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Southwark Highways Works Contract

Lot B - Projects
Contract Document B3d

Technical Specification Numbered Appendices

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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 0/3: List of numbered appendices referred to in the specification and included in the *contract*

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

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

List 'A' is a complete list of the Numbered Appendices referred to in the Specification for Highway Works with those not adopted marked 'Not Used.

Appendix No.		Title
		INTRODUCTION
0/1		*Contract*-specific Additional, Substitute and Cancelled Clauses, Tables and Figures included in the *Contract*
0/2		*Contract*-specific Minor Alterations to Existing Clauses, Tables and Figures included in the *Contract*
0/3		List of Numbered Appendices referred to in the Specification and included in the *Contract*
0/4		List of Drawings included in the *Contract*
0/5		Special National Alterations of the *Client* of Scotland, Wales or Northern Ireland
		PRELIMINARIES
1/1	Not Used	Temporary Accommodation and Equipment for the *Client*
1/2	Not Used	Vehicles for the *Client*
1/3	Not Used	Radio Communication System for the *Client*
1/4	Not Used	Working and Fabrication Drawings
1/5		Testing to be Carried out by the *Contractor*
1/6		Supply and Delivery of Samples to the *Client*
1/7		Site Extent and Limitations on Use
1/8	Not Used	Operatives for the *Client*
1/9	Not Used	Control of Noise and Vibration
1/10	Not Used	Permanent Works to be Designed by the *Contractor*
1/11	Not Used	Temporary Works Design
1/12		Setting Out and Existing Ground Levels
1/13	Not Used	Programme of Works
1/14		Payment Applications
1/15		Accommodation Works
1/16	Not Used	Privately and Publicly Owned Services and Supplies
1/17		Traffic Safety and Management

1/18	Not Used	Temporary Highways for Traffic
1/19	Not Used	Routeing of Vehicles
1/20	Not Used	Recovery Vehicles and Operation for Breakdowns
1/21		Information Boards
1/22		Progress Photographs
1/23	Not Used	Risks to Health and Safety
1/24		Quality Management System
1/25	Not Used	Temporary Closed-Circuit Television (CCTV) System for the Monitoring of Traffic
1/27	Not Used	Temporary Automatic Speed Camera System for the Enforcement of Mandatory Speed Limits at Road Works (TASCAR)
		SITE CLEARANCE
2/1		List of Buildings or Structures to be demolished
2/2		Filling of Trenches and Pipes
2/3		Retention of Material Arising from Site Clearance
2/4		Explosives and Blasting
2/5		Hazardous Materials
2/6	Not Used	Site Clearance Environmental Requirements
		FENCING
3/1		Fencing
		ROAD RESTRAINT SYSTEMS (VEHICLE AND PEDESTRIAN)
4/1		Road Restraint Systems (Vehicle and Pedestrian)
4/2		Information Required to Demonstrate Compliance of Transitions and Terminals to Clause 40
		DRAINAGE AND SERVICE DUCTS
5/1		Drainage, Manholes, Chambers And The Like
5/2		Service Duct Requirements
5/3		Surface Water Channels And Drainage Channel Blocks
5/4		Fin Drains and Narrow Filter Drains
5/5		Combined Drainage and Kerb Systems
5/6		Linear Drainage Channel Systems
5/7		Thermoplastics Structural Wall Pipes and Fittings
		EARTHWORKS

6/1		Requirements for Acceptability and Testing of Earthworks Materials
6/2		Requirements For Dealing With Class U2 Unacceptable Material
6/3		Requirements For Excavation, Deposition, And Compaction (Other Than Dynamic Compaction)
6/4		Requirements for Class 3 Material
6/5		Geotextiles Used to Separate Earthworks Materials
6/6		Fill to Structures and Fill Above Structural Foundations
6/7		Sub-formation and Capping and Preparation and Surface Treatment of Formation
6/8		Top soiling
6/9	Not Used	Earthwork Environmental Bunds, Landscape Areas, Strengthened Embankments
6/10		Gabions
6/11	Not Used	Swallow Holes and Other Naturally Occurring Cavities and Disused Mine Workings
6/12	Not Used	Instrumentation and Monitoring
6/13	Not Used	Ground Improvement
6/14		Limiting Values for Pollution of Controlled Waters
6/15		Limiting Values for Harm to Human Health and the Environment
		ROAD PAVEMENTS – GENERAL
7/1		Permitted Pavement Options
7/2		Excavation, Trimming and Reinstatement of Existing Surfaces
7/3		Surface Dressing Performance Specification (Sheets 1, 2 and 3)
7/4		Bond Coats, Tack Coats and Other Bituminous Sprays (Sheets 1, 2 and Binder Data Sheet)
7/5	Not Used	In Situ Recycling - The Remix and Repave Processes
7/6		Breaking Up or Perforation of Existing Pavement
7/7		Slurry Surfacing incorporating Micro Surfacing (Sheets 1, 2 and 3)
7/9		Cold-Milling (Planing) Of Bituminous Bound Flexible Pavement
		KERBS, FOOTWAYS AND PAVED AREAS

11/1		Listing Of Suitable Materials
11/2		Access Steps
		TRAFFIC SIGNS
12/1		Traffic Signs: General
12/2		Traffic Signs: Marker Posts
12/3		Traffic Signs: Road Markings and Studs
12/4		Traffic Signs: Cones, Cylinders, FTDs and Other Traffic Delineators
12/5		Traffic Signs: Traffic Signals
12/6		Traffic Signs: Special Sign Requirements on Gantries
		ROAD LIGHTING COLUMNS AND BRACKETS, CCTV MASTS AND CANTILEVER MASTS
13/1		Information to be Provided When Specifying Lighting Columns and Brackets
13/2		(Specification for Highway Works) Typical Lighting Column and Bracket Data Sheets 1 and 2
13/3		Instructions for Completion of Lighting Column and Bracket Data Sheets
13/4		Information to be Provided When Specifying CCTV Masts
13/5		(Specification for Highway Works) Typical CCTV Mast Data Sheet
13/6		Instructions for Completion of CCTV Mast Sheets
13/7		Information to be Provided When Specifying Cantilever Masts (11/03)
13/8		(Specification for Highway Works) Typical Cantilever Masts Data Sheets 1
13/9		Instructions for Completion of Cantilever Masts Data Sheets
		ELECTRICAL WORK FOR ROAD LIGHTING AND TRAFFIC SIGNS
14/1		Site Records
14/2		Location of Lighting Units and Feeder Pillars
14/3		Temporary Lighting
14/4		Electrical Equipment for Road Lighting
14/5		Electrical Equipment for Traffic Signs
		MOTORWAY COMMUNICATIONS
15/1		Motorway Communications

15/2		Cable Duct Requirements
		PILING AND EMBEDDED RETAINING WALLS
16/1		General Requirements for Piling and Embedded Retaining Walls
16/2		Precast Reinforced and Prestressed Concrete Piles and Precast Reinforced Concrete Segmental Piles
16/3		Bored Cast-in Place Piles
16/4		Bored Piles Constructed using Continuous Flight Augers and Concrete or Grout Injection through Hollow Auger Stems
16/5		Driven Cast-in Place Piles
16/6		Steel Bearing Piles
16/7		Reduction of Friction on Piles
16/8		Non-Destructive Methods for Testing Piles
16/9		Static Load Testing of Piles
16/10		Diaphragm Walls
16/11		Hard/Hard Secant Pile Walls
16/12		Hard/Soft Secant Pile Walls
16/13		Contiguous Bored Pile Walls
16/14		King Post Walls
16/15		Steel Sheet Piles
16/16		Integrity Testing of Wall Elements
16/17		Instrumentation for Piles and Embedded Walls
		STRUCTURAL CONCRETE
17/1		General
17/2		Pore-Lining Impregnation
		STRUCTURAL STEELWORK
18/1		Requirements for Structural Steelwork
		PROTECTION OF STEELWORK AGAINST CORROSION
19/1		General Requirements
		WATERPROOFING FOR CONCRETE STRUCTURES
20/1		Waterproofing for Concrete Structures
		BRIDGE BEARINGS

21/1		Bridge Bearings
		BRIDGE EXPANSION JOINTS AND SEALING OF GAPS
23/1		Bridge Deck Expansion Joint Schedule
23/2		Sealing of Gaps Schedule (Other than in Bridge Deck Expansion Joints)
		BRICKWORK, BLOCKWORK AND STONEWORK
24/1		Brickwork, Blockwork and Stonework
		SPECIAL STRUCTURES
25/1		Specific Appendices 25/1 – 25/5 to be provided by the *Client* and/or *Contractor* for any Task Order relating to works covered by this series
25/5		
		MAINTENANCE PAINTING OF STEELWORK
50/1		(Specification for Highway Works) Form HA/P1 (Maintenance) Paint System Sheet
50/2		Requirements for Other Work
50/3		(Specification for Highway Works) Form HA/P2 Paint Data Sheet
50/4		(Specification for Highway Works) Form HA/P3 Paint Sample Despatch List: Sheets 1 and 2
50/5		General Requirements
		CCTV survey of Highway Drainage Systems
90/1		CCTV Survey of Highway Drainage System

List 'B' *Contract* Specific Numbered Appendices devised for the *Contract*

Appendix No.		Appendix Title
		PRELIMINARIES
1/70		Reporting of Accidents
1/71		Maintenance Compounds/Depots
1/72		Stocks of Materials
1/73		Considerate Constructors Scheme (CCS)
1/74		Environmental Evaluation Checklist for Improvement Projects and Capital Renewal Schemes
1/75		Access Equipment for the *Client*
1/76		Air Quality Monitoring
		ROAD RESTRAINT SYSTEMS (VEHICLE AND PEDESTRIAN)
4/70		Restraint System Maintenance (Vehicle and Pedestrian)
		DRAINAGE AND SERVICE DUCTS
5/70		Renovation Of Highway Drainage
		EARTHWORKS
6/16		Geo-Cellular System Assemblies
6/71		Root Deflectors
		Road Pavements - General
7/8		Fine Cold Asphalt
7/10		Mastic Asphalt
		Kerbs, Footways and Paved Areas
11/70		Perforated Pipe Irrigation And Ventilation Loops Under Pavement Rooting Zones For Street Trees
11/71		Mastic Asphalt Footways
		TRAFFIC SIGNS
12/70		Posts for Permanent Traffic Signs
12/71		Location and Erection of Permanent Traffic Signs
12/72		Foundations for Traffic Sign Posts
12/73		Colour Requirements for Red Road Markings
12/74		Traffic Sign Luminaires
12/75		Preformed Thermoplastic Cycle Superhighways Logo
12/76		Removal of Road Markings by Hydroblasting

12/77		Congestion Charging Preformed Thermoplastic Markings
16/70+		**PILING AND EMBEDDED RETAINING WALLS** Specific Appendices to be provide by *Client* for any Task Order relating to works covered by this series
17/70		**STRUCTURAL CONCRETE** Repair of In Situ Structural Concrete
23/70		**BRIDGE EXPANSION JOINTS AND SEALING OF GAPS** Bridge Expansion Joints and Sealing of Gaps Maintenance
		Winter Service
28/1		Personnel Schedule
28/2		Winter Service Readiness States / Periods Of Risk
28/3		Principal Treatments
28/4		Winter Service Route Cards
28/5		Salt And Salt Stockpiles
28/6		*Contractor's* Vehicles, Plant And Equipment
		Investigations and Surveys
33/1		Rotary Coring of the Carriageway
33/2		Structural Investigations
33/3		Topographic surveys
33/4		Design
33/5		Project management
33/6		Investigations (General)
90/1		**Model *Contract* Documents For CCTV Survey Of Highway Drainage Systems** CCTV Survey Of Highway Drainage System

Appendix 0/4: List of drawings included in the *contract*

Contract-specific Drawings supplied to each Tenderer

Drawing Number	Title
n/a	When during the *Contract Period* scheme or works specific drawings are issued by the *Client* as part of a Task Order such drawings shall form part of the *Contract*.

Standard Details

Supplied to each Tenderer

Drawing Number	Title
	Standard details supplied to each tenderer applicable to this *Contract* are included volume 4.

Inspected by Tenderers

The following drawings are made available for inspection by tenderers.

Drawing Number	Title
	none

Standard Details brought into the *Contract* by Reference

1. Highway Construction Details (HCD) published by The Stationery Office (formerly HMSO) as Volume 3 of the Manual of Contract Documents for Highway Works is brought into the Contract by reference in its entirety.
2. Where there may be a conflict between standard details referred to in this Appendix and the HCD, the standard details take precedent.

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

1. The *Contractor* shall comply with all Quality Management and Product Certification schemes indicated in Table NG1/1 of Notes for Guidance on the Specification for Highway Works and shall provide certificates of compliance as required by the *Client*.
2. The *Contractor* shall be responsible for carrying out testing to prove compliance with the Specification where instructed by the *Client*. Testing, where required, shall be as identified in Table NG1/1 of Notes for Guidance on the Specification for Highway Works. In the event of results of the tests being non-compliant to the Specification, the costs associated with the testing are to be incurred by the *Contractor*.
3. Testing of spray applied waterproofing systems shall be undertaken by the *Contractor* in accordance with Appendix 20/1.
4. Testing of bridge expansion joints shall be undertaken by the *Contractor* in accordance with Clause 2306AR and Appendix 23/1.

Appendix 1/6: Supply and Delivery of samples to the *Client*

1. The *Contractor* shall be responsible for gathering material samples for testing to prove compliance with the Specification where instructed by the *Client*. Sampling, where required, should be in accordance with Clause 105, unless specified otherwise.
2. The *Contractor* shall be responsible for the packing of all samples, its transport to a laboratory approved by the *Client*, and for a number of representative samples to be sent to the *Client*'s office. The *Contractor* shall allow in its rates for these costs and for the cost of any additional labour required in sampling and documentation and for the cost of test material and approved bags. All samples shall be protected from

temperatures below five degrees centigrade.

3. All samples shall be kept for a period of not less than one month (12 months in the case of samples related to highway structures) after submission of the record and results and shall be discarded after that time only with the approval of the *Client*. The *Client* may request that certain of the samples be retained by the *Contractor* or sent elsewhere.

Appendix 1/7: Site Extent and Limitations on use

Extent of the Site

1. The extent of the site shall be defined as that part of the Affected Property required to be occupied to undertake works instructed by the *Client* by issue of a Task Order.

2. The *Contractor* shall agree with the *Client* the extent of the site necessary to undertake the works defined in the Task Order. The area site extent defined by the *Contractor* and then agreed by both parties shall include all areas of highway necessary for completion of the works, including traffic management and statutory undertaker works which may fall outside the area where the main Task Order works is required.

Limitations on the Use of the Site

3. Existing traffic and pedestrian flows are to be maintained at all times except where allowed for in the *contract* or agreed with the *Client*. The *Contractor* shall comply with the noticing and permitting requirements as set out in Clause 155AR.

4. Normal permissible working hours are set out in Clause 138AR however these do not remove the obligations on the *Contractor* to comply with the noticing and permitting requirements as set out in Clause 155AR. The granting of a permit is deemed to take precedence over the normal permissible working hours.

5. Unless otherwise stated by the *Client* by instruction within a Task Order the highway areas listed within the sensitive streets and events list shall be subject to working hour restrictions for site access and all Task Order works

6. It should be noted that the sensitive streets and events list provided shall be subject to addition, amendment and change by the *Client* throughout the *Contract* period.

7. All temporary traffic routes and access arrangements shall be co-ordinated with the *Client*, the Police and the other Emergency Services.

8. Road closures and diversions shall be co-ordinated with the *Client* and bus operators. Seven calendar days' 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.

9. 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.

Material Storage and Disposal

10. Unless otherwise stated by the *Client* by instruction within a Task Order the storage of equipment, materials and accommodation shall not be permitted on highway, footways, verges or dedicated footpaths. If permission is granted by the *Client* the *Contractor* shall be responsible for ensuring that:

    a. Any storage of equipment, materials and accommodation does not adversely affect stakeholder access and vehicle sight lines throughout the duration of

the works;

b. Areas for the storage of material/temporary offices/Site depot shall be reinstated within three weeks after completion of the Task Order.

11. The *Contractor* shall not burn any waste materials or substances on site.

12. The use of vehicular plant on footbridges shall not be permitted without consultation with the *Client* in advance. The *Contractor* shall also consult with the *Client* regarding loading restrictions that may apply either in the temporary or permanent state for other bridges and highway structures. In general, the *Contractor* will be required to demonstrate that plant, equipment and materials, etc do not exceed the safe working load of structures.

Basements

13. The *Contractor* shall note that basements may exist under some pavements and footways and therefore shall take the necessary precautions to prevent damage.

Appendix 1/12: Setting out and Existing Ground Levels

Existing Ground Levels

1. The *Contractor* shall be responsible, when required to complete the Task Order works, for satisfying itself that the existing ground levels as described in the Task Order are correct.

Setting Out

2. The *Contractor* shall be responsible for setting out the works, and for the correctness of the positions, levels and dimensions of the works. In setting out the works, it shall be the *Contractor's* responsibility to ensure that any dimensions, sizes and levels given are correct and, should they wish to query any of these, they shall give written notice to the *Client* before commencing the works.

3. If at any time during the progress of the works any error shall appear or arise in the positions, levels or dimensions of the works, the *Contractor* shall, at its own expense, remove and amend the work to the satisfaction of the *Client*, and shall become liable for any costs associated with any delay caused to the works due to such error.

4. The *Contractor* shall satisfy himself that any information provided to it relating to the existing ground levels is correct. Should the *Contractor* wish to dispute any levels they shall submit to the *Client* a schedule of the position of the levels considered to be in error and a set of revised levels. The existing ground relevant to the disputed levels shall not be disturbed before the correct levels are determined.

5. The line and levels of formation, side slopes, drainage, carriageway, footways and hard shoulders shall be carefully set out and frequently checked, care being taken to ensure that correct gradients and cross-sections are everywhere obtained.

6. The *Contractor* shall ensure that, where necessary, in order to maintain its programme, lines and levels are set out in such time as to enable Statutory Undertakers' plant and other publicly or privately-owned services or supplies to be installed, altered or removed.

7. The *Contractor* shall provide every assistance required by the *Client* for checking the setting out or for measuring up the works, at such times as may be suitable to the *Client*. The *Contractor* shall, at its own expense, rectify any errors arising from inaccurate setting out unless the *Client* shall decide to the contrary.

Markings for Setting Out purposes

8. The colour White shall be used for all paint markings for setting out purposes put down by the *Contractor* and all site staff.

9. For information purposes, the Statutory Undertakers in the *Affected Property* shall be using the following colours:

Authority	**Paint Colour**	**Letter Code**
Water	Blue	W
Electricity	Red	E
Telecom	Silver grey	T
Gas	Yellow	G
Cable operators	Green	V
Street Lighting/Traffic Signals	Orange	S

10. The *Contractor* shall agree any horizontal and vertical alignment on site, giving the *Client* twenty-four (24) hours' notice when setting out is required to be agreed. The *Contractor* shall establish sufficient temporary reference level information to demonstrate to the *Client* that the proposed levels have been achieved at all stages of the Task Order.

11. The horizontal and vertical alignment on the site shall be undertaken with respect to existing levels on site. At those locations without kerbs the *Contractor* shall undertake the necessary control levels to achieve the surface regularity.

Appendix 1/14: Payment applications

1. Any payment applications submitted by the *Contractor* shall conform to the following requirements unless otherwise specified in the *Client*'s Service Description or the Contract.

2. All NPR carriageway resurfacing schemes, NPR footway replacement schemes and Principal Road schemes completed each calendar month will be grouped together under one monthly payment application.

3. All projects anticipated to be completed within, or just in excess of, one month will be subject to one payment application on completion of the Task.

4. All projects anticipated to have a construction duration in excess of one month will be subject to interim monthly payment applications.

NPR Carriageway, NPR Footway and Principal Road Schemes.

5. At the start of each financial year, or at the start of each programme of schemes, the *Service Manager* will raise and issue to the *Contractor* one purchase order for the NPR carriageway resurfacing schemes, one purchase order for the NPR footway replacement schemes and one purchase order for any Principal Road schemes to be completed within that programme.

6. All applications for payment in respect of NPR carriageway resurfacing schemes, NPR footway replacement schemes and Principal Road schemes shall be for schemes completed up to and including the last day in the calendar month.

7. The *Contractor* will need to make one payment application to cover all the NPR carriageway resurfacing schemes completed, one payment application to cover all the NPR footway replacement schemes completed and one payment application to cover

all the Principal Road schemes completed through a Contract Management form described within the *Client's* Service Description document.

8. The *Client* will endeavour to undertake random measure checks on around 10% of completed works sites. Other sites will have their measures checked against the ordered works, any agreed changes and the design.

9. Once checked and verified the *Service Manager* will advise the *Contractor* the payment application is acceptable, or whether there are any queries, through a further Contract Management form.

10. The *Contractor* will then send the *Client* one invoice for each relevant purchase order for processing and payment. The Contractor will maintain a list of all payments against each purchase order and issue this with their monthly payment application.

All other scheme works

11. Prior to a Task Order being raised for a scheme, the *Contractor* will need to submit a quotation based on the agreed design and Early Contractor Involvement meetings. Once the quotation has been accepted by the *Service Manager*, the scheme will be approved for construction.

12. When a Task Order has been issued for a scheme the *Client* will issue a purchase order to the *Contractor* for that scheme.

13. All projects completed up to and including the last day in the calendar month shall have applications for payment made for that project.

14. On projects that have a duration in excess of one month, the *Contractor* shall be entitled to apply for monthly interim payments on that project.

15. The *Contractor* will need to make one payment application for each completed project or interim payment through a Contract Management form described within the *Client's* Service Description document.

16. The *Client* will endeavour to undertake random measure checks on around 10% of works sites where interim payment applications have been made. Other sites will have their measures checked against the ordered works, any agreed changes and the design.

17. The *Client* will endeavour to undertake measure checks on all completed work sites.

General

18. The *Contractor* shall agree with the *Client* a schedule of submission dates for its monthly applications within 28 calendar days of the *starting date*. The schedule shall be reviewed annually.

19. Unless otherwise specified in the *Client*'s Service Description, the *Contractor* shall present its monthly applications by e-mail in Microsoft Excel format.

20. The *Contractor* shall agree with the *Client* the format of the Payment Applications within 28 calendar days of the *starting date*.

21. Examples of the data that will be required include:

    a. Scheme title(s)

    b. Activity Reference

    c. Activity Description

    d. Purchase Order number

    e. Cost code(s) (budget code(s))

f. Cumulative Amount of “works” done to date

g. Cumulative Amount of any “compensation events” to date

h. Date works instructed

i. PAF rate for this item for this application

j. Status (Interim / Completed / Final)

k. Client Comments

l. Contractor Comments

m. Status (Interim / Completed / Final)

n. Client Comments

o. Contractor Comments

Appendix 1/15: Accommodation works

1 When instructed by the *Client* by issue of a Task Order the *Contractor* shall undertake, and complete accommodation works on the highway within the limits of the Affect Property.

2 When instructed by the *Client* by issue of a Task Order the *Contractor* shall provide permanent fencing for accommodation works.

Appendix 1/17: Traffic Safety and Management

General

1. The *Contractor* shall be responsible for traffic safety and management and associated works. The *Contractor* shall be responsible for the provision, maintenance and surveillance of all traffic management measures. In the case of Rolling Lane Closures, the *Contractor* shall be responsible for overall control of the closure.

2. Traffic Control Layouts shall comply with “Chapter 8 of The Traffic Signs Manual” and “Safety and Street Works and Road Works” and any subsequent updates or amendments to these documents. These requirements shall be considered to be the minimum requirements and final design of temporary traffic management shall be the responsibility of the *Contractor* with the cost of design and associated drawings included within item rates.

3. The traffic safety and management proposals submitted by the *Contractor* shall, as a minimum, include the following presented on PDF format:

a. Traffic safety and control phasing;

b. Traffic order requirements (including details of those already obtained);

c. Temporary traffic signal proposals including stop / go boards;

d. Lanes width and alignment details;

e. Existing and proposed temporary road markings;

f. Working area and safety zone details;

g. Vehicle crossover (include construction details and geometrical design required where this has not been shown on the Drawings);

h. Timing of operations;

i. Temporary lighting requirements;

j. Temporary emergency telephone numbers;

k. Restrictions arising from the use of substances hazardous to health.

4. The *Contractor's* attention is drawn to the need to assess the risks and develop and operate safe working practices when vehicles and equipment are reversing on site, whether or not they are on part of the highway

5. The *Contractor* shall consider any restrictions or specific requirements, including permitted hours of operation, given in Task Orders when developing its traffic management proposals. This shall also include consideration of the traffic sensitive streets, public events and park events and works being carried out by other contractors working for the *Client* or Statutory Undertakers.

6. If the *Contractor's* Traffic Safety and Management proposals require temporary lighting for the execution of the works it shall provide temporary lighting in accordance with Clause 1405.

Temporary Traffic Orders/Parking Suspensions

7. Temporary Traffic Orders are required when a road is closed to traffic or when a suspension of bus lanes, a ban of right or left turns, or when a contraflow is in operation. Temporary Traffic Orders, required under the Road Traffic Regulation Act 1984, shall be arranged by the *Client*. Applications, together with all supporting documentation, shall be submitted by the *Contractor* to the *Client* with the appropriate notice. For emergencies, an Emergency Traffic Notice may be applied for.

8. Parking suspension applications, together with all supporting documentation, shall be submitted by the *Contractor* to the *Client* with the appropriate notice.

9. The notice periods required by the *Client* for approval of applications shall be as described below.

Application Type	Notice Period
Amending or making traffic orders	Sixteen (16) weeks
Authorising temporary traffic control (including signals)	Two (2) weeks
Authorising of non-prescribed signs	One (1) week
Introducing temporary signs or moving existing signs	Two (2) weeks

10. The notice period required by the *Client* for works on the *Affected Property* is given in the table below.

Extent of Works	How works are defined	Notice period required
Major works	Works that take more than 10 working days to complete or require road closure	Minimum of three (3) months
Standard works	Works that take between four and 10 working days to complete	Minimum of ten (10) working days
Minor works	Works that take up to three working days to complete	Minimum of three (3) working days
Immediate works	Works are unplanned – Emergency	Within two (2) hours of work commencing
Immediate works	Works are unplanned – Urgent	Within two (2) hours of work commencing

Section 58 protection	Works that are defined as applicable for protection	Minimum of three (3) months

Records

11. The *Contractor* shall maintain a weekly record of all traffic management operations in a format to be agreed with the *Client*. The *Contractor* shall supply a copy of these records to the *Client* by 0930 hours on the Monday of the following week. The records shall show the relevant Task Order numbers, the date of the works, the location, the type of closure, the time when the closure was established and removed, and a brief description of the works undertaken within the closure.

12. The *Contractor* shall identify where any other works have been executed under the same closure. The weekly record shall be agreed by both parties within 24 hours of the submission, for inclusion in the final accounts.

Driver Information Signs

13. Driver Information Signs shall be laid out as per TSRGD diagram 7004 and Typical Arrangement Drawing

14. Legends for Driver Information Signs shall be selected from the following: Advance Sign for Major Roadworks (TSRGD 7004)

    a. Replacing worn out road
    b. Renewing damaged bridge deck
    c. Repairs to weak surface
    d. Repairs to weak bridge supports
    e. Bridge painting
    f. Repairs to bridge
    g. Installing new/Repairs to hard shoulder
    h. Installing new/Repairs to drainage system
    i. Installing new road markings
    j. Installing new cabling
    k. Installing new/Repairs to lighting
    l. Installing new/Repairs to safety barriers
    m. Installing new/Repairs to sign gantry
    n. Surveying
    o. Widening and road repairs

Temporary Traffic Signals

15. When the control of traffic is by temporary traffic signals, the *Contractor* shall monitor traffic queue lengths at intervals agreed with the *Client*. The operative selected to carry out the task, whose name shall be identified to the *Client*, shall be competent in the operation of temporary traffic signals and be capable of controlling traffic safely and effectively.

16. Should the *Contractor* elect to use temporary traffic signals with a device for self-traffic monitoring and automatic re-adjustment, the monitoring procedure shall be carried out during the morning, mid-day and evening peaks. Where temporary traffic

signals are used a set of stop/ go boards shall be kept on site for the event of the signals failing.

Other Traffic Safety and Control Operational Requirements

17. The *Contractor* shall provide all temporary traffic signs necessary for its traffic management and shall ensure that a sufficient stock of spare traffic signs is available on the site to immediately make good all foreseeable damage to the Traffic Management System. The *Contractor* shall use for its traffic management layout the recommendations contained in Chapter 8 of the Traffic Signs Manual (published by The Stationary Office), and any amendments thereto; the booklet "Safety at Street Works and Road Works – A Code of Practice" and any other Departmental instructions.

18. The *Contractor* shall cover up any existing signs which conflict with its temporary traffic management layout and uncover them immediately the temporary layout is removed.

19. All existing lane and edge lines and hatched areas not shown on the traffic management layout drawings shall be removed or obscured. Any permanent lines removed to facilitate the installation and use of temporary road markings shall be reinstated to its original layout on removal of the temporary markings.

20. All studs situated within or adjacent to such lines whether surface mounted or built into the existing surfacing shall also be removed and reinstated when appropriate. Surface mounted studs shall be removed without damage to the carriageway surfacing. Built- in studs shall be removed in its entirety and the resulting void shall be filled accordingly.

21. Ribbed lines shall be either removed completely or have the ribs removed flush with the adjacent line and the line then obscured.

22. The *Contractor* shall make no changes to the Traffic Management System without the prior approval of the *Client* in writing and subject to any restrictions imposed by the police.

23. The *Contractor* is responsible for erecting, covering, uncovering and taking down and re-erecting signs outside the site to be compatible with the state of the Works.

24. Temporary advisory signs other than those in the Traffic Signs Regulations shall be 1050mm x 750mm, with black lettering on a yellow non-reflective background and a black border. They shall be erected on metal stands weighted with sandbags.

25. Requirements for Temporary Emergency Telephone Numbers – an emergency telephone number shall be made available for the service period by the *Contractor* who shall provide twenty-four (24) hour attendance by a person competent and authorised to deal with any emergency.

26. The *Contractor* shall be responsible for the traffic safety and management and the erection, maintenance and removal of the signed road closures. The *Contractor* shall inspect the diversion signs on a daily basis and shall carry out any necessary remedial works.

27. The *Contractor* shall make no changes to the Traffic Management system without prior approval of the *Client* in writing, subject to any restrictions imposed by the police.

28. A 'New Road Layout and New Traffic Signal' signs to dia. 7014 shall be erected on lamp columns or the like where feasible and with the agreement of the *Client*, or on metal stands weighted with sandbags on each of the approaches to the site and shall be removed three months after completion of the scheme.

29. All vehicles over 1.5 tonne unladen weight used within the Works, including those

delivering Materials shall be fitted with switchable exterior mounted audible warning devices capable of being heard over a distance of twenty metres at ambient noise levels. The device shall operate automatically when the vehicle reverses. At noise sensitive sites the *Client* may instruct these devices to be switched off for defined periods. 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. Any vehicles over 1.5 tonnes reversing within the site except paving machines and rollers shall only do so under the individual supervision of a specifically designated marshal walking alongside at the rear of the vehicle. The marshal shall be visibly identifiable from the remainder of the workforce.

30. Access, footways and other Rights of Way – accesses, footways and cycle ways shall be maintained in a serviceable condition or alternative provision made. The *Contractor* shall consult with owners / tenants over maintaining access. Adequate passage for wheelchairs shall be maintained at all times.

31. Materials storage, Working Areas and fencing safety zones – Materials, stockpiles and stores shall be enclosed by a rigid barrier/fencing and signed with appropriate cones and warning signs. Where Materials and Equipment are sited on the highway, the *Contractor* shall ensure that no damage is caused to the highway, or no limitation of sight lines is caused and shall not obstruct or cause flooding of surface water runoff, channels and drainage.

32. The *Contractor* shall maintain any bus stops within the site at all times by arranging for temporary dollies to be provided by the bus companies that operate in Southwark and the covering and uncovering of existing bus stop signs. The *Contractor* shall contact the bus companies operating in Southwark as required.

33. Unless the *Client* has informed the *Contractor* that a road closure has been obtained for the purpose of undertaking the Task Order, the *Contractor* shall maintain a minimum carriageway width as specified.

34. The *Contractor* shall make adequate provision for the safe passage of pedestrians at all times by day or night.

35. Tasks shall be phased in such a manner that minimum inconvenience is caused to pedestrian and vehicular traffic. Tasks on the elevation(s) of bridge(s) shall be carried out as far as possible from scaffolds and work on the roadside faces of parapets and in footways or verges shall be confined to one side of a bridge at any one time unless the *Client* agrees to permit work on both sides simultaneously. Overnight obstructions to the carriageway shall only be permitted in the case of authorised excavations or temporary road closures.

36. For works or operations causing interruptions of short duration to the flow of two-way traffic, the *Contractor* may use manually-operated "Stop/Go" signs of the size, colour and type authorised. On roads of minor traffic importance where visibility is not restricted, and the obstruction occupies a length not exceeding 15 metres, the *Contractor* may provide and maintain signs allowing priority to traffic in one direction. (Note: this shall normally be on the side not affected by the obstruction). Traffic control by means of red and green flags is strictly prohibited. Approval from the *Client* shall be obtained before use of “Stop/Go” signs.

37. Unless agreed otherwise with the *Client* surrounding roads shall be used for the temporary diversion of traffic. The *Contractor* shall make no changes to the Traffic Management System without prior approval of the *Client*, subject to any restrictions imposed by the police and *Client*.

38. When scarifying/planing existing roads, no vertical step greater than 50mm shall be formed in the existing carriageway left open to traffic. A temporary ramp, with a

maximum gradient of 20% of material complying with Clause 910 shall be laid across the step until the discontinuity is made up with resurfacing or regulating material as described in the *Contract*, at which time the temporary ramp shall be taken out.

Appendix 1/21: Information boards

1. The *Contractor* shall provide and erect information boards at the locations and to the specification given below. The boards shall be to the approval of the *Client* and shall be placed in positions which do not impede or obstruct the passage or progress of vehicular or pedestrian traffic. The *Contractor* shall erect, clean, maintain and remove such boards upon completion.

2. In the case of general information board signs and advanced warning signs the *Contractor* shall, unless otherwise agreed with the *Client* and provided formally in writing, at least two weeks before commencement of the Task Order works provide and erect information boards at the locations described by the *Client* within the Task Order. Upon completion of the Task Order works the *Contractor* shall, unless otherwise instructed or agreed with the *Client* and provided formally in writing, remove the information boards to the *Contractor's* store or tip off site.

3. In the case of general temporary parking restriction signs the *Contractor* shall when it identifies the requirement for temporary parking restrictions as part the Task Order works follow the procedure as follow:

    a. Notify the requirement and gain approval of its temporary parking restriction proposals from the *Client*. The *Contractor's* notification should include the proposed location details for each sign and the proposed site-specific sign legend for each sign;

    b. The *Contractor* will be responsible for ensuring that approval of its temporary parking restriction proposals is achieved from the *Client* at least two weeks before commencement of the Task Order works;

    c. Provide and erect the approved temporary parking restriction signs at least two weeks before commencement of the Task Order works.

4. The *Contractor* shall ensure that the signs are kept clean, visible and are maintained in a safe and legible condition and remove them on completion of the works.

The *Contractor's* compounds

5. *Contract* information boards shall be erected by the *Contractor* at the entrances to the *Contractor's* Compounds to a size and layout approved by the *Client*.

