. Where temporary bridging is used it shall, where reasonably practicable, be constructed with the deck flush with the adjacent road surface. It shall be designed in accordance with BS EN 1990:2002+A1:2005 and BS EN 1991-1-7:2006+A1:2014 and the relevant DfT BEs and BDs. The bridge deck shall have a surface of material to be approved by the *Client* and shall have a clear width of between 3.25m and 3.5m for one-way operation or a minimum of 6.75m for two-way traffic. All temporary bridging shall be fitted with sound-deadening packing and surfacing to the approval of the *Client*. The provisions of this Clause shall not apply to any temporary access or accommodation works which the *Contractor* may construct for its sole use in the execution of the works.

119SR Routeing Of Vehicles

1. The *Client* may, at its discretion, instruct the *Contractor* on routes to be used by the *Contractor* and its Subcontractors when travelling to and from a site. In some circumstances, the *Client* may place restrictions on the allowable routes, for example, on larger schemes or Tasks where the movement of plant or materials is significant, or where a school, town centre or other sensitive area should be avoided.

122SR Progress Photographs

1. The *Contractor* shall take colour photographs of all sites, works and features associated with the works before, during and subsequent to completion of the works. When working adjacent to private property, the composition of the photographs shall include all private frontages, all front hard standings, all vehicle crossover, all highway boundary walls and fences, and any other relevant features.
2. The *Contractor* shall take colour photographs to record all defects or damage identified and all subsequent works or repairs carried out under the *contract*.
3. Where work is to be covered up on completion, the *Contractor* shall take photographs of the works before it is covered up in order to adequately demonstrate that the work has been completed in accordance with the *Client's* requirements and meets the necessary quality criteria.
4. All photographs shall be electronic and recorded on the *Client's* asset management system against the associated asset.
5. The *Contractor* shall ensure that, before leaving site, the photographs are clear and legible. Any blurred or otherwise defective photographs shall be retaken.
6. All photographs shall display the date and time, be in electronic Jpeg format, and marked with a Task Order number and brief description of the work or features, including chainage / location and direction of view. For bridges and other highway structures, the unique reference shall be the Structure Number and Structure Name.
7. The copyright of all photographs shall be vested in the *Client*. The photographs shall not be used for any purpose whatsoever without the *Client's* approval.

124SR Health And Safety Restrictions, Precautions And Monitoring

General

1. The *Contractor* shall at all times comply with the provisions of Health and Safety legislation and, in particular, the Construction (Design and Management) Regulations 2015, the Health and Safety at Work etc Act 1974, and the Management of Health and Safety at Work Regulations 1999, and shall take account of the latest issues of Construction Safety Manuals, European Safety Directives, etc.
2. The *Contractor* shall provide the *Client* with information to be included on any F10 submission.
3. The *Client* has a general duty of care in regard to the health and safety of its employees and road users who may be affected by the works being undertaken on its behalf. The *Contractor* shall ensure that appropriate measures are taken to protect its employees, road users, *Client's* staff and others from the risks that are associated with the site and activities undertaken thereupon. If, in the opinion of a member of the *Client's* staff, possessing the necessary identification, the *Contractor* is causing danger to the public, that officer has the authority to require immediate remedial action. Upon compliance with the instruction, the *Contractor* shall then contact the *Client* to report the instructions given and the actions taken.
4. The *Contractor* shall provide the *Client* with a statement of its health and safety policy made pursuant to the Health and Safety at Work Act 1974 Sections 2 and 3 or any relevant safety regulation. This statement shall have regard to, and take account of, current legislation and regulations. The *Contractor* shall review its health and safety policy and safety working procedures as often as may be necessary and in the light of changing legislation or working practices and shall notify the *Client* in writing of any

such revisions.

5. The *Contractor* shall provide information on its management arrangements for health and safety, providing an organisation chart and detail on individual roles and responsibilities.
6. The *Contractor* shall produce an annual Health and Safety Action Plan at the start of each financial year. The Plan shall:
 - a. List and support a set of Health and Safety Objectives.
 - b. Have realistic target dates assigned and be challenging but achievable.
 - c. Be presented to, and agreed by, the *Client* during mobilisation to commence delivery from 1 July in Year 1, and then in subsequent years be presented to, and agreed by, the *Client* during March to commence delivery on 1 April each year.
 - d. Be completed, evidenced and approved by the *Client* before the end of the financial year.
7. Generic Pre-Construction Information is presented in Southwark Highways Works Contract Document 5f, Pre Construction Information. *Contract*-specific Pre-Construction Information, where appropriate, will be found in the *Client's* Scope. This sets out any particular risks or hazards known to the *Client* in relation to working on the Network. In response, the *Contractor* shall provide the *Client* with a statement describing the methods by which they will give effect to its safety policy. This method statement shall include, but is not limited to, a detailed description of its arrangements for:
 - a. Making risk assessments under the Control of Substances Hazardous to Health Regulations 2004 and the Management of Health and Safety at Work Regulations 1999;
 - b. Identification of hazards and risks associated with the Contract and the method or methods of controlling those risks;
 - c. Locating and working close to underground services;
 - d. Working on and around mechanical and electrical equipment;
 - e. Working in the public highway;
 - f. Working on or adjacent to railways or tramways;
 - g. Identifying, entering and working in confined spaces;
 - h. Issuing permits to enter, and permits to work in, sewerage and drainage systems;
 - i. Reducing the need to work at height;
 - j. Reducing dust, fumes, vapour and noise generated from plant, equipment and operations;
 - k. Operating hydraulic equipment; and working with electric equipment.

The *Contractor* shall also supply method statements for works not covered by the above, but which may be relevant during the *contract*.

8. The *Contractor* shall inform the *Client* in writing, prior to making any alteration to the *Contractor's* safety policy or method statement. Such alterations shall not be implemented if the *Client* exercises its right to object.
9. The *Contractor* shall arrange, whenever necessary, for a suitably qualified, experienced and competent Safety Officer to undertake inspections of the

Contractor's operations, work places and equipment. Details of the person appointed, and its relevant qualifications/experience shall be forwarded to the *Client* prior to the *starting date*, together with details of the Safety Officer's functions, and how they may be contacted.

10. The *Contractor* shall ensure that its employees are provided with an adequate and suitable supply of protective clothing and other protective equipment as conditions may require. The equipment and clothing shall comply with the appropriate British and/or European Standard. The *Contractor* shall instruct its employees in the use of protective equipment and clothing and it shall be maintained in a fit condition. The *Contractor* shall ensure that protective clothing is effectively worn. The *Contractor* shall adopt a hierarchy of control reducing the need for protective equipment/clothing other than where such equipment/clothing is stipulated by legislation or other authoritative guidance.
11. The *Contractor* shall place warning signs at prominent locations to advise the public whenever works are being undertaken and shall remove signs on completion of the works. The type and style of the *Contractor's* warning signs shall be approved by the *Client* prior to its use on site and comply with the requirements of Appendix 1/21
12. The *Contractor* shall provide, erect, fix, maintain and subsequently remove, all protections, coverings, fencing, gangways, screens, supports, notice boards, warning flags, road markings and other devices, lights and watchmen, as may be required by the *Client*, or which may be necessary for the protection or convenience of the general public.
13. The *Contractor* shall afford facilities for the *Client* to visit and inspect any part of a site at any time during the *contract*. The *Contractor* shall keep and maintain on site all statutory records and shall make these available for inspection by the *Client*.
14. The *Contractor* shall not permit any equipment, workplace or part of the service which has a defect or presents a danger to its workforce or the public to be used until such defect has been remedied to the *Client's* satisfaction.
15. Plant and equipment shall be properly maintained and regularly inspected by a competent person to ensure it conforms to relevant safety regulations (Provision and Use of Work Equipment Regulations 1998), manufacturer's instructions, British/European Standards and HSE Guidance Notes. The *Contractor* shall notify the *Client* of its arrangements for the statutory and routine inspections and tests of plant and equipment. If no safety regulations apply, the *Contractor* shall ensure that the plant and equipment is designed and protected so that it operates safely and without risk of causing injury.
16. All Site Instructions from the *Client* or any of its authorised representatives, concerning health and safety of operatives or road users shall be complied with as specified in the Instruction(s). Unless action is taken as directed, the *Client* may provide all such materials, plant and labour as are necessary, in its opinion, and all the costs of hiring, carrying, placing, maintaining and arranging will be charged to the *Contractor* or be recovered from monies which become due to the *Contractor*.
17. The *Contractor* shall obtain *Client's* approval prior to subcontracting any part of the *contract*. The *Contractor* shall ascertain that any subcontractor is competent and experienced in works and duties of the type to be undertaken and any environment or circumstances they are likely to face, and that the subcontractor's policy and methods with respect to safe working are not inferior in any way to, or in conflict with, those of the *Contractor*.
18. The *Contractor* shall inform the *Client* as soon as becoming aware of any visits from Enforcing Authorities (Health and Safety Executive (HSE) or Local Authority

Environmental Health (EH) Department), prosecution or pending or likely prosecution of the *Contractor* for any offence pertaining to the health and safety of its employees or of other persons, or of any conviction on such prosecution, and shall provide the *Client* with such further information and documents as the *Client* may require.