Scheme / task information boards

Scheme:

6. Scheme / Task Information Boards shall be supplied by the *Contractor* as instructed by the *Client*. The boards shall include the following information included:

    a. Description.

    b. Duration or expected completion date.

    c. *Contractor* information: name and emergency telephone number.

    d. *Client* branded signs:

    e. These signs will consist of a short statement of the *Client*'s aspirations

7. All signs shall be removed upon substantial completion of the works or as agreed with the *Client*.

General Information Boards

Other signs:

8. The following General Information Boards shall be displayed as directed by the *Client* or as required by scheme-specific drawings:

   a. Traffic Signs Regulations diagram 7002A

   b. Traffic Signs Regulations diagram 7003.1

   c. Traffic Signs Regulations diagram 7007.1

Cut Engine Off Signs:

9. When specified in the Task Order, and when temporary traffic lights are being deployed, the *Contractor* is to provide a sign with the following information:

   a. The wording: "Average delay time: X seconds" where 'X' is the predicted average waiting time at the traffic lights;

   b. The wording: "Cut Engine off"

General

10. Other than as provided for above, the *Contractor* shall not display its name.

11. No photograph, advertisement or publicity of any kind relating to the works may be used without the express approval of the *Client*. If such photographs, advertisements or publicity are approved by the *Client*, they shall contain acknowledgement as shall be prescribed by the *Client* in writing.

Appendix 1/22: Progress photographs

1. The *Contractor* shall take record photographs of each site before commencement, during construction works and after completion of works at each location applicable to the Task Order.

2. The before commencement record photograph(s) should evidence the general site conditions and show details of the works applicable to the Task Order.

3. The during construction record photograph(s) should evidence the works progress, plant and materials used and show details of the works completed at that time applicable to the Task Order.

4. The after-completion record photograph(s) should evidence the completed work and show details of the surrounding area to evidence it has been left in a clean and tidy condition.

5. The *Contractor* shall ensure that all record photographs are attached / linked to each Task Order digitally through the *Client*'s asset management system, or if unavailable manually by application of a method agreed with the *Client*.

Appendix 1/24: Quality management systems

1. The *Contractor* shall institute a BS EN ISO 9001 accredited quality management system.

2. The *Contractor* shall develop, submit and update a Quality Plan for the term service element of the Contract, submission of the inaugural Quality Plan to the *Client* shall be made at least four (4) weeks before commencement of the *Contract*.

3. The *Contractor* shall develop, submit and update a project specific Quality Plans for individual Task Order works. Unless otherwise detailed by the *Client* within the Task Order submission of each inaugural Quality Plan for individual Task Order works to the *Client* shall be made at least two (2) weeks before commencement of the *Contract*.

4. As a minimum, each Quality Plan shall include the following:

   a. *Contractor's* organisation and management details;

   b. *Contractor's* method statements and construction procedures (these shall include the Suppliers' Quality Plans);

   c. Contractor's Health and Safety procedures, control measures and risk assessments;

   d. *Contractor's* construction quality control.

5. Development of Service Delivery Plans should include:

   a. Mobilisation

   b. Annual Maintenance

   c. Winter Service

   d. Continuous improvement

   e. Emergency Response

   f. Sustainability

   g. Health and Safety

   h. Customer Care

   i. Operational Resilience

   j. Diversity Training

   k. Supplier Diversity

   l. Communications

Appendix 1/70: Reporting of accidents

1. The *Contractor* shall provide the *Client* with copies of RIDDOR returns and full details of all fatal and serious accidents. Such details shall include number of people involved, severity of injuries, date and time of the accident, precise location, nature of the accident (e.g. road traffic collision, failure of temporary works, fall from height), contributory factors, and weather conditions.

2. An injury is defined as fatal when death occurs in less than 30 days as a result of the accident. 'Fatal' does not include death from natural causes or suicide. A serious Injury is defined as an injury for which a person is detained in hospital as an in-patient, or any of the following injuries whether or not they are detained in hospital: fractures, concussion, internal injuries, crushing, burns (excluding friction burns), severe cuts, severe general shock requiring hospital treatment, injuries causing death 30 or more days after the accident.

3. All fatal accidents shall be reported to the *Client* within 1 hour. All serious accidents shall be reported to the *Client* within 24 hours. The *Contractor* shall also provide the *Client* with a Summary of all fatal and serious accidents every 3 months.

Appendix 1/71: *Contractor's* compound/depots

1. The locations are to be as close as reasonably practical but will be determined at tender stage.

Appendix 1/72: Stocks of Materials

1. The *Contractor* shall hold stocks of materials they deem necessary to meet the requirements of their programme.

2. As may be required to reflect fluctuations in anticipated demand, the *Contractor* may be instructed by the *Client* to store additional materials for use in future works in its compounds/depots. These additional materials shall be primarily Modular Units, Kerbs and other Edge Restraints and Street Furniture, though the *Client* may require other materials to be stored from time to time. The maximum floorspace in compounds/depots used for storage of such additional materials shall not exceed 150 square metres. Those materials shall be for exclusive use under the *Contract* and shall not be used for any other purposes. Topsoil, granular fill, unbound granular materials and other flexible materials shall not be stored in such space and any storage of such materials shall be elsewhere.

Appendix 1/73: Considerate constructor's scheme

(CCS) Introduction

1. This Appendix describes the Scheme and the Code, to which the *Contractor* and every one of its staff shall adhere.

2. The aim of the Scheme is to improve the image of Construction. It is managed by the Construction Industry Board.

3. There are thousands of construction projects in progress at any time throughout the country. Many are in prime spots, for example, in the High Street, or in residential areas, and therefore many people pass by them. If these sites always presented an image of competent management, efficiency, awareness of local environmental issues and above all neighbourliness, then each one of them would promote the whole construction industry as caring, and responsible. Every site would become a positive advertisement for the industry.

4. The Code commits those contractors in the Scheme to be Considerate and Good Neighbours, as well as Clean, Respectful, Safe, Environmentally Conscious, Responsible and Accountable.

5. The Scheme shares, and builds on, the experience of existing schemes, particularly in the London Borough of Westminster and Corporation of London, by extending the concept nationally.

6. Many individual sites from all over the UK have registered with the Scheme, and many construction companies automatically register all of its sites. The Scheme is open to construction companies of all sizes whether they are national, regional or local companies.

7. Posters displayed around the construction site that set out the Code to which the constructors are committed advertise the Scheme. If passers-by wish to comment, the name and telephone number of the Site Manager will be clearly displayed, alongside the telephone number of the overall administrators of the Scheme. Those contacted are expected to take the action required.

8. The Scheme started in July 1997. A feature of the Scheme is that regional awards for the best performing sites and constructors are presented annually.

9. The Construction Industry Board is a partnership between the Construction Industry, its *Client*s and Government, to improve the performance of the industry. We are working together on a huge programme of change in the industry following a major report by Sir Michael Latham. His recommendations were wide-ranging but included the idea of a nationwide CCS to improve the image of the industry's construction activities.

10. For further information on the CCS:

    PO Box 75

Great Amwell

Ware Hertfordshire SG12 0YX

E-mail: enquiries@ccscheme.org.uk Internet: https://www.ccscheme.org.uk

Tel: 0800 783 1423

Code of Considerate Practice

11. CONSIDERATE - All work is to be carried out with positive consideration to the needs of traders and businesses, site personnel and visitors, pedestrians, shoppers and the general public. Special attention is to be given to the needs of those with sight, hearing and mobility difficulties.

12. ENVIRONMENT - Noise from construction operations and all other sources is to be kept to a minimum at all times. Consideration should be given in the selection and use of resources – local resources should be used wherever possible. Attention should be paid to waste management and the avoidance of pollution – recycling of surplus materials is to be encouraged.

13. CLEANLINESS - The site is to be kept clean and in good order at all times. Temporary traffic management systems, lights and warning signs are to be maintained in a clean and safe condition. Surplus materials, rubbish, etc shall not be allowed to accumulate on the site or spill over on to the surrounding environment. Dust, etc from construction operations shall be kept to a minimum.

14. GOOD NEIGHBOURS - Full and regular consultation with neighbours, including adjacent traders and businesses, regarding programming and site activities shall be maintained from pre-start to completion. General information regarding the scheme for these neighbours using the area shall be provided.

15. RESPECTFUL - Respectable and safe standards of dress, appropriate to the weather conditions, shall be maintained at all times. Lewd or derogatory behaviour and language should not be tolerated under threat of severe disciplinary action. Pride in the management and appearance of the site and the surrounding environment is to be shown at all times. Operatives shall be instructed in dealing with the general public.

16. SAFE - Construction operations and site vehicle movements are to be carried out with great care and consideration for the safety of the general public, traders, shoppers and as well as site personnel. No building activity shall be a security risk to others.

17. RESPONSIBLE - Considerate Constructors will ensure that all site personnel, specialist subcontractors, drivers and any other persons working on the site understand and implement the obligations of this Code and monitor its compliance with it.

18. ACCOUNTABLE - Posters relating to the Scheme will be displayed around the site, giving names and telephone numbers of staff who can be contacted in response to issues raised by the general public, traders, shoppers and others affected by the site operations. Induction procedures should incorporate General Public issues.

Terms of Reference for Site Managers

19. Considerate

    a. Show consideration to site neighbours and the public at large.

    b. Send letters to neighbours at the start of site work, apologise for inconvenience, etc and give a contact name and telephone number.

    c. Inform neighbours if any unusual activities occur, such as large loads, early

deliveries, noisy work.

d. Monitor parking, especially on neighbouring roads.

e. Be mindful of people with sight, hearing or mobility difficulties.

f. Deal personally with comments or complaints from the public or neighbours.

g. Consider the use of additional signs in languages other than English where appropriate.

h. Ensure off-site parking is dealt with considerately.

i. Consider ensuring deliveries do not coincide with the rush hour.

20. Environment

a. Ensure that work does not start too early or go on until late and, especially if noise is a problem, be flexible. Normal permissible working hours are set out in Clause 138AR however these do not remove the obligations on the *Contractor* to comply with the noticing and permitting requirements as set out in Clause 155AR. The granting of a permit is deemed to take precedence over the normal permissible working hours. 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*.

b. Protect trees and vegetation.

c. Keep down the noise of plant, vehicles, radios, etc.

d. Avoid pollution and wastage at all times.

e. Ensure that hoarding and site hutting is clean, tidy and, if possible, painted in a suitable colour.

f. Provide unobtrusive but clear signage.

g. Provide safe passage for pedestrians around the boundary of the site.

h. Ensure lorries take the most appropriate route to the site to minimise disruption.

i. Ensure boundaries are well lit where they are affected by the site works, and maintain adequate sign posting to the site office along a safe and clearly marked route.

21. Cleanliness

a. Ensure materials and plant are kept within site boundaries to avoid 'overspill' from the site.

b. Control discarded paper and other general rubbish around the site.

c. Ensure roads and footpaths adjacent to the site are kept clean of construction materials, mud and spillage.

d. Maintain clean hoarding.

e. Box out temporary works where they can affect passers-by.

f. Wash window sills and cars if they are affected by dust from the site.

g. Ensure materials are stacked neatly and correctly.

h. Clean the site on a regular basis, especially around canteens and toilets.

i. Ensure skips are emptied before they become overfilled.

j. Skips need to be covered at all times.

k. Ensure accesses are kept clear and clean.

22. Good Neighbour

a. Maintain full and regular consultation with neighbours regarding site activity at all times.

23. Ensure site lighting does not affect neighbours. 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).

a. Make available, where possible, viewing facilities.

b. Keep a complaints book with single line entries.

c. Shield noise by baffles or sound-deadening quilt and ban loud radios.

d. Minimise false alarms from security systems.

e. Allow a representative to act for a group.

f. Invite the local school to visit your site.

24. Respectful

a. No 'wolf whistling'.

b. Maintain respectable standards of dress.

c. Understand that you are an intruder into an established community for the duration of the construction work and show respect for your neighbours.

d. Provide general public consideration training in induction procedure.

e. No tea breaks in view of the general public.

f. Radios or other communication devices, if allowed on site at all, should be controlled and the volume maintained at a reasonable level.

g. Site personnel should be made to realise they are representing the construction industry as a whole and they are expected to help in improving its image.

h. Consider the implication of your operatives arriving and leaving the site in the same clothes that they carry out its work in.

25. Safe

a. Follow all Health and Safety procedures.

b. Ensure netting is provided where sites oversail or abut neighbouring structures.

c. Keep all walkways to, from and around the site in a good and safe condition.

d. Make sites secure, especially during non-working hours.

e. Examine whether temporary works mean any reduction of security for site neighbours.

f. Position warning signs where they are required.

g. Ensure the site boundary cannot be penetrated.

h. Provide ramps for wheelchairs and prams where your activities have affected the footway.

26. Responsible

a. If there are schools in the vicinity, arrange to talk to classes explaining about building sites and its dangers.

b. Get to know the local Police and any neighbourhood associations.

c. Treat specialist contractors and suppliers as part of your team and ensure they comply with the Code.

d. Ensure there is a trained First Aider on site at all times.

e. Site Managers should show respect for Building Control Officers and Health and Safety Officers.

f. Remember your *Client* at all times – its reputation is in your hands!

g. Be aware of the location and contact details of the nearest Police Station and outpatients' hospital.

h. Keep a record available of names and telephone numbers of all potentially affected people.

27. Accountable

a. Posters provided by the Scheme should be displayed outside the site at all times during the construction period.

b. Maintain a clean and presentable company sign board with telephone number.

c. Keep an incident and complaint book.

d. Be personally available to anyone who has a query or complaint.

e. Regular safety visits with reports.

f. Monitor non-reportable accidents.

g. Maintain and advertise a 24-hour 'Hotline'.

Appendix 1/74 Environmental Evaluation Checklist for Improvement Projects and Capital Renewal Schemes

1. This Environmental Evaluation Checklist (the Check list) defines the requirements for achieving the appropriate level of environmental evaluation and mitigation for a project or scheme so that environmental impacts are understood, environmental risks managed and the risk of challenges reduced.

Client's Responsibilities

2. The *Client* shall make an initial assessment on whether proposed works are subject to an evaluation checklist and where appropriate instruct the *Contractor* accordingly.

3. The *Client*'s Service Manager shall contact the *Client*'s Environmental Advisor with project or scheme information at the preliminary design stage or earlier, before key design decisions are taken, for example before options appraisal is completed.

4. The *Client*'s Service Manager, the *Client*'s Environmental Advisor and the *Client*'s Arboriculture Manager (if required) shall approve the findings of the Checklist by signing it.

5. The *Client*'s Service Manager shall retain a copy of the signed Checklist and include it

in project documentation which is passed on to the *Contractor* to inform method statements and construction environmental management plans.

***Contractor's* Responsibilities**

6. The *Contractor's* Environmental Advisor shall receive the checklist completed by the *Client* as part of the project or scheme handover information.

7. The *Contractor's* Environmental Advisor shall complete the *Contractor's* relevant sections of the Checklist.

8. The *Contractor's* project manager and *Contractor's* Environmental Advisor shall approve the findings of the Checklist by signing it. If required, the *Contractor's* Landscape Manager, the *Client*'s Arboriculture Manager and the *Client*'s Environmental Manager shall approve the findings of the Checklist by signing it.

9. The checklist contains a number of questions and bullet points which are intended to be key prompts. These do not represent an exhaustive list of best available practice or required consents. As such, expert legal, technical and environmental advice should be sought when in doubt

Environmental Evaluation Checklist for Improvement Projects and Capital Renewal Schemes

Project / Scheme Name:	
Description of site, project / scheme and construction activities:	

		Client	
1	**Determination of need for Environmental Impact Assessment (EIA) – ONLY FOR IMPROVEMENT PROJECTS**	**YES**	**NO**
1.1	Is the project listed in Schedule 1 of the EIA Regulations? If so which section and paragraph?		
1.2	As defined in the EIA Regulations, is the project an Urban Development over 0.5 hectare (5,000m2) (Schedule 10(b)) or the Construction of a Road exceeding 1 hectare (10,000m2) (Schedule 210(f))?		
1.3	Is the project in or within 2km of a sensitive site, as defined by the EIA Regulations i.e. National Nature Reserve, Scheduled Monument, SAC, SPA, SSSI, World Heritage Site? If so, which?		
1.4	Does the project require EIA?		

Comments and Recommendations

		Client			*Contractor*	
2	**Natural Environment**	**YES**	**NO**		**YES**	**NO**
2.1	Will works require land take, excavation or temporary use of the grassed verge or planted areas? <u>If YES:</u> • Contact the *Client*'s Arboriculture and Landscape Service Manager					
2.2	Will the works be in close proximity to or require the removal or disturbance of street trees? <u>If YES:</u> • Contact the *Client*'s Arboriculture and Landscape Service Manager					
2.3	Are there any injurious weeds in the vicinity of the works? <u>If YES:</u> • Contact the *Client*'s Arboriculture and Landscape Service Manager • Injurious weeds shall be treated as controlled waste unless herbicide is present, in which case they shall be treated as hazardous waste					
2.4	Is new or replacement planting proposed? <u>If YES:</u> • Contact the *Client*'s Arboriculture and Landscape Service Manager					
2.5	Is there scope for new or enhanced planting in the area? E.g. empty planters or tree pits, unused land, room on the footway for street trees, existing green space in poor condition. <u>If YES:</u> • Contact the *Client*'s Arboriculture and Landscape Service Manager					
2.6	Are protected species, sightings of protected species or areas of habitat potential present with 200 metres of the works? <u>If YES:</u> • Contact the *Client*'s Arboriculture and Landscape Service Manager • Contact the *Client*'s Environmental Manager					

	Note: Only Defra licensed ecologists are to handle protected species					
2.7	Are designated landscape sites (i.e. Metropolitan Open Land, Green Belt, Commons), Sites of Importance for Nature Conservation (SINC) or areas of habitat potential present with 200 metres of the works? If YES: • Contact the *Client*'s Arboriculture and Landscape Service Manager • Contact the *Client*'s Environmental Manager Note: biodiversity features must be protected in accordance with the requirements of the relevant authority (e.g. Natural England or Local Authority).					

		Client				*Contractor*			
Impact on the Natural Habitat		L	M	S	N	L	M	S	N
	Adverse								
	Beneficial								
	Comments and Recommendations								

L = Large; M = Moderate; S = Slight; N = Neutral

		Client			*Contractor*	
3	**Cultural Heritage**	**YES**	**NO**		**YES**	**NO**
3.1	Are heritage features such as a Conservation Area within 100m, listed buildings within 50m, registered park and garden within 200m, London Square or archaeological features (e.g. London Wall) within 50m from the works. Are the works within an archaeological priority area? If YES: • Contact the *Client*'s Environmental Manager Note: Heritage or archaeological feature must be protected in accordance with the requirements of the relevant authority (e.g. English Heritage or Local Authority).					
3.2	Are heritage or archaeological artefacts encountered on site during the works? If YES: • Works should cease immediately. • Consult the relevant authority (e.g. English Heritage or Local Authority). • Contact the *Client*'s Environmental Manager					

		Client				*Contractor*			
Impact on Cultural Heritage		L	M	S	N	L	M	S	N
	Adverse								
	Beneficial								
	Comments and Recommendations								

L = Large; M = Moderate; S = Slight; N = Neutral

		Client		*Contractor*	
4	**Air Quality (NOx and PM10)**	**YES**	**NO**	**YES**	**NO**
4.1	Upon completion, will the project/scheme generate additional stop and start traffic conditions?				
4.2	Is the project /scheme in a road flanked by tall buildings on either side (i.e. street canyon) which prevent pollutants from dispersing?				
4.3	Will dust be generated as a result of the works? If YES: • Works should be carried out in accordance with the Greater London Authority and London Councils "The Control of Dust and Emissions during Construction and Demolition – Supplementary Planning Guidance" July 2014.				
4.4	Are vehicles, plant and equipment to be used? If YES: • Contractors should be encouraged to fit emission controls to all vehicles, plant and equipment where possible • Vehicles, plant and equipment should be turned off when not in use. • Vehicles, plant and equipment should be inspected and maintained regularly.				

		Client				*Contractor*			
Impact on Air Quality		L	M	S	N	L	M	S	N
	Adverse								
	Beneficial								
	Comments and Recommendations								

L = Large; M = Moderate; S = Slight; N = Neutral

		Client			*Contractor*	
5	**Climate Change Mitigation ($CO_{2)}$**	**YES**	**NO**		**YES**	**NO**
5.1	Upon completion, will the project/scheme increase congestion?					
5.2	Will the project/scheme increase energy consumption?					
5.3	Are vehicles, plant and equipment to be used? If YES: • The *Contractor* should be encouraged to use energy and fuel efficient vehicles, plant and equipment where possible • Vehicles, plant and equipment should be turned off when not in use. • Vehicles, plant and equipment should be inspected and maintained regularly.					

		Client				*Contractor*			
Impact on Climate Change Mitigation		L	M	S	N	L	M	S	N
	Adverse								
	Beneficial								
	Comments and Recommendations								

L = Large; M = Moderate; S = Slight; N = Neutral

Client Contractor

6	Climate Change Adaption	YES	NO	YES	NO
6.1 (2.1)	Will works require land take, excavation or temporary use of the grassed verge or planted areas which will increase hard surfaced area and/or surface water run-off? <u>If YES:</u> • Contact the *Client*'s Arboriculture and Landscape Service Manager				
6.2 (2.2)	Will the works be in close proximity to or require the removal or disturbance of street trees? <u>If YES:</u> • Contact the *Client*'s Arboriculture and Landscape Service Manager				
6.3 (2.4)	Is new or replacement planting proposed? <u>If YES:</u> • Contact the *Client*'s Arboriculture and Landscape Service Manager				
6.4 (8.1)	Upon completion, will the project/scheme increase hard surfaced area and/or surface water turn-off?				

		Client				*Contractor*			
Impact on Climate Change Adaption		L	M	S	N	L	M	S	N
	Adverse								
	Beneficial								
	Comments and Recommendations								

L = Large; M = Moderate; S = Slight; N = Neutral

		Client		Contractor	
7	**Noise and Vibration**	**YES**	**NO**	**YES**	**NO**
7.1	Are works likely to create noise and vibration that will disturb residences, schools, hospitals, places of worship, sensitive habitats or other sensitive receptors? If YES: • BS5228 Parts 1 and 2 – *Noise and vibration control on construction and open sites* should be adhered to. • Vehicles, plant and equipment should be turned off when not in use. • Consider alternative 'quiet' running plant and equipment. • Noisiest activities should be planned during 'normal working hours'				
7.2	Are works required to be carried out at night or outside of 'normal working hours'? If YES: • Obtain Section 61 consent from the local authority environmental health officer. https://forms.southwark.gov.uk/ShowForm.asp?fm_fid=900				

		Client				*Contractor*			
Impact on Noise and Vibration		L	M	S	N	L	M	S	N
	Adverse								
	Beneficial								
	Comments and Recommendations								

L = Large; M = Moderate; S = Slight; N = Neutral

		Client		*Contractor*	
8	**Soil and Water**	**YES**	**NO**	**YES**	**NO**
8.1	Upon completion, will the project/scheme increase hard surfaced area?				
8.2	Is the project/scheme within a flood risk area?				
8.3	Are the works in, over or under a watercourse or within 16 metres of a tidal river (e.g. River Thames) or 8 metres from a non tidal river, river bank, river wall, embankment or flood defence structure? If YES: • Contact the *Client*'s Environmental Manager. • Consent for Works Affecting Watercourse and / or Flood Defences is required from the Environment Agency. • Prepare a detailed Method Statement to support application for consent. • Adhere to the Environment Agency's Pollution Prevention Guidelines.				
8.4	Is discharge to a watercourse or waterbody required? Are any dewatering activities required? If YES: • Contact the *Client*'s Environmental Manager. • Environmental Permit is required from the Environment Agency.				
8.5	Is discharge to a sewer required? If YES: • Contact the *Client*'s Environmental Manager. • Trade Effluent consent is required from Thames Water.				

Impact on Soil and Water		L	M	S	N	L	M	S	N
	Adverse								
	Beneficial								
	Comments and Recommendations								

L = Large; M = Moderate; S = Slight; N = Neutral

		Client			*Contractor*	
9	**Community**	**YES**	**NO**		**YES**	**NO**
9.1	Upon completion, will the project/scheme be visually intrusive or cause light pollution to residences, schools, hospitals, places of worship, sensitive habitats or other sensitive receptors?					
9.2	Can residents and users of nearby premises view the works? <u>If YES:</u> • The site shall be kept tidy and in good order, with minimal disturbance and footprint. • The use of floodlights and flashing lights shall be minimised, where possible and positioned away from residences and oncoming traffic.					
9.3	Upon completion, will the project/scheme have moved traffic closer to residences, schools, hospitals, places of worship, sensitive habitats or other sensitive receptors?					
9.4	Will the works require diversion routes or temporary alterations to accesses? <u>If YES:</u> • Traffic management measures shall be timed to minimise disruptions and should be clearly signed.					

		Client				*Contractor*			
Impact on Community		L	M	S	N	L	M	S	N
	Adverse								
	Beneficial								
	Comments and Recommendations								

L = Large; M = Moderate; S = Slight; N = Neutral

		Client		Contractor	
10	**Hazardous Substances**	**YES**	**NO**	**YES**	**NO**
10.1	Will the works require the use of fuels, chemicals or other hazardous substances? If YES: • Hazardous substances must be stored away from sensitive receptors such as watercourses, habitat areas and residences. • Outside storage of oil (i.e. fuel) over 200 litres must comply with the Oil Storage Regulations • Hazardous substances must be stored in a secure location within drip trays and/or bunds. • Refuelling should be undertaken within a designated impermeable, bunded area or undertaken off site. Spill kits must be readily available.				

	Comments and Recommendations

		Client			Contractor	
11	**Waste**	**YES**	**NO**		**YES**	**NO**
11.1	Will the works cost in excess of £300,000? If YES: • Contact the *Client*'s Environmental Manager • Site Waste Management Plan (SWMP) is required. • Use the *Client*'s Site Waste Management Plan Template					
11.2	Will the works generate waste? If YES: • Ensure waste containers are not damaged and are suitable and safe for the type of waste. • Ensure that all waste containers are clearly labelled • Prevent dispersal of waste by wind, rain, animals or people. • Store waste away from drains, water courses and trees • Reduce the amount of waste created on site. • Reuse materials on site wherever possible. • Segregate waste for recycling • Ensure that the company removing waste is registered as a Waste Carrier. • Ensure that the waste is taken to an authorised waste facility					
11.3	Will the works generate hazardous waste, including contaminated soil? If YES: • All hazardous waste must be segregated from general waste. • Ensure that consignment notes are retained. • If more than 500 kgs of hazardous waste is produced each year, then the site must be registered as an hazardous waste premises with the Environment Agency.					

Comments and Recommendations

		Client		*Contractor*	
12	**Environmental Incidents**	**YES**	**NO**	**YES**	**NO**
12.1	Has any polluting substance been spilled over land, into a drain or watercourse? <u>If YES:</u> • Contact the Environment Agency • Inform the *Client*'s Environmental Manager				
12.2	Has any protected animal or habitat been harmed or damaged during the works? <u>If YES:</u> • Contact the *Client*'s Environmental Manager • Contact the *Client*'s Arboriculture and Landscape Manager				
12.3	Has any tree, planted area or grassed area been harmed or damaged during the works? <u>If YES</u>: • Contact the *Client*'s Arboriculture and Landscape Manager				

Comments and Recommendations

		Client			*Contractor*	
13	**Cumulative Impacts**	**YES**	**NO**		**YES**	**NO**
13.1	Will the project cumulatively cause adverse or positive impacts to any of the above if the evaluation took account of any other related project and / or schemes in the area?					

		Client				*Contractor*			
Cumulative Impacts		L	M	S	N	L	M	S	N
	Adverse								
	Beneficial								
	Comments and Recommendations								

L = Large; M = Moderate; S = Slight; N = Neutral

		Client			*Contractor*	
14	**Built Environment**	**YES**	**NO**		**YES**	**NO**
14.1	Would the project/scheme benefit from a Design Review and/or surgery? Note: Design Review for projects over £2m is compulsory					
14.2	Is the project/scheme compliant with *Client*'s streetscape design manual?					

Comments and Recommendations

Summary Table

	Client							*Contractor*						
	Adverse			**Neutral**	**Beneficial**			**Adverse**			**Neutral**	**Beneficial**		
	L	**M**	**S**		**S**	**M**	**L**	**L**	**M**	**S**		**S**	**M**	**L**
Natural Environment														
Cultural Heritage														
Air Quality (NOx & PM10)														
Climate Change Mitigation CO_2														
Climate Change Adaptation														
Noise and Vibration														
Soil and Water														
Community														
Cumulative Impacts														

The Project/Scheme has no significant impacts on the environment. No further appraisal is required	
The Project/Scheme may have significant impacts on the environment. Further appraisal is required	

	Comments and Recommendations

Approvals

	Client			*Contractor*		
Completed by:		**Date**			**Date**	
	***Client*'s Environmental Manager**			***Contractor's* Environmental Advisor**		
Confirmed by:		**Date**			**Date**	
	Client*'s *Service Manager			***Contractor's* Project Manager**		
As required:				As required:		
Confirmed by:		**Date**			**Date**	
	***Client*'s Arboriculture and Landscape Service Manager**			***Client*'s Arboriculture and Landscape Service Manager**		
Confirmed by:	-				**Date**	
				***Contractor's* Landscape Manager**		
				As required:		
Confirmed by:	-				**Date**	
				***Client*'s Environmental Manager**		

Note to *Client*'s *Service Manager*: Contact the *Client*'s Environmental Manager if the scope or detail of the project changes.	**Note to *Contractor's project manager*: Contact the *Contractor's* Environmental Advisor if the scope or detail of the project changes**

Supporting Information (e.g. drawing, maps)

Environmental best practice and legal compliance check list

The *Client* shall make an initial assessment on whether proposed works are subject to this check list requirement ia appropriate instruct the *Contractor* accordingly

		Client	*Contractor*	Approval or Consent Required	Approving or Consenting Authority	WHAT YOU HAVE TO DO
Green Estate	Works require removal of or affect tree(s), planted area(s), grassed area(s), injurious weeds			Approval for removal of trees, planted areas or grassed areas	*Client* Senior Manager	**Contact** *Client's* Arboriculture & Landscape Service Manager
Biodiversity	Protected animal species found on site			Approval to handle protected species	Defra Licensed Ecologist	**Stop works** and **Contact** *Client's* Arboriculture & Landscape Service Manager and *Client's* Environmental Manager
Heritage & Archaeology	Works affect or are close to any heritage (e.g. listed building) or archaeological feature (e.g. London Wall)			Consent to work on or close to listed structures or buildings	Local Authority Conservation Officer or English Heritage	**Contact** the *Client's* Environmental Manager

	Archaeological artefacts found on site during works			Approval to carry out works	Local Authority Conservation Officer or English Heritage	**Stop works** and **Contact** *Client's* Environmental Manager
Noise & Vibration	Works generate noise outside of Normal Working Hours			Section 61 Consent	Local Authority Environmental Health Officer	**Contact** *Client's* Service Manager. The Service Manager will liaise with the Local Authority
	Works are likely to create noise and vibration that will disturb sensitive receptors					**Comply** with BS5228 Part 1 and 2
Water	Works over a river (on a bridge) within 16m of a tidal river or 8m of non-tidal river, river bank, river wall or flood defence structure			Consent for Works Affecting Watercourse and/or Flood Defences	Environment Agency	**Contact** *Client's* Environmental Manager
	Works require			Environmental	Environment Agency	**Contact**

	discharge of water to a watercourse or water body			Permit		*Client's* Environmental Manager
	Works require discharge of water to sewer			Trade Effluent Consent	Thames Water	**Contact** *Client's* Environmental Manager
Hazardous Substances	Outside storage of oil (ie fuel) over 200 litres					**Comply** with Oil Storage Regulations
Waste	Works generate > 500kg of hazardous waste per site per annum			Site must be registered with the Environment Agency	Environment Agency	**Contact** *Client's* Environmental Manager
	Construction works costs over £300k			Site Waste Management Plan required		**Contact** *Client's* Environmental Manager
	Works produce waste					**Ensure** that the company removing waste is registered as a Waste Carrier and that waste is taken to an authorised

						waste facility
Dust	Works generate dust					**Comply** with the GLA and London Councils 'Control of Dust and Emissions from Construction and Demolition Best Prcatice Guide' 2006
Environmental Incidents	Has any polluting substance been spilled over land, into a drain or watercourse?					**Contact** the Environment Agency **Inform** *Client's* Environmental Manager
	Has any protected species or habitat been harmed? Has any tree, planted area or grassed area been damaged?					**Contact** *Client's* Arboriculture & Landscape Service Manager

Appendix 1/75: Access equipment for the *Client*

1. When requested, the *Contractor* shall provide the following items of access equipment in accordance with Clause 182AR:

    a. Van mounted hydraulic telescopic aerial access platform. Cage able to accommodate 2 people. Working height 10 metres, maximum outreach 8 metres. Full 360° rotation. Stabilizing jacks to operate within overall width of vehicle.

    b. 7.5 tonne mounted hydraulic telescopic aerial access platform. Cage able to accommodate 3 people. Working height 18 metres, outreach 13 metres centre-line of plant at heights between 0 and 9 metres. Full 360° rotation. Stabilizing system to allow either left or right outriggers only to be extended independently if work is limited to that side of vehicle. Working cage to have full 180° sideways rotation. Intercom link between cage and base. Full dual controls on base and cage. Silenced alternative power system to be mounted on base to enable operation in noise sensitive areas.

    c. Truck mounted hydraulic telescopic aerial access platform. Cage able to accommodate 3 people. Working height 29 metres, outreach 23 metres centre-line of plant at heights between 0 and 13metres. Full 360° rotation. Stabilizing system to allow either left or right outriggers only to be extended independently if work is limited to that side of vehicle. Working cage to have full 180° sideways rotation. Intercom link between cage and base. Full dual controls on base and cage. Silenced alternative power system to be mounted on base to enable operation in noise sensitive areas.

    d. Truck mounted hydraulic telescopic aerial access platform. Cage able to accommodate 3 people. Working height 42 metres outreach 23 metres centre-line of plant at heights between 0 and 32 metres. Full 360° rotation. Stabilizing system to allow either left or right outriggers only to be extended independently if work is limited to that side of vehicle. Working cage to have full 180° sideways rotation. Intercom link between cage and base. Full dual controls on base and cage. Silenced alternative power system to be mounted on base to enable operation in noise sensitive areas.

    e. Underbridge Inspection Unit. Platform to provide minimum 6 metres access length under bridge with vehicle on bridge deck surface. Platform to be able to operate at up to 8 metres depth below carriageway level. Vehicle to be able to move along bridge deck with cage below. Cage able to accommodate 3 people.

Appendix 1/76: Air quality monitoring

1. During operations involving the spraying of waterproofing membranes, the spraying of any other hazardous material, or an operation which generates dust, the following measures shall be taken:

    a. Air quality monitoring shall be undertaken during the operation involving the substance hazardous to health in any location that the general public have access to during the operation. The exposure limits shall be as follows, and measured over both the 8-hour Time Weighted Average (TWA) and the 15-minute short term reference periods, except that where no limit is given for one of the reference periods then the *Contractor* shall not be required to monitor the air quality over that period:

        i. Where there is exposure to a substance for which a Workplace Exposure Limit (WEL) is specified in Schedule 1 of the COSHH

Regulations and/or EH40/2005 – Workplace Exposure Limits, published by the Health and Safety Executive - then the level of exposure shall be in accordance with the COSHH Regulations and shall be not greater than 1% of the Workplace Exposure Limit;

ii. Where there is likely to be exposure to mixed substances hazardous to health then the combined levels shall be assessed in accordance with EH 40/2005.

b. In order that the above limits are not exceeded, the *Contractor* shall undertake one or more of the following, such that the levels of exposure are reduced, and the limits satisfied:

i. The operation involving the hazardous substance is controlled to reduce the dispersion of the substance (e.g. wetting of dust producing operation or adjusting spraying equipment);

ii. Areas of access to the general public are controlled using signed diversions. Adequate barriers shall be provided to ensure that unauthorised access cannot be made into the restricted buffer zone. Any measures taken shall be in accordance with the requirements for traffic and pedestrian, etc set out elsewhere in the *contract*;

iii. The provision of barriers or enclosures to control or prevent the dispersion of substances hazardous to health.

c. Notwithstanding the exposure limits above, none of the operations involving hazardous substances listed in this Appendix shall be undertaken if the wind speed is greater than 20 mph. In addition, if the speed of traffic which is within 10m of the operation shall fall below 20mph for a period of 5 minutes then the operation shall be suspended.

Appendix 2/1: List of buildings or structures to be demolished

1. When instructed by the *Client* by issue of a Task Order the *Contractor* shall provide demolish, break up and remove buildings and structures. The extent of any partial demolition of structures shall be as described in the Task Order.

2. Underground structures, chambers and foundations shall be demolished to the depths prescribed by the *Client*, properly cleaned out, and filled.

Appendix 2/2: Filling of trenches and pipes

1. The Contactor shall ensure that all voids resultant on removal of drains or services within areas accessible to the public are backfilled immediately.

2. 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.

3. If there is no foundation, the post shall be completely removed.

4. Before removal of sign posts carrying illuminated signs, the *Contractor* shall arrange for the disconnection of the electricity supply to the electrical Equipment.

Appendix 2/3: Retention of Material Arising from Site Clearance

Clearing

1. All materials arising from site clearance which are not required, or unacceptable for use in the permanent works and not included in for retention in the *Client* Task Order, shall become the property of the *Contractor* and shall be recycled or disposed of in licensed tips.

2. Materials included for retention in the *Client* Task Order shall be carefully dismantled, taken up or taken down, cleaned and retained for re-use, stacked, labelled and

protected or loaded, and transported to store as described in the Task Order and items damaged in this operation shall be replaced. All replacements shall be of equivalent quality to the original materials.

3. The *Contractor* shall provide and maintain a secure storage area of 300 m2 for the storage of such retained materials. The *Contractor* shall provide and maintain an inventory of all retained materials.

4. When instructed by the *Client* by issue of a Task Order the *Contractor* shall take from store and use retained materials.

5. Unless specified otherwise in the *Client* Task Order voids left by items that have been removed shall be backfilled immediately to match the existing surface in accordance with the appropriate Clauses in Series 600.

6. All existing road markings and road studs that become superfluous during completion of Task Order Works shall be removed immediately in accordance with the appropriate Clauses in Series 1200.

Appendix 2/4: Explosives and Blasting

Explosives and Blasting

1. Explosives shall not be used on this *Contract*.

Appendix 2/5: hazardous materials

Hazardous Materials

1. The police and the fire service have the primary role when dealing with emergencies involving spillage or leakage of hazardous materials onto the *Affected Property*. The *Contractor* shall provide assistance and materials for containment of any chemical spillage and shall remove any substances which have been rendered safe, but which shall be handled with care to avoid contamination or pollution.

2. The *Contractor* shall dispose of any hazardous material when ordered to do so by the *Client*, following consultation with the emergency services or Waste Disposal Officer. Any hazardous material shall be disposed of at a fully licensed site approved by the Environment Agency Waste Regulation Officer and in full compliance to the Environmental Protection Act 1990.

Appendix 3/1: Fencing

1. Steel Palisade fencing shall comply with BS 1722-12:2016. Standard panels shall be 2.75 metres wide and 2.00 metres high comprising 17 “D” pales with single point heads. Pales shall be secured by anti-vandal fixings. Fences shall be supplied galvanised unless otherwise specified on scheme specific drawings.

2. Concrete footings shall be 450mm by 450mm by 600mm deep unless otherwise recommended by the manufacturer.

3. Gates shall have posts, hinges and a sliding bar to take a heavy duty padlock. All gates shall have a retainer in the open position. Double gates shall have two centre stops and two retainers in the open position. Timber gates shall have ironmongery as shown on the scheme specific drawings.

4. Timber for fences shall be supplied and treated as specified in Clauses 304 and 311. The use of clear timber preservative is prohibited without the prior written acceptance of the *Client*.

Appendix 4/1: Road Restraint Systems (Vehicle and Pedestrian)

Vehicle Restraint Systems

1. When instructed by the *Client* by issue of a Task Order the *Contractor* shall provide

and erect Vehicle Restraint Systems (VRS). The minimum Performance Class Requirements (Containment Level, Impact Severity Level [ISL], Working Width Class [W], Vehicle Intrusion [VI], Performance Level, Redirection Zone Class [Z], Permanent Lateral Displacement Zone Class [D], Performance Class [P], Permanent Lateral Displacement Zone [D. y. x.], Exit Box Class[Z] and other requirements such as the Length of Need (as defined in TD19 (DMRB 2.2.8)), the Setback (as defined in TD 19), the minimum height of parapets, requirement for pedestrian provision and the maximum height of the road restraint that allows the required visibility shall be determined by the *Contractor* and approved by the *Client*.

2. For the purposes of clarity:

   a. "Connection" shall be the connection between a road restraint system and a rigid parapet, abutment or wall.

   b. "Transition" shall be the transition between two types of safety fence.

Acceptance of Proposals

3. If additional acceptance of proposals requirements are required the requirements shall be specified within the *Client's* Task Order.

Information Required to be Provided by the *Contractor* Prior to Installation

4. When the *Client's* Task Order specifies requirements for loads imposed by road restraint systems on foundations or structures the nominal loads (direct forces, moments and co-existent shears) that will be transferred from the barrier or parapet to the structure or foundation shall be provided by the *Contractor*.

Protection Against Corrosion

5. When instructed by the *Client* by issue of a Task Order the *Contractor* shall carry out surface preparation and protection against corrosion of all steel vehicle parapets and steel components of combined metal and concrete vehicle parapets shall comply with Series 1900.

Pedestrian Restraint Systems

6. The location of pedestrian parapets and pedestrian guardrails are shown on scheme specific drawings.

7. Pedestrian guardrails shall be manufactured from Steel Grade 43A or 43C to BS 4360, conform to the requirements of BS 7818:1995 and be erected in accordance with the recommendations of the manufacturer.

8. Guardrails and all component parts shall be galvanized after manufacture by the hot dip process in accordance with BS EN ISO 1461:2009.

9. The colour and type of the finishing coat shall be instructed in the Task Order.

10. When amending existing guardrail installations then the style of guard railing shall be to match existing or as described on the drawings for instructed works.

11. The *Contractor* shall be responsible for the measurement on site and include for any special lengths and will need to establish any guardrail rake to suit the slope of any paved surface.

12. Guardrails shall be erected to flowing alignment both in plan and elevation unless otherwise stated by the *Client*.

13. The height of new panels installed into an existing arrangement shall suit the adjacent in-situ panels unless otherwise stated by the *Client*.

14. Unless required otherwise in the instructing Task Order, materials for new pedestrian

guardrail arrangements shall be as follows:

a. Overall height of railing (as installed) shall be 1.0m high.

b. The system shall consist of short intermediate or end stub posts on to which detachable railing panels are directly mounted and secured. Stub posts shall have an extended root for below ground planting.

c. The system shall include measures for connections to secure adjacent panels in an arrangement. Connections shall allow hinging/pivoting between panels to take in radii or other alignment shifts.

d. The system shall include modular vertical upright end units for mounting to the end panels in the arrangement.

e. Railing panels shall consist of vertical bars providing a transparency of 75% at a slight angle of less than 2.5°. Panels shall not include intermediate horizontal bars.

f. The system shall be capable of meeting or exceeding BS 7818:1995 Design load class 2 in the intended service conditions.

15. All pedestrian guardrail posts shall be compatible with the relevant panels.

16. Concrete foundations to pedestrian guard-rail posts shall be at least 300mm x 300mm x varying depth. The depth to the bottom of the foundation shall be 150mm below the bottom of the post when the post is in its permanent position. The minimum depth to the base of the foundation from existing ground level shall be 400mm. The concrete shall be mix ST2 to Clause 2602. The surface finish detail above the foundation around the base of posts shall be as required in the instructing Task Order.

17. Pedestrian guardrails and pedestrian parapets shall comply with the requirements of TD 19 (DMRB 2.2.8) Road Restraint Systems (BS 7818:1995). The required pedestrian restraint class shall be agreed by the *Client*.

18. Legacy systems shall comply with the requirements of Clause 409.2 (i) & (ii).

Acceptance of Proposals

19. If additional proposals requirements need acceptance, the requirements shall be specified within the *Client*'s Task Order.

20. When the *Client*'s Task Order specifies requirements for loads imposed by road restraint systems on foundations or structures the nominal loads (direct forces, moments and co-existent shears) that will be transferred from the barrier or parapet to the structure or foundation shall be provided by the *Contractor*.

21. The overall layout and location of safety barriers, terminals, transitions, removable barrier sections (RBS) and crash cushions shall be as indicated in the *Client*'s Task Order.

Appendix 4/2: Information required to demonstrate compliance of transitions and terminals

Vehicle Restraint Systems General

1. When required to demonstrate compliance with the requirements of the Task Order works instructed by the *Client* the *Contractor* shall complete and submit the proforma included in NG Appendix 4/2 with supporting information for each type of transition or terminal as required by Clause 401 demonstrating compliance with BS EN 1317-1:2010, BS EN 1317-2: 2010, DD ENV 1317-4:2002 to the *Client*.

Appendix 5/1: Drainage, manholes, chambers and the like

General

1. UPVC and thermoplastic pipes shall be used for carrier drains or gully connections if agreed with the *Client* before commencement of the Task Order works.
2. Perforated with watertight joints and with a pipe stiffness class, creep ratio and impact resistance as described in Task Order.
3. Vitrified clay pipes and fittings and pipe joints for drains and sewers shall comply with BS EN 295.
4. Concrete pipes and ancillary concrete products shall comply with BS 5911.
5. Unless otherwise described in only one type of pipe shall be used within any individual drain or service duct between consecutive chambers.
6. Below ground sulfate resisting cement is required for pre-cast concrete pipes, pre-cast concrete chamber components and all in-situ concrete. Concrete bed and surround shall comply with Class 2 sulfate resistance.
7. GRP pipes shall be used for carrier drains or gully connections, subject to class proffered being approved, if agreed with the *Client* before commencement of the Task Order works
8. Hydraulic flow capacities shall be as indicated by the Hydraulics Research "Tables for the Hydraulic Design of Pipes, Sewers and Channels" eighth edition, for a friction coefficient of 0.6mm. A minimum flow velocity of 0.75m/s is required.

Pipes and Bedding

9. Surface water carrier drain design groups are to be indicated in Task Order. The permitted alternative pipe/bedding options for specified groups are given in Table 5.1. Trench and bedding details shall be in accordance with Highway Construction Detail F1. All joints in new surface and foul water sewers and drains shall be watertight. New works shall be tested for water-tightness upon completion.

Table 5.1 Surface Water Drainage Schedule

Pipe Dia (mm)	Pipe Group	Vitrified Clay			Precast Concrete			Ductile Iron	GRP	Thermoplastic	
		120	160	200	L	M	H			PVCu	PP/PE
100	6		ASBF N	ASBF N							
100	12		ASBF N	ASBF N							
100	16		Z	Z							
150	6		ASBF N	ASBF N	ASB N	ASB F N		S	S	ST	ST
150	12		ASBF N	ASBF N	ASB	ASB F		S	S	ST	S
150	16		Z	Z	Z	Z		Z	Z	Z	Z
225(1)	6		ASBF	ASBF N	AS	ASB		S	S	ST	ST
225(1)	12		ASBF	ASBF	AS	ASB		S	S	S	S
225(1)	16		Z	Z	Z	Z		Z	Z	Z	Z
300	6		ASBF N	ASBF N	AS	ASB		S	S	ST	ST
300	12		ASBF	ASBF		A		S	S	S	S
300	16		Z	Z	Z	Z		Z	Z	Z	Z
375(1)	6		ASBF N	ASBF N	A	ASB	ASB F	S	S	ST	ST
375(1)	12		ASBF	ASBF		AS	ASB	S	S	S	S
375(1)	16		Z	Z	Z	Z	Z	Z	Z	Z	Z
450(1)	6	ASB F	ASBF N			ASB	ASB	S	S	ST	ST
450(1)	12	ASB F	ASBF			A	AS	S	S	S	S
450(1)	16	Z	Z			Z	Z	Z	Z	Z	Z

Note
For Ductile Iron, GRP and Thermoplastic, 250mm dia pipe equates to 225mm, 400mm dia pipe equates to 375mm, and 500mm dia pipe equates to 450mm.

10. Filter drain design groups are indicated on scheme specific drawings. The permitted alternative pipe/bedding options for specified groups are given in Table 5.2. Trench and bedding details shall be in accordance with Highway Construction Detail F2.

Table 5.2 Filter Drain Schedule

Drain Type (Lower Trench)	Drain Type (Surface Level)	Pipe Dia (mm)	Pipe Group	Vitrified Clay		Precast Concrete		Thermoplastic	
				160	200	L	M	Structured Wall	SDR 41
GHIJKLM	VWXY	150	4	√	√	√	√	√	
GHIJKLM	VWXY	225	4	√	√	√	√		√
Notes For Lower Trench, refer to HCD Drawing F2. For Surface Level, refer to HCD Drawing B15.									

11. Fin drains and narrow filter drains shall be any Type as Highway Construction Details F18 and F19, as required in the instructing Task Order. Unless required otherwise in the instructing Task Order, backfill to filter drains shall be either Type A to Clause 505.

Jointing of Pipes

12. Joints in surface water drains shall be watertight in accordance with Clause 504.2 and tested in accordance with Clause 509 . Wrap type joints shall not be used.

13. Where new drains of different diameters are to be connected to existing pipes, proprietary reducers shall be used at the point of connection.

14. Connections to existing drains are to be made with rigid joints.

Backfilling of Trenches and Filter Media

15. Unless otherwise stated by the *Client* by instruction within a Task Order trenches and filter drains shall be back filled as described in Clause 505.

16. The filter material type used by the *Contractor* shall be as instructed in the *Client*'s Task Order.

17. The replacement of filter drain media materials in drainage systems shall include for the following operation:

    a. Removal of all filter media from the area affected by the Task Order works;

    b. If instructed within the Task Order, removal and replacement of filter trench pipes and pipe bedding;

    c. Backfilling of the filter drain trench with new or recycled filter media material compliant with the requirements of Clause 505.

18. All materials removed from trenches other than materials for re-cycling shall be taken off site.

Connecting to Existing Drains Chambers and Channels

19. When instructed by the *Client* by issue of a Task Order the *Contractor* shall provide connections to existing drains chambers and channels. The connection and jointing requirements shall be as described within the Task Order

20. When abandoned pipes outside any carriageway works are identified as part of the Task Order works the *Contractor* shall break out within one (1) metre of formation and remove the pipe and the excavation shall be backfilled with acceptable material to Clause 608 and compacted to Clause 612. Drains in excess of one metre (1) from formation to be abandoned outside any carriageway works shall be sealed throughout its length with a cement/pfa mixture grout as described in Clause 506

Manholes and Chambers

21. Manholes and inspection chambers shall be built from brick, precast concrete or in-situ concrete, as required in the instructing Task Order, and shall comply with BS EN 124-5:2015 and F-series Highway Construction Details except that:

    a. 1050mm diameter precast concrete chamber ring construction shall be acceptable for manholes not exceeding 1.2 metres in depth with a pipe diameter not exceeding 225mm.

    b. All precast concrete manholes and chambers shall be surrounded by 150mm Class ST2 sulphate resisting concrete.

    c. Unless required otherwise in the instructing Task Order, ST4 concrete for in-situ concrete manholes and chambers shall be sulphate resisting concrete.

Catchpits

22. Catchpits shall be built from brick, precast concrete or in-situ concrete, as required in the instructing Task Order, and shall comply with relevant Types as Highway Construction Details F11 and F12, except that:

    a. All precast concrete catchpits shall be surrounded by 150mm Class ST2 sulphate resisting concrete. Connections to communicated gullies shall, as a minimum, be to a self-cleansing gradient.

    b. Unless required otherwise in the instructing Task Order, ST4 concrete for in-situ concrete manholes and chambers shall be minimum 150mm thick sulphate resisting concrete.

Gullies

23. In-situ and precast concrete gullies shall comply with Highway Construction Detail F13. Gullies shall be surrounded by 150mm Class ST2 sulphate resisting concrete.

24. 375mm diameter x 750mm deep gullies shall be used in carriageways unless otherwise specified by the *Client*. 300mm diameter x 600mm deep gullies shall be used in footways unless otherwise specified by the *Client*. All gullies shall be trapped.

25. Where chute gullies are needed, due to shallow depth, they shall not be connected to a catchpit. Chute type gullies shall not be installed in areas subject to excessive leaf fall or areas prone to flooding.

26. It will not normally be acceptable to connect one gully connection directly to another unless instructed by the *Client*.

Covers to Manholes, Chambers and Gullies

27. Unless required otherwise in the instructing Task Order, covers to manholes, chambers and gullies shall comply with BS EN 124-X:2015 as follows:

    a. A15
    Areas which can only be used by pedestrians and cyclists.

    b. B125
    Footways, pedestrian areas and comparable areas, car parks or car parking decks.

c. C250
Areas at the kerbside of roads up to 0.5m into the carriageway or up to 0.2m into the footway when measured from the kerb edge.

d. D400
Carriageways of roads (including pedestrianised streets), hard shoulders and parking areas.

28. A15, B125 and C250 covers shall be solid one-piece top covers 100mm deep. D400 covers shall be double or triple triangular cast iron non-rocking 100 or 150mm deep. Infill Covers shall be in units of 300 x 600mm for larger chambers. Maximum infill cover depth shall be 75mm, except for recess tray covers which may be up to 90mm.

29. Recessed covers and frames shall be manufactured in steel, hot dip galvanised to the requirements of BS 729. Covers shall be of a 'slide out' design. For footway areas, covers shall be to Load Class B specified by the Fabricated Access Cover Trade Association (FACTA). The orientation of covers and frames shall be as required in the instructing Task Order or directed by the *Client* on site.

30. Unless required otherwise in the instructing Task Order, infill to recess tray covers shall be with the same materials as used to the existing or proposed new surface of the neighbouring pavement(s). Where this requires the use of Modular Unit infill then, unless instructed otherwise in the Task Order or on-site by the *Client*, Units shall be cut-in such that the paving bond to the neighbouring surfaces continues visually uninterrupted across the cover. Any resulting cut units not meeting BS 7533 dimensional requirements shall not constitute a defect. All Modular Units shall be mortar adhesive bedded to frames using the frame and cover manufacturer's recommended adhesive for the service conditions. Unbound granular laying course materials shall not be used. Where the neighbouring pavement surface is composed of bound Modular Units, then the same jointing mortar shall be used to Modular Units within the cover. Where the neighbouring pavement surface is unbound then, unless required otherwise in the instructing Task Order, Modular Units shall be jointed with J-X1 stabilised granular jointing material as Appendix 11/1.

31. Unless required otherwise in the instructing Task Order, all covers to the *Clients* drainage and lighting chambers and rodding eyes located in Modular Unit surfaced footway or cycleway pavements shall be 450 x 600 mm recess tray covers as (12) above. The depth of covers and frames shall be sufficient to accommodate the Modular Units used to the neighbouring pavement surfaces.

32. Gully covers shall be of the following types, unless required otherwise in the instructing Task Order:

a. Type A
450 x 450 cast iron non-rocking 100mm deep with a minimum waterway area of 900cm2.

b. Type B
430 x 370 cast iron 100mm deep with a minimum waterway area of 1000cm2.

c. Type C
560 x 400 ductile iron kerb inlet type gulley 190mm deep.

d. Type D
505 x 345 ductile iron 150mm deep with a minimum waterway area of 690cm2.

33. All gully covers shall be captive hinged type and have a bar or grid pattern which is "cycle friendly" as agreed with the *Client*.

Brickwork to Chambers and Gullies

34. Brickwork for chambers and gullies shall be built in English Bond unless required

otherwise in the instructing Task Order.

Drawpit Chambers and Access Boxes

35. Drawpit chambers shall be constructed as per Typical Arrangement Drawing LBS/T/005 from brick or precast concrete, as required in the instructing Task Order.

36. Unless required otherwise in the instructing Task Order, where trenches and ducting are required, the installation shall be provided with drawpit chambers so that any cable can be installed or removed without the need for further civil engineering works. Drawpit chambers shall be provided at the end of each duct run, where the duct changes direction and on both sides of the carriageway. Beacon pole pits shall be installed immediately adjacent to each beacon pole.

37. The existing location of cable drawpit chambers and beacon pole pits will be shown on the drawings along with proposed additional or new ducts and pits. If any changes need to be made because of site conditions then these shall be agreed in writing with the *Client* and recorded on the as-built drawings.

38. Particular care shall be taken to ensure, where possible, drawpit chambers are sited to avoid areas of pedestrian activity.

39. Brick drawpit chambers shall be are to be brick built in 215mm English Bond brickwork using Class B engineering bricks with a Class A mortar bond. The base shall be 100mm Class ST2 concrete on a 100mm compacted layer of Type 1unbound mixture. Drainage through the base shall be via a vertical 100mm plastic duct 300mm long. Any alternative form of drawpit chamber construction shall be approved by the *Client* prior to the start of construction.

40. Unless required otherwise in the instructing Task Order, concrete for in-situ concrete draw pit chambers shall be 150mm thick ST4 sulphate resisting concrete.

Appendix 5/2: Service duct requirements

1. Details of duct layouts are shown on the drawings.

2. Design groups for service ducts are as follows:

Pipe Group 1	2 No.	100mm dia	UPVC/ polyethylene
Pipe Group 2	2 No	100mm dia	split UPVC
Pipe Group 3	4 No	100mm dia	UPVC
Pipe Group 4	4 No	100mm dia	split UPVC
Pipe Group 5	2 No	150mm dia	UPVC
Pipe Group 6	2 No	150mm dia	split UPVC
Pipe Group 7	4 No	150mm dia	UPVC
Pipe Group 8	4 No	150mm dia	split UPVC
Pipe Group 9	2 No	50mm dia	UPVC/ polyethylene
Pipe Group 10	1 No	50mm dia	UPVC/ polyethylene
Pipe Group 11	1 No	100mm dia	UPVC/ polyethylene
Pipe Group 12	6 No	100mm dia	UPVC
Pipe Group 13	6 No	100mm dia	split UPVC
Pipe Group 14	4 No	50mm dia	polyethylene
Pipe Group 15	3 No	50mm dia	polyethylene
Pipe Group 16	3 No	100mm dia	polyethylene

3. Cover to road crossing ducts shall be 600mm minimum unless otherwise described in drawings or instructed by the *Client*. Covers to ducts in footways shall have a minimum of 450mm cover unless otherwise indicated. Under-kerb ducts shall extend a minimum of 50mm beyond the carriageway face of the kerb and a suitable marking pin

shall be inserted in the carriageway to mark the duct's position.

4. Polypropylene draw cords, with a breaking weight of 5.5kN be installed in all ducts and secured by fixing the draw cord to the stopper. One metre of slack rope shall be provided at either end of every duct and terminated at ground level or inside chambers.

5. Duct configuration may be altered to suit site requirements. The configuration shall be ordered by the *Client* in a Task Order.

6. Ducts shall be laid such that the lowest duct in the excavated trench is at the depth to invert detailed in the Task Order unless instructed otherwise by the *Client*.

7. Where ducts have existing cables already installed, a cobra rod may be used to prove continuity of the existing duct. A decision to replace existing ducts with new shall only be taken by the *Client*.

8. All ducts shall be laid in a straight line. In cases where this is not possible, the deviation from straight shall be via a long radius bend and shall not exceed 35o. If necessary, a series of straight chords shall be used to negotiate bends with drawpits at the intersection of each of the chords.

9. All ducts shall be thoroughly brushed and mandrelled to prove no debris or excessive deflection. Longitudinal and cross-carriageway cable ducts shall be proved by drawing a wooden or plastic mandrel through as the ducts are laid. Local ducts from chambers to cabinets shall be proved by drawing through each completed length of duct a spherical mandrel of diameter 10% less than the nominal bore of the duct. On the successful completion of each pull the *Contractor* shall certify compliance of the duct and immediately plug the duct.

10. Where cables are required to be laid in ducts, the *Contractor* shall swab through the duct prior to drawing in the cables and a further draw rope. On completion of cabling, ducts shall be left with a draw rope in place and re- sealed with a suitable material, to adequately seal the ducts against the ingress of foreign matter.

Bedding, Laying and Surrounding of Pipes

11. Plastic ducts for electrical services shall be red or black overlaid with purpose made marker tape, for power, orange for Street Lighting and Traffic Signals and green or black for data cables. Power and data cables (including fibre optics) shall not be installed in the same duct. The electrical service shall be permanently marked on the outside of the duct in white.

12. The bed to service ducts shall be 100mm of concrete grade ST4. The surround and up to the underside of base course shall be concrete grade ST4 and above this level reinstatement shall be as stated in the Task Order.

13. Draw pit chambers for electrical supply cables shall be as detailed in drawing XXXX.

14. The cover material for ducts in footways shall be the same as the duct bedding material.

15. The backfill above the cover material shall be Class 8 material to Table 6/1 up to formation level and above this level reinstatement shall be as stated in the Task Order.

Appendix 5/3: Surface water channels and drainage channel blocks

1. Unless stated otherwise in the Task Order, the Surface Water channels and drainage channel Blocks shall be:

2. Certified to Load Class C as defined in DIN 19580/EN 1433;

3. 100mm nominal internal width;

4. Installed with manufacturer's grating appropriate to the Load Class of the place of installation and locked securely in place using the manufacturer's locking system;

5. Installed in accordance with the manufacturer's instructions and in accordance with recognised good practice.

Appendix 5/4: Fin drains and narrow filter drains

1. Fin drains and narrow filter drains shall be types 5, 6, 7, 8 or 9 and shall be constructed in accordance with Highway Construction Details F18, F19 and F20, except that, where required to be located beneath a constructed pavement, unless required otherwise in the instructing Task Order, granular backfill material shall finish at subbase formation level.

2. The maximum permissible O90 size of the geotextile shall be 400 microns. (Ref BS EN 1897:2001). The permeability of the geotextile shall be not less than 30 litres/m2/sec.

3. The minimum long term in-plane flow rates shall be:

   a. Type 5 200.

   b. Type 6 100.

4. Internal pipe diameter shall be 100mm.

5. D15 particle size for granular material in narrow filter drain Type 8 shall be as indicated in scheme specific drawings.

6. Composite Drain considerations

   a. Non-woven needle punched or heat bonded or woven flat type made from polyethylene, polyester or polypropylene filaments.

   b. Allow water to flow through perpendicular to the principle plane, in either direction, at a rate of no less than 30 litres/m²/s under constant head of water of 100mm.

Fin Drains and Narrow Filter Drains

7. Fin Drains and Narrow Filter Drains shall be in accordance with Series 500 and any additional instruction given by the *Client* in the Task Order.

Materials

8. Have a size distribution of pore openings such that 90% are between 100 micron and 500 micron, determined in accordance with BS EN ISO 13431:1999, BS EN 1897:2001.

Appendix 5/5: combined drainage and kerb block systems

1. Locations where combined drainage and kerb systems shall be detailed in the Task Order.

2. Combined drainage and kerb systems, complete with outfalls, silt traps, access covers and stop ends, shall be laid as shown on drawings included with the Task Order and as defined in this Appendix.

3. The design requirements of combined drainage and kerb system units are as follows:

   a. Units shall be laid to a horizontal alignment that conforms to Clause 702 and to be as that for kerbs, channel blocks and edge lines. The vertical alignment shall conform to table 7/1, Clause 702 of Series 700 and to be as that for road surfaces;

   b. The front profile of combined drainage and kerb system units above

carriageway level shall be the same as half battered precast concrete kerb to Clause 1101, unless otherwise stated in the Task Order;

c. Upstand of combined drainage and kerb system units above carriageway level shall be 125mm, unless otherwise stated in the Task Order;

d. Combined drainage and kerb system units shall not vary from the manufacturers stated dimensions by more than 5mm in width, height or length;

e. Combined drainage and kerb system units shall be capable of being contained inside the outline of the structural element (including for all concrete bedding and backing). Any dimension not completed by the insertion of the unit and its bedding/backing shall be made up with concrete mix ST4, laid in conjunction with the units bedding and backing;

f. combined drainage and kerb system units shall be of uniform appearance and grey in colour, similar to standard concrete kerbs;

g. Units shall be bedded and backed with a minimum of 150mm of concrete mix ST4. Bedding shall extend a minimum of 75mm in front of the unit and a minimum of 150mm behind the unit. Backing shall extend up to 50mm from top of unit from where it shall be chamfered away from the unit at 45 degrees.

Classification

4. Combined drainage and kerb system classification shall be as instructed by the

5. *Client* within the Task Order.

6. Units shall be thermally stable and unaffected by the range of temperatures likely to arise in service.

7. Units shall be capable of complying with the transverse strength requirements of BS 726-1: 1990 for kerb type gully covers and frames.

8. Units shall be capable of withstanding an impact load of D400, throughout the range of temperatures likely to be experienced in service.

Hydraulic Design Parameters

9. Units shall be capable of containing the flow rate specified in the Task Order.

10. Units shall meet the following hydraulic design parameters:

    a. Water inlets slots shall be either continuous slots or discrete apertures with entry areas (measured in the vertical plane) of not less than 0.0075m² and totalling not greater than 0.015m²/m length.

    b. Minimum waterway areas shall be 0.075m² for one-part blocks or the combined parts of two-part blocks and shall be 0.04m² for the lower part of two-part blocks.

    c. Discharge openings shall be circular and of 225mm minimum diameter or shall be elliptical of minimum area of 0.05m².

11. No reduction in the internal waterway cross section of the unit shall be permitted at any point, connection or chamber. Minimum internal waterway cross sectional area shall be 0.075 m2.

12. The units shall have a capacity equal or greater than the outlets. If the units shall have a lesser capacity than the designed outlets, additional outlet points shall be provided at the *Contractor's* own expense.

13. Comparable capacities are to be evaluated in accordance with Hydraulics Research (Wallingford) "Charts for the Hydraulic Design of Channels and Pipes" and a

roughness value (Ks) = 0.6mm.

Outfalls, Silt Traps and Access covers

14. Silt traps are to have no outfall facilities but be built into the run of units, be watertight and have a silt holding capacity of not less than 0.5 m3.

15. Outfalls are to have an outfall facility of at least 150mm internal diameter and have a silt holding capacity of not less than 0.3 m3 combined with the outfall. All outfalls are to be trapped.

16. Access covers are to be placed at all silt traps, outfalls and at the heads of runs of the units. Covers are to be sufficiently large to allow mechanical means of cleaning.

17. Outfall pipes from units to other pipes or to silt traps and the like shall have a minimum diameter of 225mm. Other non-circular openings shall have a minimum dimension of 200mm and a minimum area of 0.05 m2.

General

18. Any cover plates, access plates and the like shall be manufactured from at least Grade 43A1 mild steel to BS 4360 and be hot dip galvanised in accordance with BS EN ISO 1461:2009. The strength of the plates shall not be less than those defined in paragraph 6 of this Appendix.

19. They shall further have a span to square of the thickness ratio that does not exceed 1:8.

20. Facilities shall be available to collect surface water from both sides of the unit by the turning of the upper part of the unit or by purpose factory made holes formed in the centre of the rear of the units.

21. Joints shall be provided within the units which pass over bridge expansion/Contraction joints. Such joints shall be capable of accommodating the degree of movement anticipated without damage to the units themselves and whilst remaining watertight.

Appendix 5/6: Linear drainage block systems

1. Locations of linear drainage block systems are shown on scheme specific drawings.

2. Linear drainage block systems shall be designed and installed in accordance with Clause 517.

3. The system shall be constructed with constant inverts unless otherwise indicated on scheme specific drawings.

4. Sump units and access rodding units shall be provided where described in the Task Order.

5. Where required the linear drainage channels shall be connected into new gullies.

6. See Appendix 11/1 for further requirements.

Appendix 5/7: Thermoplastics structural wall pipes and fittings

1. The *Contractor* shall submit to the *Client*, prior to commencement of the *Contract*, completed information sheets in accordance with Tables 1 to 3 within NG5/7

Appendix 5/70: Renovation of highway drainage long-sleeve cured-in-place linings

Materials

1. A hot-cure thermosetting resin system shall be selected for highway drainage systems, such that its properties are suitable for the mechanical and chemical requirements of the completed product. Resins shall contain only those additives approved by, and in quantities defined by, the resin manufacturer to control viscosity and pot life.

2. The unreinforced fully-cured resin shall have an elongation at break greater than 2.5% and a heat distortion temperature 20°C above the expected maximum service temperature of the liner when tested in accordance with Method 320C of BS 2782: Methods 320A to 320C and BS EN ISO 75-2 respectively.

3. The reinforcement shall exist singly or in any combination of fibrous materials manufacturedfrom synthetic or mineral fibre. For combinations of reinforcement there shall be good adhesion between the different layers and the bonded interface shall be highly resistant to the ingress of water.

4. Stitched or heat-welded joints in continuous tube linings shall be resistant to the corrosive action of the sewer environment.

5. Non-corroding mechanical strengthening tapes or strips may be interleaved between the layers of reinforcement to control longitudinal stretching during installation.

6. Any coating on the internal surface of the finished Cured-in-Place liner shall be adequately bonded to the liner. It shall have no adverse effect on the resin system used in the body of the lining.

Construction

7. The lining shall consist of an inner impermeable membrane, optional longitudinal strengthening tapes and a fibrous reinforcement material impregnated with a thermosetting resin.

8. The volume of resin used to impregnate the lining shall be between 0 and 15% greater than the nominal volume of the reinforcement layers. Resin impregnation of the reinforcement shall be carried out under vacuum in a controlled manner and the resin shall be evenly dispersed throughout the liner and be free from entrained air. Mixing and impregnation the resin materials shall be carried out at an ambient temperature.

9. The resin system and lining thickness shall be selected to meet the chemical and structural requirements of the lining.

10. Where the liner is built up using more than one layer of reinforcement, the joints in the reinforcement shall be offset to prevent excessive local thickening of the completed Cured-in-Place liner.

Dimensions

11. The liner shall be fabricated so that, when installed, an intimate contact between itself and the host pipe is maintained around its entire circumference. The internal surface of the installed liner shall be smooth and free from significant wrinkles. The manufactured length and thickness of the lining tube shall include allowances for any longitudinal and circumferential stretch during installation.

12. The liner shall be installed in continuous lengths between points of access to the sewer.

13. The mean wall thickness of the composite liner shall not be less than the design thickness, and the minimum wall thickness shall not be less than 80% of the design thickness. The minimum thickness requirement does not apply to points where local wall thickness reduction is caused by irregularity in the host pipe.

14. The maximum allowable wall thickness compatible with the hydraulic design shall be included in the information provided by the *Contractor*.