19. The *Contractor* shall ensure that accurate records are kept of any accident, near miss or other dangerous occurrences relating to health and safety, whether personal injury or damage to property. The *Contractor* shall fully investigate any accident or near miss and shall immediately forward to the *Client* copies of any documents related thereto. In addition, the *Contractor* shall provide a report for the *Client* every month summarising incidents, near misses or other dangerous occurrences relating to health and safety.

CDM regulations

20. The *Contractor* shall act as Principal *Contractor* under the requirements of the Construction (Design and Management) Regulations 2015 at all sites and shall undertake all duties of the Principal *Contractor* required by the Regulations. They shall be responsible for developing and implementing a Construction Phase Plan for all notifiable works and for providing the Principal Designer with such information as is necessary to maintain and develop the Health and Safety File.
21. The *Contractor* shall be provided with access to, and user rights to enable it to provide all information required by the Principal Designer through, the *Client's* CDM Management System.
22. The *Contractor* shall be responsible, at no additional cost, for the coordination of the works as well as health and safety on site and all works, including those by other contractors working under direct orders from the Client (e.g. in-house lighting delivery, street furniture/traded services, etc) or under any other statutory powers (e.g tFL signals, utilities companies, etc).
23. Where the Contract requires design input by the *Contractor*, the *Contractor* will undertake the duties and responsibilities of the Designer under the Regulations for that design function for which they are responsible. The *Contractor*, in exercising this role, shall liaise as necessary with other designers involved in the project and provide the Principal Designer with such information as is necessary to maintain and develop the Health and Safety File. In certain circumstances, the *Contractor* may also be asked to undertake the role of Principal Designer.

Asbestos

24. The *Contractor* shall have in place a procedure for ensuring that, if asbestos is encountered or suspected, the 'Control of Asbestos at Work Regulation' and all other mandatory Regulations are complied with. If asbestos is encountered or suspected, the *Contractor* shall stop all works in the immediate vicinity of the suspect material and isolate the area. The *Contractor* shall notify the *Client* (or its site representative) who will instruct the appropriate action to be taken. Such action may include testing of the suspect material (using a UKAS accredited laboratory) and arrangements for the removal of the material, if necessary, using a licensed *Contractor*. Where a project is notifiable, the *Contractor* shall also notify the Principal Designer of the location and condition of the asbestos containing material and include all relevant information in the Health and Safety File.
25. The *Contractor* shall liaise with the *Client* ensuring that all relevant information on the asbestos containing material, location, condition, type, remedial action, etc is provided in order for the *Client* to update the asbestos register.

Manual handling and lifting equipment

26. The *Contractor* shall ensure that all employees, including those of subcontractors, that may be required to lift or handle materials or equipment, etc, have received manual handling training and that all operations are covered by a suitable risk assessment.
27. Kerbs and flags shall be installed using mechanical lifting aids, where reasonably practicable, such that the health and safety of the kerb/flag layer or any assistant is not compromised.
28. All crane/lifting vehicle operatives shall be trained by an approved instructor in the safe operation of the crane/lifting arm. The *Contractor* shall provide the *Client* with copies of its employees' "Crane/Lifting Arm Training Certificate" and its employees shall carry a copy of its certificates at all times when engaged on the *contract*.
29. Lift vehicles shall be used in a safe manner in order to ensure the safety of other road users, pedestrians, the operators and adjacent property. Lift vehicles shall be used only in ways suitable for the purpose intended and shall comply with all relevant Regulations, Specifications and Codes of Practice.
30. All lifting equipment and accessories for lifting shall comply with the requirements of the Lifting Operations and Lifting Equipment Regulations 1998.

Air quality and substances hazardous to health

31. The *Contractor* shall ensure that the *Client* is notified of any substances hazardous to health which may be used in connection with the *contract*. Full information, including manufacturers' hazard data sheets and the *Contractor's* own COSHH assessment, shall be provided by the *Contractor* to the *Client* for approval 28 calendar days prior to the use of any substance hazardous to health under COSHH Regulations 2004.
32. All work shall be planned to avoid generating dust. Where dust is generated and it is practical to do so, a water bowser, or other suitable dust suppressant or mechanical dust extractor, shall be on site to enable dust to be controlled. For minor cutting with hand tools, a fine water spray shall be used.
33. Live carriageways and footways shall be protected from dust or spray arising from a site which might otherwise reduce visibility. The *Contractor* shall take measures to prevent debris, dust, spray or other materials from affecting any live carriageway or footway.
34. The *Contractor* shall ensure that the protective measures stated in Highways Agency Advice Note SA 8/94 'Use of Substances Hazardous to Health in Highway Construction', incorporating Amendment No. 1 dated October 1994, are enforced. The following substances and activities are likely to be used during the works and may be hazardous to health:
 - a. Bituminous substances;
 - b. Proprietary materials or substances; and
 - c. Working in and around existing drainage systems.
35. During operations involving the spraying of waterproofing membranes, the spraying of any other hazardous material, or an operation which generates dust, the measures set out in Appendix 1/76 shall be taken.

Working at height

36. Whenever works above ground level are ordered, the *Contractor* shall provide safe access for both its own operatives and those of the *Client*.
37. The *Contractor* shall not use a ladder to gain access to lighting equipment except in situations where access with a vehicular mounted platform cannot be made. Ladders

shall be of wood or other non-conducting material and shall not be reinforced by metal attachments running along the stiles of the ladder and shall be to the appropriate British or European Standard.

38. Any scaffolding provided shall comply with the requirements of BS EN 12811-1: 2003 and NASC TG20:13. Scaffolding work shall be undertaken under the immediate supervision of a competent person with adequate experience of this type of work. When the scaffold is complete, certification stating the time and date the scaffold is ready for use shall be maintained.
39. Full details of the safe working load shall be attached to the scaffolding giving details of the correct distribution of personnel, plant and materials and the allowable depth of debris.
40. The *Contractor* shall arrange for inspection of the scaffold once every 7 calendar days, or following alteration and/or adverse weather conditions, and shall maintain a record of such inspections. Inspections shall only be undertaken by a competent person. A detailed written report from the person undertaking the inspection shall be provided to the *Contractor* within 24 hours of the inspection.
41. The *Contractor* shall ensure that all access plant is maintained in good working order and serviced in accordance with the manufacturer's recommendations, and they shall maintain all relevant certificates. All aerial access platform operatives shall be trained by an approved instructor in the safe operation of the aerial access vehicle. The *Contractor* shall provide the *Client* with copies of its employees' "Aerial Access Platform Training Certificates" and its employees shall carry a copy of its certificate at all times when engaged on the *contract*.
42. Every employee of the *Contractor* shall, when employed upon duties involving the use of a raised platform, wear a safety harness of the appropriate British/European Standard and in accordance with current authoritative guidance, e.g. HSE Information Sheet MISC 614, which shall be attached at all times to a secure anchor point on the platform. Where required, the *Contractor* shall provide such safety harnesses to the *Client's* staff, providing instruction on its fit and use.
43. All working at height shall be subject to a suitable risk assessment clearly identifying the need for working at height and the use of the identified equipment. The risk assessment shall also clearly identify emergency and rescue arrangements.
44. Each access to a part of the works shall remain in position or be available until the *Client* has inspected that part of the works and has accepted it as satisfactory.

Work in vicinity of overhead lines

45. The *Contractor* shall ensure that all personnel employed upon the Contract are fully informed with regard to the procedures as laid down by the REC and National Grid Plc, and that such personnel are fully equipped and competent to carry out works in the vicinity of overhead lines.
46. Lighting columns sited beneath, or adjacent to, high voltage overhead power lines may have attached to them a "High Voltage" warning notice. The *Contractor* shall inform all its employees of the serious danger of elevating any equipment and plant or the working platform of any lift vehicle in the vicinity of such columns and to the possibility of discomfort arising from electrostatic effects in certain circumstances. Where the *Contractor* considers that such notices should be fitted but are not, they shall notify the *Client* in writing.
47. The *Contractor* shall ensure that all vehicles, plant and equipment are effectively electrically earthed when operating beneath or adjacent to high voltage overhead power lines.

48. The *Contractor* shall ensure that approved rubber gloves are worn at all times by all staff when operating beneath or adjacent to high voltage overhead power lines, and that approved rubber mats are also employed at ground level and within the vehicle platform.
49. The *Contractor* shall prepare and provide the *Client* with a copy of a suitable and sufficient risk assessment before any works below overhead power lines are undertaken, particularly where the use of plant/equipment is required to perform the works.