Installation

15. In all circumstances where uncured resin may be squeezed from the lining into apertures within the existing drainage system, thereby reducing the thickness of the lining, a suitable pre-liner shall be installed. In particular, a pre-liner shall be installed

prior to installation of the lining in all brick sewers.

16. In sewers with running infiltration, a pre-liner or external membrane shall be used to prevent contamination of the resin system by water entering the existing pipeline.

17. Prior to installation, the *Contractor* shall provide a method statement for the intended cure procedure along with the design of the lining. The *Contractor* shall provide an automatic data logger for recording temperature, pressure and time for the entire curing procedure. The logger shall have GPS facility to define the location of reading being taken. Recording shall be taken once every 2 minutes throughout the curing cycle.

Short Sleeve (Patch) Repairs

Materials

18. A resin system shall be selected such that its properties are suitable for the mechanical and chemical properties required for the completed product. Resins shall contain only those additives approved by, and up to the limits defined by, the resin manufacturer to control viscosity and pot life.

19. The unreinforced fully cured resin shall have an elongation at break greater than 2.5% and a heat distortion temperature 20oC above the expected maximum service temperature of the liner when tested in accordance with Method 320C of BS 2782: Methods 320A to 320C and BS EN ISO 75-2 respectively.

20. The reinforcement shall exist singly or in any combination of glass fibre and polyester felt layers. For combinations of reinforcement it is advised there is good adhesion between differing layers and the bonded interface is highly resistant to the ingress of water.

21. Stitched or heat-welded joints in continuous tube linings shall be resistant to the corrosive action of the sewer environment.

Construction and Manufacture

22. The lining sleeve shall be prepared as either:

23. A rectangular patch wrapped around an inflatable packer which, when expanded, forms an annulus against the sewer wall; or

24. A lining sized to the required dimensions and stitched, or heat welded, into a continuous sleeve.

25. For the lining sleeve formed in (1), the width of the region overlap must lie between 10 to 20% of the sleeve circumference.

26. The volume of resin used to impregnate the lining shall be between 0 and 15% greater than the nominal volume of the reinforcement layers. Resin impregnation of the reinforcement shall be carried out in a controlled manner.

27. During mixing and impregnation, the temperature of the resin materials shall be not be less than 15C.

28. The resin system and lining thickness shall be selected to meet the chemical and structural requirements for the lining.

Dimensions

29. The liner shall be fabricated so that when installed an intimate contact between itself and the host pipe is maintained around its entire circumference. The internal surface of the installed liner shall be smooth and free from wrinkles. The manufactured length and thickness of the patch lining tube should include allowances for any longitudinal and circumferential stretch during installation.

30. The liner shall be installed in a length that is approximately one metre greater than the length of the region identified for repair.

31. The wall thickness at all points around the circumference of the liner sleeve shall be at least the minimum specified in the design.

32. For each sewer repair carried out, a sample shall be fabricated and cured above ground in a plastic pipe of a diameter similar to that of the sewer being repaired.

33. Once curing of the localised patch repair has been completed, the cured sample shall be delivered to the testing laboratory approved by the *Client*. If all tests are passed, then no further quality control testing shall be required on this patch repair except for the separate verification of wall thickness.

Resin Injection

Repair Process

34. Resin injection is a type of pipe renovation by which individual defects can be repaired using an epoxide particulate composite as sealant.

35. The resin injection method of sewer renovation is generally carried out without excavation working from existing manholes. It can be used on a range of sewer materials (clayware, concrete, cast iron, etc) in diameters ranging from 100mm to 600mm. It is potentially capable of structurally repairing circumferential cracks, longitudinal cracks, open or displaced joints, infiltration, exfiltration, holes, defective connections, voids, partial collapses, and problems of root ingress. The repair shall provide a totally watertight seal on individual defects.

36. The renovation process is operated from a mobile, self-contained unit incorporating CCTV, high pressure jetting, drilling equipment and the resin injection equipment itself. A computer logging system provides automated monitoring of the curing process.

37. Internal visual inspection is carried out by CCTV in the defective pipeline for assessment of pipe condition. The survey is recorded on DVD. Cleansing, desilting, blockage clearance and descaling take place prior to repair by using high pressure jetting. When necessary, cutting equipment is used for removal of intruding lateral connections, encrustation or root intrusion.

38. The repair is carried out by introducing a flexible cylindrical repair head through a manhole into the defective length of pipeline. The head is positioned with the aid of hand-winching equipment and CCTV.

39. To allow for misalignment or ovality in the existing pipe, the repair heads have a clearance allowance for each standard diameter. The repair head is connected to the repair vehicle by three umbilical lines: the compressed air line, the resin line and the hardener line. When located alongside the defect, the repair head is pressurised through the compressed air line and expands. Due to the nature of the head design, the two ends of the tube expand against the inside surface of the sewer, while the central section leaves a small annulus between the now rigid outer surface of the repair head and the defective sewer wall. The resin and hardener are pumped through separate lines into a mixing chamber located inside the repair head. The mixed material is introduced into a sump cylinder and then into the defect through an injection port in the central section of the repair head wall.

40. Since the epoxide system is thixotropic, the agitated components flow easily through the lines. The pumping pressure then enables the mix to dispense through fine cracks and to fill the surrounds before gelation commences. Within a few minutes the repair mix gels into a highly viscous state and can be pumped against a back pressure ensuring a complete repair with a reinforcing collar inside the sewer pipe ending with tapered feather edges. The repair head continues to act as a former and can be

removed when the resin has cured to a sufficient structural strength.

41. The mixing of the two components causes an exothermic chemical reaction. The heat produced is monitored by pre-positioned thermocouple(s) and a data logger is used to collect the readings of temperature vs time. Since the thermocouples are situated in the sump cylinder near the actual repair, the recorded exotherm peak is indicative of the degree of cure of the resin and the state of the repair underground. The cure time of a typical underground repair is approximately 2 hours, depending on the mass of the material used and on the heat dissipation into the environment.

Manual Controls on Process

42. Resin and hardener delivery ratio shall be checked prior to and after repair.

43. In-line pressure gauges shall be mounted to constantly monitor pump performance on both resin and hardener lines.

44. A test sample of the resin mixture shall be pumped and cast into a tray for further checking of pumping, mixing and cure. The plaque provided is used for quality assurance testing.

45. Repair heads shall be hydrostatically tested prior to use on site.

46. Repair head expansion rates shall be checked to monitor its condition and ensure no excessive loads are transmitted to the pipe to be repaired.

Performance Requirements

The requirements for the repaired area of the sewer after lining are as follows:

47. The defect shall be totally sealed to ensure that the sewer is

48. watertight (as judged by CCTV inspection after lining).

49. The epoxy system shall be fully cured.

50. The inner surface of the sewer shall be smooth, free of wrinkles or bulges which would produce turbulence in flow or blockage.

Method for the Determination of Flexural (Bending) Creep Modulus under Aquaceous Conditions

Scope

51.1 Method of test to determine 50-year flexural creep modulus of sewer lining material subjected to a constant flexural stress under aqueous conditions. This method is based on BS EN ISO 899-2:2003.

52. Apparatus

52.1 The apparatus shall consist of the following equipment such that the specimen is maintained at 23 ± 2^{o}C immersed in potable tap water of pH 5.5.

52.2 A pair of supports that:

a. are parallel;

b. can be adjusted to give the required span;

c. do not deflect under the forces applied during testing;

d. do not impose significant longitudinal restraint on the specimen;

e. provide line contacts with the specimen without significant indentation;

f. have a nose radius r of 5mm ± 0.1mm.

52.3 A means of applying to the specimen a force that:

a. is constant;

b. is applied through a central loading member which shall have a radius r of 5mm ± 0.2mm;

c. is midway between the supports (within a tolerance of ±1% of the span);

d. is uniform along a continuous line perpendicularly across the width of the specimen.

52.4 A means of measuring the deflection of the specimen that:

a. is as close as practicable to the line of application of the force;

b. itself applies only an insignificant force to the specimen;

c. is accurate with ± 0.5%.

52.5 A water bath or similar equipment that:

a. maintains the sample immersed in water;

b. maintains the water temperature at 23 ± 2 oC;

c. is adequately covered to avoid rapid loss of water due to evaporation.

53. Test specimens

53.1 For each of the minimum, maximum and an intermediate thickness manufactured, at least three specimens shall be prepared from the full thickness of lining wall to produce specimens with rectangular cross-sections (with square corners) and to the following dimensions:

a. span length (L) of 16 ± 1 h;

b. specimen length of not greater than 1.3L;

c. specimen width b greater than d but less than 3d;

d. specimen width and thickness constant to within a tolerance of ± 1%.

53.2 The specimen shall be stored in water at the test temperature for at least 24 hours prior to testing.

54. Procedure

a. Prepare each specimen.

b. With a felt-tipped marker, mark on the specimen, the centre and approximate positions where each end support will bear.

c. Determine the width and thickness of the specimen at each of the 3 lines to within an accuracy of ± 0.2% and calculate the arithmetic mean of the width and thickness measurements.

d. Seal the edges of the test specimens with a silicone sealant such that only the inner and outer faces of the lining will be exposed to the test environment, and allow the sealant to cure fully.

e. Condition each specimen.

f. Set the span length L to the required value.

g. Measure the span length L mm (± 0.5%).

h. Calculate the mass M kg, to be applied to the specimen to give the required flexural stress from:

$$M = \frac{bd^2\sigma}{14.71L}$$

Where

b is the average width of the specimen (between the supports) (mm). d is the average thickness of the specimen between the supports (mm)

σ is the required flexural stress (MPa) and is equal to 0.0025Es, where

Es is the initial tangent flexural modulus of elasticity determined from short-term testing.

L is the distance between the supports (span length) (mm).

The applied mass shall be accurate to within ± 0.1% of the calculated mass.

i. Place the specimen in the apparatus with the specimen's longitudinal axis at right angles to the supports so that the 'inner surface' of the lining when in service will be in tension when the load is applied.

j. Set and/or zero the deflection measuring device.

k. Immediately after carrying out step (i), smoothly apply the mass and commence timing the test.

l. Calculate the flexural creep modulus Et MPa for each value of t at time t from:

$$E_t = \frac{2.45ML^3}{bd^3\delta_t}$$

m. Plot log10 creep modulus against log10 time. If for any reason the readings do not approximate to a smooth trace the test shall be abandoned, the occurrence recorded and the test repeated.

n. The graph predicted for each test specimen may appear to be a line which goes through a transition to an approximately straight line of greater slope. This being so, observe the position of the transition. After the transition or 100 hours (whichever is the later) regress the calculated values of log10 creep modulus on log10 time using the method of least squares and determine the extrapolated 50-year value of creep modulus EL.

o. If the appropriate part of the graph does not approximate to a straight line and continues to curve downwards, the procedure in (n) is invalid.

55. Report

55.1 For each specimen the test report shall include;

a. Complete description and identification of the lining, including method of manufacture, times and temperatures involved, manufacturer, code and batch number of resin;

b. Dimensions of the specimen;

c. Method of specimen preparation;

d. Graph or graphs of log10 flexural creep modulus versus log10 time; (e) Mass applied to the specimen;

e. The calculated value of flexural creep modulus EL at 50-years; (g) The period of the test;

f. Any other relevant information.

Method for the Determination of the Flexural Creep Strength under Acidic

Conditions

56. Apparatus

56.1 The apparatus is exactly as that used for the determination of the long-term flexural modulus. It shall consist of the following equipment such that the specimen is maintained at 23 ± 2oC immersed in dilute sulphuric acid of pH 2.0.

56.2 A pair of supports that:

a. are parallel;

b. can be adjusted to give the required span;

c. do not deflect under the forces applied during testing;

d. do not impose significant longitudinal restraint on the specimen;

e. provide line contacts with the specimen without significant indentation;

f. have a nose radius r of 5mm ± 0.1mm.

56.3 A means of applying to the specimen a force that:

a. is constant;

b. is applied through a central loading member which shall have a radius r of 5mm ± 0.2mm;

c. is midway between the supports (within a tolerance of ±1% of the span);

d. is uniform along a continuous line perpendicularly across the width of the specimen.

56.4 A means of measuring the deflection of the specimen that:

a. is as close as practicable to the line of application of the force; (b) itself applies only an insignificant force to the specimen;

b. is accurate with ± 0.5%.

56.5 A water bath or similar equipment that:

a. maintains the sample immersed in dilute sulphuric acid;

b. maintains the temperature of the acidic environment at 23 ± 2oC; (c) avoids rapid loss of the environment due to evaporation.

57. Test Specimens

57.1 In order to determine the 50-year value of flexural strength, a minimum of eighteen test specimens is necessary.

57.2 Each specimen shall be prepared from the full thickness of lining wall to produce a specimen with a rectangular cross-section (with square corners) and to the following dimensions:

a. Span length (L) equal to or greater than 16d, where d is the depth of the specimen;

b. Specimen length of not greater than 1.3L;

c. Specimen width b greater than d but less than 3d;

d. Specimen width and thickness constant to within a tolerance of ± 1%.

57.3 The specimen shall be immersed in the environment at the test temperature for at least 24 hours prior to testing.

57.4 Procedure:

a. Prepare each specimen.

b. With a felt-tipped marker, mark on the specimen, the centre and approximate positions where each end support will bear.

c. Determine the width and thickness of the specimen at each of the 3 lines to within an accuracy of ± 0.2% and calculate the arithmetic mean of the width and thickness measurements.

d. Seal the edges of the test specimens with a silicone sealant such that only the inner and outer faces of the lining will be exposed to the test environment, and allow the sealant to cure fully.

e. Condition each specimen.

f. Set the span length L to the required value.

g. Measure the span length L mm (± 0.5%).

h. Calculate the mass M kg, to be applied to the specimen to give the required flexural stress from:

$$M = \frac{bd^2\sigma}{14.71L}$$

Where:

b is the average width of the specimen (between the supports) (mm).

d is the average thickness of the specimen between the supports (mm).

σ is the required flexural stress (MPa) and is equal to 0.0025Es, where:

Es is the mean initial tangent flexural modulus of elasticity determined from short-term testing.

L is the distance between the supports (span length) (mm).

The applied mass shall be accurate to within ± 0.1% of the calculated mass.

i. Place the specimen in the apparatus with the specimen's longitudinal axis at right angles to the supports so that the 'inner surface' of the lining when in service will be in tension when the load is applied.

j. Immediately after carrying out step (h), smoothly apply the mass and commence timing the test.

k. Note the time at which each specimen fails.

l. Plot log10 stress against log10 time to failure and regress the values of log10 creep modulus on log10 time using the method of least squares and determine the extrapolated 50-year value of failure stress.

m. The aim should be to obtain a minimum of 18 data points regularly spaced (on a log10 time scale) with failure times ranging from zero to 10,000 hours. If there are obvious 'gaps' in the data, then further specimens shall be tested.

57.5 Report

For each series of tests, the test report shall include:

a. Complete description and identification of the lining, including method of manufacture, times and temperatures involved, manufacturer, code and batch number of resin;

b. Dimensions of the specimens;

c. Method of specimen preparation;

d. Graph of log10 flexural stress versus log10 time; (e) Mass applied to the specimen;

e. The calculated value of flexural failure stress EL at 50 years; and

f. Any other relevant information.

58. Control of Test Conditions

Test Temperature

a. All test measurements shall be conducted at a temperature of 23 ± 2oC.

b. Specimen Conditioning

c. For type testing in air, samples shall be maintained in air at a temperature of 23 ± 2oC for not less than 24 hours prior to testing.

d. For quality control testing, specimens shall be kept in air at a temperature of 23 ± 2oC for not less than 24 hours prior to testing.

59. Test Specimen Preparation

a. For mechanical tests, specimens shall be machined following the recommendations of BS EN ISO 2818.

Appendix 6/1: Requirements for acceptability and testing of earthworks materials

Classification, Definitions and Uses of Earthworks Materials

General Classification

1. The *Contractor* shall be responsible for determining the acceptability, classification and construction make-up of all bituminous and earthworks materials, including all testing required in Appendix 1/5 and Appendix 1/6 and any other testing the *Contractor* considers appropriate.

2. For planned maintenance works, the *Contractor* shall construct trial pits, coring or similar, at their own cost and take and analyse samples in advance of excavation and resurfacing works so that those materials can be adequately characterised prior to excavation/milling and disposal. For bituminous materials, testing/s are required for footway and carriageway where resurfacing is intended in excess of the surface course. The test results will be used by the *Client* to help determine the final treatment proposal. As a minimum, representative samples shall be taken for analyses at a minimum depth of 0.5 metres below the surface and at a twenty-five (25) metre chainage along the length of the proposed earthworks and 100m2 for footway/carriageway resurfacing works, or as otherwise agreed with the *Client*. Further testing locations may be required where Class U1A or U1B materials are encountered during excavation and resurfacing works.

3. For all other tasks, the *Client* will issue a Task Order to the *Contractor* to construct trial pits, coring or similar, and take and analyse samples in advance of excavation and resurfacing works so that those materials can be adequately characterised prior to excavation/milling and disposal. For bituminous materials, testing/s are required for footway and carriageway where resurfacing is intended in excess of the surface course. The test results will be used by the *Client* to help determine the final treatment proposal. The *Client* will provide specification for testing/s. Further testing locations may be required where Class U1A or U1B materials are encountered during excavation and resurfacing works. The *Contractor* will be paid for the testing on a scheme by scheme basis in accordance with their price list. The *Contractor* will need to provide the test results within 28 days of the instruction/*Task Order.* The classes of earthworks materials appropriate to the *contract* are set out in the table below.

Permitted constituents and properties are set out in SHW Table 6/1, supplemented by the requirements given below.

CLASS	DESCRIPTION	TYPICAL USE	PROPERTY	ACCEPTANCE LIMITS: Lower	Upper
1A	Well graded granular material	General fill	mc MCV	OMC -2% 8	OMC +2% 10
1B	Uniformly graded granular material	General fill	mc MCV	OMC -2% 8	OMC +2% 12
1C	Coarse granular material	General fill			
1C	Coarse granular material	General fill			
2A	Wet Cohesive material	General fill	Plastic Limit Mc MCV Undrained shear strength of remoulded material	- OMC -2% 8 80	50 OMC +2% 10 100
2B	Dry Cohesive material	General fill	Mc MCV	OMC -2% 12 80	OMC +2% 16
			Undrained shear strength of remoulded material	80	100
2E	Reclaimed Pulverised Fuel Ash cohesive material	General fill	ii. bulk density		
4	General	Fill to landscape areas	ii. mc		1.4 x OMC
5A	Topsoil or turf existing on site	Topsoiling			
5B	Imported topsoil (BS 3882 general purpose)	Topsoiling			

6B	Selected coarse granular material	Starter layer			
6C	Selected uniformly graded granular material	Starter layer			
6D	Selected uniformly graded granular material	Starter layer below pulverised fuel ash			
6E	Selected granular material (Class 9A)	For stabilisation with cement to form capping			
6F1	Selected granular material (fine grading)	Capping			
6F2	Selected granular material (coarse grading)	Capping			
6F3	Selected granular material	Capping			
6F4	Selected granular material (fine grading) – imported onto the site	Capping			
6F5	Selected imported granular material (coarse grading)	Capping			
6S	Selected well graded granular material	Filter layer below sub-base			
6N	Selected well graded granular material	Fill to structures	iv. undrained shear parameters v. effective angle of internal friction and effective cohesion vi. permeability vii. mc	C' = 0 Phi' = 40o 4 x 10-5 m/s OMC – 2.5%	OMC

6Q	Well graded or uniformly graded or coarse granular material	Overlying fill for corrugated steel buried structures			
9A	Cement stabilised well graded granular material	Capping			
9B	Cement stabilised silty cohesive material	Capping			
9C	Cement stabilised conditioned pulverised fuel ash cohesive material	Capping			
9D	Lime stabilised cohesive material	Capping			
9E	Lime and cement stabilised cohesive material	Capping			
9F	Lime and cement stabilised well graded granular material	Capping			

4. Any special requirements for the acceptability of any proposed fill material shall be as instructed by the *Client*.

5. Information regarding materials that might be classified as Class 3 will be included in the instructing *Task Order*.

6. For imported General Fill Class 1 the acceptable upper and lower moisture content limits shall be those between which at least 95% of the maximum dry density is achieved using the appropriate test given in BS 1377.

7. Material excavated as a result of the clearance of existing sewers, ditches, channels, streams or watercourses or material removed from excavation in artificial Hard Material, fly tipping spoil and other material, shall be designated Class U1A or U1B unacceptable material unless the *Client* states otherwise. Argillaceous clay deposits shall be classified as Class U1A or U1B.

8. The *Contractor* is encouraged to submit proposals for processing to render unacceptable material Class U1 that is encountered acceptable and, if its proposals are acceptable to the *Client*, this will be confirmed to the *Contractor* in writing.

9. All materials which are excavated or planed off, and which are not re-used on site because of its chemical and/or physical characteristics shall be classified as Controlled Waste under the Environmental Protection Act 1990 and the Control of Pollution Act 1974.

10. The *Contractor* shall maintain contemporaneous site records of the following information relating to the proposed earthworks:

    a. The transfer location for all waste material for disposal off site;

    b. The source and classification of each source of any imported fill material (if used);

    c. For varying sources or classifications; the location within the works of each fill

source or classification, and the dates over which it was placed (if used).

11. Generally, all controlled wastes shall be handled and disposed of in accordance with the Environmental Protection (Duty of Care) Regulations 1991 and the accompanying Code of Practice. Special Wastes and asbestos wastes shall also be subject to other relevant controls including those referred to in this Specification.

12. Waste materials shall only be transported off site by a carrier registered under the Controlled Waste (Registration of Carriers and Seizure of Vehicles) Regulations 1992. A copy of the appropriate registration certificate shall be supplied to the *Client* for approval before start of the *Task Order*. All open vehicles used for transporting wastes off site shall be sheeted securely prior to leaving the site areas.

13. The *Contractor* shall make available independent UKAS accredited testing services for any additional testing of solid or liquid samples required by the relevant Waste Regulation Authority, or the licensed receiving waste disposal facility, or as instructed by the *Client*.

14. Any requirements for groundwater lowering, or other treatment, shall be as stated in any *Task Order*, or as instructed on site by the *Client*. General groundwater lowering will not be permitted.

15. The minimum MCV required immediately before compaction, for any lime stabilised Class 9D material to be used in any site, shall be as instructed by the *Client*.

16. The requirements for acceptability and testing of un-burnt colliery shale shall be as instructed by the *Client* if the need arises.

17. The rapid assessment procedure for material acceptability shall not be used unless exceptionally permitted by the *Client*.

18. The effects of water-soluble sulphate, oxidisable sulfides and total potential sulfate shall only be assessed upon the exceptional request of the *Client*. Such assessments, if required, are likely to be undertaken by others engaged by the *Client* under separate arrangements.

19. Magnesium sulphate tests, and other tests for particle soundness, shall only be undertaken upon the exceptional request of the *Client*. Such tests, if required, are likely to be undertaken by others engaged by the *Client* under separate arrangements.

20. All materials except U2, organic material or material that is susceptible to spontaneous combustion, may be constituents of Class 4 material. However, Class 4 landscape fill must be capable of forming stable embankments at a side slope of 1 in 2 and of being compacted to 85% maximum dry density to remove large voids. A further requirement shall be that Class 4 material within 500mm of the underside of topsoil (and to the full depth of landscaping material in areas of farmland to be reinstated/regraded) shall be free from bituminous material, ash, shale, slag, colliery spoil, densely compacted clay, oil and other pollutants likely to cause damage to planting. The material shall be free draining.

21. Levels of contamination for any imported earthworks material shall not exceed the values specified in the table below. Values in brackets apply to imported Class 4 landscape fill only.

Phenol	5
Sulphate	2000
Toluene Extractable	5000
Sulphide	250
PH	Range 5.5 – 8.5 (5.5 – 8.0)

Arsenic	40
Boron (water soluble)	3
Cadmium	15
Chromium (total)	1000
Chromium (hex)	25
Coal Tars	1000 (50)
Copper (available)	(50)
Copper (total)	100
Cyanide (free)	100 (25)
Cyanide (complex)	250
Lead (total)	2000
Mercury	20
Nickel (available)	(20)
Nickel (total)	20
Selenium	6
Sulphur	5000
Thiocyanate	50
Zinc (available)	(130)
Cyanide (free)	100 (25)
Cyanide (complex)	250
Lead (total)	2000
Mercury	20
Nickel (available)	(20)
Nickel (total)	20
Selenium	6
Sulphur	5000
Thiocyanate	50
Zinc (available)	(130)
Zinc (total)	250

Classification and Testing

22. A schedule of tests and acceptability limits for the fill materials is given in Table 6/1 of the SHW. Particular requirements not included in Table 6/1 shall be either determined by the *Contractor* or specified by the *Client*.

23. The *Contractor* shall gain the *Client*'s acceptance/confirmation of the classification of earthworks materials, following the submission of the results of classification tests, before materials are incorporated into the works.

24. Where the *Client* is of the opinion that the classification of site arisings or imported material has changed, they shall require the *Contractor* to repeat the classification tests to check its acceptability.

25. Where a material satisfies the criteria for more than one class, or is marginal between the classes, the material shall be classified as that requiring the greater compaction.

26. The *Contractor* shall provide two copies of all the classification test results, within one working day from the completion of the test, to the *Client*, duly signed by the *Contractor*.

Appendix 6/2: Requirements for dealing with class u1b and class u2 unacceptable material

General Requirements

1. The *Contractor* shall undertake all work under the Contract in a manner which prevents contamination of existing water courses, sewers, public highways and other areas of work.
2. Details of Class U1B, U2 and hazardous materials encountered on site within the *Affected Property* shall be established by the *Contractor*.
3. All excavated material classed as unacceptable material Class U1B that cannot be processed into acceptable material as defined in accordance with the requirements of Table 6/1 and Appendix 6/1 shall be disposed off-site to a licensed tip.
4. The *Contractor* shall, in the event of uncovering any Class U2 material while carrying out the works, immediately notify the *Client* and shall subsequently comply with all requirements for the handling and disposal of such materials.
5. The *Contractor* shall comply with any special requirements issued by the *Client* or Thames Water Authority for dealing with any leachate or contaminated water that may arise while carrying out the works.
6. Methods of excavation, precautions and requirements proposed by the *Contractor* for handling shall comply with the requirements of the local Environmental Health Officer, the Health and Safety Executive and the London Waste Regulation Authority and be approved by the *Client*
7. The *Contractor* shall comply with any special requirements issued by the *Client* that may arise while carrying out the works for drainage and for sealing the exposed surfaces of any contaminated materials.
8. The *Contractor* shall produce a waste management plan and the following procedure shall be followed:
    a. When any waste is removed, the *Contractor* shall record on the plan:
        i. The identity of the person removing the waste;
        ii. The waste carrier registration number of the carrier;
        iii. A copy of, or reference to, the written description of the waste required by section 34 of the Environmental Protection Act 1990; and
        iv. The site that the waste is being taken to and whether the operator of that site holds a permit under the Environmental Permitting (England and Wales) Regulations 2007 or is registered under those Regulations as a waste operation exempt from the need for such a permit.
9. As often as necessary to ensure that the plan accurately reflects the progress of the Service, and in any event not less than every six months, the *Contractor* shall:
    a. Review the plan;
    b. Record the types and quantities of waste produced;
    c. Record the types and quantities of waste that have been:
        i. Re-used (and whether this was on or off site);
        ii. Recycled (and whether this was on or off site);
        iii. Sent for another form of recovery (and whether this was on or off site);
        iv. Sent to landfill; or

v. Otherwise disposed of; and

vi. Update the plan to reflect the progress of the Service.

10. Within three months of the works being completed, the *Contractor* shall add to the plan:

a. Confirmation that the plan has been monitored on a regular basis to ensure that work is progressing according to the plan and that the plan was updated in accordance with this regulation;

b. A comparison of the estimated quantities of each waste type against the actual quantities of each waste type;

c. An explanation of any deviation from the plan; and

d. An estimate of the cost savings that have been achieved by completing and implementing the plan.

Appendix 6/3: Requirements for excavation, deposition, compaction (other than dynamic compaction)

General

1. The use of blasting and explosives for excavation and other purposes is strictly prohibited on site and under this *Contract*.

2. Requirements for any earthworks operations to be undertaken as part of the works shall be as stated in the instructing Task Order.

3. Requirements for geotextiles to be used in the works shall be as stated in the instructing Task Order. Geotextiles shall be as per Appendix 6/5.

4. Requirements for the removal of abandoned services, backfilling of cellars and the like to be undertaken as part of the works shall be as stated in the instructing Task Order.

5. All excavations shall be adequately supported at all times to prevent collapse. Water shall be prevented from running into the excavations.

6. All excavations shall be fenced or otherwise protected at all times so as to safeguard and protect the public from danger. Excavations shall be protected with flashing low voltage electrical lamps during the hours of darkness. Where fencing of excavations is not practical, the *Contractor* shall plate over such excavations at its own cost. Plates shall be secured to the ground and its edges shall be ramped with suitable material to afford a slope not steeper than 1 in 5

7. Compaction of all materials shall be in accordance with Table 6/1 and Clause 612. Layer thickness, compaction rates and materials to be used in fill and embankments will be described in individual scheme documentation.

8. Surface finishes to embankments shall be topsoil and grass seeding unless otherwise specified. See Appendix 6/7 for detail on topsoil.

9. Geotextiles shall be as per Appendix 6/5.

10. All excavated and surplus materials shall be removed from the site daily.

Method Of Excavation

Roadworks

11. The method(s) of excavation shall be proposed by the *Contractor* and be subject to the approval of the *Client.*

12. Excavations in the carriageway shall be undertaken only after saw cutting through the existing pavement construction. Where benching and kerb excavation is undertaken

the carriageway shall be saw cut prior to any work commencing.

Bridge/Structures Works

13. The method(s) of excavation shall be proposed by the *Contractor* and be subject to the approval of the *Client*. All existing bituminous and waterproofing materials shall be removed with a minimum of two stages, as follows:

    a. The first stage(s) shall cause no damage to the existing concrete surface and shall comprise the removal of the bulk of the surfacing materials;

    b. The final stage shall be the complete removal of the remaining materials and only slight abrasion of the concrete surface is acceptable;

    c. Rectification of Damage: any damage caused to the underlying layer shall be rectified as follows:

        i. Formation: by the removal of any unacceptable material and its replacement with sub-base as described in the *Contract*;

        ii. Sub-base: by the removal and replacement of any contaminated or damaged material;

        iii. Roadbase and basecourse: by the removal of any loose material to the full depth of the layer if required and its replacement with the roadbase or basecourse described in the *Contract*;

        iv. Concrete Surfaces: the proposed methods shall be submitted to the

        v. *Client* for approval.

Excavation Of Foundations

14. The treatment of the bottom of excavations shall be carried out immediately before laying of the new material on it unless otherwise agreed by the *Client*.

15. Where excavations are not immediately back-filled the *Contractor* shall be responsible for making good at its own expense any damage caused by the weather.

Watercourses

16. The *Contractor* shall provide evidence to the *Client* that all operatives and Plant operators employed in cleaning and clearing of any open ditch or watercourse and the like are suitably experienced and trained in the maintenance of open watercourses and the potential implications to wildlife and the environment in general.

17. The *Client* shall provide with each Task Order a specification for the maintenance along each section of ditch or watercourse, and this shall include details of the biodiversity and limitations on working methods.

18. Any existing sewer, ditch, channel, stream or watercourse which is severed as a consequence of facilitating construction of the Task Order works shall be reinstated and reconnected where possible by the *Contractor* to the approval of the *Client* and the Environment Agency. Where the Task Order requires an existing ditch, channel, stream or watercourse to be backfilled, this shall be carried out using Class 6F2 material to the satisfaction of the *Client*.

19. All arisings shall be classed as U1B or U2.

20. The clearance and modification of existing, or the construction of new watercourses, including ditches, streams, rivers, lagoons and ponds, shall be as described in the Task Order.

Appendix 6/4: Requirements for class 3 material

1. Excavated Class 3 material shall not be used for the construction of embankment

extensions where the main constituent material comprising the original embankment is clay.

Appendix 6/5: Geotextiles used to separate earthworks materials

Geotextiles and geotextile-related products used to separate earthworks material

1. Details for the use of geotextiles, including geo-grids and other cellular confinement system but excluding geo-cellular system assemblies, shall be given in the Task Order.

2. The geotextile separator shall be thermally bonded, woven or non-woven, non-biodegradable synthetic fibre and sufficiently durable to maintain its integrity for 120 years.

3. Geotextile separating fabric, where required, shall be a geosynthetic designed for filtration and drainage, which shall allow filtration of water, but shall protect the filled area against migration of Materials from underneath or above. Details of the proposed geotextile separator shall be provided to the *Client* for approval, prior to incorporating into the works.

4. The geotextile manufacturer shall provide production test certificates at the rate of one set of certificates for each manufacturing batch of 5,000m² of geotextile delivered to site. Certificates relevant to a batch of geotextile shall be provided to the *Client* prior to that batch of geotextile being incorporated in the works. Each test certificate shall include the following information:

   a. Product name and grade;

   b. Batch or code number;

   c. Manufacturing characteristics including:

      i. Composition and type of constituent

      ii. Method of manufacture

      iii. Consignment number and delivery note.

5. Prior to incorporation in the works samples of the geotextile shall be taken to site and shall be tested in accordance with sub-clause 4 of this appendix to prove that the geotextile meets criteria listed in the table below.

Material Property	Test Method	Required Values
Ultimate tensile strength and strain in both directions	BS EN ISO 10319:2008	Minimum 18kN/m
Pore size (Maximum O90) and minimum permeability	BS EN ISO 12956:2010	300 microns
Water flow	BS EN ISO 12958:2010	40 l/m²/sec

6. The geotextile shall be provided in rolls not less than one metre wide and jointing shall be by lapping only. Overlap shall be 300mm or overlap recommended by the manufacturer, whichever is the greater.

Earthworks Separator

7. Where geotextiles are to be used in embankment construction they should have a minimum design life of 120 years.

8. The geotextiles shall sustain a tensile load of not less than 18kN per metre run with an associated axial strain of at least 28% when tested in accordance with BS EN ISO 10319.

Drainage Separator

9. Where geotextiles are required as a separation membrane around filter drains they shall have a minimum design life of 120 years.

10. The geotextile shall:

    a. Sustain a maximum tensile load of not less than 18kN per metre run with an associated axial strain of at least 28% when tested in accordance with BS EN ISO 10319;

    b. Allow water to flow through it at a rate of 90 litres/m2/s when tested in accordance with Clause 609.4

    c. Perform such that the flow rate shall not drop by more than 75% when under a normal pressure of 2 bar (200kN/m2).

    d. Satisfy the following criterion: O90/D85 <1 Where O90 is the 90% pore size of the geotextile [90% of openings are smaller] and D85 is the 85% size [85% is finer] of the adjacent material. If there is more than one type of adjacent material, the smaller D85 of these materials shall be taken.

Appendix 6/6: Fill to structures and fill above structural foundations

Fill To Structures

1. Material permitted shall be Class 6N and complying with Table 6/1 of Series 600.

2. Locations where the *Contractor* shall apply fill to structures as confirmed with the Task Order.

3. Compaction end product 95% of maximum dry density to BS 1377-4:1990.

4. Class 6N material shall be shown to be stable at a slope of 1 vertical to 1 horizontal.

Appendix 6/7: Sub-formation and capping - preparation and surface treatment of formation

Sub-Formation And Capping

1. Preparation and surface treatment of the formation shall be in accordance with Clause 616 . The *Contractor* shall comply with the requirements of Clause 617 regarding the use of sub-formation and formation by construction vehicles.

2. The preparation of formation on existing subbase in carriageways, footways and other paved areas, as stated in the instructing Task Order, shall comply with the requirements for surface levels and regularity stated in Clause 702 and the requirements for compaction stated in Clause 802.

3. If hard material is encountered at formation level, the formation shall be treated in accordance with Clauses 616.4 and 616.5.

4. The capping layer covered under this *Contract* maybe up to 600mm thick Class 6F2 material in accordance with Table 6/1. The capping layer shall consist of Class 6F2 material for the full depth of the capping layer and shall be laid and compacted in maximum 150mm thick layers. Minimum CBR value 15% after compaction.

5. Requirements for the shaping of the formation shall be as stated in the instructing Task Order.

6. The procedures to be adopted for the construction of any capping in cuttings or on embankments shall be as stated in sub-Clause 613.3 unless otherwise stated in the instructing Task Order.

7. Compaction of capping layer material shall be in accordance with Clause 612 and the method prescribed in Table 6/1 (Table 6/4 – Method 6) appropriate to a compacted

layer thickness of 150mm.

8. The Permitted Classes of capping shall be as stated in sub-Clause 613.3 unless otherwise stated in the instructing Task Order. Class 9 material shall only be used where approved in writing in advance by the *Client*. Use of Class 9D, Class 9E and Class 9F materials shall not normally be permitted in the vicinity of street trees. The *Contractor* shall be permitted to use any of the Permitted Classes of Class 6 capping material unless otherwise stated in the instructing Task Order. Where the *Client* expressly requires a particular Class 6 capping material to be used then the *Contractor* shall be due additional payment.

9. Subject to the requirements of (8) above, the *Contractor* may be permitted to use quicklime, hydrated lime, or other form of stabilisation as stated in the instructing Task Order. Cement for lime and cement stabilisation shall be Portland cement complying with Clause 1001 unless otherwise stated in the instructing Task Order. The material shall be stabilised in a single layer if its compacted thickness is 250mm or less unless otherwise stated in the instructing Task Order.

10. Material used in capping layers shall have an in-situ CBR value of not less than 15% when tested by a method approved by the *Client*, or a laboratory CBR value of not less than 15% when tested in accordance with BS 1377 Part 2:1990, Test 16, at the in-situ moisture content following compaction.

11. In cuttings, any overbreak shall be blinded with a regulating layer of sub-base.

12. The formation shall be regulated to the tolerances given in Clause 616.

13. Formation and sub-formation preparation and treatment shall be carried out only after completion of sub-grade drainage, including outfall, unless otherwise instructed by the *Client*, immediately prior to laying capping or sub-base. Subgrade drainage outfalls shall be either to permanent outfall or a temporary outfall approved by the *Client*.

Appendix 6/8: Topsoiling

General Requirements

1. Any areas of the works that are to be designated as areas of Class 5A material shall be identified as such in the instructing Task Order.

2. The *Contractor* shall ensure that all areas of topsoil, grassed areas and verges on the site are left undisturbed (including by trafficking during the works or the storage of materials for the works), except where such disturbance forms an essential part of the works. Any requirements for the removal and/or reuse of indigenous topsoil (including its use as turf) shall be as stated in the instructing Task Order.

3. Topsoil shall not be stockpiled on any part of the site for longer than the duration of the works, as agreed with the *Client*.

4. Any requirements for covering slopes of Classes 2E fill shall be as stated in the instructing Task Order.

5. Topsoiling shall be carried out in accordance with Clause 618 and all Class 5 material shall be identified in the Task Order.

6. Depths to which topsoil is to be stripped shall be stated in the Task Order.

7. Where stated in the Task Order existing topsoil shall be stripped as turf in accordance with sub-clause 3005.13

8. All excavated topsoil on site is to be designated Class 5A material and stockpiled at locations indicated in the Task Order or agreed with the *Client*.

9. All Class 5A topsoil arising from the site, or any Class 5B material replacing Class 5A material in accordance with sub-Clause 3 of this Clause, in excess of the requirements

for topsoiling, shall be subject to the requirements described in the Task Order.

Topsoiling

10. Imported topsoil shall only be required if that excavated from site is not adequate in quantity. Any imported topsoil (Class 5B) shall be of a similar or better quality to that excavated from site (Class 5A).

11. Thickness shall be as follows (overall minimum depths of topsoil after firming and settlement) unless otherwise stated in the Task Order:

    a. Grass verges - 100 mm;

    b. Retention pond banks -100 mm;

    c. Reed bed areas in retention ponds -100 mm;

    d. Shrub beds - 350 mm.

12. Topsoiling and seeding shall take place as soon as practicable, to prevent any erosion of the sub grade. If instructed, provide as necessary to make up any deficiency of topsoil existing on site and to complete the work to BS 3882:2015, grade: General Purpose Grade. Arrange for the *Client* to inspect a sample load of not less than five metres cubed before making further deliveries to site. The sample shall be retained for comparison with subsequent loads. The source shall be to the approval of the *Client*. The *Contractor* shall provide a declaration of analysis including information detailing each of the relevant parameters given BS 3882:2015, for the grade of topsoil specified.

13. Existing topsoil herbicide shall be stripped from all construction areas, prior to work commencing. If any damage occurs to verges, footways, embankment slopes and the like, outside the immediate works area, this shall be reinstated at the *Contractor's* cost.

14. Contaminated topsoil shall not be used. The *Contractor* shall inform the *Client* if any evidence or symptoms of soil contamination are discovered on the site or in topsoil to be imported.

15. The handling of topsoil shall be in accordance with Clause 618.3 and different grades of topsoil shall be kept separate from each other when handling and stockpiling.

16. Topsoil shall not be compacted in order to preserve a friable texture of separate visible crumbs wherever possible.

17. Finished levels of topsoil after settlement, unless otherwise stated in the Task Order, shall be:

    a. 30mm above adjoining paving or kerbs;

    b. Unchanged within the root spread of existing trees;

    c. 30mm higher for shrub areas than for adjoining grass areas;

    d. Married-in with adjoining soil areas.

Appendix 6/10: Gabions

1. Locations where Gabions are required shall be as stated in the instructing Task Order.

2. Any special requirements for Gabions shall be as stated in the instructing Task Order. The Gabion wire is to be double twisted.

3. Mesh sizes shall be either 60mm or 80mm, as stated in the instructing Task Order.

Appendix 6/14: Limiting values for pollution of controlled waters

Classification, Definitions And Uses Of Earthworks Materials

Unacceptable Materials

Unacceptable material Class U1B shall be contaminated materials, including controlled wastes (as defined in the Environmental Protection Act 1990 Part IIA) but excluding all hazardous wastes (as defined in the Hazardous Waste (England and Wales) Regulations 2005) and radioactive wastes (as defined in the Radioactive Substances Act 1993).

Appendix 6/15: Limiting values for harm to human health and the environment

Classification, Definitions And Uses Of Earthworks Materials

Unacceptable Materials

Unacceptable material Class U1B shall be contaminated materials, including controlled wastes (as defined in the Environmental Protection Act 1990 Part IIA) but excluding all hazardous wastes (as defined in the Hazardous Waste (England and Wales) Regulations 2005) and radioactive wastes (as defined in the Radioactive Substances Act 1993).

Appendix 6/16: Geo-cellular system assemblies

1. Locations where Geo-Cellular System Assemblies are required shall be as stated in the instructing Task Order. The overall form and dimensions of assemblies shall be as stated in the instructing Task Order

2. Any special requirements for Geo-Cellular System Assemblies shall be as stated in the instructing *Contract* Documents for the Task Order.

3. Materials for Geo-Cellular System Assemblies shall be from one of the following Type designations and associated proprietary product systems, as required in the instructing Task Order. Other proprietary systems shall only be used where agreed with the *Client* in advance of Design due to the need for Geo-technical design validation of the structure during the design process and the significantly varying structural performance of different products. The *Contractor* shall be responsible for obtaining and installing all accessories necessary for proper assembly of the proprietary system to be used including: ground fixings; sheer connectors; side connectors; and void spanning units. Any encapsulating geo-textiles shall be excluded.

   a. **Type designation: GW1**

      Summary: Interlocking cuboid rectangular cells composed of grid faced outer walls with internal supporting columns

      Primary application: To create under-pavement reservoirs for surface water as part of infiltration or attenuation system.

      Requirements:

      i. Units shall be comprised of polypropylene.

      ii. The system shall be durable within likely service conditions and limit states (as defined by the *Client*) for minimum of 30 years.

      iii. All opposing grid-faced walls within each cell shall be planar to one another to allow close connection between adjoining cells.

      iv. Individual cells shall be to be capable of vertical and lateral mechanical interlock with those adjoining to any face through secure connectors and ties.

      v. The system shall be capable of assembly and function as:

         - A single layer thickness sub-base replacement raft (in the horizontal plane)

- A single raft (in the vertical plane)
- A hollow tank formed from walls assembled from multiple rafts as above.
- A multi-layer tank composed of two or more complete layers of cell assemblies without substantial internal voids.
- Effective perforated surface of grid-faced sides to be >50%.
- Intrinsic permeability to be > 1.0×10^{-5} m
- The system and individual cells shall meet the requirements of BS 7533-13, Table B.

b. **Type designation: GW2**

Summary: As Type GW1 but incorporating a floating bio-treatment geotextile within the cell.

Primary application: As water quality treatment devices with within an under-pavement surface water infiltration or attenuation system, or under-pavement soil vault system for street trees.

Requirements:

i. All requirements as per GCS-W1 with the following exceptions.

ii. Volumetric void ratio of individual cells to be >90%

iii. Oil retention capability of bio-treatment geo-textile to be >55g/m2

iv. Bio-treatment geotextile to be durable in service conditions for minimum of 30 years.

c. **Type designation: GW3**

Summary: As Type GW1 but incorporating a foam filling within each cell capable of retaining moisture at plant available levels.

Primary application: As hydraulic breaks within under-pavement surface water infiltration or attenuation systems, or to retain moisture within an under-pavement soil vault system for street trees.

Requirements:

i. All requirements as per GCS-W1 with the following exceptions.

ii. Foam filling to be durable within service conditions for a minimum of 30 years.

iii. Effective volumetric water storage capacity of units with foam inserts to be >775 litres per m3.

d. **Type designation: GT1**

Summary: Open-sided frame cells intended for assembly as individual columns 1-3 units high, each topped with a grid-cover deck.

Primary application: To create under-pavement soil vaults for street trees.

Requirements:

i. Materials shall be fibreglass reinforced, chemically-coupled, impact modified polypropylene and galvanised steel tube.

ii. The system shall be comprised of:

- Polypropylene frame units, each incorporating 6 structural posts with an overall dimension of 600mm x 1200mm. Sides of units between the frame and posts shall be entirely void providing a minimum open space of 300mm wide x 346mm high in order to provide substantially unimpeded access for tree roots and services. Frame units shall be capable of stacking securely directly on top of each other with vertical mechanical interlock to create individual columns of variable height. Adjoining columns shall not touch and shall not laterally interlock with one another in order allow simple removal without disturbance to adjoining columns should maintenance be necessary.
- Polypropylene, galvanised steel reinforced grid-cover decks for installation on top of each column of frame units
- The system shall be capable of receiving soil fill by tipping prior to placement of the deck without vacuuming or sweeping in.

Appendix 6/71: Root deflectors

1. Locations where Root Deflectors shall be as stated in the instructing Task Order. The overall form and dimensions of assemblies shall be as stated in the instructing Task Order

2. Any special requirements for Root Deflectors be as stated in the instructing *Contract* Documents for the Task Order.

3. Materials for Geo-Cellular System Assemblies shall be from one of the following Type designations and associated proprietary product systems (or similar approved by the *Client*, as required in the instructing Task Order.

a. **Type designation: RD1(S)-900/550**

i. Single piece moulded rectangular surround unit with vertical sides set to repose of ~10degree from vertical.

ii. Vertical ribs to internal faces.

iii. ~900mm square opening

iv. ~550mm overall depth

v. Manufactured from ≥5mm thick MDPE.

b. **Type designation: RD1(S)-1200/550**

i. Single piece moulded rectangular surround unit with vertical sides set to repose of ~10degree from vertical.

ii. Vertical ribs to internal faces.

iii. ~1200mm square opening

iv. ~550mm overall depth

v. Manufactured from ≥5mm thick MDPE.

c. **Type designation: RD1(M)-450**

i. Modular root deflector flat panel system

ii. Moulded root secure interlock system to allow linking between panels.

iii. Continuous vertical ribs to inner face of panels to direct root downwards.

iv. Brief horizontal ribs to inner face of panels to prevent movement of panels in the ground, to be spaced so as not to intercept roots directed downwards by vertical ribs.

v. ~450mm high.

vi. ~600mm long.

vii. Manufactured from injection moulded Copolymer Polypropylene, ≥2mm thick.

viii. Material properties to be as follows:

Property	Test	Value
Tensile stress @ yield	ASTM D638	3800 PSI (26,200 kPa or kN/m²)
Elongation @ yield	ASTM D638	10%
Notched Izod Impact	ASTM D256A	7.1
Flexural Modulus	ASTM D790	155,000 PSI (1,068,687 kPa or kN/m²)
Rockwell Hardness r-scale	ASTM D785A	68

d. **Type designation: RD1(M)-600**

All requirements as RD1(M)-450 except for the following.

i. Panel height ~600mm.

e. **Type designation: RD1(M)-900**

All requirements as RD1(M)-450 except for the following.

i. Panel height ~900mm.

f. **Type designation: RD1(M)-1200**

i. Modular root deflector flat panel system

ii. Moulded root secure interlock system to allow linking between panels.

iii. Continuous vertical ribs to inner face of panels to direct root downwards.

iv. Brief horizontal ribs to inner face of panels to prevent movement of panels in the ground, to be spaced so as not to intercept roots directed downwards by vertical ribs.

v. Panel height ~1200mm.

vi. Panel length ~600mm.

vii. Manufactured from injection moulded Copolymer Polypropylene, ≥2mm thick. Material properties to be as follows.

Property	Test	Value

Tensile stress @ yield	ASTM D638	3800 PSI (26,200 kPa or kN/m²)
Elongation @ break%	ASTM D638	10%
Tensile Modulus	ASTM D638	155,000 PSI (1,068,687 kPa or kN/m²)
Notched Izod Impact	ASTM D256A	0,4-4,0
Flexural Modulus	ASTM D790	145,000 PSI (999,739 kPa or kN/m²)
Hardness Shore	ASTM D2240	P66

g. **Type designation: RD2(M)-450**

i. Modular multi-piece root director surround system capable of constructing rectangular surrounds of variable dimensions. Resulting overall surround assembly to have sides set to repose of approx. 10degree from vertical.

ii. To consist of variable length panels (all of common depth) and corner units

iii. Moulded root secure interlock system to all panels and corner units to allow these to be securely fixed to one another.

iv. Vertical ribs to internal faces of panels.

v. Modular panels to be available in individual lengths of 500/750/1000mm.

vi. As assembled depth of surround to be ~450mm.

vii. Manufactured from ≥5mm thick MDPE.

viii. To be combination of "RDMC450", “RDMS500”, “RDMS750”

Appendix 7/1: Permitted pavement options

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

1 Road pavements shall be constructed from one of the permitted options described in this Appendix and in compliance with this Series and the appropriate Clauses of Series 800, 900 and 1000.

Permitted Bituminous Mixture Surfaced Carriageway Pavement Material Options

Table 7/A – Permitted Bitumen

Hard Paving Grade Bitumen – BS EN 13924	
Grade 10/20 (Class 3)	Penetration 25 °C (EN 1426): 10 - 20 Softening point in °C (min) (EN1427): 58
Grade 15/25 (Class 2)	Penetration 25 °C (EN 1426): 15 - 25 Softening point in °C (min) (EN1427): 55
Paving Grade Bitumen - BS EN 12591	
Grade 40/60	Penetration 25 °C (EN 1426): 40 – 60 Softening point in °C (min) (EN1427): 48

Grade 50/70	Penetration 25 °C (EN 1426): 50 - 70 Softening point in °C (min) (EN1427): 46
Grade 70/100	Penetration 25 °C (EN 1426): 70 - 100 Softening point in °C (min) (EN1427): 43
Grade 100/150	Penetration 25 °C (EN 1426): 100 - 150 Softening point in °C (min) (EN1427): 39
Polymer Modified Bitumen – BS EN 14023	
PMB 1	Penetration 25 °C (EN 1426): Class 3 (maximum) Softening point: R&B (EN1427): Class 3 (maximum) Resistance to hardening Retained Penetration (EN12607-1): Class 3 (minimum) Resistance to hardening Increase in Softening Point (EN12607-1): Class 2 (maximum) Resistance to hardening Change in Mass (EN12607-1): Class 2 (maximum) Fraass breaking point (EN 12593): Class 3 (minimum) Elastic recovery at 25°C (EN13398): Class 5 (maximum) Elastic recovery at 10oC (EN 13398): Class 3 (maximum) Cohesion Force-ductility (EN13598 followed by EN13703): Class 9 (maximum)

Polymer Modified Bitumen – BS EN 14023	
PMB 2	Penetration 25 °C (EN 1426): Class 5 (minimum) Softening point: R&B (EN1427): Class 5 (maximum) Resistance to hardening Retained Penetration (EN12607-1): Class 7 (minimum) Resistance to hardening Increase in Softening Point (EN12607-1): Class 2 (maximum) Resistance to hardening Change in Mass (EN12607-1): Class 2 (maximum) Fraass breaking point (EN 12593): Class 6 (minimum) Elastic recovery at 25°C (EN13398): Class 4 (maximum) Elastic recovery at 10oC (EN 13398): Class 3 (maximum) Cohesion Force-ductility (EN13598 followed by EN13703): Class 3 (maximum)
PMB 3	Penetration 25 °C (EN 1426): Class 7 (minimum)

	Softening point: R&B (EN1427): Class 3 (maximum) Resistance to hardening Retained Penetration (EN12607-1): Class 7 (minimum) Resistance to hardening Increase in Softening Point (EN12607-1): Class 2 (maximum) Resistance to hardening Change in Mass (EN12607-1): Class 2 (maximum) Fraass breaking point (EN 12593): Class 9 (minimum) Elastic recovery at 25°C (EN13398): Class 2 (maximum) Elastic recovery at 10oC (EN 13398): Class 2 (maximum) Cohesion Force-ductility (EN13598 followed by EN13703): Class 2 (maximum)

Permitted Hot and Warm Mix Asphalt Pavement Materials

Tables 7/B, 7/C and 7/D provide specifications for permitted bituminous mixture (and other material) surface, binder/regulating and base course for bituminous mixture surfaced carriageway and footway/cycleway pavements. With the exception of proprietary Thin Surface Course System products, all bituminous mixture materials shall be in accordance with the relevant part of BS EN 13108.

Table 7/B – Permitted Bituminous Mixture Surface Course Materials and Specifications.

Bituminous Mixtures Surface Course Materials				
Material Ref.	Clause	Description	Special Requirements	
ST 14	942	TSCS 14	Thickness:	35 mm – 50 mm
			Traffic Count:	> 600 cv/lane/day
			Stress Level:	2
			PSV	55/60/65/68+
			Maximum Aggregate Abrasion Value:	AAV_{12}/AAV_{14}
			Red Colour - When specified for use:	Both aggregate and binder shall be red to an approved mixture colour.
			Minimum Wheel Tracking level required on BBA HAPAS Certificate:	Level 2
			Noise Level Relative to HRA required on BBA HAPAS Certificate:	Level 2
			Minimum compacted layer thickness:	30 mm
			Average macrotexture depth value:	As per Clause 942.19 table 9/12
			Performance Guarantee Period:	5 years
ST 10	942	TSCS 10	Thickness:	25 mm – 40 mm
			Traffic Count:	> 600 cv/lane/day
			Stress Level:	2

			PSV	55/60/65/68+
			Maximum Aggregate Abrasion Value:	AAV_{12}
			Red Colour – When specified for use:	Both aggregate and binder shall be red to an approved mixture colour.
			Minimum Wheel Tracking level required on BBA HAPAS Certificate:	Level 2
			Noise Level Relative to HRA required on BBA HAPAS Certificate:	Level 2
			Minimum compacted layer thickness:	20 mm
			Average macrotexture depth value:	As per Clause 942.19 table 9/12
			Performance Guarantee Period:	5 years
ST 6	942	TSCS 6	Thickness:	20 mm
			Traffic Count:	> 600 cv/lane/day
			Stress Level:	2
			Minimum	55/60/65/68+
			Maximum Aggregate Abrasion Value:	AAV_{12}
			Red Colour – When specified for use:	Both aggregate and binder shall be red to an approved mixture colour.
			Minimum Wheel Tracking level required on BBA HAPAS Certificate:	Level 2
			Noise Level Relative to HRA required on BBA HAPAS Certificate:	Level 2
			Minimum compacted layer thickness:	15 mm
			Average macrotexture depth value:	As per Clause 942.19 table 9/12
			Performance Guarantee Period:	5 years

S3A	912	AC10 Close surf 40/60	Thickness:	30 mm – 40 mm
			Minimum compacted layer thickness:	25 mm
			Noise Level:	Level 2
			PSV:	55/60/65/68+
			Maximum Aggregate Abrasion Value:	AAV_{14}
			Performance Guarantee Period:	5 years
S4A	912	AC14 Close surf 40/60	Thickness:	40 mm – 55 mm
			Minimum compacted layer thickness:	35 mm
			Noise Level:	Level 2
			PSV:	55/60/65/68+
			Maximum Aggregate Abrasion Value:	AAV_{14}
			Performance Guarantee Period:	5 years
S5A	909	AC6 Dense	Thickness:	15mm
			Minimum compacted layer thickness:	N/R
			Noise Level:	Level 2
			PSV:	50
			Maximum Aggregate Abrasion Value:	AAV_{12}
			Performance Guarantee Period:	5 years
S1H	943/915	HRA 35/14 F surf des WTR 2 + PCC 14/20	Thickness:	45-50 mm
			Minimum compacted layer thickness:	40 mm

			Grade of binder:	40/60 pen grade or a polymer modified binder (PMB) to achieve the wheel tracking performance to PD 6691 Table C.3 Class 2 (Wheel Tracking Test Temperature 60ºC)
			Coated chippings:	As per Cl 915, Grading 14/20
			Noise Level	Level 3
			PSV:	55/60/65/68+
			Maximum Aggregate Abrasion Value:	AAV_{14}
			Texture Depth	As per Clause 942.19 table 9/12
			Red Colour- When specified for use:	Both aggregate and binder shall be red to an approved mixture colour.
			Performance Guarantee Period:	5 years
S2H	943/915	HRA 35/14 F surf des WTR 1 + PCC 14/20	Thickness:	45-50 mm
			Minimum compacted layer thickness:	40 mm
			Grade of binder:	40/60 pen grade or a polymer modified binder (PMB) to achieve the wheel tracking performance to PD 6691 Table C.3 Class 1 (Wheel Tracking Test Temperature 45ºC)
			Coated chippings:	As per Cl 915, Grading 14/20
			Noise Level	Level 3
			PSV:	55/60/65/68+
			Maximum Aggregate Abrasion Value:	AAV_{14}
			Texture Depth	As per Clause 942.19 table 9/12
			Red Colour- When specified for use:	Both aggregate and binder shall be red to an approved mixture colour.

			Performance Guarantee Period:	5 years
S3H	943/915	HRA 35/14 F surf des WTR 1 + PCC 14/20	Thickness:	40 mm
			Minimum compacted layer thickness:	35 mm
			Grade of binder:	40/60 pen grade or a polymer modified binder (PMB) to achieve the wheel tracking performance to PD 6691 Table C.3 Class 1 (Wheel Tracking Test Temperature 45ºC)
			Coated chippings:	As per Cl 915, Grading 14/20
			Noise Level	Level 3
			PSV:	55/60/65/68+
			Maximum Aggregate Abrasion Value:	AAV_{14}
			Texture Depth	As per Clause 942.19 table 9/12
			Red Colour- When specified for use:	Both aggregate and binder shall be red to an approved mixture colour.
			Performance Guarantee Period:	5 years
S4H	943/915	HRA 30/10 F surf des WTR 1 + PCC 14/20	Thickness:	35 mm
			Minimum compacted layer thickness:	30 mm
			Grade of binder:	40/60 pen grade or a polymer modified binder (PMB) to achieve the wheel tracking performance to PD 6691 Table C.3 Class 1 (Wheel Tracking Test Temperature 45ºC)
			Coated chippings:	As per Cl 915, Grading 14/20
			Noise Level	Level 3
			PSV:	55/60/65/68+

			Maximum Aggregate Abrasion Value:	AAV_{14}
			Texture Depth	As per Clause 942.19 table 9/12
			Red Colour- When specified for use:	Both aggregate and binder shall be red to an approved mixture colour.
			Performance Guarantee Period:	5 years
S5H	943/915	HRA 30/14 F surf des WTR 1 + PCC 14/20	Thickness:	40 mm
			Minimum compacted layer thickness:	35 mm
			Grade of binder:	40/60 pen grade or a polymer modified binder (PMB) to achieve the wheel tracking performance to PD 6691 Table C.3 Class 1 (Wheel Tracking Test Temperature 45ºC)
			Coated chippings:	As per Cl 915, Grading 14/20
			Noise Level	Level 3
			PSV:	55/60/65/68+
			Maximum Aggregate Abrasion Value:	AAV_{14}
			Texture Depth	As per Clause 942.19 table 9/12
			Red Colour- When specified for use:	Both aggregate and binder shall be red to an approved mixture colour.
			Performance Guarantee Period:	5 years
S1S	960	SMA 10 surf	Thickness:	50 mm - 60 mm
			Minimum compacted layer thickness:	40 mm
			PSV:	55/60/65/68+
			Noise Level	Level 2
			Maximum Aggregate Abrasion Value:	AAV_{14}
			Texture Depth	As per Clause 942.19 table 9/12
			Red Colour- When specified for use:	Both aggregate and binder shall be red to an approved mixture colour.
			Performance Guarantee Period:	5 years
S2S	960	SMA 14	Thickness:	60 mm - 80 mm

		surf	Minimum compacted layer thickness:	50 mm
			PSV:	55/60/65/68+
			Noise Level	Level 2
			Maximum Aggregate Abrasion Value:	AAV_{14}
			Texture Depth	As per Clause 942.19 table 9/12
			Red Colour- When specified for use:	Both aggregate and binder shall be red to an approved mixture colour.
			Performance Guarantee Period:	5 years
S3S	960	SMA 20 surf	Thickness:	80 mm - 100 mm
			Minimum compacted layer thickness:	70 mm
			PSV:	55/60/65/68+
			Noise Level	Level 2
			Maximum Aggregate Abrasion Value:	AAV_{14}
			Texture Depth	As per Clause 942.19 table 9/12
			Red Colour- When specified for use:	Both aggregate and binder shall be red to an approved mixture colour.
			Performance Guarantee Period:	5 years
S1E	961	EME 10 surf	Thickness:	60 mm- 100 mm
			Minimum compacted layer thickness:	50 mm
			PSV:	55/60/65/68+
			Noise Level	Level 2
			Maximum Aggregate Abrasion Value:	AAV_{14}
			Texture Depth	As per Clause 942.19 table 9/12
			Red Colour- When specified for use:	Both aggregate and binder shall be red to an approved mixture colour.
			Performance Guarantee Period:	5 years
S2E	961	EME 14 surf	Thickness:	70 mm - 130 mm
			Minimum compacted layer thickness:	60 mm
			PSV:	55/60/65/68+
			Noise Level	Level 2
			Maximum Aggregate Abrasion Value:	AAV_{14}
			Texture Depth	As per Clause 942.19 table 9/12
			Red Colour- When specified for use:	Both aggregate and binder shall be red to an approved mixture colour.

			Performance Guarantee Period:	5 years
S3E	961	EME 20 surf	Thickness:	90 mm - 150 mm
			Minimum compacted layer thickness:	70 mm
			PSV:	55/60/65/68+
			Noise Level	Level 2
			Maximum Aggregate Abrasion Value:	AAV_{14}
			Texture Depth	As per Clause 942.19 table 9/12
			Red Colour- When specified for use:	Both aggregate and binder shall be red to an approved mixture colour.
			Performance Guarantee Period:	5 years
SFA		Dense Asphalt Concrete Surface Course (AC6 dense 100/150)	Thickness:	30mm (or as specified in Task Order)
			Conform to:	EN13108:1 and PD6691 Annex B
			PSV:	50
			Maximum Aggregate Abrasion Value:	AAV_{16}
			Limestone fine aggregate shall not be used.	
SAG	942.19	Surface applied grit	0/4 clean dry or lightly coated angular grit. Where required.	

Table 7/C – Permitted Bituminous Mixture Binder Course and Regulating Materials and Specifications

Pavement Binder Course Materials (Also Suitable for Regulating)				
Material Ref.	Clause	**Description**	**Special Requirements**	
Bi1S	937	SMA 14 bin 40/60 des WTR 2	Thickness:	35 mm – 60 mm
			Grade of binder:	SMA shall conform to BS EN 113108-5 and the detailed requirements from BSI PD6691 Annex D. 40/60 pen paving grade or a poly modified binder (PMB) to achieve the wheel tracking performance to PD 6691 Table D.2 Class 2 (Wheel Tracking Test Temperature 60ºC).
			Deformation after installation:	As per sub-Clause 937.6
Bi2S	937	SMA 14 bin 40/60 des WTR 1	Thickness:	35 mm – 60 mm
			Grade of binder:	SMA shall conform to BS EN113108-5 and the detailed requirements from BSI PD6691 Annex D. 40/60 pen paving grade or a poly modified binder (PMB) to achieve the wheel tracking performance to PD 6691 Table D.2 Class 1 (Wheel Tracking Test Temperature 45ºC).
			Deformation after installation:	As per sub-Clause 937.6.
Bi3S	937	SMA 10 bin 40/60	Thickness:	30 mm – 80 mm
			Grade of binder:	SMA shall confirm to BS EN113108- 5 and the detailed requirements from BSI PD6691 Annex D.
			Deformation after installation:	As per sub-Clause 937.6
Bi1H	905	HRA 60/20 bin 40/60 des WTR 2	Thickness:	45 mm – 100 mm.
			Grade of binder:	40/60 pen paving grade or a poly modified binder (PMB) to achieve the wheel tracking performance to PD 6691 Table C.3 Class 2 (Wheel Tracking Test Temperature 60ºC).

Bi2H	905	HRA 60/20 bin 40/60 des WTR 1	Thickness:	45 mm – 80 mm
			Grade of binder:	40/60 pen paving grade or a poly modified binder (PMB) to achieve the wheel tracking performance to PD 6691 Table C.3 Class 1 (Wheel Tracking Test Temperature 45ºC).
Bi3H	905	HRA 60/20 bin 40/60	Thickness:	45 mm – 80 mm
			Composition:	PD 6691 Table B11
			Volumetric properties after installation:	Conforming to the requirements of sub-Clause 929.3.
Bi1A	929	AC 20 HDM bin 40/60 WTR 2	Thickness:	50mm -100mm.
			Stiffness:	S_{min} 1800MPA.
			Composition:	PD 6691 Table B11. 40/60 pen paving grade or a poly modified binder (PMB) to achieve Wheel Tracking performance to PD 6691 Table B.4 at 60ºC.
			Volumetric properties after installation:	Conforming to the requirements of sub-Clause 929.3.
Bi2A	929	AC 20 HDM bin 40/60 WTR 1	Thickness:	50mm -100mm.
			Stiffness:	S_{min} 1800MPA
			Composition:	PD 6691 Table B11. 40/60 paving grade binder to achieve Wheel tracking performance to PD 6691 Table B.4 at 45ºC.
			Volumetric properties after installation:	Conforming to the requirements of sub-Clause 929.3.
Bi3A	906	AC 20 dense bin 100/150	Thickness:	50mm -100mm
			Composition:	PD 6691 Table B11.
B2E	930	EME 14 bin	Thickness:	70 mm - 130 mm
			Minimum compacted layer thickness:	60 mm
			Performance Guarantee Period:	5 years
B3E	930	EME 20 bin	Thickness:	90 mm - 150 mm
			Minimum compacted layer thickness:	70 mm

			Performance Guarantee Period:	5 years
Footways/Cycleways Only				
BiFC	948	14 Cold Mix	Thickness:	40mm -70mm
			SVH or QVH as available. Class B1.	
BiFA	906	AC 14 dense bin 100/150	Thickness:	40mm -55mm
			Composition:	PD 6691 Table B14.
Regulating (in addition)				
BiRH	904	HRA 50/10	Thickness:	25mm - 50mm
			Minimum compacted layer thickness:	20 mm

All Road Types Concrete and Hydraulically Bound Material Base Course	Pavement Quality Concrete Base Course	CRCP (C32/40)
		CRCB (C32/40)
	Hydraulically Bound Material Base Course	CBGM B (C8/10)
		CBGM B (C12/15)
		CBGM B (C16/20)

Table 7/D – Permitted Bituminous Mixture and Other Base Course Materials and Specifications for Carriageway and other Pavements

Pavement Base Course Materials (Also Suitable for Regulating)				
Material Ref.	**Clause**	**Description**	**Special Requirements**	
Ba1A	929	AC 32 HDM	Thickness:	70 mm – 150 mm.
			Minimum compacted layer thickness	55 mm
Ba1H	904	HRA 60/32 base 40/60	Thickness:	60 mm – 150 mm.
			Minimum compacted layer thickness	55 mm
Ba3H	904	HRA 60/20 base 40/60	Thickness:	45 mm – 80 mm.
			Minimum compacted layer thickness	55 mm
Ba2A	904	AC 32 HDM base 40/60	Thickness:	70mm – 150 mm.
			Minimum compacted layer thickness	55 mm
Ba1E	930	EME 10	Thickness:	60 mm- 100 mm
			Minimum compacted layer thickness	50 mm

Ba2E	930	EME 14	Thickness:	70 mm - 130 mm
			Minimum compacted layer thickness	60 mm
Ba3E	930	EME 20	Thickness:	90 mm - 150 mm
			Minimum compacted layer thickness	70 mm
Ba2C Ba3C	948	20 Cold Mix	Thickness:	50 mm – 100 mm.
			QVH as available:	Class B4.
			Trafficking Trial:	Only if sand fines used (as Clause 948.8).
Ba3A	906	AC 20 dense base 40/60 rec	Thickness:	50mm -100mm.
			Stiffness	S_{min} 1800MPA
			Composition:	Conforming to PD 6691 Table B11.
Ba3OA	906	AC 20 open bin 100/150 (or) AC 20 open bin 40/60	Thickness:	45mm - 75mm.
			Composition:	Conforming to PD 6691 Table B12, except that binder shall be grade 100/150 or 40/60.
			Aggregate type:	Crushed rock or slag.

Subbase and Capping Layer for Bituminous Mixture Surfaced Pavements

1. Materials for subbase shall be as per Table 7/E. Where instructed these may also be appropriate for modular unit surfaced pavements. The exact materials and thicknesses shall be as required in the instructing Task Order. Requirements for Capping Layer shall be as per Appendix 6/1.

Table 7/E – Permitted Subbase Materials for Carriageway and other Pavements

Pavement Subbase Materials				
Material Ref.	**Clause**	**Description**	**Special Requirements**	
Unbound granular mixture subbase	801SR & 803	Type 1A	Minimum Thickness:	As required in the instructing Task Order.
			Aggregate:	Gravel shall be used only where required in the Instructing Task Order.
			Maximum fines content of mixture:	Where required in the instructing Task Order then the maximum fines content of the mixture as Clause 801SR Table 8/1 shall be category UF_3 instead of UF_9.