Confined spaces

50. The *Contractor* shall provide and maintain, for the duration of the *contract*, sufficient trained and certified operatives and specialist equipment for working in confined spaces in order to be able to conduct confined space entries simultaneously via at least two different locations.
51. The *Contractor* shall implement, maintain and operate a permit to work/enter system. A permit to enter shall be required for each confined space entry. Permits shall be signed and dated by the *Contractor's* supervisor/manager and detail all procedures for purging, ventilation, entry and rescue. All works within, and entries to, confined spaces shall be subject to risk assessment and detailed method statement. Copies of all risk assessments, method statements and permits shall be maintained on site whilst works within confined spaces take place and shall be available to the *Client* for inspection on request.
52. The *Contractor* shall ensure that its permit to enter system includes all personnel who are entering the confined space. This includes subcontractors, *Client's* Representatives and others notified to the *Contractor* by the *Client* in addition to the *Client's* Representatives who may from time to time require access to the confined space during the currency of the works for the purpose of overseeing the works.
53. All work shall be carried out in accordance with the requirements of the Confined Space Regulations 1997 (SI 1997 No 1713) and Approved Code of Practice (2009: L101).

Storage of flammable/explosive materials

54. No petroleum spirit within the meaning of the Petroleum Consolidation Act 1928 and The Petroleum (Consolidation) Regulations 2014 shall be stored on site without the prior written consent of the *Client*. Such consent shall not be given unless the *Contractor* has provided copies of all relevant licenses to the *Client*.
55. No acetylene, oxygen, propane or other gas cylinders shall be stored on site or within 10 metres of a highway structure without the prior written consent of the *Client*.
56. The *Contractor's* arrangements for the safe storage of petroleum and gases shall be fully described in the Health and Safety Policy and the *Contractor* shall ensure that such arrangements are adhered to at all times.

Hot works

57. All Hot Works (welding, soldering, flame cutting, disc cutting of metal, etc) shall be subject to a written risk assessment, method statement and permit to work system. The *Contractor* shall maintain suitable first aid and firefighting equipment on site whilst hot works are taking place and staff shall be trained in its use. Members of the public shall be protected from all hot works operations and from UV rays generated from welding operations.
58. All compressed gas cylinders used during hot works shall be adequately secured and all regulators/hoses shall be subject to regular inspection. The *Contractor* shall maintain records of inspection and make these available to the *Client* upon request.

Health and safety managers meetings

59. The *Contractor's* Health and Safety Advisor shall attend Health and Safety Managers Meetings on a quarterly basis to discuss with the *Client* and, if appropriate, other contractors:
- a. Health and Safety legislation, and *Client* policies;
 - b. Performance and benchmarking;
 - c. Innovations and efficiencies; and
 - d. Training.
60. Meetings will be hosted by the *Client* and the *Contractor* on a rotating basis at venues agreed by the attendees. The frequency of meetings will be reviewed as and when required. The meetings will be chaired by the *Client*.

Safety restrictions and precaution

61. The *Client* may suspend a Task Order or part thereof in the event of non-compliance by the *Contractor* with health and safety matters as described in the *Contract*. The *Contractor* shall not resume the Task Order until the *Client* is satisfied that non-compliance has been rectified. In respect of any such period of suspension, the *Contractor* shall not add any cost to the Task Order price and no extra time shall be allowed for completion.
62. All sites under the jurisdiction of the *Client* shall be managed in strict accordance with the Construction (Head Protection) Regulations 1989 and supporting Health and Safety Executive guidance.
63. When entering into any sub-contract for the execution of part of a Task Order, the *Contractor* shall bring these requirements to the attention of subcontractors.
64. The *Contractor* shall display at appropriate locations, signs as described in the HSE Guidance on Regulations.
65. All sites are to be considered as hard hat sites.
66. In addition to all other information required the *Contractor* shall provide copies of CE marking information for all CE marked works, goods or materials used in the works for inclusion in the Health and Safety File. This information shall include, as appropriate, the Declaration of Conformity or Declaration of Performance and all safety information.

Series 200 – Site Clearance

202SR Existing trees, stumps and roots

1. Where any existing trees are to be removed under the Contract for the carrying-out of the works the *Contractor* shall, before commencing any clearing in the areas concerned, clearly mark such trees under the direction of the *Client*. No other trees shall be felled and care shall be taken to avoid damaging the remaining trees during any felling or other operations. The *Contractor* shall not lop or cut back any other trees near the works.
2. The *Client* will arrange or approve any trimming of trees which they may consider necessary to enable the *Contractor* to carry out its operations.
3. The remaining trees on or adjacent to the works shall be protected by a substantial timber protective fence. Any existing protective surrounds to trees on the site shall be preserved unless otherwise directed by the *Client*. The ground within 6 metres of the trunks of the trees shall not be covered by huts or materials for periods exceeding one month. No spoil or materials of any kind shall be piled against any tree and the *Contractor* shall take care that overhanging branches are not damaged by plant operating near them or by passing vehicles, and that all precautions necessary are taken to ensure that no damage is sustained by tree roots.
4. More general vegetation clearance shall be in accordance with Clause 3004.

Series 600 - Earthworks

607SR Explosives and blasting for excavation

1. Explosives and Blasting are not permitted in this *contract*.

609SR Geotextiles and geotextile-related products used to separate earthworks materials

1. Geotextiles required as part of the Permanent Works to separate earthworks materials at locations described in Appendix 6/5 shall be as required in Appendix 6/5 for that Task Order. They shall be manufactured from synthetic or other fibres as required therein and be in the form of thin permeable membranes.
2. Geotextiles shall be protected at all times against mechanical or chemical damage. Those susceptible to damage by light shall not be uncovered between manufacture and incorporation in the Permanent Works. Temporary exposure shall not exceed 5 hours or the value recommended by the manufacturer.
3. The geotextile shall be laid and lapped as described in this Clause or as described in Appendix 6/5 and where lapping is employed adjacent sheets or strips of geotextile shall be overlapped by at least 300 mm, or an alternate dimension described in Appendix 6/5.
4. The layer of material on which the geotextile is to be placed shall not have protrusions or sharp projections which are likely to damage the geotextile during installation or in service. The method of installation shall ensure that the geotextile is in continuous contact with the surface on which it is to be placed and the geotextile shall not be stretched or bridged over hollows or humps. Operation of construction plant directly on the installed geotextile will not be permitted and its covering with fill material shall take place immediately after its laying.

618SR Topsoiling

1. Unless permitted in Appendix 6/8, topsoil shall not be excavated from stockpiles, whether on site or imported:
 - a. Which have been exposed to a cumulative rainfall exceeding 100 mm, or other figure stated in Appendix 6/8, over the preceding 28 days measured at a point detailed in Appendix 6/8; or
 - b. When heavy rain is falling; or
 - c. With a tracked vehicle; or
 - d. Which have been stockpiled for more than 2 years; or
 - e. Which are frozen; or
 - f. In the case of topsoil which has been stockpiled for more than 6 months, unless the stockpile has been treated with a total, non-residual herbicide as recently as is seasonally possible (allowing the period of time recommended by the manufacturer to elapse prior to excavation). The *Contractor* shall notify the *Client* on the date of the application of any such herbicide, providing evidence of application and details of the manufacturer's recommended elapse period.
2. Topsoil shall:
 - a. Be deposited and spread on the areas to the thicknesses described in Appendix 6/8, in layers not exceeding 150 mm for general purposes or of between 250-300 when the *Client* instructs that installation is to be into a geo-cellular system assembly as per Clause 651AR as a rooting medium for street trees (or similar under pavement soil chamber). Each layer shall be

firmed lightly by heel to remove large voids without over compaction before spreading the next. The thickness shall be reduced where necessary to allow for any subsequent turfing required by the *Client*. Except where permitted otherwise in Appendix 6/8, topsoil shall be spread by hand tools only. It shall not be trafficked by tracked or any other vehicles.

- b. Have stones and other debris removed and disposed of off Site which have:
 - i. Dimensions greater than 100 mm equivalent diameter, unless otherwise permitted in Appendix 6/8.
 - ii. Dimensions greater than 50 mm equivalent diameter which lie within 50 mm of the surface.
 - iii. Be graded to smooth contours.
 - iv. Not have stones or other debris protruding above the surface by more than 30mm and comply with the further requirements of Clauses 3004 and 3005.
3. Unless required otherwise in the instructing Task Order, before spreading any layer of topsoil onto or against an existing layer of soil or other granular material (including such materials already deposited and compacted as part of the Permanent Works) the *Contractor* shall scarify the top or side surfaces of that existing material in order to promote free drainage.
4. Where required in the Instructing Task Order, when spreading any layer of Topsoil onto or against an existing layer of soil or other granular material (including such materials already deposited and compacted as part of the Permanent Works) the *Contractor* shall deposit an initial 50mm thick lift of soil onto or against that existing material and thoroughly till this into the existing material to a depth of 50mm beneath the formation level of that layer (so as to mix the two layers) without firming. They will then deposit a further thickness of material as required in sub-Clause 2(i) having first deducted a value of 100mm before proceeding to firm this.
5. The *Contractor* shall take steps to prevent the accumulation of construction dust and other debris over layers of Topsoil during the works which may serve to impede future drainage. Where this occurs then the surface should be re-scarified as per sub-Clause 3 else, for more severe contamination, the debris should be removed.

Series 700 Road Pavements – General

711SR: Overband And Inlaid Crack Sealing System

1. Overbanding and inlaid crack sealing systems shall have current British Board of Agrément HAPAS (BBA HAPAS) Certificates. If no BBA/HAPAS certificates have been issued then, in the interim, only overbanding and inlaid crack sealing systems approved by the *Client* shall be used.
2. All cracks shall be thoroughly cleaned and dried by hot compressed air blasting prior to treatment.

Approved Crack Sealing Systems

3. Type A – Crack Filling
The crack filling system shall comprise a hot poured 50 pen bitumen, compliant to BS 2499, poured into visible cracks in a milled (planed) surface. This system shall not be used to treat pavement surface cracks.
4. Type B – Strain Alleviating Flexible Membrane
This crack sealing system shall comprise a proprietary system incorporating, as a minimum, a spray applied polymer modified bituminous seal with either chippings or micro-surfacing applied. This crack sealing system shall be applied directly to the planed surface.
5. Type C – Overband Sealing
The installed width and nominal thickness of overbanding sealants applied on the road surface shall not exceed 40mm and 3mm respectively.
6. Type D – Crack Filling and Overband Sealing
The crack sealing system shall have a current British Board of Agrément HAPAS (BBA HAPAS) Certificate of Conformity. The installed width and nominal thickness of overbanding sealants applied on the road surface shall not exceed 40mm and 3mm respectively.
7. Type E – Inlaid (Single Crack/Multiple Cracks)
The crack sealing system shall have a current British Board of Agrément HAPAS (BBA HAPAS) Certificate of Conformity. Where installed in conjunction with asphalt inlay works, the inlaid crack repair system shall be installed at the depth of planing.
8. Type F – Inlaid (Single Crack/Multiple Cracks) plus vertical saw joint
The inlaid crack sealing system shall have a current British Board of Agrément HAPAS (BBA HAPAS) Certificate of Conformity. Where installed in conjunction with asphalt inlay works, the inlaid crack repair system shall be installed at the depth of planing. Following installation of overlying asphalt layers, a 5mm wide vertical saw joint is to be cut to act as a crack initiation slot. The vertical joint is to be sealed with a rubberised sealant.

Installation and Quality Control Procedures

9. The installation and quality control procedures for overbanding and inlaid crack sealing systems shall be in accordance with the current BBA/HAPAS Certificate for each system and the current Method Statement agreed by the BBA. The results of all quality control checks carried out on site by the *Contractor* and quality assurance information compiled in accordance with the requirements of the BBA/HAPAS Certificate, including results from BBA surveillance visits, shall be made available to the *Client* on request.

Series 800 - Unbound, Cement and other Hydraulically Bound Mixtures

801SR General Requirements For Unbound Mixtures

1. Unbound mixtures shall be made and constructed to conform to BS EN 13285 and BS EN 13242, the requirement categories in Table 8/1 and Clauses 802 to 806. The permitted alternatives for each part of the Permanent Works shall be as described in Appendix 7/1.

Table 8/1: Mixture and Grading Requirement Categories for Unbound Mixtures

Unbound mixture	Type 1	Type 2	Type 3/40 (open grade)	Type 3/20 (open graded)	Category B (close graded)	Type 4 (asphalts arising)
Clause	803	804	805	805	806	807
Standard	BS EN 13285 Categories for unbound mixture properties					
Mixture requirement category - Designation - Maximum fines - Oversize	0/31,5 <i>UF</i> ₉ – see NOTE 1 <i>OC</i> ₇₅	0/31,5 <i>UF</i> ₉ <i>OC</i> ₇₅	0/40 <i>UF</i> ₅ <i>OC</i> ₈₀	0/20 <i>UF</i> ₅ <i>OC</i> ₈₅	0/31,5 <i>UF</i> ₉ <i>OC</i> ₈₀	0/31,5 <i>UF</i> ₉ <i>OC</i> ₇₅
Grading requirement category - Overall grading	GP	GP	GO	GP	GB	GP
<p>NOTES:</p> <p>1. Where required as Appendix 7/1 then a maximum fines category of <i>UF</i>₃ shall apply instead.</p>						

2. Unbound mixtures shall not be deposited within 500 mm, or any other distances described in Appendix 7/1, of concrete, cement bound materials, other cementitious mixtures or stabilised capping forming part of the Permanent Works if, when tested in accordance with TRL Report 447 either:
 - a. The water-soluble sulfate (WS) content exceeds 1500 mg of sulfate (as SO₄) per litre (Test No.1); or
 - b. The oxidisable sulfides (OS) content exceeds 0.5% of sulfate (as SO₄) (Test No.2 and Test No. 4); or
 - c. The 2:1 water to soil extract prepared for the determination of water-soluble sulfate in (i) has a pH value of less than 7.2, when tested using the electrometric method of pH determination in accordance with BS 1377-3.

At least five samples of each material shall be tested for WS, OS and pH value. The mean of the highest two values shall be used for comparison with the limiting values. This also applies if six to nine results are available. If ten or more results are available, the mean of the highest 20% of the results shall be used for comparison with the limiting values.

3. Unbound mixtures shall not be deposited within 500 mm, or any other distances described in Appendix 7/1, of metallic structural elements forming part of the Permanent Works if, when tested in accordance with TRL Report 447 either:

- a. The water-soluble sulfate (WS) content exceeds 300 mg of sulfate (as SO₄) per litre (Test No.1); or
- b. The oxidisable sulfides (OS) content exceeds 0.06% of sulfate (as SO₄) (Test No.2 and Test No. 4).

At least five samples of each material shall be tested for WS and OS. The mean of the highest two values shall be used for comparison with the limiting values. This also applies if six to nine results are available. If ten or more results are available, the mean of the highest 20% of the results shall be used for comparison with the limiting values. The requirements in (i) and (ii) above shall not apply to metallic items protected by concrete and ancillary metallic items such as the tops of chambers and gullies.

4. The properties of aggregates used in unbound mixtures shall comply with the selected requirements of BS EN 13242 listed in Table 8/2.

Table 8/2: Additional Requirements for Recycled Coarse Aggregate and Recycled Concrete Aggregate Used in Type 1, Type 2 and Type 4 Unbound Mixtures

Unbound mixture	Type 1	Type 2	Type 3/40 Type 3/20 (open graded)	Category B (close graded)	Type 4 (asphalt arising)
Clause	803	804	805	805	805
Standard	BS EN 13285 Categories for unbound mixture properties				
Crushed, or broken and totally rounded particles - crushed rock, crushed artificial and crushed recycled aggregates - see NOTE 1 - crushed gravel	$C_{90/3}$ $C_{50/10}$ – see NOTE 2		$C_{90/3}$ Not permitted		
Shape of coarse aggregate – flakiness index	F_{NR} (no requirement)		F_{20}	F_{NR} (no requirement)	
Resistance to fragmentation - Los Angeles test	LA_{50} – see NOTE 4.		LA_{40} – see NOTE 3		LA_{50}
Resistance to wear - micro-Deval test	M_{DENR} (no requirement). The supplier shall state the value for the aggregate used.				
Resistance to freezing and thawing magnesium sulfate soundness	MS35				
Water absorption	W_{DENR} (no requirement). The supplier shall state the value for the aggregate used.				
Volume stability of blast furnace slags	Free from dicalcium silicate and iron disintegration.				
Volume stability of steel (BOF and EAF) slags	V_5		Not permitted		V_5

All other BS EN 13242 aggregate requirements	Category _{NR} (no requirement)
<p>NOTES:</p> <p>1. BS EN 13242 assumes that crushed rock aggregates comply with category C90/3 without further testing.</p> <p>2. Where permitted in Appendix 7/1.</p> <p>3. See sub-Clauses 805.3 and 806.3 for additional requirements.</p> <p>4. Where required as Appendix 7/1 then a resistance to fragmentation category of LA₄₀ shall apply instead. See also sub-Clause 803.2 for additional requirements.</p>	

5. Where recycled coarse aggregate or recycled concrete aggregate is used in unbound mixtures in accordance with Clauses 802 to 807 as appropriate, it shall have been tested in accordance with Clause 710. Recycled coarse aggregate and recycled concrete aggregate used in unbound mixtures in accordance with Clauses 803, 804 and 807 shall also comply with the additional requirements of Table 8/3.