			Resistance to fragmentation of mixture:	Where required in the instructing Task Order then the resistance to fragmentation of the mixture as Clause 801SR Table 8/2 shall be categoryLA_{40} instead of $LA_{50.}$
			Reinforcement:	Where required in the instructing Task Order then the mixture shall be reinforced with a geo-confinement system as Appendix 6/5 to part or the entire of its depth.
			CBR validation:	Where required in the instructing Task Order the mixture shall be tested as Clause 801.6SR and satisfy the stated minimum CBR value within the Task Order.
	801SR & 803	Type 1B (or) Type 1 (where sub-Type not stated)	Minimum Thickness:	As required in the instructing Task Order.
			Aggregate:	Gravel shall be used only where required in the Instructing Task Order.
			Maximum fines content of mixture:	Where required in the instructing Task Order then the maximum fines content of the mixture as Clause 801SR Table 8/1 shall be category UF_3 instead of $UF_{9.}$
			Resistance to fragmentation of mixture:	Where required in the instructing Task Order then the resistance to fragmentation of the mixture as Clause 801SR Table 8/2 shall be categoryLA_{40} instead of$LA_{50.}$
			Reinforcement:	Where required in the instructing Task Order then the mixture shall be reinforced with a geo-confinement system as Appendix 6/5 to part or the entire of its depth.
			CBR validation:	Where required in the instructing Task Order the mixture shall be tested as Clause 801.6SR and satisfy the stated minimum CBR value within the Task Order.
	801SR & 804	Type 2A	Minimum Thickness:	As required in the instructing Task Order.
			Aggregate:	Gravel shall be used only where required in the Instructing Task Order.
			Reinforcement:	Where required in the instructing Task Order then the mixture shall be reinforced with a geo-confinement system as Appendix 6/5 to part or the entire of its depth.

			CBR validation:	Where required in the instructing Task Order the mixture shall be tested as Clause 801.6SR and satisfy the stated minimum CBR value within the Task Order.
	801SR & 804	Type 2B (or) Type 2 (where sub-Type not stated)	Minimum Thickness:	As required in the instructing Task Order.
			Aggregate:	Gravel shall be used only where required in the Instructing Task Order.
			Reinforcement:	Where required in the instructing Task Order then the mixture shall be reinforced with a geo-confinement system as Appendix 6/5 to part or the entire of its depth.
			CBR validation:	Where required in the instructing Task Order the mixture shall be tested as Clause 801.6SR and satisfy the stated minimum CBR value within the Task Order.
	801SR & 805SR	Type 3/40	Minimum Thickness:	As required in the instructing Task Order.
			Reinforcement:	Where required in the instructing Task Order then the mixture shall be reinforced with a geo-confinement system as Appendix 6/5 to part or the entire of its depth.
	801SR & 805SR	Type 3/20	Minimum Thickness:	As required in the instructing Task Order.
			Reinforcement:	Where required in the instructing Task Order then the mixture shall be reinforced with a geo-confinement system as Appendix 6/5 to part or the entire of its depth.
	801SR & 882SR	Structural Soil	Minimum Thickness:	As required in the instructing Task Order.
			Reinforcement:	Where required in the instructing Task Order then the mixture shall be reinforced with a geo-confinement system as Appendix 6/5 to part or the entire of its depth.
			Soil pH:	Where required in the instructing Task Order the pH shall be varied from the standard range stated in the specification.

			Soil nutrient levels:	Further to testing, where instructed by the *Client* amendments shall be added to the mixture in accordance with the recommendations of the testing Soil Scientist to vary this from the specification.
Geo-cellular system reservoir/ soil vault/ subbase replacement system	651AR	Where required in the instructing Task Order geo-cellular systems (including subbase replacement systems) may be used to footway/cycleway pavements to create surface water reservoirs and/or under pavement rooting zones for street trees at subbase/foundation level else to serve as a direct subbase replacement system. Any associated fill for within assemblies shall be as specified in the instructing Task Order.		
Hydraulically Bound Material (HBM) subbase	810 & 822	CBGM B	Minimum Thickness:	75 mm
			General:	Standard to HD26, specification to Series 1000 – see notes 1 and 2
			Mechanical performance:	The minimum tensile strength and modulus of elasticity shall be as one of the following to BS EN 14227-01, as required in the instructing Task Order: to BS EN 14227-10, as required in the instructing Task Order: - C3/4 (or T1) - C5/6 (or T2) - C6/8 (or T3)
			Coefficient of linear expansion	To be calculated as Clause 810.6 where required in the instructing Task Order.
			Aggregate:	Where required in the instructing Task Order then: - the layer shall contain at least 50% by mass of coarse aggregate complying with BS EN 13242, Category C90/3. (and/or) - the mixture shall use an aggregate with a coefficient of linear thermal expansion of < 10 x 10-6 per degree C.
			Induced cracking:	Where required in the instructing Task Order then longitudinal and/or transverse cracks shall be induced as Clause 818.
	810 & 821	CBGM A	Min thickness:	100 mm.
			General:	Standard to HD26, specification to Series 800 – see notes 1 and 2

			Mechanical performance:	The minimum tensile strength and modulus of elasticity shall be as one of the following to BS EN 14227-01, as required in the instructing Task Order: to BS EN 14227-10, as required in the instructing Task Order: - C3/4 (or T1) - C5/6 (or T2) - C6/8 (or T3)
			Coefficient of linear expansion	To be calculated as Clause 810.6 where required in the instructing Task Order.
			Aggregate:	Where required in the instructing Task Order then: - the layer shall contain at least 50% by mass of coarse aggregate complying with BS EN 13242, Category C90/3. (and/or) - the mixture shall use an aggregate with a coefficient of linear thermal expansion of < 10 x 10-6 per degree C.
			Induced cracking:	Where required in the instructing Task Order then longitudinal and/or transverse cracks shall be induced as Clause 818.
	810 & 840	Soil treated by cement (SC)	Minimum Thickness:	75 mm .
			General:	Standard to HD26, specification to Series 800.
			Mechanical performance:	The minimum tensile strength and modulus of elasticity shall be as one of the following to BS EN 14227-01, as required in the instructing Task Order: - C3/4 (or T1) - C5/6 (or T2) - C6/8 (or T3)
			Coefficient of linear expansion:	To be calculated as Clause 810.6 where required in the instructing Task Order.
Wet Lean Concrete Subbase	1030	ST3	Minimum Thickness:	75 mm.
	1030	ST4	Minimum Thickness:	75 mm.
	1030	ST5	Minimum Thickness:	75 mm.

2. Where instructed these materials may also be appropriate for modular unit surfaced pavements. The exact materials and thicknesses shall be as required in the instructing Task Order. Requirements for Capping Layer shall be as per Appendix 6/1.

3. Crushed gravel shall only be used as a constituent material for Type 1 and Type 2 unbound granular mixtures where expressly required by the *Client* in the instructing Task Order.

4. Type 1 or Type 2 unbound granular mixtures comprised either of crushed rock or crushed gravel or of recycled concrete aggregate or recycle coarse aggregate with constituent proportions to Table 8/3, sub-Type classification Type 1A or Type 2A, shall be classified as Type 1A or Type 2A respectively.

5. Type 1 or Type 2 unbound granular mixtures comprising recycled concrete aggregate or recycle coarse aggregate with constituent proportions to Table 8/3, sub-type classification Type 1B or Type 2B, shall be classified as Type 1B or Type 2B respectively.

6. Where Type 1 or Type 2 unbound granular mixtures are required in the instructing Task Order, but no reference is made to the sub-type as per (6) or (7) above, then it shall be assumed that this may be either - in the case if Type 1 - Type 1A or Type 1B, or - in the case of Type 2 – Type 2A or Type 2B.

Permitted Composite Geosynthetic for Asphalt Overlay

Materials Reference	Clause	Requirements	
Composite Geosynthetic	0960	Tensile Strength	50kN x 50kN / 100kN x 100kN / 200kN x 200kN

Stress Absorbing Membrane Interface (SAMI)

SAMI Membrane

Materials Reference	Clause	Requirements	
SAMI Membrane	0960	Thickness	≤3mm
SAMI Asphalt	0960	Binder	PMB3
		Thickness	25mm

Proprietary Thin Surface Course System

7. Where they are required then proprietary Thin Surface Course Systems shall be proposed by the *Contractor* for the approval of the *Client*. The supporting information to be provided by the *Contractor* shall include the following:

   a. A copy of the British Board of Agrément HAPAS Roads and Bridges Certificate/s or the thin surfacing course system/s that are proposed for use in the works, together with a copy of the Quality Plan and Installation Method Statement associated with each Certificate.

   b. For any Certificate that covers several variants of one thin surface course system, proposed variant/s of the system to be used in the works.

   c. The proposed component materials to be used in the thin surface course system and its proportions for each proposed system.

   d. Proposed source/s of coarse aggregate together with statement of properties including polished stone value, ten percent fines value, aggregate abrasion value and flakiness index.

   e. If regulating material is to be used, evidence of its deformation resistance either independently or in combination with the surface course system.

f. Requirements for resin-based high skid resistant surface dressing.

High Friction Surface Treatment

8. Resin-based high skid resistant surface dressing shall be applied to the areas shown on the drawings and as required in this Appendix. It shall be applied to areas of carriageway in accordance with the following:

   a. The material shall comply with Clause 924, Category Type 1

   b. The material shall be BBA/HAPAS Type 1 Cold applied unless otherwise indicated on the drawings.

   c. The material shall be resin-based binder and small size bauxite as Clause 959AR with min PSV 70.

   d. The material colour shall be as indicated on scheme specific drawings or as indicated in Clause 959AR

   e. The materials shall be machine laid, unless otherwise authorised by the *Client* or for small areas as specified in this Appendix.

   f. Any existing resin-based surface treatment shall be removed mechanically before applying new high friction surfacing, unless otherwise instructed by the *Client*.

Bitumen Samples

9. The *Contractor* shall supply samples of bitumen to the *Client* as instructed by the *Client*. Bitumen shall be sampled from at the point of delivery where the product is transferred to the sprayer and from the asphalt binder storage tank for asphalt production. Two 1litre samples of bitumen shall be taken by the *Contractor* on each sampling occasion. The *Contractor* shall retain one of these samples and forward the other sample to the *Client* for independent testing.

Temporary Ramps

10. When carrying out surfacing works, the *Contractor* shall provide temporary ramps suitable for the passage of all traffic at the end of each working day as necessitated by the programme of works. The layer thickness to length ratio of such ramps shall be not more than 1:5. The *Contractor* shall allow for the cost of such ramps in the rates for surfacing. The *Contractor* will not be permitted to leave a longitudinal level difference on the centre joint of a carriageway when the road is open to traffic. Each working day's production shall terminate in a ramp which is continuous for the full width of the carriageway.

Surface Regularity

11. For the purposes of SHW Table 7/2 – Maximum Permitted Number of Surface Irregularities – Category A Roads shall be Strategic Routes and Main Distributor Roads and Category B Roads shall be all others. Unless otherwise stated herewith, all excavations and reinstatements shall be undertaken in accordance with the requirements outlined in 'Specification for the Reinstatement of Openings in Highways (2010)'. Bituminous materials for reinstatement shall be as per Appendix 7/1.

12. All road surfaces shall be cut back using diamond blade saws.

13. Vertical joints shall be stepped by the layer thickness where this does not exceed 75mm, and by a minimum of 75 mm elsewhere.

14. Where new construction of bituminous material abuts existing construction, whether it be kerbs or other bituminous construction, the joint between the two shall be sealed with hot poured bitumen.

15. Where excavation takes place in areas on which resin-based skid resistant surface dressing or coloured surfaces exist, the existing surface treatment shall be reinstated. This reinstatement may be hand laid if less than 0.75m wide or less than 10 square metres in area.

16. Where excavation or reinstatement takes place in areas on which road markings exist, the existing road markings shall be reinstated.

17. All excavated material, which is not to be reused shall be removed to licensed tip.

Local Repairs

Potholes and Patching

1. All loose material shall be removed before filling the hole.
2. All standing water shall be removed before filling the hole.
3. The filling material shall be compacted with a circular headed hammer in layers not exceeding 40 mm thick.
4. The finished surface shall be level with that of the adjacent road.
5. Further requirements are set out in Clause 946.
6. Alternatively, but only with the *Client*'s approval, proprietary in-situ cold lay repair systems may be used. Such use shall be fully in accordance with the manufacturer's specification.

Infra-Red Surfacing Repairs

7. Heat shall be applied to the existing bituminous surfacing course by means of an infra-red heater.
8. The existing bituminous surfacing course shall be scarified to a nominal depth of 40mm.
9. Arisings shall be regulated and reshaped in-situ by the addition of an emulsified bitumen rejuvenator and with bitumen coated additional material.
10. The recycled material shall be compacted to produce an efficient and joint- free repair evenly tied in with the surrounding surfacing course.
11. The finished surface shall be protected with a penetrative bitumen preservative.
12. Fine silica aggregate shall be applied to the surface to ensure adequate skid resistance.
13. Further requirements are set out in Clause 946.

Appendix 7/2: Excavation and reinstatement of existing surfaces

1. Unless otherwise stated herewith, all excavations and reinstatements shall be undertaken in accordance with the requirements outlined in 'Specification for the Reinstatement of Openings in Highways (2010)'. Bituminous materials for reinstatement shall be as per Appendix 7/1.
2. All road surfaces shall be cut back using diamond blade saws.
3. Vertical joints shall be stepped by the layer thickness where this does not exceed 75mm, and by a minimum of 75 mm elsewhere.
4. Where new construction of bituminous material abuts existing construction, whether it be kerbs or other bituminous construction, the joint between the two shall be sealed with hot poured bitumen.
5. Where excavation takes place in areas on which resin-based skid resistant surface

dressing or coloured surfaces exist, the existing surface treatment shall be reinstated. This reinstatement may be hand laid if less than 0.75m wide or less than 10 square metres in area.

6. Where excavation or reinstatement takes place in areas on which road markings exist, the existing road markings shall be reinstated.

Appendix 7/3: Surface dressing

Type Designation	**Type 1**
Location	As directed by the *Client*
Road Surface	Hard
Type of Binder	Premier polymer modified bitumen binder shall be used. This shall be an emulsion in which a polymer has been incorporated and which can demonstrate enhanced performance properties at both high and low ambient temperatures.
Chippings	Uncoated 14 mm granite chippings with uncoated 6 mm granite chippings racked in.
Minimum PSV	65
Maximum AAV	12
Requirements for Rolling	Initial pass with a light steel roller and then compaction by pneumatic multi-wheel roller.
Type Designation	**Type 2**
Location	As directed by the *Client*
Road Surface	Hard
Type of Binder	Premier polymer modified bitumen binder shall be used. This shall be an emulsion in which a polymer has been incorporated and which can demonstrate enhanced performance properties at both high and low ambient temperatures.
Chipping Size	Single layer of 14 mm uncoated granite chippings
Minimum PSV	65
Maximum AAV	12
Requirements	Pneumatic multi-wheel roller
Type Designation	**Type 3**
Location	As directed by the *Client*
Road Surface	Hard
Type of Binder/Chippings	Proprietary Surface Dressing System

Performance Criteria	24 months after laying the surface dressing shall have a surface texture of 1.5 mm as measured by the sand patch test and shall not have fretted to the extent that more than 25% of the chippings have been lost from the original continuous mosaic pattern.
Minimum PSV	65
Minimum AAV	12

The *Contractor* is responsible for inspections and testing to be carried out to produce surface dressing designs which are in accordance with Design of Road Surface Dressing Seventh Edition:2016 (Road Note 39)

Contractor should provide method statements pertaining to the selected surface courses as well as sourcing information for chippings alongside the intended properties (e.g. – grading, flakiness, minimum declared PSV and AAV)

Appendix 7/4: Bond coats, tack coats and other bituminous sprays

1. All street furniture, iron work, drop-kerbs (and other unintended surfaces) to be protected with a self-adhesive masking material before work begins. This is to be removed upon completion of the task. Surface is to be free of water before spraying.
2. Bond coats shall be used underneath all asphalt layers. Bond coats shall conform to the requirements outlined in BS 594987:2010.
3. 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 2 mm in width shall be cleaned and filled prior to the application of the bond coat. Cracks shall be filled level with the surrounding surface using a polymer modified bituminous sealant.
4. Tack coats shall not be used without the prior approval of the *Client*.
5. The approved binder is to be C50BP or C60BP only.
6. Residual binder is to be 0.2 kg/m2, 0.35kg/m2 or 0.7 kg/m2 and is to be specified in the Task Order

Appendix 7/5: In-situ recycling – the remix and repave processes

In Situ Recycling: The Repave process

1. Requirements for in-situ recycling shall be given in the Task Order.
2. Where instructed in a Task Order, an infrared road repair system shall be used. Repairs using this system shall be undertaken in accordance with the supplier's specification.
3. The depth of scarification shall be such that the bottom of the scarified layer is parallel to and below the finished road surface level by the thickness of the surface course material specified within the Task Order.

Appendix 7/6: Breaking up or perforation of existing pavement

Breaking Up or Perforation of Redundant Pavement

1. Existing pavements shall be perforated to permit free passage of moisture with puncture

holes at five hundred-millimetre (500mm) centres. The perforation shall be carried out in such a manner that shall not damage other existing services or utility works including drainage systems that form part of the new works.

2. Unless agreed otherwise and instructed by the *Client* in the Task Order existing pavement removed by the *Contractor* shall be recycled and/or re-used.

3. Adequate precaution shall be taken to ensure that breaking of the existing pavement does not exceed the specified boundaries that form part of the existing pavement. Areas of the pavement to be broken or perforated shall be delineated both longitudinally and transversely by saw cutting prior to perforation.

Appendix 7/7: Slurry surfacing/micro-surfacing/micro-asphalt

1. Slurry surfacing/micro-surfacing/micro-asphalt shall be applied in accordance with Clause 918 and the manufacturer's instructions.

2. All ruts and depressions in the existing surface exceeding 10mm under a 3m straight edge shall be filled as directed by the *Client* either with the proposed new surfacing material or with hot rolled asphalt.

3. Scheme drawings may stipulate one of the following three methods for preparing the existing surface:

   a. Scabbling;

   b. Scratch coat; or

   c. Pressure washing and drying.

4. All loose materials shall be removed to Tip.

5. Where laying by mechanical means is not possible, laying by hand may be carried out subject to the *Client*'s acceptance.

6. The *Contractor* shall guarantee all workmanship and materials against defaults for a period of two years from the date of completion of the works. Minimum macrotexture at the end of the guarantee period shall be 1mm. Maximum percentage decrease in macrotexture initially measured and at the end of the guarantee period shall be 40%.

7. Where detailed on scheme specific drawings or instructed by the *Client*, Slurry Surfacing, Micro-Surfacing and Micro-Asphalt shall be coloured by the addition of pigments.

	Slurry Surfacing	**Micro- Surfacing**	**Micro-Asphalt**
Description	Controlled setting cationic veneer carpet surfacing	Polymer modified dense graded surfacing	Polymer modified dense graded surfacing
Spread Rate	4 to 10 kg/m²	12 kg/m²	24 kg/m²
Nominal Thickness	3 to 6mm	8 to 10mm	15mm
Minimum PSV	55	60	60

Scratch Coat

8. When a Scratch Coat is specified for the preparation of the existing surface before the application of slurry surfacing, micro-surfacing or micro-asphalt, it shall be a resin-based screed specifically formulated to fill voids, minor undulations and blowholes in both concrete and asphalt surfaces.

9. All substrates shall be clean, dry and structurally sound. All substances that are detrimental to the bond, such as laitance, dust, dirt, oils, fat, waxes and chemical contaminants shall be removed. New concrete shall be a minimum of 7 calendar days old.

10. Further details of surface preparation, and full application details, shall be as specified by the manufacturer.

Appendix 7/8: Fine cold asphalt

1. Fine Cold Asphalt shall comprise 3mm aggregate and comply with BS 4987 Part 1:2006, Clause 7.7.

Appendix 7/9: Cold-milling (planing) of bituminous bound flexible pavement

Cold-milling (Planing) of Bituminous Bound Flexible Pavement

1. Where the thickness of existing courses is such that it is not practicable to plane off the thickness specified in the *Contract*, the *Contractor* shall immediately inform the *Client* of the thickness they propose to plane. Failure to do so may result in the *Contractor* being held responsible for the cost of any remedial works.

2. All inset road studs shall be removed at the commencement of each phase prior to milling operations.

3. Where de-laminSteiation of the layer occurs, further milling is to be carried out to the level of sound material and replaced with a regulating course appropriate to the overlying material using a material described in Schedule 5 of Appendix 7/1.

4. Forty-eight (48) hours prior to cold-milling the *Contractor* shall carry out a sweep of the area(s) to locate any buried metalwork within the layer to be cold-milled

Appendix 7/10: Mastic asphalt

1. Mastic asphalt shall be produced and laid in accordance with BS 1447:1988 – Specification for Mastic Asphalt (Limestone fine Aggregate) for roads, footways and paving in buildings.

Appendix 11/1: Kerbs, footways & paved areas

1. When instructed by the *Client* by issue of a Task Order the *Contractor* shall construct or repair kerbs, footways and other paved areas.

2. precast concrete kerbs, channels, edgings and quadrants shall conform to BS EN 1340 and its dimensions, type designations and performances and classes shall be as described in the Southwark Streetscape Design Manual and Materials Palette.

3. Kerbs shall be constructed to the dimensions described in the Southwark Streetscape Design Manual and Materials Palette.

4. At expansion joints in bridge decks, the kerb joints shall be as in the Southwark Streetscape Design Manual and Materials Palette.

5. All paving related works are to be carried out in accordance with the NHSS 30 – The National Highways Sector Scheme for the Installation, Maintenance and Repair of

Modular Paving. Modular paving includes paving blocks, flags, slabs, kerbs setts and accessories, manufactured in precast concrete, natural stone or clay.

6. Holes in in-situ footways and paved areas shall be repaired as follows:

   a. Hole shall be excavated back to a sound base, thoroughly cleaned, and all loose material shall be removed before filling the hole;

   b. All standing water shall be removed before filling the hole;

   c. After cleaning, the hole shall be primed with bitumen tack coat;

   d. Fill hole with 0 to 6mm medium graded surface course repair material;

   e. Holes shall be backfilled with materials compacted to refusal with a circular headed vibrating hammer in layers not exceeding 40mm thick.

Mastic Asphalt Recycling

7. Surplus excavated mastic asphalt shall be stored for recycling/reuse.

8. Patching and repairs in footways, footpaths and other paved areas shall comply with the requirements of Clause 946

In-Situ Asphalt Kerbs

9. Kerbs shall be constructed to the dimensions described in the Southwark Streetscape Design Manual and Materials Palette.

Self Adhesive/Stick Down Kerbs

10. The self adhesive kerbs shall be installed using tack coat primer/coat primer as bedding adhesive

Freestanding In-Situ Concrete Kerbs, Channels and Edge Details

11. Freestanding in-situ concrete kerbs, channels and edge details shall be constructed to the dimensions described in the Southwark Streetscape Design Manual and Materials Palette.

12. The carriageway surfacing adjacent to new kerbs, kerb blocks and channels, etc shall be made good by saw cutting the existing surfacing to a straight square edge, applying a tack coat and surfacing, with surface course material stated in Appendix 7/1.

13. Kerbs, channels, edgings, quadrants, paving and bedding materials shall be transported, stored and laid in accordance with the manufacturer's instructions, unless detailed otherwise in the *Contract* documents.

14. Precast units are to be manufactured and tested in accordance with the relevant parts of BS EN 1340:2003.

15. The identification of footway construction areas and kerb, channel and edging types are indicated on the drawings issued with the Task Order.

16. Standard construction details relating to footways are indicated in the Southwark Streetscape Design Manual and Materials Palette.

17. Sub-bases may be type 1 granular or type 4 (recycled materials) for all footway types, unless otherwise instructed by the *Client*.

18. Repairs and reinstatements of existing footways and paved areas shall comply with the construction types in the Southwark Streetscape Design Manual and Materials Palette. Repairs and reinstatements may comprise replacement of the full construction depth

and/or works to component layers.

19. Where existing surfacing is removed, this shall include removal around chambers, boxes, adjacent to kerbs and vehicle crossover.

20. Where the subgrade CBR is less than 5% then sub-base thicknesses shall be increased to the values given in the Southwark Streetscape Design Manual and Materials Palette.

Footways and Paved Areas (Precast Concrete Flags and Natural Stone Slabs)

21. Granite kerbs, channels, edgings and quadrants are to be manufactured to the requirements of BS EN 1343:2012.

22. Granite kerbs shall be dressed on a minimum of the front and top faces.

Footways and Paved Areas (Flexible Surfacing)

23. Flexible surfacing and subbase for footways and paved areas shall be constructed using the materials and layer thicknesses described in the Southwark Streetscape Design Manual and Materials Palette.

24. Bituminous mixture surface course materials and installed thicknesses for footways and cycleways shall be as required in the instructing Task Order. Materials shall be selected from those listed in Appendix 7/1.

25. Resin bound gravel and self-binding gravel surface course materials (including stabilised self-binding gravel surfacing) shall be to the Southwark Streetscape Design Manual and Materials Palette, as required in the instructing Task Order. The installed thickness shall be as required in the instructing Task Order. The *Contractor* shall provide samples of all materials to the *Client* for approval a minimum of 14 days in advance of the date of the installation works. Where the *Contractor* proposes alternative products to those indicated as acceptable then they will be required to provide such as evidence as is necessary to satisfy the *Client* that these have a substantive previous record of successful use as a surfacing material in comparative service conditions.

Footways and Paved Areas (In-Situ Concrete)

26. Where in-situ concrete slab surfacing is required then the materials to be used and thickness shall be as required in the instructing Task Order.

Modular Unit Pavers

27. Flag, slab, block, sett and paver Modular Units made from precast concrete, clay or natural stone shall be one or more of the following:

    a. An LBS Standard Unit to one of the Type designations and related specifications given in in the Southwark Streetscape Design Manual and Materials Palette.

    b. An Unlisted Unit. This shall be '*Client* Specified' equipment as Clause 143AR.

    For whichever Modular Units are required, the bonding pattern(s) that they shall be laid in shall be as required in the instructing Task Order.

28. The colour and appearance of granite sett Modular Paving Units shall be to one of the Types given in the Southwark Streetscape Design Manual and Materials Palette as required in the instructing Task Order.

Footways and Paved Areas (Concrete Block Paving)

29. Precast concrete paving blocks shall be chamfered and shall conform to BS EN 1338

and the shapes, dimensions, colours and performances and classes described in the Southwark Streetscape Design Manual and Materials Palette.

30. The layout of blocks and details at edges, chamber covers, gullies and other openings shall be as described in the Task Order.

31. Block or brick paving shall be subjected to a minimum of three passes of a vibrating plate compactor which shall have a minimum centrifugal force of 16kN and a frequency of 75-100 Hz and a minimum plate area of 0.25 m^2. Vibration shall not be carried out within one metre of an unrestrained edge. After initial vibration dry sand shall be brushed into the joins and further passes of the vibrating plate compactor made until the joints are full.

32. At edges or obstructions such as gully or chamber covers and frames, blocks shall be cut to fit. Gaps of less than 50mm at the edges of block or brick paving, including against obstructions within paved areas shall be filled and compacted to the full depth of the paving block with class 1 mortar to Clause 2404.

33. No vehicle traffic shall be permitted to travel within one metre of an unrestrained edge on any completed section of block paving.

34. Where traffic has been permitted to run on new block paving with unrestrained edges or ends, the block paving shall be removed for a minimum distance of one metre longitudinally and two metres transversely and relayed before continuing with laying of block paving.

35. Recycled glass sand may be used in areas of block paving un-trafficked by vehicles to replace the sand laying course in relevant footway types in accordance with BS 7533.

36. Blocks shall be cut evenly and symmetrically around obstructions to avoid small dimensions.

37. Mortar infill around chambers etc. in slabs or blocks shall be 50mm wide maximum.

38. Cut blocks and slabs shall be not less than 150mm wide

Footways and Paved Areas (Clay Pavers)

39. Clay pavers shall conform to BS EN 1344. The shapes, dimensions, colours and performances and other required classes of clay pavers shall be as described in the Southwark Streetscape Design Manual and Materials Palette.

40. The layout of pavers and details at edges, chamber covers, gullies and other openings shall be as described in the Task Order

Laying Course Materials for Natural Stones

41. Natural Stones are to be laid on a high performance, naturally pure hydraulically bonding mortar, with the bedding depths varying between 30mm to 70mm, as instructed in the Task Order. Bonding Mortar is to be compliant to BS7533-7 & BS7533-12. As per BS7533-4, a slump of 150mm is recommended when laying paving. Items in the price list are based on a bedding depth of 35mm.

42. The jointing of Natural Stone is to be carried out with a high performance, naturally pure hydraulically bonding mortar containing no polymer or resin adhesives requiring only the addition of water. It shall comply or exceed the requirements of BS7533-7 and BS 7533-12.

43. Prior to the Laying of the Natural Stones, to the bonding mortar these are to receive a layer of primer mortar complying or exceeding the requirements of BS7533-2 and

BS7533-12.

Laying Course Materials for Modular Unit Paved Surfaces and Bedding of Kerbs and Other Edge Restraints

44. Bound and unbound laying course and bedding materials for Modular Unit paved surfaces, Kerbs and other Edge Restraints shall be one or more of the following:

    a. A material to one of the Type designations and related specifications given in the Southwark Streetscape Design Manual and Materials Palette, as required in the instructing Task Order.

    b. A material to another specification provided in the instructing Task Order.

    In either instance, the installed thickness of the laying course materials shall be as required in the instructing Task Order.

Jointing Materials for Modular Unit Paved Surfaces, Kerbs, and Other Edge Restraints

45. Bound and unbound jointing materials for Modular Unit paved surfaces, Kerbs and other Edge Restraints shall be one or more of the following:

    a. A material to one of the Type designations and related specifications given in the Southwark Streetscape Design Manual and Materials Palette, as required in the instructing Task Order.

    b. A material to another specification provided in the instructing Task Order.

    In either instance, the depth and width of the joints shall be as required in the instructing Task Order.

Kerbs, Channels, Quadrants, Angle and Edgings

46. Kerbs, Channels, Quadrants, Angles and Edgings shall be one or more of the following.

    a. An LBS Standard Unit, as required in the instructing Task Order.

    b. An Unlisted Unit. This shall be '*Client* Specified' equipment as Clause 143AR.

Construction Requirements for Pavements

47. For Modular Unit Paver surfaced pavements, materials and thicknesses for base course (where required), subbase, capping layer (where required) and any associated inter-layers shall be as required in the instructing Task Order.

48. For Flexible Surface pavements, materials and thicknesses for base course (where required), subbase, capping layer (where required) and any associated inter-layers shall be as required in the instructing Task Order. Materials shall be selected from options permitted under other Appendices within this Annex.

49. For Flexible Surface pavements, materials and thicknesses for base course (where required), subbase, capping layer (where required) and any associated inter-layers shall be as required in the instructing Task Order. Materials shall be selected from options permitted under other Appendices within this Annex.

Construction Requirements for Kerbs and Other Edge Restraints

50. Wherever possible, a new kerb alignment shall be created by saw cutting the carriageway. Where this is not possible, reinstatements to Appendix 7/2 shall be carried out. A hot poured bitumen seal shall be provided to existing road construction.

Linear Drainage Block Systems

51. Linear Drainage Block Systems shall be as required in the instructing Task Order. All systems shall be two-part, consisting primarily of a precast polymer concrete block base unit and interchangeable grille cover tops with associated system accessories including alternative grille covers, cover plates, silt boxes, junction and radius base units, pipe sealants, transition base units and outfall units.

52. The type of grille or slot cover top unit to be as required in the instructing Task Order. Gratings shall be locked securely in place using the manufacturer's locking system.

Combined Drainage and Kerb Block Systems

53. Combined Drainage and Kerb Block Systems shall be as required in the Task Order. All systems shall be two-part, consisting primarily of a precast concrete block base unit and interchangeable grille cover tops with associated system accessories including alternative grille covers, cover plates, silt boxes, junction and radius base units, pipe sealants, transition base units and outfall units.

Linear Hydrocarbons/Solids Separator Block Units

54. Linear Hydrocarbons/Solids Separator Block shall be as required in the Task Order.

55. Units shall be two-part systems consisting of a concrete block base unit and a grille cover top unit. Each concrete base unit shall include a pipe outlet aperture in one or more of its longer sides. The base units shall be trapped with a weir so as to prevent flushing through of solids and hydro carbons to that aperture. In order to promote low velocities, base units shall each create a separately confined channel rather than a continuous channel running between blocks.

56. Construction materials and workmanship shall be in accordance with the manufacturer's recommendations for the service conditions encountered.

Surface Finish Details to Around Bases of Items of Street Furniture

57. Where items of street furniture are to be installed into a paved surface, the surface finishing detail used around its immediate base above the items foundation shall be as described in the Southwark Streetscape Design Manual and Materials Palette, as required in the instructing Task Order.

Appendix 11/2: Access steps

Access Steps

1. The *Contractor* shall provide the access steps identified in the Task Order and where required by instruction in *Contract* specific Appendix 1/10 shall undertake the design of the access steps or elements thereof.

Footbridges, Subways and Approach Ramps

2. Before laying new surfacing, all existing surfacing shall be removed and the existing concrete or steel base shall be thoroughly cleaned. On footbridges, new surfacing shall be laid on a waterproofing membrane. On concrete footbridges, the waterproofing membrane shall be laid on 50mm of sand/cement screed.

Mastic Asphalt

3. Mastic asphalt shall be laid in two coats to an overall finished thickness of not less than 25mm in accordance with Series 2000 as follows:

   a. First coat - minimum thickness 10mm.

   b. Second coat - minimum thickness 15mm with additional grit both to Clause 5.1

of BS8204-5 2004 + A1:2011.

Granolithic Concrete Surfacing

4. The granolithic mix shall be 2 parts OPC to 5 parts granite chippings (6mm to dust with only 20% passing a 76 x 76 sieve) to BS EN 206-1: 2000 and BS 8500-1:2015 + A1:2016 and shall comply with Specification Series 1700.
5. Surfacing shall be laid to a thickness of 38mm and in alternate bays of up to 3.5m x 3.5m.
6. The surface shall be finished with a steel trowel just prior to the mix hardening.
7. The finished surface shall be cured with a spray applied curing membrane.