Table 8/3: Additional Requirements for Recycled Coarse Aggregate and Recycled Concrete Aggregate Used in Type 1, Type 2 and Type 4 Unbound Mixtures

Unbound mixture	Type 1		Type 2		Type 4
	Type 1A	Type 1B	Type 2A	Type 2B	N/A
Unbound mixture sub-type (where relevant)					
Component Identified by Clause 710	Maximum Permitted Content (% by mass)				
Asphalt (Class Ra)	5	50	5	50	100
Glass (Class Rg)	25				
Other materials (Class X), including wood, plastic and metal	1				

6. When required by Appendix 7/1 and Clauses 803 and 804 as appropriate, the unbound mixture shall satisfy the minimum CBR requirement of Appendix 7/1 when tested in accordance with clause 7 of BS 1377-4, with surcharge discs. The specimens shall be tested in a soaked condition. The mixture 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% and the value of optimum water content declared when tested as required by BS EN 13285.

Frost Heave

7. Subject to the tolerances given in Table 7/1 and unless otherwise stated in Appendix 7/1, material shall not be frost susceptible if it is used within 450 mm of the designed final surface of a road or paved central reserve, or 350 mm if the Mean Annual Frost Index (MAFI) of the site is less than 50.
8. Material shall be classified as non-frost susceptible if the mean heave is 15 mm or less, when tested in accordance with BS 812-124. Comparator specimens in accordance with Annex B of BS 812-124 shall be used.

Marking and Labelling

9. The *Contractor* shall retain on site for all unbound granular mixtures suppliers Delivery Tickets to BS EN 13285, CE labels to BS EN 13242 and any separate attached Supplier Declarations as sub-Clause 10 for inspection by the *Client* upon request.
10. In addition to the minimum information required on Delivery Tickets as BS EN 13285, the following further information shall be provided on those Delivery Tickets or in a separate attached Supplier Declaration:
 - a. Declared laboratory dry density and optimum moisture content of the mixture as BS EN 13285, clause 5.3 and the test method used for the determination.

805SR Type 3/40, Type 3/20 (Open Graded) Unbound Mixtures

1. Type 3/40 and Type 3/20 unbound mixtures shall be made from crushed rock, crushed blast furnace slag or recycled concrete aggregate. When tested in accordance with Clause 710, recycled concrete aggregate used in these mixtures shall not contain more than 5% asphalt (Class Ra) and not more than 1% other materials (Class X).
2. For Type 3/40 (open graded) unbound granular mixture, the mixture shall comply with BS EN 13285 and the requirements of Table 8/1. The grading requirements for the mixtures are summarised in Table 8/7A.
3. For Type 3/20 (open graded) unbound granular mixture, the mixture shall comply with BS EN 13285 and the requirements of Table 8/1. The grading requirements for the mixture are summarised in Table 8/7B.
4. The properties of aggregates used in the mixtures shall be in accordance with BS EN 13242 and the requirements of Table 8/2. Evidence of satisfactory performance in similar mixtures shall be provided when aggregates with a value of Los Angeles coefficient greater than 30 are used.
5. The size fraction of the unbound mixtures passing the 0.425 mm size test sieve shall be non-plastic as defined by BS 1377-2 and tested in compliance therewith.
6. The mixtures shall be transported, laid and compacted without drying out or segregation.

Table 8/4A: Summary Grading Requirements for Type 3/40 (open graded) Unbound Mixtures

Sieve size, mm	Percentage by mass passing		
	Overall grading range – See NOTE 1	Supplier declared value grading range	Tolerance on the supplier declared value
80	100		
40	80 – 99		
20	50 – 78 (A)	58 – 70	± 8
10	31 – 60 (B)	39 – 51	± 8
4	18 – 46 (C)	26 – 38	± 8
2	10 – 35 (E)	17 – 28	± 7
1	6 – 26 (F)	11 – 21	± 5
0.500	0 – 20 (G)	5 - 15	± 5
0.063	0 - 5		
Grading of individual batches - differences in values passing selected sieves			
Retained sieve size, mm	Passing sieve size, mm	Percentage by mass passing	
		Not less than	Not more than
10	20	10	25
4	10	10	25
2	4	7	20
1	2	4	15

Table 8/4B: Summary Grading Requirements for Type 3/20 (open graded) Unbound Mixtures

Sieve size, mm	Percentage by mass passing		
	Overall grading range – See NOTE 1	Supplier declared value grading range	Tolerance on the supplier declared value
31,5	100		
20	85-99		
10	43 – 81 (A)	54 – 72	± 8
4	23 – 66 (B)	33 – 52	± 8
2	12 – 53(C)	21 – 38	± 8
1	6 – 42 (E)	14 – 27	± 7
0.500	3 – 32 (F)	9 – 20	± 5
0.063	0 - 5		
Grading of individual batches - differences in values passing selected sieves			
Retained sieve size, mm	Passing sieve size, mm	Percentage by mass passing	
		Not less than	Not more than
4	10	7	30
2	4	7	30

Series 1100 - Kerbs, Footways and Block Paved Areas

1101SR Precast Concrete Kerbs, Channels, Quadrants, Angles And Edgings

1. Precast concrete kerbs, channels, quadrants, angles and edgings shall only be used when instructed by the *Client*. Where they are required then they shall be one of the following:
 - a. LBS Standard Units as per Appendix 11/1.
 - b. Unlisted Units. These shall be '*Client Specified*' equipment as Clause 143.
2. Except where required in Appendix 11/1 or otherwise specified in this Clause, precast concrete kerbs, channels, quadrants, angles and edgings shall conform to BS EN 1340 and its dimensions, type designations and performances and classes shall be as described in this Clause and Appendix 11/1.
3. Units shall be laid and bedded in compliance with one of the foundation Types shown in the Southwark Streetscape Design Manual and Materials Palette and the requirements of sub-Clauses below. The foundation Type to be used shall be as required in the instructing Task Order. Existing Units that are to be reset or replaced shall be broken out, reset or replaced in compliance with one of the methods shown in the Southwark Streetscape Design Manual and Materials Palette. Existing surfaces shall be reinstated over foundations as shown.
4. Dowel bar or mild steel mesh reinforcement of backing and foundations, as shown in Typical Arrangement Drawings shall only be provided where required in the instructing Task Order. Where this is required then the Contract shall be due additional payment.
5. Pinning of Units to foundations using dowel bars and adhesives, as shown in Typical Arrangement Drawings, shall only be provided where required in the Instructing Task Order. Where this is required then the *Contractor* shall be due additional payment.
6. Dowel bars shall be mild steel 20mm diameter to BS EN 13877-3:2004, Grade B500B steel. Steel mesh reinforcement shall be at least as given in BS 4483:2005, A393.
7. Concrete for foundations and (where required) separate backing shall be an ST Type concrete as Clause 2602. Unless required otherwise in the instructing Task Order, the minimum ST type shall be as shown in the Typical Arrangement Drawings as sub-Clause 3. Where other ST concretes as Clause 2602 are required then the *Contractor* shall be due additional payment.
8. Where the *Client* requires Units to be laid onto a fresh mortar race rather than being directly bedded in a fresh race of concrete then, unless otherwise required in the instructing Task Order, the mortar to be used shall be as shown in the appropriate Typical Arrangement Drawing as sub-Clause 3. Where the same is not instructed but becomes necessary due to the *Contractor's* Method or other delay, then the *Contractor* shall consult the *Client* to agree a suitable mortar or other adhesive.
9. Precast concrete kerbs and other edge restraints which are to be bonded to the pavement surface without concrete backing, shall conform to BS EN 1340. The bonding materials and methods of bonding shall be to the manufacturer's recommendations for this specific application. Bonded kerbs shall not be less than 100 mm in width at the base, its height shall not exceed its width and they shall be bonded over its full width. Kerbs shall be precast to the dimensions described in Appendix 11/1. The clear distance between unsupported pavement edge and back of kerb shall be not less than 100 mm. The bending strength of units shall be established by testing in accordance with BS EN 1340 and shall not be less than

class 2 in Table 3 of BS EN 1340. Units shall be installed in accordance with the manufacturer's instructions. They shall be bonded to the pavement surface with a resilient adhesive compatible with the pavement materials and be capable of withstanding a static push-off load of 10 kN/m applied parallel to the pavement surface at right angles to the kerb.

10. Filled movement joints shall be provided in all foundations as per the recommendations of BS 7533-6. Joint filler board shall be placed vertically and shall comply with Clause 1015. This shall be provided through the full vertical extent of the foundation. Where edge restraints are laid on or adjacent to a concrete pavement (including pavements with pavement quality concrete base slabs) then joints between edge restraint units and associated movement joints to its foundations shall be provided to coincide with the pavement transverse *contraction*, warping and expansion joints. The joints shall be the same width as the joint sealing grooves of the pavement and shall be caulked and sealed as described in Clauses 1016 and 1017. At expansion joints in bridge decks, the Unit joints shall be as described in Appendix 11/1. Where the details of bridge expansion joints are proposed by the *Contractor*, such details shall include the intended treatment at kerbs and footways.
11. For curves of radius 12 m or less then, with the exception of transition dropper Units, Units of appropriate radius shall be used as per BS EN 1340.
12. The minimum cut length of kerbs, channels and edgings shall be 300mm. Where such units are to be laid in the carriageway to raised tables or as intermediary restraints in other instances then its maximum length shall not exceed 650mm.
13. Where precast concrete dropper transition kerbs are required then these shall be purpose formed units that present a flat bedding face. Orthogonal units with all side planar that are laid to falls on its foundations shall not be used unless approved in writing in advance by the *Client*.
14. The longitudinal surface regularity of precast concrete kerbs, channels, quadrants, angles and edgings shall not deviate from the design level more than 3 mm in 3 m when checked with a 3 m straight edge. Horizontal alignment shall comply with Clause 702. The surface level of Units shall not shall not deviate from the design level by more than the following:
 - a. $\pm 6\text{mm}$ for sides of units required to present an upstand of $<30\text{mm}$.
 - b. $+ 6\text{mm} / - 3\text{mm}$ for sides of units required to present an upstand of $\leq 25\text{ mm}$ or to be flush with a neighbouring surface.
15. Where an arris to an upper face of a precast concrete kerb, channel, quadrant, angle or edging is required to have a profile other than square, then the surface level of immediately bounding pavement surfaces shall not exceed the height of the spring line of that arris feature on the vertical face of the unit by greater than 4mm at any point.

Series 1200 Traffic Signs

1202SR General requirements for permanent traffic signs

1. Materials for permanent traffic signs and its construction, assembly, location and erection shall comply with this Series and Series 1400. The manufacture and installation of traffic signs shall be in accordance with the quality management scheme described in Appendix A.
2. Each complete traffic sign or part thereof shall comply with, and be capable of passing the tests in, BSEN 12899.
3. Before the commencement of fabrication of any traffic sign the *Contractor* shall submit fabrication drawings for the *Client's* approval.
4. All traffic sign large base compartments shall be provided with vandal and weather resistant locks. The number of keys to be provided will be confirmed by the *Client* at the time of order. Types of lock will be specified by the *Client*.
5. The backs of traffic signs shall have a location identifying mark unless otherwise specified by the *Client*.
6. Traffic signs shall be carefully handled to prevent damage and transported and stored in accordance with the sign face manufacturer's instructions.

1203SR Foundations for permanent traffic signs and signals

1. Foundations for permanent traffic signs and signals shall be as described in Appendix 12/3 and, unless otherwise stated, in compliance with this Clause.
2. All excavations for foundations shall be dug by hand in compliance with Clause 604 and shall be cleared of all loose material before placing of concrete and backfilling.
3. Grade ST2 concrete shall be placed in the bottom of the post hole until the planting depth shown in Appendix 12/3 is reached. The post shall be set vertically in the centre of the hole to the correct planting depth and the void filled to within 150mm of ground level with grade ST2 concrete in accordance with Clause 611, except that where pipes or buried cables are installed compliance shall be with Clauses 505 and 1421 respectively. Reinstatement of existing surfaces above foundations shall comply with Clause 706.
4. Posts shall be supported for a minimum of 3 calendar days after placing of concrete.
5. For traffic signals and illuminated signs, provision shall be made for cable entry through the foundation by means of ducting.
6. Where pockets are formed in concrete foundations, its plan dimensions shall be sufficiently larger than those of the post to allow for positioning and bedding of the post and backfilling of the pocket.
7. All posts and base plates shall be provided with the additional protection of a bitumen coating both internally and externally below ground level.

1204SR Posts for permanent traffic signs

1. In all cases where a new sign post is required to be installed, the *Contractor* shall determine the need for a passively safe design by employing a robust risk-based assessment such as recommended by the Institution of Lighting Professionals Technical Report TR 30 "Passive Safety – Guidance on the Implementation of Passively Safe Lighting Columns and Signposts". The Specifications for passively safe equipment shall be as per BS EN 12767 "Passive Safety of Support Structures for Road Equipment – Requirements Classification and Test Methods". The Specifications for the installation of passively safe sign posts and its associated hardware shall be as per the equipment manufacturer's recommendations.

2. Posts for permanent traffic signs shall be steel tubular hollow sections complying with BS EN 12899 and BS EN 10210, as described in Appendix 12/1. Steel shall comply with grade S275 JO or S275 J2.
3. All posts shall be fitted with a base plate and plastic end caps. The size of the base plate shall be calculated in accordance with BS 12899.
4. Posts with flange plates shall have holes or slots as instructed by the *Client*.
5. Posts shall not protrude above the top of the sign unless supporting an external luminaire, in which case the protrusion shall be kept to a minimum.
6. Internally illuminated posts for pedestrian crossing beacons shall comply with this Clause and, where appropriate, BS 12899.
7. All electrical equipment shall be enclosed in a large base housing. Access to the interior of such compartments shall be by means of a weatherproof door having tamper-resistant key fastenings. The lower edge of the door shall be positioned so that, when the post is installed as intended, it is not less than 300mm above ground level. Doors to base compartments for sign posts shall be fully interchangeable with those for lighting columns of the same base compartment diameter.
8. All holes cut in posts to provide a route for internal wiring shall be bushed to prevent chafing of any wiring and suitably protected using a zinc rich material specifically designed to provide a rust inhibiting coating.
9. A 6mm brass or stainless steel earthing stud, complete with two brass washers and a brass nut and lock nut, shall be provided on metal sign doors.
10. The internal baseboard shall be manufactured from marine plywood or other substantially non-hygroscopic and rot resistant material, minimum thickness 15mm, and shall be securely fixed to the back of the compartment on which the electrical equipment will be mounted. A separate 6mm or 8mm diameter brass or stainless steel earthing stud, complete with two brass washers and a brass nut and locknut shall be provided on the housing in a suitable and easily accessible position. The distance from the face of the baseboard to the inside of the front of the housing shall be at least 100mm.
11. Detachable root boxes shall not be used unless directed by the *Client*.
12. Posts shall be protected against corrosion in accordance with Clause 1221.

1208SR Location and erection of permanent traffic signs

1. The erection of signs and posts shall comply with the requirements of Appendix 12/2, Chapter 13 of the Traffic Signs Manual, BS 12899-1 and, where still appropriate, BS873.

1210SR Permanent traffic bollards

1. Permanent traffic bollards are those bollards which incorporate a traffic sign (usually a directional arrow). Bollards which do not incorporate a traffic sign are deemed to be items of street furniture and are covered in Series 4000.
2. Retroreflective traffic bollards may be used to indicate traffic islands to road users without the requirement for a mounted traffic sign. The use of retroreflective bollards shall always be considered before resorting to a directly illuminated bollard.
3. Internally illuminated bollards shall be of the base lit variety. They shall be vertically installed, assembled, correctly orientated, connected and left in good working order, strictly in accordance with the manufacturer's instructions. Furthermore, base boxes shall be securely fixed with rag bolts in its correct positions, usually on the public highway or in other locations as may be specified by the *Client*.

1211SR Permanent marker posts

Hazard Marker Posts

1. Hazard marker posts shall comply with BSEN 8442. They shall be capable of being overrun by vehicles so that they deflect and spring back to the upright position without shattering, even in extreme weather conditions and with little or no vehicular damage.
2. Hazard marker posts shall be fitted with anti-removal tabs below final ground level to prevent removal.
3. The reflectors shall be of Class 1 retroreflective sheet material to comply with Diagram 561 of the Traffic Signs and General Directions. The retroreflective sheeting shall be protected from damage from overrunning vehicles by raised edges or other acceptable methods.
4. Hazard marker posts shall have the main body self-coloured black, with a highly visible, weather resistant white band to the sizes given in Figure 4.84 in Chapter 4 of the Traffic Signs Manual.
5. The hazard marker post shall be installed so that its top is between 750mm and 1000mm above ground level, unless otherwise required by the *Client*, and it shall present a projected width of not less than 100mm.

Distance Marker Posts

6. Distance marker posts shall be made from hard-wearing polymer and shall be supplied and installed with a ground socket or mounted on a safety fence in compliance with the distance marker post manufacturer's instructions.

1212SR Road markings

General

1. Road markings shall be white, yellow or red complying with BSEN 1436:2018 Table 6, as appropriate. Insofar as BSEN 1436 refers only to white, yellow and black thermoplastic materials, for the purposes of this Specification, all references to yellow material in BSEN 1436 shall be deemed to apply equally to red material. Yellow lines shall be primrose yellow (BS 381C No. 310) for substantive sections of lining and standard lemon yellow (BS 381C No. 355) for local replenishment. In all cases the *Client* shall be consulted as to the choice of yellow line.
2. The markings shall consist of continuous or intermittent lines, letters, figures, arrows or symbols.

Permanent Road Markings

3. All permanent road markings shall be formed from thermoplastic material in accordance with BS EN 1871:2000 or permanent preformed road markings in accordance with BS EN 1790:2013. All markings shall be reflectorised. They shall be tested in road trials to the Roll-over class P5 in accordance with the procedure stated in BS EN 1824:2011 to demonstrate compliance with the performance requirements as stated in Sub-Clauses 4 to 6 below. The test report shall give particulars of the quality and quantity of the material, including drop on glass beads laid at the test site for future reference and comparison purposes should such a need arise. Painted road markings shall only be used transversely on kerbs to indicate parking or loading restrictions, or on the carriageway in association with speed cameras.
4. Road markings shall have the following road performance as defined in BS EN 1436 for the period of the functional life starting from the date of application or when the road is trafficked, whichever is later. The materials to be used shall be to the same mix, material quality, quantity and rate of application as used on the test site.