Appendix 11/3: Perforated pipe irrigation and ventilation loops to under pavement rooting zones for street trees

1. Where they are required, perforated pipe irrigation and ventilation loops for rooting zones and associated inlets shall be arranged and located as required in the instructing Task Order.
2. Materials for perforated pipe irrigation/ventilation loop assemblies shall meet the following requirements:
   a. The main loop pipe shall be a 60mm internal diameter perforated thermoplastic polymer pipe. This shall be a minimum of 3m long.
   b. The connecting pipe between inlet and the main loop pipe shall be a 60mm internal diameter non-perforated thermoplastic polymer pipe. It shall be a minimum of 750mm long.
   c. Inlets shall be manufactured from ≥5mm thick LM6 grade aluminium to BS 1490 with a 100mm square top aperture.
   d. The below ground length and design of inlets shall be sufficient for these to be secured in a concrete surround concealed beneath pavement surface and laying/binder courses.
   e. Inlets shall be covered with a securely fastened polished stainless-steel grille cap with a secure opening mechanism that keeps the grille attached to the inlet when opened.
   f. The system shall include an HDPE 'T' pipe joining piece to allow connection between inlet pipes and the main perforated loop pipe.
   g. The overall system shall allow for the lengths of pipes to be adjusted by cutting.
   h. The overall system shall be modular such that one or more pipe loops sections may be linked together to create a longer loop with multiple inlets.
3. Multiple instances of perforated pipe irrigation/ventilation loop assemblies shall be joined together by the *Contractor* as necessary in accordance with the manufacturer's instructions to create assemblies with longer loop lengths or multiple inlets, as necessary to meet the requirements of the instructing Task Order.
4. Where required then granular surrounds for perforated pipe loops shall be as stated in the instructing Task Order.
5. Unless required otherwise in the instructing Task Order, inlets shall be securely bedded

in or fixed to a concrete foundation in accordance with the manufacturer's recommendations in such a manner as to allow a full surface and binder/layer course to be installed up to the edge of the inlet without exposure of any concrete footing. Joint widths to the edge of the inlet shall not exceed the maximums permitted for the type of surface course being installed.

Appendix 11/70: Mastic asphalt footways

General

1. When instructed by the *Client* by issue of a Task Order the *Contractor* shall replace mastic asphalt footways.

Preparation Of Base

2. The existing mastic asphalt surface or any temporary surfacing material including ramps and fillets shall be removed by the *Contractor* and joints formed by saw cutting to a firm, straight edge.
3. The base shall be free of surface water and swept clean prior to laying mastic asphalt.
4. All chamber and gully frames, boxes, kerbs, etc. shall be cleaned and painted with one coat of bitumen.

Materials

5. Mastic asphalt shall comply with BS EN 13108-6: 2006, the asphaltic cement to be in accordance with Table 1 Column 1 and the coarse aggregate shall consist of clean, crushed igneous or calcareous rock. The proportions shall be in accordance with volume 4. Where existing mastic asphalt is to be re-used, it shall be mixed in accordance with the specification as detailed in volume 4 and shall be cleaned of all extraneous material before re-melting.
6. Where specified by the *Client*, the *Contractor* shall supply and lay an approved waterproof membrane to prevent blistering.
7. The *Contractor* shall provide details of the source and type of material they propose to supply with its tender.

Laying Mastic Asphalt

8. All material shall be prepared by mixing continuously in a purpose-built mechanically agitated mixer for at least one hour, at a temperature of between 175º and 230°C.
9. Mastic asphalt shall be laid on the previously prepared base in accordance with Appendix A of BS EN 13108-6:2016. The heated material shall be spread evenly over the base to a finished thickness of 25mm or as directed by the Service Manager. It shall be worked to a uniform and true surface free of blisters and the finished surface shall be flush with or not more than 3mm above all iron work and kerbs.
10. The surface shall be finished by the application of a thin coating of sand while the asphalt is still plastic and rubbing in well by means of wooden floats. Asphalt laid as a separate base layer need not be finished.
11. Work shall not be carried out during unsuitable weather, nor on ice-bound surfaces. The *Contractor* shall, at its own expense, make good any work damaged by weather to the satisfaction of the Service Manager.
12. Care shall be taken to ensure that all joints are saw cut and properly and truly made.
13. The joints between sections of work must be made by warming the existing asphalt by

the application of an excess of hot mastic which is subsequently trimmed off to form an accurately level joint.

Appendix 12/70: Posts for permanent traffic signs

1. Tubular steel posts shall be as directed in Clause 1204SR.
2. Each post shall have a base plate having a minimum area of 0.052sq.m.
3. All posts and base plates shall be provided with the additional protection of a bitumen coating both internally and externally below ground level.
4. Posts shall be of the following dimensions:
    a. Type 1 76.1mm OD x 3.2mm Thick Straight Post
    b. Type 2 114.3mm OD x 3.6mm Thick Straight Post
    c. Type 3 76.1mm OD x 3.2mm Thick Straight Post with Flange Plate Base
    d. Type 4 76.1mm OD x 3.2mm Thick Large Base Post
    e. Type 5 114.3mm OD x 3.6mm Thick Large Base Post
    f. Type 6 76.1mm x 76.1mm x 3.2mm Thick Square Straight Post
5. The height shall be as instructed.
6. All posts shall be supplied complete with plastic end caps.
7. Signposts shall be protected against corrosion in accordance with Clause 1221.
8. Signpost Bracket types shall be defined as:
    a. Type 1 Standard clip outreach with flange.
    b. Type 2 Post top outreach with flange.
    c. Type 3 Post top outreach with adjustable lantern fixing and flange.
    d. Type 4 Double arm post top outreach with flange.
    e. Type 5 For single spot lamps.
    f. Type 6 For twin spot lamps.
9. Signpost brackets shall be made by the same manufacturer as the sign lighting units.
10. Signpost brackets shall be protected against corrosion in accordance with Clause 1221.
11. The type of duct to be installed through the foundations of a post into which electrical equipment is to be installed shall be 50mm diameter UPVC street lighting duct of 5mm wall thickness.

Appendix 12/71: Location and erection of permanent traffic signs

1. The minimum distance from the edge of the carriageway or hardened verge to the nearest edge of the sign shall be as follows:
    a. Verge or central reservation of a high speed dual carriageway - 1.5m
    b. Verge or central reservation of a dual carriageway, but not high speed - 0.6m
    c. Sites where the carriageway has a severe camber or crossfall - 0.6m
    d. Sites having a hardened verge - 0.6m
    e. All other sites - 0.5m

NB High speed roads are those with a maximum speed limit of 50mph limit or more.

2. Signs erected on a single post shall be positioned so that the post is in the centre of the sign. Signs erected on two posts shall have each post positioned so that the distance from the centre of the post to the edge of the sign plate is 300mm. Posts shall be sited so that the post having the control base housing is the one farthest from the edge of the carriageway. Where this is not possible, the control access opening shall face away from the carriageway.

3. Signs shall be correctly aligned when attached to its posts so that the tops of rectangular signs are horizontal, and sides of the signs are vertical.

4. 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. Where two or more posts are used for one sign, the tops of the posts shall be at the same level as the top of the sign.

5. Signs shall be mounted at the height specified by the *Client*. Where multiple direction signs are mounted on the same post or posts, the mounting height shall be to the underside of the lowest sign. Primary Route signs shall be erected above local signs and, unless otherwise directed by the *Client*, a gap shall be left between the two signs. The gap shall be half of the x-height (i.e. the height of the lower-case lettering) on the lower sign, up to a maximum of 50mm.

6. To avoid specular reflection on straight lengths of road and on right hand curves, signs shall be set at an angle of between 2 and 4 degrees from a line at right angles to the road in the direction away from approaching traffic. Signs on left hand curves shall be set at an angle of between 2 and 4 degrees from a line at right angles to a chord, forming a point on the edge of the carriageway at the position of the sign to a similar point 185 metres in advance of the sign, in the direction away from approaching traffic.

7. When directed by the *Client*, the sign plate shall be screened using waterproof opaque material until such time as the sign is brought into use.

Appendix 12/72: Foundations for traffic sign posts

1. It shall be the responsibility of the *Contractor* to ensure that the foundations for each sign assembly are adequate to withstand the loading conditions imposed on either face of the erected sign. Minimum foundation sizes are set out below.

Size of post (mm)	76.1mm OD or Square	114.3mm OD
Minimum diameter of excavation (mm)	750	1000
Minimum depth of excavation (mm)	675	1075
Planting depth (mm)	600	1000

Appendix 12/73: Colour requirements for red road markings

1. Red road markings shall be to BS 381C Colour No 537 (Signal Red). The initial red colour shall lie within the polygon defined by the following coordinates according to the CIE colour measuring system:

X	Y
0.570	0.340
0.650	0.340
0.690	0.300
0.520	0.300
0.510	0.320
0.570	0.340

2. When subjected to an exposure period of 6 months under normal London traffic conditions, the colour of the red material shall lie within the polygon defined by the following coordinates according to the CIE colour measuring system:

X	Y
0.580	0.300
0.490	0.300
0.460	0.330
0.540	0.330
0.570	0.340

3. The *Contractor* shall provide evidence to the *Client* that the material to be used meets the above specification.

Appendix 12/74: Traffic sign luminaires

Overhead mounted

EA1	2 x 8-watt MCFE (side by side)
EA2	2 x 8-watt MCFE (end to end)
EA3	2 x 20-watt MCFE (side by side)
EA4	2 x 40-watt MCFE (side by side)
EA5	2 x 50-watt MBFU
EA6	2 x 80-watt MBFU
EA7	2 x 125-watt MBFU
EA8	2 x 250-watt MBFU

Pedestal mounted

EFS1	2 x 50-watt MBFU
EFS2	2 x 80-watt MBFU
EFS3	2 x 125-watt MBFU
EFS4	2 x 250-watt MBFU

Refuge Beacon mounted

RB1	Lantern with white globe
RB2	Lantern with orange globe
RB3	Lantern with 2 orange globes and 1 white globe

Gantry mounted

EG1	2 x 50-watt MBFU

EG2	2 x 80-watt MBFU
EG3	2 x 125-watt MBFU

Appendix 12/75: Preformed thermoplastic cycle superhighways (CS) logo

Cycle symbols and associated lettering used on Cycle Superhighways shall be pre-formed. Hand drawn symbols will not be acceptable.

The specifications for the preformed materials are given below. A specific feature of Cycle Superhighways is TSRGD diagram 1057 with route lettering laid on a coloured background, referred to as CSH logos, and used where a coloured cycle lane/track could not be implemented. These logos comprise the standard cycle symbol, diagram 1057, with CS# beneath, where # denotes the route number.

1. Materials to be used:
   - a. On carriageway in blue cycle lane
     - i. Size: 1057 symbol – size small (1215 x 750mm), lettering 705mm Preformed: White 1057 and CS# (where # is the CS route number) Material: Preformed Skid Resistant Thermoplastic
     - ii. EN 1436 standard: S3, R3, Q2
     - iii. Thickness: min 2.5mm
     - iv. The top of the CS# lettering shall be 350mm from the bottom edge of the1057 diagram
   - b. Off carriageway in blue cycle track
     - i. Size: 1057 symbol – size small (1215 x 750mm), lettering 705mm Preformed: White 1057 and CS# (where # is the CS route number) Material: Preformed Skid Resistant Thermoplastic
     - ii. EN 1436 standard: S3, R3, Q2
     - iii. Thickness: min 2.5mm
     - iv. The top of the CS# lettering shall be 350mm from the bottom edge of the 1057 diagram
   - c. On carriageway not in cycle lane
     - i. Symbol and lettering within a coloured background rectangle
     - ii. Size: 1057 symbol – size medium (1780 x 1100mm), lettering 1035mm
     - iii. Preformed: White 1057 and CS# on blue, RAL 5015, background (3845 x1500mm)
     - iv. Material: Preformed Skid Resistant Thermoplastic
     - v. EN 1436 standard: White S3, R3, Q2 Blue S5
     - vi. Thickness: min 2.8mm
     - vii. The 1057 shall be 250mm from the top edge of the blue patch and 200mm from the side edge of the blue patch, i.e. centred
     - viii. The CS# lettering shall be 530mm from the bottom edge of the 1057 diagram and 250mm above the bottom edge of the blue patch.
     - ix. The CS# lettering shall be placed centrally to the 1057 diagram.

d. Off carriageway not in blue cycle track

a. Symbol and lettering within a coloured background rectangle

b. Size: 1057 symbol – size small (1215 x 750mm), lettering 705mm

c. Preformed: White 1057 and CS# on blue, RAL 5015, background (2570 x 950mm)

d. Material: Preformed Skid Resistant Thermoplastic

e. EN 1436 standard: White S3, R3, Q2 Blue S5

f. Thickness: min 2.5mm

g. The 1057 shall be 150mm from the top edge of the blue patch and 100mm from the side edge of the blue patch, i.e. centred

h. The CS# lettering shall be 350mm from the bottom edge of the 1057 diagram and 150mm above the bottom edge of the blue patch.

i. The CS# branding is to be placed centrally to the 1057 diagram.

e. In ASL

i. Size: 1057 symbol – size large (2750 x 1700mm) Preformed: White 1057

ii. Material: Preformed Skid Resistant Thermoplastic

iii. EN 1436 standard: S3, R3, Q2

iv. Thickness: min 2.5mm

2. Materials shall come with a guarantee for both the material and workmanship for a period of two years.

3. The material used in the performed thermoplastic logos shall be able to demonstrate the stated properties after 12 months in service when tested to P5 standard of Table 3 EN 1824:2011.

4. The Colour of Blue shall match the colour details below, using the CIE 1979 LAB:

Named: Sky Blue (RAL 5015)

L +42 ± 8

a* -12 ± 3

b* -22 ± 10

5. The specification for the sizing of the lettering is to be 1035mm long when used in conjunction with the medium sized diagram 1057 and 705mm when used with the small sized diagram 1057. The font, widths and spacing are to be as stated on page 371, schedule 13 part VI, TSRGD 2002 and pages 139-141, chapter 5, Traffic Signs Manual 2003.

Appendix 12/76: Removal of road markings by hydroblasting

1. The pavement surface shall be inspected to assess its suitability for hydroblasting. The *Contractor* shall notify the *Client* if the existing pavement surface is not suitable for hydroblasting.

2. The *Contractor* shall ensure that any hydroblasting activities do not damage the existing asphaltic surface course.

3. Where hydroblasting occurs on open graded asphalt surface course (including stone mastic asphalts, thin surface course asphalts), the *Contractor* shall ensure that the hydroblasted area is sealed with either a bituminous filler (for example microsurfacing, surface dressing or similar) or resin-based product with a current BBA HAPAS Certificate. The minimum wet Skid Resistance value when newly installed shall not be less than 60 when determined using the portable skid resistance tester (pendulum) in accordance with BS EN 13036-4:2011, except that for sealant widths less than 75mm, the narrow slider shall be used over the full 126mm sliding length utilising the normal slider scale C.

4. Where hydroblasting occurs on high friction (calcined bauxite) surfacing, the hydroblasted area shall be covered with high friction surfacing in accordance with the requirements of Clause 924.

5. The *Contractor* shall ensure that any hydroblasting activities that result in removal of more than 5mm depth of the existing asphaltic layer are repaired in accordance with the treatments available in Clause 711SR and Appendix 7/6.

6. Alternative methods for repairing damaged hydroblasted surfaces which do not comply with the requirements of Clause 711SR or Appendix 7/6 shall be approved by the *Client*.

Appendix 12/77: Congestion charging preformed thermoplastic road markings

1. Materials to be used:

   a. White marking 1m x 3m to Typical Arrangement Drawing to be supplied as required by the *Client*

   b. Red marking 1m x 3m with white C to Typical Arrangement Drawing to be supplied as required by the *Client*

   c. Preformed / Skid Resistant / Thermoplastic

   d. EN 1436 standard: S3 / R3 / Q3

   e. Minimum thickness: 3mm (+0.4mm / - 0.3mm)

Appendix 17/1: General

1. The requirements for any structural concrete necessary for the works, including strength, aggregate size, etc shall be as stated in sub-Clause 1701.1 and the instructing Task Order.

2. The requirements for cement shall be as stated in sub-Clause 1702.1, unless otherwise stated in the instructing Task Order.

3. The requirements for lightweight aggregates shall be as stated in sub-Clause 1702.2, unless otherwise stated in the instructing Task Order.

4. All admixtures shall comply with the requirements of sub-Clause 1702.3, unless otherwise stated in the instructing Task Order.

5. Routine identity testing for compressive strength, slump, flow and air content of concrete batches shall only be undertaken upon the issue of a written instruction by the *Client*. Such instructions will only be issued where there is a specific doubt over the quality of the concrete in question.

6. Details of any requirements for construction joints shall be as stated in the instructing Task Order.

7. Retarding agents shall not be used, except upon the prior written instruction of the

Client.

8. Details of any requirements for any permanent formwork shall be as stated in the instructing Task Order.

9. Details of any requirements for lifting and supporting any precast concrete members shall be as stated in the instructing Task Order. The *Contractor* shall ensure that all requirements for the lifting and supporting of precast members are properly addressed in the Construction Phase Health and Safety Plan.

10. Details of any requirements for the assembly and erection of any precast concrete members shall be as stated in the instructing Task Order. The *Contractor* shall ensure that all requirements for the assembly and erection of precast members are included in its Construction Phase Health and Safety Plan for the Work Task.

11. Details of any requirements for reinforcing bars shall be as stated in the instructing Task Order.

Appendix 17/2: Pore-lining impregnation

1. Application and selection of pore-lining impregnants shall satisfy the requirements of Standard BD 43/03 – The Impregnation of Reinforced and Prestressed Concrete Highway Structures Using Hydrophobic Pore-Lining Impregnants.

2. Details and areas to receive impregnation will be shown on project-specific design drawings and described in any relevant Task Order

Appendix 18/1: Requirements for structural steelwork

1. Suppliers of services for the execution of steelworks are required to be registered with National Highways Sector Schemes for Quality Management in Highway Works 20 “The Execution of Steelwork in Transportation Infrastructure Assets” in accordance with Appendix A of the Specification for Highway Works.

   Other registrations that may be required for execution of steelwork include (but are not limited to) :-

   a. Environmental barriers – Organizations fabricating and/or installing environmental barriers shall be registered to NHSS 2C.

   b. Parapets – Organizations fabricating and/or installing steel parapets shall be registered to NHSS 5A and/or NHSS 5B as appropriate.

   c. Lighting columns and masts – Organizations fabricating and/or installing lighting columns or masts shall be registered to NHSS 6 and/or NHSS 8, as appropriate.

   d. Traffic sign/signal posts – Organizations fabricating and/or installing traffic sign/signal posts excluding sign/signal gantries shall be registered to NHSS 9A and/or NHSS 8, as appropriate.

   e. Organizations undertaking the corrosion protection of steelwork using industrial coatings shall be registered to NHSS 19A.

2. The requirements for the execution of structural steelwork are generally to be in accordance with BS EN 1090-2:2018 - Execution of steel structures and aluminium structures - Part 2: “Technical requirements for the execution of steel structures” and such other documents as may be specified on a Project specific basis.

3. The tables in BS EN 1090-2:2018 - Appendix A list additional information (Table A.1), options (Table A.2) and requirements related to the execution classes (Table A.3)

required to fully define the requirements for execution of the work to be in accordance with the Standard.

The following clauses are additional to BS EN 1090-2:2018 and shall apply unless otherwise specified on a scheme specific basis. Section headings in bold refer to the appropriate section in BS EN 1090-2:2018 and additional requirements are suffixed "(AR)".

SPECIFICATIONS AND DOCUMENTATION

4.1 Execution Specification

4.1.2 Execution classes

4.1.201(AR) For bridge structures, EXC3 shall generally apply, except where specified otherwise in this Appendix or on Project specific drawings.

4.1.203(AR) Where a greater scope of inspection and testing and/or higher quality level acceptance criteria is required on particular structures generally or elements of structures, these will generally be as per the guidelines in PD 6705-2 "Recommendations for the execution of steel bridges to BS EN 1090-2:2018" and specified on Project specific drawings.

4.2 Constructor's documentation

4.2.2 Quality plan

4.2.201(AR) For all structural steelwork projects, a quality plan for the execution of works, in accordance with National Highways Sector Schemes for Quality Management in Highway Works (NHSS) 20 "the execution of steelwork in transportation infrastructure assets" Appendix A, shall be provided and maintained.

5 CONSTITUENT STEEL PRODUCTS

5.2 Identification, inspection documents and traceability

5.2.201(AR) A record shall be maintained of the source of, and test certificates for, main structural steel elements in order to provide traceability for each product. Traceability shall be by piece, by type or by stock certificate, as follows:

a. For flanges, webs and diaphragms in main girders, the records shall be maintained for each individual piece. A unique item mark shall be made on each piece.

b. For stiffeners, splice plates, bracing members, and fasteners, the records shall be maintained for each item type, of which there can be many individual pieces. Products of one type may come from more than one source and be installed in more than one location.

c. For welding consumables and shear connectors, the records shall be maintained according to stock certification, which shall show that the stock material meets the project requirements.

5.3 Constituent steel product

5.3.1 General

5.3.101(AR) The grade and quality of structural steel shall be as required on a Project specific basis and specified on the Project drawings.

5.3.2 Thickness tolerances

5.3.201(AR) Structural steel plates shall generally be thickness class A in accordance with EN

10029 unless otherwise specified on a project specific basis.

5.3.3 Surface conditions

5.3.301(AR) The surface condition shall comply with Class A3 (for flat products) or Class C3 (for sections) to BS EN 10163-1:2004.

5.3.302(AR) The surface of the steel material, before surface preparation and protective treatment, shall comply with rust grades A or B according to EN ISO 8501-1:2007. Material which is pitted, i.e. rust grades C or D, shall not be used.

5.3.4 Special Properties

5.3.401(AR) The locations where internal discontinuity quality class S1 is required are specified on the relevant drawings on a Project specific basis.

5.3.402(AR) Areas where material shall comply with requirements for improved deformation properties perpendicular to the surface according to EN 10164 are specified on the drawings on a Project specific basis.

5.5 Welding consumables

5.5.501(AR) Welding process 136 is permitted, using one of the options for process 135, for steels according to EN 10025-5.

5.6 Mechanical fasteners

5.6.3 Structural bolting assemblies for non-preloaded applications

5.6.301(AR) Non-preloaded bolts are to be used for non-structural applications only. The property classes of non-preloaded bolts and nuts, and surface finishes, shall be as specified on the drawings on a Project specific basis and shall generally be Grade 4.6 unless otherwise specified.

5.6.4 Structural bolting assemblies for preloading

5.6.401(AR) The property classes of preloaded bolts and nuts, and surface finishes, shall be as specified on the drawings on a Project specific basis and shall generally be Grade 8.8 HR unless otherwise specified.

5.6.6 Weather resistant assemblies

5.6.601(AR) The chemical composition of weather resistant assemblies shall comply with the requirements for Type 3 fasteners to ASTM standard A325, Grade A, or equivalent.

5.6.7 Foundation bolts

5.6.701(AR) Reinforcing steels shall not be used for foundation bolts.

5.6.8 Locking devices

5.6.801(AR) For non-preloaded assemblies, locking devices shall be provided.

5.7 Studs and stud connectors

5.701(AR) Stud shear connections shall be type SD1 in accordance with EN ISO 13918.

5.8 Grouting materials

5.801(AR) Grouting materials to be used shall be as specified on the relevant drawings on a Project specific basis.

5.9 High strength cables, rods and terminations

5.9.901(AR) The tensile strength grade and coating class for wires for high strength cables shall be as specified on the relevant drawings on a Project specific basis.

5.9.902(AR) The designation and class of strands for high strength cables shall be as specified on the relevant drawings on a Project specific basis.

5.9.903(AR) The minimum breaking load, diameter and corrosion protection requirements for steel wire ropes shall be as specified on the relevant drawings on a Project specific basis.

5.9.904(AR) The filling material for the sockets shall be to EN 13411-4 as specified on the drawings on a Project specific basis

6 PREPARATION AND ASSEMBLY

6.1 Identification

6.101(AR) Hard stamping shall only be used in the areas marked on the drawings on a Project specific basis. Punched or drilled marks may be used for steels up to and including grade S355.

6.102(AR) Soft or low stress stamps may be used except in any areas specified on the Project specific drawings.

6.2 Cutting

6.2.4 Hardness of free edge surface

6.2.401(AR) For carbon steels, hardness of plasma-cut free edge surfaces shall be in accordance with Clause 6.4.4 of BS EN 1090-2:2018 Table 10, except where all the following apply:

a. there is no geometrical discontinuity on the surface;

b. the surface is not subsequently subject to cold forming; and

c. the element of which the surface is a part is not in an area exposed to accidental impact from vehicles.

Elements in areas exposed to vehicle impact are identified on the Project specific drawings.

6.2.402(AR) Where a hardness limit specified in Table 10 is applicable, the processes that are likely to produce local hardness (thermal cutting, shearing, punching) shall have their capability checked. The check of the capability of the processes shall be as specified in 6.4.4.

6.3 Holing

6.3.1 Dimensions of holes

6.3.101(AR) For hot rivets the nominal diameter of holes shall be 2 mm larger than the nominal diameter of the cold rivet as manufactured.

6.3.102(AR) For countersunk bolts or hot rivets the nominal dimensions of the countersinking shall be such that after installation the bolt or rivet will be flush with the outer face of the outer ply.

6.4 Execution of holing

6.4.301(AR) Holes for fasteners shall be formed by drilling or by punching followed by reaming. Thermal cutting is not acceptable.

6.5 Cut-outs

6.501(AR) Punched cut-outs are not permitted. For cut outs Execution Class EXC4 is required.

6.6 Full contact bearing surfaces

6.601(AR) Where full contact bearing is specified, other than at the ends of stiffeners, the fit between two surfaces shall be such that two surfaces mate to give a maximum 0.5 mm gap; the fit may be achieved by machining or grinding. Where ends of stiffeners are specified on the drawings as required to be fitted, they shall be ground, where necessary, so that the maximum gap over 60% of the contact area does not exceed 0.25 mm.

6.7 Assembly

6.701(AR) The acceptability of the addition of any welded temporary attachments and the making of any butt welds additional to those specified on the drawings shall be verified according to the design rules. A record of the details of such attachments and butt welds shall be provided as part of the constructor's execution documentation. Areas where temporary attachments have been made shall be made good. If weld repairs are necessary these shall be carried out in accordance with the requirements of the appropriate Standard. (See also Additional Requirements 7.5.601(AR) to 7.5.603(AR) inclusive.)

6.8 Assembly check

6.1801(AR) Where required, trial erection of steelwork will be specified on a Project-specific basis.

7 WELDING

7.4 Qualification of welding procedures and welding personnel

7.4.1 Qualification of welding procedures

7.4.1.1 General

7.4.1.101(AR) In general, tack welds should be made to the same welding procedure specification as the permanent weld. If special deposition conditions for tack welds are required, they shall be included in the welding procedure specification on a Project specific basis.

7.4.1.2 Qualification of welding procedures for processes 111, 113, 12, 13 and 14

7.4.1.201(AR) For particular joints, pre-production welding tests, qualified in accordance with EN ISO 15613, shall be carried out as required on a Project specific basis and as specified on the drawings

7.4.1.3 Validity of a welding procedure qualification

7.4.1.301(AR) For stud shear connectors, in addition to validation of a welding procedure, production tests shall be carried out in accordance with 12.4.402(AR) and 12.4.403(AR).

7.5 Preparation and execution of welding

7.5.6 Temporary attachments

7.5.601(AR) The use of temporary attachments is permitted except as restricted in 7.5.602(AR) and other areas as specified on the drawings on a Project specific basis, subject to the constraints on their removal given in 7.5.603(AR).

7.5.602(AR) Temporary welded attachments shall not be attached within 25 mm of the edges

of flange plates.

7.5.603(AR) Any temporary welded attachments shall be completely removed. Attachments may be removed by flame cutting not less than 3 mm above the connection on condition that the welded area is subsequently ground flush and checked for cracks using Magnetic Particle Inspection.

Any welded attachments provided for temporary works during construction that can, with the agreement of the designer, be left in position, such as lifting cleats on top flanges that are subsequently cast into reinforced concrete, shall be considered as permanent works and be subjected to appropriate testing and inspection.

7.5.9 Butt welds

7.5.9.2 Single sided welds

7.5.9.201(AR) Permanent backing material shall not be used for single sided welds unless specifically indicated on the Project specific drawings. In all cases, where allowed, the permanent backing material shall be closely fitted and firmly located only by tack welds in the root of the permanent weld.

7.5.10 Welds on steels with improved atmospheric corrosion resistance

7.5.1001(AR) For welds on steels with improved atmospheric resistance, C- Mn consumables may be used for single run fillet welds up to 8 mm leg length using welding processes 121 to 125, 135 and 136, and for butt welds formed by a single run from each side.

7.5.13 Slot and plug welds

7.5.1301(AR) Plug welds shall not be made without previous slot welding.

7.5.17 Execution of welding

7.5.1701(AR) Butt welds shall be ground flush only where specified on

Project specific drawings.

7.6 Acceptance criteria

7.601(AR) Unless stated on the drawings on a Project specific basis, the acceptance criteria for “Excessive throat thickness” (5214) shall be quality level D of EN ISO 5817:2007, Table 1, No.1.21

8 MECHANICAL FASTENING

8.2 Use of bolt assemblies

8.2.1 General

8.2.101(AR) Non-preloaded bolts shall be provided with locking devices.

8.2.2 Bolts

8.2.201(AR) Bolt sizes for structural bolting shall be as specified on a Project specific basis on the drawings.

8.2.4 Washers

8.2.401(AR) Washers shall be provided under the nut or the bolt head of non-preloaded bolts, whichever is rotated.

8.2.402(AR) The dimensions and steel grades of plate washers shall be as specified on the

drawings on a Project specific basis.

8.4 Preparation of contact surfaces in slip resistant connections

8.401(AR) The area of contact surfaces in preloaded connections shall be as specified on the drawings on a Project specific basis. Where a particular treatment is specified for contact surfaces in slip resistant connections, the treated surfaces shall be adequately protected until they are brought together.

8.5 Tightening of preloaded bolts

8.5.1 General

8.5.101(AR) In addition to the tightening methods in 8.5, the part turn method described in 8.5.7(AR) may be used.

8.5.4 Combined method

8.5.401(AR) For the combined method, when using the value *Mr,1* for the first tightening step, the simplified expression in 8.5.4 may be used.

8.5.402(AR) For the combined method, values other than those given Table 21 shall not be used unless calibrated in accordance with Annex H.

8.5.5 HRC method

8.5.501(AR) For the HRC method, the first tightening step shall be repeated as necessary if the pre-tightening is relaxed by the subsequent tightening of the remainder of the bolts in the connection.

8.5.7(AR) Part turn method

8.5.701 (AR) Before commencement of preloading, the connected components shall be fitted together and the bolts in a bolt group shall be tightened in accordance with 8.3 but the residual gap at the edges shall be limited to 2 mm with the necessary corrective action on steel components.

Tightening by the part-turn method comprises two steps:

a. A first tightening step, using a torque wrench. The wrench shall be set to a torque value in accordance with Table 8.1. This first step shall be completed for all bolts in one connection prior to commencement of the second step;

b. A second final tightening step in which a specified part turn is applied to the turned part of the assembly. The position of the nut relative to the bolt threads shall be marked permanently after the first step, so that the final rotation of the nut relative to the thread in this second step can be easily determined.

The second step shall be in accordance with the values given in Table 8.*2*

TABLE 8.1 First step tightening of nuts

Nominal dia. mm	Bedding torque of bolt ± 10% Nm
24	270 Nm
30	460 Nm

TABLE 8.2 Final tightening of nuts

Total nominal thickness "t" of parts to be connected (including all packs and washers)	Further angle of rotation to be applied during the second step of tightening	
	Degrees	Part turn
t ≥ 160 mm	180	1/2

8.5.702(AR) Where the part turn method of tightening is adopted, the as- delivered lubrication of high strength bolts for preloading may be modified

8.7 Hot riveting

8.7.2 Installation of rivets

8.7.201(AR) Where countersunk rivets are specified on Project specific drawings, they shall have a flush surface

8.7.3 Acceptance criteria

8.7.301(AR) Where countersunk rivets are specified on Project specific drawings, the outer faces of plies shall be free of indentation by the riveting machine.

8.9 Use of special fasteners and fastening methods

8.901(AR) Where the use of special fasteners and fastening methods in non-preloaded or preloaded applications is specified on Project specific drawings, following procedure tests shall be carried out as specified on those drawings

9 ERECTION

9.3 Erection method statement

9.301(AR) The construction method and/or sequences assumed in the design will be given in Project specific documents.

9.302(AR) Requirements for temporary bracing compatible with the construction method and/or sequences will be specified a Project specific basis.

9.303(AR) Allowances for permanent deformation (including settlement of the supports) and other associated dimensions for the quasi- permanent effects of the following actions will be specified on a Project specific basis using the design basis method of erection.

a. After steelwork erection:

   i. Self weight of structural steelwork

b. After completion of structure:

   i. Self weight of structural steelwork

   ii. Self weight of structural concrete

   iii. Self weight of non-structural parts

   iv. The effects of shrinkage modified by creep

9.3.2 Constructor's erection method

9.3.201(AR) If the constructor proposes to adopt an alternative construction method and/or sequence to that referred to in 9.3.301(AR) the constructor shall verify in accordance with the design rules that the alternative method and/or sequence can be used without detriment to the permanent works. The constructor shall allow a period for the verification of the erection method in accordance with the design rules, to the satisfaction of the permanent works designer. The number of weeks to be allowed will be specified on a Project specific basis.

Note – take out all "will be specified on a Project specific basis" and put into a schedule in the base Appendix. Check need for X- ref to clause in BS EN.

9.4 Survey

9.4.1 Reference system

9.4.101(AR) The reference temperature of steelwork dimensions on the drawings will be specified on a Project specific basis.

9.5 Supports, anchors and bearings

9.5.3 Maintaining suitability of supports

9.5.301(AR) Compensation for settlement of supports shall be made by the constructor if such settlement differs from the design assumptions.

9.5.4 Temporary supports

9.5.401(AR) The finished cover to steel packings (comprising a total thickness of grout and any concrete) shall comply with the cover requirements of EN 1992.

9.5.402(AR) Packings and levelling nuts may be left in position provided that the constructor verifies in accordance with the design rules that there is no detriment to the permanent works.

9.5.5 Grouting and sealing

9.5.501(AR) The treatment of steelwork, bearings and concrete surfaces before grouting shall be as specified on Project specific drawings.

9.5.502(AR) Areas where the edges of the base plate are to be sealed, without grouting, will be specified on Project specific drawings.

9.6 Erection and work at site

9.6.5 Erection methods

9.6.5.3 Fit-up and alignment

9.6.5.301(AR) If shims are provided in slip resistant connections, the class of contact surface and surface treatment of the shims shall be the same as for the contact surfaces of the primary components.

10 SURFACE TREATMENT

10.2 Preparation of steel substrates

10.201(AR) All exposed edges that are prepared for coating shall be rounded to a minimum radius of 2 mm.

10.202(AR) Preparation Grade P3 is required for surfaces exposed to corrosivity category C4 and above where specified on Project specific drawings.

10.3 Weather resistant steels

10.301(AR) External surfaces of weather resistant steel shall be blast cleaned to grade Sa2 to BS EN ISO 8501-1:2007 to ensure uniform weathering. Weather resistant steel shall be kept free of contamination such as oil, grease, paint, concrete and asphalt.

10.5 Galvanizing

10.501(AR) Where specified on Project specific drawings, fabricated components that contain enclosed spaces to be galvanized internally, these enclosed spaces shall be sealed after galvanizing. The material and method of sealing shall comply requirements specified on the Project specific drawings.

10.6 Sealing of spaces

10.601(AR) Where the Project specific drawings specify that enclosed spaces are to be provided with an internal treatment system, the internal treatment system shall be specified on the drawings.

10.602(AR) Where spaces are to be fully enclosed by seal welds to prevent the ingress of moisture, weld imperfections otherwise permitted under the welding specification shall be sealed by application of suitable filler material.

10.603(AR) Where mechanical fasteners penetrate the wall of sealed enclosed spaces, the penetrations shall be sealed to prevent the ingress of water.