Property	BSEN 1436 Reference	Requirement	Value
Colour	Table 6	1. White 2. Yellow (Class Y1, Y2) 3. Red	1. x, y coordinates given 2. x, y coordinates given 3. see Appendix 12/4
Luminence Factor	Table 5	1. Class B2 2. Class B1 3. Class B1	0.3 0.2 0.2
Skid Resistance	Table 7	Class S3	55
Retroreflectivity	Table 2 Class of RL for dry markings	1. Class R2 2. Class R1 3. Class R1	100 80 80
	Table 3	Class RW3	50

1 = White; 2 = Yellow; 3 = Red

5. The width tolerances and thickness for white, yellow or red lines shall be in accordance with The Traffic Signs Regulations and General Directions. With the exception of the road markings listed in Regulation 32(2) of The Traffic Signs Regulations and General Directions, in no case shall any materials be laid more than 6mm thick. Unless specified, all markings shall be reflectorised with glass beads in accordance with BSEN 1423 and BSEN 1424 by incorporation into the road marking mixture and to the wet surface of the marking. The glass beads shall not have more than 1000ppm of arsenic trioxide, 200ppm of lead and 1000ppm of antimony. The *Contractor* shall supply test certificates showing compliance with these requirements.
6. Where there is a requirement for improved visibility in wet conditions at night, products showing the following performance in addition to that stated in sub- Clause 4 shall be used.
7. The pavement shall be prepared in accordance with the following:
 - a. Where the marking is to be applied on a concrete carriageway, the transverse texturing shall be freed from all traces of curing compound by wire brushing or other approved means. Prior to the application of the thermoplastic material a tack coat compatible with the road surface and the marking material shall be applied in accordance with the manufacturer's instructions.
 - b. On surface dressed carriageways, all loose chippings where the marking is to be applied shall be removed prior to application.
8. Permanent thermoplastic road markings shall be screed applied, spray applied or extruded, as stipulated by the *Client*. Application of permanent road markings shall

be in accordance with the Sector Scheme described in Appendix A. Road marking materials shall only be applied to surfaces which are clean and dry. Markings shall be free from raggedness at its edges and shall be uniform and free from streaks. Longitudinal road markings shall be laid to a regular alignment.

Heat Fused Retroreflective Preformed Road Markings

9. Retroreflective preformed road marking material shall be suitable for adhering to asphalt and concrete pavements by means of heat fusion. The thermoplastic material shall conform to BSEN 7396 and AASHTO M249-79(86) with the exception of the relevant differences due to the material being preformed.
10. The markings shall contain a minimum of 30% glass beads homogeneously blended throughout the material with a securely bonded protruding exposed layer of beads that provide immediate retroreflectivity. The markings shall have average minimum retroreflective intensities of 250 millicandelas for white and 150 millicandelas for yellow or red, as measured with a MiroLux retroreflectometer.
11. The material shall have a minimum skid resistance value of 55. The thermoplastic material shall not dissolve or smear after rubbing a small amount of motor oil on a small piece of preformed thermoplastic for two minutes.

Raised Rib Road Markings

12. Raised rib road markings shall only be used on roads (both single and dual carriageway) with at least 1 metre wide hardstrips. They shall comply with sub-Clauses 1, 2, 3, 4, 6, 7 and 8 above, and be in accordance with The Traffic Signs Regulations and General Directions diagrams (TSRGD) 1012.2 and 1012.3, as appropriate.
13. Raised rib road markings shall be white lines, continuous except where gaps need to be provided for drainage purposes. Spacing of the transverse raised ribs shall be 500mm or 250mm, as specified by the *Client*. The maximum width of the ribs shall be 50mm, minimum length 40mm and height in the range of 8mm to 10mm.
14. Raised rib road markings shall not be used adjacent to hatched areas or central reserve crossings, except as prescribed for use with diagrams 1040.3, 1040.5 and 1041.

Preformed Thermoplastic Cycle Superhighways Logo

15. The Cycle Superhighway logo comprises the standard cycle symbol, diagram 1057 in the TSRGD, with CS# underneath it, where # denotes the route number. The specifications for the preformed Cycle Superhighways logo are at Appendix 12/6.

Temporary Road Markings

16. Temporary road markings shall only be used with the prior approval of the *Client*. They shall comply with Sub-Clauses 1 to 8 above and be constructed only from a proprietary preformed road marking material complying with BSEN 1790.
17. When temporary road markings are used on surfaces that will continue to be used by public traffic after its removal, any shadow trace remaining after its removal shall be permanently obliterated. Preformed materials shall not be used for this obliteration.
18. Temporary road markings constructed from a proprietary preformed road marking material shall only be applied to surfaces that are clean and dry. The marking material shall be new and, together with any primer, shall be stored and installed in accordance with the manufacturer's instructions and within the recommended shelf life. Upon removal, they shall be disposed of off site and, if any making good is necessary to the road surface, it shall be satisfactorily carried out before the road is opened to traffic.

19. Trials carried out on thin surface courses have indicated that some temporary road marking materials leave a sticky deposit on the surface and/or cause surface aggregate to pluck out. The *Contractor* shall undertake sufficient trials to ensure that any temporary road marking tape that they propose to use will come free from the surface without damaging it.

Masking of Existing Road Markings

20. The *Contractor's* proposed method of masking existing road markings shall be agreed with the *Client*.
21. When black masking materials are required to cover existing permanent road markings, they shall comply with BS 7962. The total thickness of original and masking materials shall not exceed 6mm.

Road Markings on Porous Asphalt Surfacing

22. Thermoplastic applied by machine screed, spray or extrusion or preformed road markings shall be used for carriageway markings on porous asphalt surfacing. Manual screeding shall not be permitted except for directional arrows and similar markings.

Removal of Road Markings

23. Permanent road markings shall be removed by one of the following methods:
- a. hand grinding (scrabbling);
 - b. motorised grinding;
 - c. hydroblasting (see Appendix 12/7);
 - d. planning
24. The *Contractor* shall adopt best practical means to limit environmental impact of the work. Sufficient protection shall be provided such that users of the highway are not exposed to debris, spray, or any other nuisance caused by any road marking removal.
25. The *Contractor* shall submit a method statement for the approval of the *Client* outlining the method to be used not less than 7 calendar days prior to commencement of work. When required by the *Client*, the *Contractor* shall carry out a representative trial of its intended method of removal.
26. Waste material arising from the erasure of permanent road markings shall be carefully removed using a mechanical (road) sweeper so that the surface is clean and free from dust. Handsweeping and collection of arisings shall only be used with the approval of the *Client*.
27. Where existing road markings are to be replaced, the markings shall be removed to below aggregate height. Prior to the application of new road markings, a tack coat compatible with the road surface and the marking material shall be applied in accordance with the manufacturer's instructions.
28. Unless otherwise agreed by the *Client*, the removal/replacement shall be carried out as a combined operation such that the new markings are applied on the same day that the old markings are removed.
29. Where existing road markings are to be removed and not replaced, the thermoplastic material shall be removed to its full depth. Any residual marking or abrasion of the surface shall be obscured using a suitable bituminous slurry, complying with the requirements of Series 700 and 900.

Setting Out

30. The *Contractor* shall be responsible for the correct setting out of all lines, words,

arrows and stripes. Unless otherwise directed, on roads having reflectorised road studs, intermittent longitudinal lines shall be laid symmetrically between the studs. At tie-ins, new and existing road markings are to have a flowing alignment.

31. The length and width of road markings shall be as specified, with a permitted tolerance of +10% to -5% on both length and width.

1217SR Traffic signals

Permanent Traffic Signals

1. Any alterations to permanent traffic signals will be undertaken by Transport for London and the local electricity supply company or its respective subcontractors. The *Contractor* shall allow in its rates for programming its work to suit its requirements. The allowance shall include for preliminary discussions, phasing of work to suit and any delays that the *Contractor* may feel will be caused to it as a result of the foregoing.

Temporary Traffic Signals

2. The use and positioning of temporary traffic signals shall be agreed with the *Client* prior to its installation.
3. Temporary traffic signals shall be vehicle actuated, comply with Department for Transport Specifications MCE0111 and MCE 0114, and be installed and used in accordance with:-
 - a. Chapter 8 of the Traffic Signs Manual;
 - b. Department for Transport Standards TD 21/85 and TA 47/85; and
 - c. "An Introduction to the Use of Vehicle Actuated Portable Traffic Signals" published by HMSO.
4. Any portable generator used as a power supply shall be a sound reduced model and be properly silenced and maintained in accordance with the manufacturer's instructions and operated in accordance with BS 5228:2009. Further requirements relating to noise control are set out in Clause 109SR.
5. Cables for the traffic signals which cross a carriageway which is open to vehicles shall be contained in a Cable Crossing Protector designed to prevent damage to the cable and to permit traffic, particularly two wheeled vehicles, to cross safely. Drivers shall be warned of the presence of the Cable Crossing Protector by means of "RAMP" signs.
6. The *Contractor* shall provide all operatives using temporary traffic signals with the Department for Transport booklet "An Introduction to the Use of Vehicle Actuated Portable Traffic Signals" published by HMSO in May 1986 and any subsequent amendments.
7. The *Contractor* shall provide the necessary advance warning signs and shall have STOP/GO signs available for immediate use in case of electrical or mechanical breakdown.
8. The maximum distance between the two signal heads, when using temporary traffic signals, shall not exceed 150 metres unless otherwise agreed with the *Client*.

Manual STOP/GO sign control

9. For some short duration works, when agreed with the *Client*, the *Contractor* may use manual STOP/GO sign traffic control. All operators of STOP/GO signs shall be suitably experienced and certificated for this type of work. The traffic signs layout for this type of work shall be in accordance with Chapter 8 of 'The Traffic Signs Manual.'

10. Where the length of the works necessitates the use of two STOP/GO signs, then its operators shall ensure that they are clearly visible to each other at all times. If not, then a third central operator may be required to relay instructions to the two STOP/GO sign operators.

1219SR Controlled And Uncontrolled Crossings

1. Permanent road markings shall be white and comply with Clause 1212SR. They shall be of a nominal width as directed by the *Client* and shall conform with the requirements of the Zebra, Pelican and Puffin Pedestrian Crossing Regulations and General Directions 1997 as amended by the Pelican & Puffin Pedestrian Crossings General (Amendment) Direction 1998 and any subsequent amendment or replacement thereof. Road markings at Pelican Crossings shall comply with the current Pelican Crossing Regulations and General Directions and the Design Manual for Roads and Bridges (DMRB) Volume 8 Section 5 Part 1 (TA 68/96). All surfacing materials shall have a minimum skid resistance Class of S3 when tested in compliance with BSEN 1436.
2. Non-retroreflecting road studs shall comply with Clause 1213.
3. Traffic signals, related control and other equipment where incorporated in controlled crossings shall comply with Clause 1217SR.

Series 2000 Waterproofing for Concrete Structures

2008SR Replacement Waterproofing and Repairs to Existing Waterproofing

1. Existing bituminous bound flexible surfacing shall be removed by cold-milling (planing) in accordance with Clause 709.
2. Concrete and other materials shall be removed by methods accepted by the *Client*. The work shall be carried out in a manner which does not damage or disturb any part of the existing structure that is to remain on completion of the waterproofing.
3. The existing waterproofing system shall be stripped by hand or mechanical means. The use of heat or solvents shall only be allowed with the approval of the *Client*. The existing primer shall be removed by mechanical means. All horizontal concrete surfaces shall then be cleaned by Vacu Blasting, not open blasting. Open blasting shall only be used on areas agreed by the *Client* as unsuitable for Vacu Blasting.
4. All replacement waterproofing systems shall be compatible with the existing system with which they will be in contact. Written guarantees shall be sought by the *Contractor* to confirm the compatibility of new waterproofing membranes with existing for acceptance by the *Client*.
5. After removal of the bridge deck waterproofing, but before the preparation of surfaces to receive the replacement waterproofing, the *Contractor* shall allow the *Client* unhindered access to those surfaces to carry out tests on the concrete. The time allowed for such access shall be at the rate of 1 day for each 500 m² (or part thereof) of surface made available at any one time to the *Client*.
6. Concrete surfaces which are to receive the replacement waterproofing system shall be cleaned of all oil, bitumen, contaminants and all elements of any previous waterproofing membrane and/or primer. Surfaces contaminated with lichens and vegetative growths shall be treated with a fungicidal wash of a type accepted by the *Client* and rinsed with clean water to remove any residual traces of fungicide. Cement laitence shall be removed. It shall be noted that sub-Clause 2001.1 states the requirements for new structures. The *Contractor* shall not expect the concrete surface finish of the existing deck to be the same standard as for new structures or a U4 finish, but rather an unsmooth, non- uniformed finish with defects and blemishes. Where a spray applied waterproofing system is to be used for the repairs, surfaces

may require further preparation and/or additional material over the amount specified in the BBA Board and Bridges Agreement Certificate to ensure that a minimum of 2mm coverage of spray applied waterproofing membrane is achieved. Final preparation of all surfaces shall be by recoverable abrasive blast cleaning. "Open" blast cleaning will not be permitted.

7. Prior to the application of the new waterproofing the deck concrete will be examined by the *Client* who may require concrete repairs (in accordance with Clause 2009AR) and resin injection of cracks (in accordance with Clause 1731AR). Typically, the repairs will include the following:
 - a. removal of chloride contaminated and/or corrosion delaminated concrete;
 - b. removal of surface defects such as screed marks and footprints;
 - c. removal of formwork and falsework anchors from the original construction which have inadequate cover;
 - d. resin injection of cracks >0.25mm;
 - e. repairs to, or forming of, fillets and chases to facilitate waterproofing.
8. Immediately before the application of the primer or laying of the waterproofing system or protective layer, the concrete surface or primed surface shall be clean, dry and free from ice, frost, loose aggregate, dust and other debris. Written guarantees shall be sought by the *Contractor* to confirm the suitability of substrate with the waterproofing membrane and wearing course for acceptance by the *Client*.
9. The waterproofing membrane, primer and bonding agents including tack coat shall be compatible with each other.
10. The use of ventilating layers, partial bonding or bond breakers with the waterproofing system is not permitted.
11. An additional protective layer shall be applied immediately above bridge deck waterproofing to all those areas shown on the scheme specific drawings or detailed in the Task Order and shall comply with sub-Clause 2005.5. All non- vertical areas treated with a spray applied waterproofing system are to receive a 20mm thick red tinted sand asphalt protection layer. Waterproofed vertical faces at the ends of the deck shall receive a 20mm thick bituminised compressible board protection layer.
12. The replacement waterproofing system shall be a proprietary system complying with Clauses 2002, 2003, 2005 and 2007 or, where shown on the Drawings or detailed on the Task Order, a spray applied system in accordance with Clause 2010AR.
13. Where the existing waterproofing is a spray applied system, for repair areas of less than 2m² at any one location, an accepted hand-applied system equivalent to and compatible with the existing may be used, subject to acceptance by the *Client*.

Cancelled Clauses, Tables and Figures

101CR	Temporary Accommodation and Equipment for the <i>Client</i>
106CR	Design of Permanent Works by the <i>Contractor</i>
111CR	Existing Ground Levels
115CR	Accommodation Works
120CR	Recovery Vehicles for Breakdowns
203CR	Explosives and Blasting
204CR	Hazardous Materials
405CR	Temporary Safety Barriers
603CR	Forming of Cuttings and Cutting Slopes
619CR	Earthwork Environmental Bunds
620CR	Landscape Areas
621CR	Strengthened Embankments
622CR	Earthworks for Reinforced Soil and Anchored Earth Structures
623CR	Earthworks for Corrugated Steel Buried Structures
624CR	Ground Anchorages
625CR	Crib Walling
627CR	Swallow Holes and Other Naturally Occurring Cavities
628CR	Disused Mine Workings
629CR	Instrumentation and Monitoring
630CR	Ground Improvement
707CR	Breaking Up or Perforation of Redundant Pavement
712CR	Maintenance of Arrester Beds
713CR	Saw-cut and Seal Bituminous Overlays on Existing Jointed Concrete Pavements
715CR	Saw-cut, Crack and Seat Existing Jointed Reinforced Concrete Pavements
716CR	Cracking and Seating of Existing Jointed Unreinforced Concrete Pavements and Hydraulically Bound Mixture (HBM) Bases
717CR	Monitoring of Cracked and Seated Jointed Unreinforced Concrete Pavements and HBM Bases using the Falling Weight Deflectometer (FWD)
718CR	Monitoring of Saw-cut, Cracked and Seated Jointed Reinforced Concrete Pavements Using the Falling Weight Deflectometer (FWD)
719CR	Back-analysis of Falling Weight Deflectometer (FWD) Measurements Made on Concrete Pavements Treated by Fractured Slab Techniques
926CR	In Situ Recycling: The Repave Process
1104CR	Footways and Paved Areas (Precast Concrete Flags and Natural Stone Slabs)

1105CR	Footways and Paved Areas (Flexible Surfacing)
1107CR	Footways and Paved Areas (Concrete Block Paving)
1108CR	Footways and Paved Areas (Clay Pavers)
1109CR	Grass Concrete Paving
1727CR	Inspection and Testing of Structures and Components
2603CR	Porous No Fines Concrete
2605CR	Plastic Coated High Tensile Wire
2606CR	Cored Thermoplastic Node Markers