10.7 Surfaces in contact with concrete

10.701(AR) Surfaces that are to be in contact with concrete, including parts of the undersides of baseplates, shall be coated with the protective treatment applied to the steelwork, excluding any cosmetic finishing coat, for a distance from the exposed edge. Where concrete is cast against the surface, this distance shall be at least 25 mm. Where permanent formwork bears on the surface, the distance from the exposed edge shall be at least 100 mm, or a greater distance as specified on Project specific drawings. Uncoated surfaces shall be blast cleaned or wire-brushed to remove loose mill scale and cleaned to remove dust, oil and grease. Immediately before concreting, any loose rust, dust and other loose debris shall be removed by cleaning.

10.9 Repairs after cutting or welding

10.901(AR) Where precoated constituent products are welded, all coatings affected by the welding process shall be made good to the original standard.

11 Geometrical tolerances

11.1 Tolerance types

11.101(AR) Requirements for special tolerances are given in 11.201(AR) and 11.3.102(AR).

11.2 Essential Tolerances

11.201(AR) The tolerance on steelwork dimensions and levels at completion is as follows:

a. on level, relative to that specified:

   i. at the supports: 5 mm.

   ii. at midspan: span/1000, up to a maximum of 35 mm.

b. on level, of one main girder relative to another, adjacent, main girder: 20 mm.

c. on plan position of steelwork at bearings (structure at datum temperature):

i. Transverse position of bearing top and bottom plates relative to substructure: ±15 mm.

ii. Longitudinal position of bearing top plate relative to bottom plate: ±(10 mm+Ls/10000).

iii. Longitudinal position of bearing bottom plate relative to substructure: ±10 mm.

Where Ls is distance from the fixed point.

d. on verticality of main girder webs at supports: Depth/300 or 3 mm, whichever is greater.

e. on spacing of top flanges where permanent formwork is to be used: ±10 mm.

If the steelwork is not within tolerance, it shall be reported to the designer of the permanent works and shall be adjusted, if necessary, to maintain the structural adequacy in accordance with the design rules.

11.3 Functional tolerances

11.3.1 General

11.3.101(AR) The tabulated values in D.2 shall apply and the tolerance class shall be class 1.

11.3.102(AR) In addition to the requirements in D.2, where additional functional tolerances apply these will be specified on Project specific drawings.

12 INSPECTION, TESTING AND CORRECTION

12.2 Constituent products and components

12.2.1 Constituent products

12.2.101(AR) Requirements for the specific testing of constituent products will be specified on a Project specific basis.

12.3 Manufacturing: geometrical dimensions of manufactured components

12.301(AR) Repair by welding on cover plates is not permitted.

12.4 Welding

12.4.2 Inspection after welding

12.4.2.2 Scope of inspection

12.4.2.201(AR) The extent of supplementary NDT for EXC3 is given in Table 24. Where increased supplementary NDT is required the extent will be specified on Project specific documentation and unless otherwise specified will be in accordance with the frequency for EXC4.

12.4.4 Production tests on welding

12.4.401(AR) The frequency of the production tests of the penetration of deep penetration fillet welds shall be defined in the Inspection Plan in the Project specific specification or on the drawings.

12.4.402(AR) Weld production tests shall be carried out on stud shear connectors, as follows:

a. Each stud shall be tested by striking the side of the head of the stud with a 2 kg hammer. The weld shall be considered acceptable if there is a clear ring tone

due to the striking.

b. Selected studs shall be bent by striking the side of the head of the stud with a6 kg hammer until its head is displaced laterally a distance of approximately 0.25 times the height of the stud from its original position. The stud shall not show any signs of cracking or lack of fusion. Satisfactory studs shall not be bent back again.

12.4.403(AR) The studs to be tested in accordance with 12.402(AR) b) shall be selected at a rate of approximately 1 in 50 studs on each girder or piece of steelwork, with a minimum of 2 per piece. The direction of test shall be such as not to interfere with the fixing of reinforcement.

Additionally, before the start of each day's welding, three studs shall be welded to a plate of the same thickness as the flange plate and tested in accordance with 12.402 (AR) b). If any of these studs fail, further sets of three studs shall be welded and tested until satisfactory results are obtained, before any studs are welded to the girders.

Studs whose welds have failed either of these tests shall be replaced, according to an approved welding repair procedure.

12.5 Mechanical fastening

12.5.2 Inspection and testing of preloaded bolted connection

12.5.2.3 Inspection during and after tightening

12.5.2.301(AR) The inspection shall be carried out in accordance with the procedure given in 12.5.2.4.

12.5.2.4 Torque method

12.5.2.401(AR) For the torque method, the torque may be applied to the head, if access to apply torque to the nut is not possible.

12.5.2.8 (AR) Part turn method

12.5.2.801(AR) For the part turn method, the first step shall be controlled by use of a calibrated torque wrench.

Before the second step starts, the markings of all the nuts relative to the bolt threads shall be visually inspected. Any missing mark shall be corrected.

After the second step, the marks shall be inspected with the following requirements:

a. If the angle of the second step rotation is more than 15° below the specified value, this angle shall be corrected.

b. If the angle is more than 30° over the specified angle, or the bolt or the nut has failed, the bolt assembly shall be replaced by a new one.

12.7 Erection

12.7.1 Inspection of trial erection

12.7.1(AR) Where trial erection is required on a Project specific basis, the inspection requirements will be specified in the Project documents

12.7.3 Survey of geometrical position of connection nodes

12.7.3.1 Survey methods and accuracy

12.7.3.101(AR) All records shall become part of the record of the as-built structure

12.7.3.4 Location and frequency

12.7.3.401(AR) Measurements shall be taken on completion of steelwork erection of the position of main girders at site connections, mid-span, at supports and at any additional locations specified on the drawings.

12.7.3.402(AR) Where required, additional measurements to be taken at specified locations and/or stages of loading will be specified on a Project specific basis.

12.7.3.403(AR) The positional accuracy of the erected steelwork shall be measured under self-weight of steelwork.

12.7.3.5 Other acceptance tests

12.7.3.501(AR) Where components of the structure are to be erected such that a specific internal force in a component is to be achieved, rather than to a specific geometry, the tolerance range shall be as specified on Project specific drawings.

Appendix 19/1: General requirements

1. Suppliers of services for the undertaking the corrosion protection of steelwork are required to be registered with National Highways Sector Schemes for Quality Management in Highway Works (NHSS) 19A "Corrosion Protection of Ferrous Materials by Industrial Coatings" in accordance with Appendix A of the Specification for Highway Works. Subcontractors shall not provide services under the umbrella of another registered supplier.

2. For all corrosion protection projects, a quality plan for the execution of works, in accordance with National Highways Sector Schemes for Quality Management in Highway Works (NHSS) 19A Appendix A, shall be provided and maintained.

3. Painting shall not be carried out in rain or fog/mist conditions, when the surface to be painted is wet or damp, at temperatures above or below those specified by the paint manufacturer, or in windy conditions. Any painting carried out contrary to the above shall not be accepted and the *Contractor* shall carry out such repainting works as required by the *Client* at its own expense.

4. When required by the *Client*, the *Contractor* shall carry out a paint compatibility test to ensure the paint system proposed is suitable to overcoat the existing system, including any pitch-based coats near ground level.

5. Newly galvanised surfaces shall be degreased, where necessary, with an abrasive sponge and warm water with the addition of ammonia and a conventional detergent without wax (for 10 litres of water, half litre 25% ammonia solution and a measured quantity of detergent). The developing foam shall be left for ten minutes before scraping off. Surfaces shall then be rinsed thoroughly with clear water removing foam completely.

6. Primer, undercoat and finish coat(s) shall be as specified on *contract* drawings or on the Task Order or as otherwise specified by the *Client*.

7. Brush application shall be carried out with soft brushes using short strokes. Any spray painting operation proposed by the *Contractor* to be carried out on site shall be carried out in an approved enclosed area suitable for spray painting systems and shall be subject to the *Client*'s approval. Spray application shall be by suitable airless equipment in accordance with the paint manufacturer's recommendations.

8. Drying time between coats shall be in accordance with the paint manufacturer's instructions.

9. For items which require polyester powder coating, the galvanised metal items shall be coated with a polyester powder coating system in accordance with the BS EN 13438:2013. The polyester powder coated system shall be fully protected during transportation, site handling and installation process.

10. All paint shall be lead free and shall comply with the specified grade and quality and, if possible, be obtained from same manufacturer. The paint shall be manufactured in accordance with the latest British Standard/Specification and shall be of "Exterior" quality unless specified otherwise.

11. Visibility bands shall be provided on all street furniture in areas of high pedestrian flows, with the exception of pedestrian guardrails, seats and wooden bollards.

12. Low profile, clear, anti-poster finish shall be provided in areas where fly- posting and graffiti are problems or where specified in the Task Order. This coating shall be applied up to a height of 3000mm on street lighting columns in all areas.

13. Lighting Columns, High Mast Lighting, Catenary Lighting Supports, CCTV Masts, Sign and Signal Posts and steel Pedestrian and Vehicle Bridge Parapets are to be galvanised in accordance with Clause 1909 and painted as Table19/2B Type IV.

14. Corrosion protection systems based on Glass Flake Paints are permitted for structural steelwork and root protection of planted columns and bases of lighting columns, high mast lighting, centenary lighting masts, CCTV masts, sign and signal posts and similar installations.

15. Corrosion protection systems based on Polysiloxane Paint (BD 35 Item Sheet No.185) are not permitted.

16. Aluminium Metal Spray systems are not permitted.

17. The following systems may be considered as alternatives to the Type I system:

    (Note that the minimum total dft quoted is indicative and should comply with the minimum thicknesses in the appropriate Table in Series 1900)

    a. Zinc phosphate blast primer systems:

        i. Item 111, 112 MIO & 168/169 finish – (min) total dft: 315um.

    b. Zinc rich epoxy primer systems:

        i. (provisionally BD35 Item 109): Item 109, 112 MIO & 168/169 finish – (min) total dft: 260um.

18. The following systems may be considered as alternatives to the Type II system:

    a. Zinc rich epoxy primer systems:

        i. (provisionally BD 35 Item 109): Item 109, 112 MIO, 112 MIO & 168/169 finish – (min) total dft: 400um.

    b. Zinc phosphate blast primer systems:

        i. Item 110, 112 MIO, 112 MIO & 168/169 finish - (min) total dft: 375um.

        ii. Item 111, 112 MIO, 112 MIO & 168/169 finish – (min) total dft: 400um.

19. The epoxy glass flake system included in the 1900 series is also an alternative Type II coating system incorporating Items 110, 123 & 168/169.

20. Each paint coat in all of the above coating systems must be in contrasting colours. This includes the brush applied stripe coats, where specified.

21. Where a traffic signs is present on a signpost or column to be painted, then such sign shall be left in-situ and its fixing bands or brackets painted over. It is not permissible to deposit paint or primer on the face of any such sign.

22. Where any other sign is encountered on items to be painted, then the guidance of the *Client* shall be sought and the *Client*'s instructions executed. The *Contractor* shall be aware that such instructions may include the removal of any or all such signs before any paint treatment is commenced. The *Contractor* shall include in its rates any and all expenses incurred in carrying out such removals.

23. Where a disc or plate with numbers is affixed to a street lighting column to be painted, this shall be removed and disposed of before painting is commenced. Where a column to be painted is numbered via a stencil, this shall be ignored and painted over.

24. All newly-painted street lighting columns shall be numbered or re-numbered by use of a stencil or durable self-adhesive signs within 14 calendar days such that 50mm high figures result, white on black, as specified by the *Client*. These figures shall be read vertically from top to bottom and positioned at a mean height of 2m above ground level on the side of the column that faces vehicular traffic and on the side of the column that faces the back of footpath.

25. Generally, column numbering shall commence at the low house number end of the road, beginning with "1" to finish at the high house number end of the road, unless otherwise specified by the *Client*.

26. Other items of street furniture, generally internally illuminated bollards, illuminated signs and beacon posts, shall, when directed by the *Client*, be numbered as above, but with the following exceptions :-

    a. Bollards - figures to be positioned horizontally on the left-hand side panel when the bollard is viewed from the front, approximately 600mm above ground level.
    b. Sign posts - figures to be positioned vertically at a mean height of 1.7m above ground level, to face vehicular traffic.
    c. Beacon posts - figures to be positioned vertically within the highest white segment and facing vehicular traffic.

27. Care shall be taken not to paint over manufacturer's date plates, mechanical or electrical equipment or any optical components. All compartment doors shall be removed during the painting operation, each door being painted in the same manner as the lamp column. The door edge and the lip of the column base compartment opening shall be included. Locking devices and hinges shall be lubricated after painting and replacement of the door. The *Contractor* shall ensure that the public is adequately protected at all times until paint has dried and the door has been refitted.

Appendix 20/1: Waterproofing for Concrete Structures

General

1. New waterproofing systems permitted for use on highway structures shall generally be a proprietary seamless liquid applied membrane system for concrete bridge deck waterproofing complying with Series 2000 and satisfying the requirements of DfT Standard BD47 “Waterproofing and Surfacing of Concrete Bridge Decks”.

2. Prior to the *Client* approving the proposed system, the *Contractor* shall supply to the *Client* the technical information on the product from the manufacturer. The product shall have BBA certification.

3. Additional requirements for the repair and replacement of existing bridge deck

waterproofing shall be as described in Clause 2008.

4. Additional requirements for non-destructive testing of waterproofing membranes shall be as described in sub-Clauses 11 to 19 below.

5. Waterproofing shall only be applied when the ambient temperature is 4C and rising or above 4C. The *Contractor* shall allow in its prices for the cost of providing a temporary enclosure system to ensure the application of waterproofing membrane is not affected by inclement weather.

Protection Layers to Waterproofing

6. Unless otherwise specified, all non-vertical areas treated with a spray applied waterproofing system are to receive a 20mm thick red tinted sand asphalt protection layer as described in Clause 2003, except that compliance shall be with BS EN 12591:2009, BS EN 13924-1:2015 and BS EN 13108-4:2016 recipe type F wearing course mixture designation 0/3 with 5% of filler content inorganic red oxide. Marshall stability shall be 5.5kN +/- 2kN. Liquid spray membranes shall have a suitable tack coat applied prior to the laying of the additional protective layer so that a good bond is achieved between the additional protective layer and the waterproofing membrane.

7. Unless otherwise specified, all vertical areas treated with spray applied waterproofing system shall receive a 15 to 20mm thick bituminised compressible board protection layer.

8. The protective layer shall be applied immediately above bridge deck waterproofing to those areas shown on scheme drawings in accordance with sub-Clauses 2005.4 and 2005.5.

9. The permission of the *Client* shall be obtained before plant, equipment or traffic is permitted onto the waterproofing system.

10. Where it is necessary for plant, equipment or traffic to stand or travel on the waterproofing system, suitable temporary protection shall be provided to the satisfaction of the *Client*.

Testing Requirements for Spray Applied Waterproofing Systems

11. Following deck preparation and before application of the primer, tests shall be carried out in accordance with BS EN 4624:2016 on random areas agreed with the Designer, to assess the adhesive strength of the cured primer and membrane to the deck. A minimum of two pull off tests shall be carried out on the waterproofing system per structure per visit.

12. The *Contractor* shall provide with each batch of material delivered to the site, a certificate showing that the material complies with the details given on the PWS data sheet.

13. Two samples of size at least 20mm x 200mm x 2mm minimum thickness from material sprayed on to open moulds shall be provided and tested or tensile strength and elongation at break to BS ISO 48:2018, and tear strength to BS ISO 48:2018 method C. The *Contractor* shall supply the *Client* with copies of the test results.

14. The coverage rate of material used shall be monitored continuously and the *Client* shall be provided with daily sheets showing the weight of material used and the area covered for each period of spray operation.

15. The wet film thickness shall be monitored continuously using a comb type thickness gauge or pin gauge, and the *Client* shall be provided with daily sheets showing the wet

film thicknesses measured and its location. Where directed by the *Client*, pieces of the fully cured membrane of size not less than 50mm x 50mm shall be cut out, to establish the dry film thickness and given to the *Client* labelled with its location of origin.

16. The adhesion of the fully cured membrane to the deck shall be measured by two tests for each 100m2 of finished membrane or part thereof, or one test per spraying session if the sprayed area during the session is less than 50m2, at locations chosen by the *Client*. Tests shall be carried out by a method approved by the *Client* and the apparatus used shall have a current certificate of calibration. The *Client* shall be provided with the test results labelled with the location of the test site. Test values falling below 1.0N/mm2 shall require spraying operations to be suspended while further investigation is undertaken. Areas deemed not to meet this figure shall be removed and resprayed to the satisfaction of the *Client* at the *Contractor's* cost.

17. The finished membrane shall be tested by the *Contractor* for pin holes and discontinuities and any imperfections detected shall be rectified by overcoating the membrane with brush or spray applied material compatible with the membrane for a distance of 50mm on all sides of the defect to the satisfaction of the *Client* by the *Contractor* at its own expense.

18. Testing shall be carried out using a high voltage direct current detector. In addition to the manufacturer's instructions for use, the following requirements and conditions shall apply:

    a. The instrument is to be operated above 13.5kv.

    b. The earth lead is not to be more than 10m long.

    c. Movement/expansion joints shall not be crossed when testing.

    d. Earthing with screws set into substrate or exposed reinforcement shall be used.

    e. When a leakage path has been found its position is to be marked with a permanent marker pen on the membrane.

    f. The instrument is not to be used on wet or damp surfaces.

    g. The equipment is to have a current certificate of compliance / calibration.

19. All areas of membrane destroyed by testing shall be made good by a method accepted by the *Client*.

Appendix 21/1: Bridge bearings

1. Bearings shall be designed, installed and maintained in accordance with the following standards:

Standard	Title
Structural Bearings	
EN 1337-1	Structural Bearings - Part 1: General Design Rules
EN 1337-2	Structural bearings Part 2: Sliding elements
EN 1337-3	Structural bearings Part 3: Elastomeric bearings
EN 1337-4	Structural bearings Part 4: Roller bearings

EN 1337-5	Structural bearings Part 5: Pot bearings
EN 1337-6	Structural bearings Part 6: Rocker bearings
EN 1337-7	Structural bearings — Part 7: Spherical and cylindrical PTFE bearings
EN 1337-8	Structural bearings Part 8: Guide Bearings and Restraint Bearings
EN 1337-9	Structural Bearings Part 9: Protection
EN 1337-10	Structural bearings Part 10: Inspection and Maintenance
EN 1337-11	Structural Bearings Part 11: Transport, Storage and Installation
BSI Published Document	
PD 6709:2009	Structural Bearings – Guidance on the use of structural bearings
Structural Eurocodes	
EN 1990	Eurocode 0 : Basis of Design
EN 1991	Eurocode 1: Action on Structures
EN 1992	Eurocode 2: Design of Concrete Structures
EN 1993	Eurocode 3: Design of Steel Structures
EN 1994	Eurocode 4: Design of Composite Steel and Concrete Structures
EN 1995	Eurocode 5: Design of Timber Structures
EN 1996	Eurocode 6: Design of Masonry Structures
EN 1997	Eurocode 7: Geotechnical Design
EN 1998	Eurocode 8: Design Provision for Earthquake

Design shall be specific to the bearing schedule shown on the Structure Drawings. Any Departure from the above standards shall be agreed in advance with the *Client*.

2. Bearings shall be tested in accordance with EN 1337. Additional guidance is given in PD6703. Where identical bearings are proposed for different bridges, the bearings with the greatest scheduled loadings shall be considered for testing.

3. The testing programme shall be arranged such that the bearing tests are carried out and satisfactory results received by the *Client* at least 14 calendar days before incorporation of the bearings into the works. Any omission of bearing tests shall be agreed with the *Client*.

4. Bearings shall be identified as follows:

   Structure Number / Bearing Type / Consecutive Number i.e. S01/ FX / 01

   Where Bearing Types are abbreviated to:

   FX – Fixed

   SG – Sliding Guided

   FR – Free

   E – Elastomeric

   MFX – Mechanical Fixed

   MG – Mechanical Guided

5. Full dimensions, details, material specifications and calculations for the bearing dowels, tangs and fixing plates proposed shall be subject to approval by the *Client*.

6. All bearings excluding dowels, tangs and fixing plates shall be capable of removal and replacement without damage to the structure.

7. The design life of the tangs, dowels and fixing plates shall be 120 years.

8. Bearing pressures imposed by dowels or tangs on the surrounding concrete shall comply with the requirements EN 1337, PD6703 and Structural Eurocodes.

9. The average contact pressure between the bearing and the structure shall comply with the requirements EN 1337, PD6703 and Structural Eurocodes.

10. Refer to Series 2600 for the required strength of the bedding mortar at the time of loading.

11. All bedding details and any amendments to abutments and pier top levels with equivalent amended reinforcement details together with the bearing submission shall be subject to approval by the *Client*.

12. Mortar bedding for laminated elastomeric bearings shall be brought up to a true flat surface finish, smooth over an area exceeding the bearing dimensions by 20mm in all directions and the bearings shall be set in position while the mortar is soft.

13. For concrete composite structures, the beams shall be temporarily supported until the mortar wedge between the beam soffit and the bearing has attained the required strength. Refer to note 10 for mortar strength.

14. Surface preparation and surface protection system requirements for steel components of bearings to be in accordance with the 1900 Series of the Specification and Appendix 19/1.

15. For steel composite structures the gradient of the tapered plate immediately above the bearings shall be designed such that under all dead loads the sliding surfaces shall be horizontal, both longitudinally and transversely.

16. Elastomeric bearings shall be set level.

17. Mechanical bearings shall be supplied with temporary clamping plates.

18. Mechanical bearings shall not be dismantled on site.

Appendix 23/1: Bridge deck expansion joints

General

1. All bridge deck expansion joints shall satisfy the requirements of Standard BD33, 'Expansion Joints for Use in Highway Bridge Decks'.

2. Design of new bridge deck joint systems shall be in accordance with guidance in the PD 6688-2:2011 (Published Document - Background to the National Annex to BS EN 1991-2, Traffic Loads on Bridges).

3. Selection of the particular mechanical joint type is to be based on the known or calculated recoverable and non-recoverable movements or in accordance with the manufacturer's specification and recommendations.

4. Selection of a joint type shall satisfy the requirements of Standards BD33 and BA 26 and shall take into reasonable account the "whole life costing" of a joint system and the necessity of regular or long-term maintenance.

5. Unless otherwise specified, any joint system shall be continuous across the full width of the deck and taken through the kerb and verge to terminate at the front edge of the parapet or into the parapet wall.

Selection and installation

6. Installation shall be conducted by an approved contractor or directly under the supervision of the supplier of the joint type and in accordance with the manufacturer's specifications and recommendations.

7. During installation, the existing air gap of the structure must be kept clear of any debris arising as a result of the preparation or construction of the gap. The *Contractor* shall ensure that a continuous uninterrupted separation in the structure below the bridge joint is maintained throughout the joint installation operations.

8. Specific requirements for the protection of newly installed joints shall be shown on the drawings, where appropriate.

9. Joint systems shall only be applied to sound concrete. Minor spalls or damage on bridge decks or to the top of abutment walls may be repaired with the resin beds or encapsulation resins of the selected joint in accordance with the joint manufacturers advice.

10. Concrete affected by cracking or deterioration shall be repaired or replaced with proprietary repair material with minimum Grade 30. Repair materials shall be fully cured in accordance with the manufacturer's instructions and recommendations. Any additives included shall not be incompatible with the selected joint system or affect the bond of resins, adhesives or other fixing materials used for the installation of any new joint system. All surfaces to receive joint systems shall be prepared in accordance with the expansion joint manufacturer's advice.

11. Separate areas of concrete repairs must be marked out and agreed with the *Client* in advance and rectified structurally in accordance with a method of working which is agreed with the *Client*. All separate repairs shall be undertaken following the principles outlined in The Concrete Society Technical Report No 26.

Requirements for subsurface drainage

12. Unless otherwise specified, all joints shall incorporate its own sub-surface and below joint drainage system, designed provided and installed to the manufacturer's recommendations, that collects pore pressure and or surface water drainage away form the joint and discharges water to the bridge deck drainage system. The drainage shall discharge into the general drainage of the structure or to a point which will not present a hazard or contamination to any part of the structure.

13. Design and installation of expansion joint drainage and its waterproofing shall also follow where practicable the guidance and recommendations in the TRL application guide 33 "Water management for durable bridges", by S Pearson and JR Cuningham.

14. Requirements for subsurface drainage for joints shall be shown on scheme specific drawings.

15. Consideration shall be given for including sleeves to all ducts and drainage units through or under joints. All such sleeves shall be adequately sealed to prevent resin migration in to the joint air gap. Where ducts are placed into a purpose built channel or trough, provision shall be made in the design to support the selected mechanical joint in this area. Locations, details and site specific requirements for sleeving and additional support shall be shown on scheme specific drawings.

Requirements for cover plates

16. Cover plates shall be provided to cover rebates in joints within footways and or at all carriageway kerb transitions.

17. Unless otherwise specified, cover plates shall be either galvanised steel or aluminium plates of appropriate thickness to suit joint width and traffic loadings to satisfy the accidental wheel loading requirements and to protect kerbs subject to wheel attrition on tight radius curves or to cover skewed kerbs where a simpler fabrication is required.

18. Cover plate holding down bolts and fixings shall be of stainless steel, complete with rubber isolation washers and neoprene sheeting, where required, for water-tightness in accordance with the joint manufacturer's recommendations.

Joint types

19. The following proprietary bridge expansion joints currently exist on the Network:

Maurer D Series Thorma Joint

Britflex BEJ Rubba Pak

Prismo Ceva Felspan

Radaflex Zebra Joint Bridgemaster Fabreeka Mageba Transflex Reinstahl

Macspansion DEMAG Rolling leaf movement joint

20. New expansion joint types for use in this *contract* are as scheduled below. Type references are as described in Table 1 of BD33. The minimum range is given to indicate when the type of joint may not be economical.

Joint Type (as in Table 1 of BD33)	Joint Description	Total acceptable longitudinal movement		Max acceptable vertical movement between sides of joint	Nosing Size		Joint Width
		Min (mm)	Max (mm)	mm	Max Width (mm)	Max Depth (mm)	mm
1	Buried joint under continuous surfacing	5	20	1.3	n/a	n/a	n/a

1	Buried joint under continuous surfacing with elastomeric pad or buried galvanised steel plates	5	20(1)	1.3	n/a	n/a	n/a
2	Asphaltic plug joint in carriageway	5	40	3.0	n/a	n/a	500
2	Asphaltic plug joint in carriageway	5	40	3.0	n/a	n/a	500 to 1000
2	Asphaltic plug joint in verge or footway	5	40	3.0	n/a	n/a	500
2	Asphaltic plug joint in verge or footway	5	40	3.0	n/a	n/a	500 to 1000
3	Nosing joint with poured sealant	5	12	3.0	200	150	n/a
4	Nosing joint with preformed compression seal	5	40	3.0	200	150	n/a
5 REJ	Reinforced elastomeric joint without bonded metal plates in carriageway	5	45(1)	3.0	n/a	n/a	n/a
5 REJ	Reinforced elastomeric joint with bonded metal plates in carriageway	10	350(1)	3.0	n/a	n/a	n/a

5 REJ	Reinforced elastomeric joint without bonded plates in verge or footway	5	45(1)	3.0	n/a	n/a	n/a
5 REJ	Reinforced elastomeric joint with bonded metal plates in verge or footway	10	350(1)	3.0	n/a	n/a	n/a
6 EMR (CI)	Elastomeric joint in metal runners cast into deck – single	5	80(1)	3.0	150	150	n/a

	element joint						
6 EMR (CI)	Elastomeric joint in metal runners cast into deck – multi-element joint	15	100(1)	3.0	150	150	n/a
6 EMR (RE)	Elastomeric joint in metal runners – resin encapsulated or bolted on	55	150(1)	3.0	150	150	n/a
7 CT	Cantilever comb or tooth joint - proprietary	25	440(1)	3.0	n/a	n/a	n/a
T CT	Cantilever comb or tooth joint – purpose made	25	1000(1)	3.0	n/a	n/a	n/a

(1) The maximum range varies according to manufacturer or type.

Testing of bridge deck expansion joints

21. The *Contractor* shall provide with all batches of materials delivered to site the Certificate of Compliance in accordance with BD33 and BA26 "Expansion Joints for Use in Highway Bridge Decks".

22. Additional requirements for testing asphaltic plug joints are set out in Clause 2306AR.

Appendix 23/2: Sealing of gaps (other than in bridge deck expansion joints)

1. This Appendix applies to the sealing of vertical, horizontal and inclined gaps formed as movement or other joints excluding bridge deck expansion joints.

2. Joints shall be sealed with a proprietary two-part polysulphide sealant to BS EN ISO 11600:2003+A1:2011. The joint shall be prepared, and the sealant shall be applied in accordance with the manufacturer's instructions.

3. Generally, the joint surfaces shall be dry, clean and frost free. Oil and grease shall be cleaned from the surface. The joint shall be cleaned of all of the old sealant. Any joint filler material should be checked to ensure it remains tightly packed and serviceable to the full length of the joint. If the existing filler material is not serviceable, the filler shall be raked out to a depth that allows suitable backer/filler strip to be installed.

4. The finished sealant joint shall be smooth and continuous with a uniform slightly bevelled convex surface over the full length of the joint. Unless otherwise instructed, the sealant

shall be slightly recessed from the face edges of the joint. Any masking tape used shall be removed along with any accidental overspill or smearing of the sealant material to leave a clean, neatly finished appearance.

5. Details of joint fillers and sealants shall be specified in individual Task Orders, but shall utilise the following:

Joint Filler 1:	Semi-rigid closed cell, cross linked, polyethylene foam.
Joint Filler 2:	Cellular performed low density filler.
Joint Filler 3:	Expanded polystyrene foam.
Sealant 1 Grey:	Two-part polysulphide liquid polymer to BS EN ISO 11600:2003+A1:2011 or polyurethane elastomeric sealant of equivalent performance.
Sealant 2:	Hot poured rubber bitumen.
Sealant 3:	Bitumen based sealing compound vertical grade.

Appendix 24/1: Brickwork, blockwork and stonework

1. The *Contractor* shall only use sulphate-resisting Portland cement for clay brick masonry in retaining walls or in other structures.

2. Unless otherwise stated in the Task Order, the *Contractor* shall use mortar designations (i) and (ii), except for masonry which incorporates reconstructed stone, concrete or calcium silicate bricks and blocks, where mortar designation (iii) shall be used.

3. The particular requirements for clay bricks, to BS EN 771-1:2011+A1:2015 unless otherwise stated in the Task Order, shall be Class B Engineering bricks or in accordance with the following:

Durability (Refers to the Frost Resistance and the Soluble Salt Content of the brick as described in BS 3921)	FN or FL
Compressive Strength (N/mm2)	20.0
Colour	Red
Water Absorption % Weight	Less than 7
Brick Type	Solid or perforated

4. The particular requirements for concrete blocks to, BS EN 771-3:2011 +A1:2015 and BS EN 772-2:2011 + A1:2015 unless otherwise stated in the Task Order, shall be:

Work Size mm (L x H x T)	390 x 190 x 100
Minimum Compressive Strength (N/mm2)	7.0

5. Details of the type and quality of any natural building stone required shall be as stated in the Task Order.

6. Any particular requirements for working with reconstructed stone shall be as stated in the Task Order.

7. The type of bonding for brickwork and blockwork shall be as stated in the Task Order.

8. Overhand work shall only be undertaken when permitted or specified in the Task Order.

9. All exterior facing surfaces shall be weather struck. Other brickwork shall be flush pointed unless otherwise stated in the Task Order.

10. All exposed faces shall be fair faced finishing unless specified otherwise in the Task Order.

11. The requirements for dimensions of stones shall be as stated in sub-Clause 2413.1, unless otherwise stated in the Task Order.

12. The requirements for tooling stonework required shall be as stated in the Task Order.

13. The requirements for dimensions of bond stones shall be as stated in sub- Clause 2413.9, unless otherwise stated in the Task Order.

14. The requirements for levelling squared random rubble coursed and uncoursed stonework required shall be as stated in the Task Order.

15. The variation in depth, front to back, for masonry facework shall not exceed 25mm unless stated otherwise in the Task Order.

16. All brickwork shall be set out to the dimensions, thickness and heights as instructed by the *Client*. Walls, piers, etc shall be built in a uniform manner and no part of the work shall be raised more than 900mm above another at any time.

17. Perpends and quoins, shall be maintained throughout the height of the building and shall be kept strictly true and square. All courses shall be maintained level and faces of walls and piers, angles, etc shall be kept plumb at all times.

18. All bricks shall be well battered with mortar before being laid and all bricks shall be laid frog uppermost. Unless otherwise instructed by the *Client*, the mortar bed and vertical joints shall be 10mm thick and shall extend over the full surface area of the bricks.

19. The exposed surface of each brick is to be regular and free from chip marks and other defects.

20. Damp proof courses shall be "Hessian Based Bitumen" to BS743:1970, BS 6398:1983, BS 6515:1984, BS 8215:1991 and laid with 150mm laps, bedded in mortar.

21. Brickwork in contact with soil shall be coated in two coats of "Synthaprufe" or similar approved to the manufacturer's instruction (BBA Approved high performance, brush applied damp proofing emulsion containing synthetic rubber latex)

22. Expansion joints in brickwork shall be formed at 6m intervals, or other such interval as instructed by the *Client*. They shall be formed by returning the brickwork both sides to leave a clear 20mm gap through the complete thickness of the wall. Sandwiched between the walls is to be "Flexcell" or similar approved, which is to be cut and positioned 20mm short of all external faces of the wall. This gap shall be sealed with "Secoflex" or similar approved to the manufacturer's instructions.

23. All bricks, except blue bricks, shall be thoroughly soaked in water by being immersed in a tank for as long a time as the *Client* shall direct before being used.

24. Unless permitted by the *Client*, the *Contractor* shall not build any of the face work overhand and must provide all scaffolding and staging necessary for laying it in every case from the face side. The cost of all scaffolding, centring and staging necessary is to be included in the prices for brickwork in the Schedule of Rates.

25. Bricks arches shall be built in concentric half-brick rings. In the back rings of arches, headers shall be left projecting upwards at intervals to be approved by the *Client*, to ensure the thorough bonding with the haunching and spandrels.

26. The brickwork in sewers shall be in rings, or otherwise as may be directed by the *Client*, and shall break joint correctly with the adjoining bricks. The courses shall be laid evenly and uniformly to the curvature of the moulds and centres in neat, close and regular joints, and shall be kept straight or regularly curved, as the case may be with the direction of the work. All brickwork in sewers, underground work and elsewhere where ordered shall, on completion, be left thoroughly watertight.

27. Unless otherwise specified or ordered by the *Client*, radial facing bricks shall be used for all arches or other circular work of an internal radius of less than 450mm.

28. The method of bonding concrete and brickwork shall in all cases be approved by the *Client*.

29. In all brickwork requiring support, the *Contractor* shall provide a sufficient length of centring and lagging. The centring and lagging shall be accurately and substantially constructed of well-seasoned wrought timber. The lagging shall be planed and kept smooth and true as long as it is in use. Details of the centring shall be submitted to the *Client* for approval. In the case of arches being built curved on plan, particular care shall be taken by bringing the centres close together and using narrow lags to ensure that the arches are truly built. Great care shall be taken at the toothings so that joint curves are continuous. The joints of the brickwork shall be immediately rubbed or scraped out and pointed as the *Client* may direct.

Appendix 33/1: Rotary coring of the carriageway

1. The walls and base of all holes from which core samples have been cut shall be thoroughly dried and painted with hot bituminous binder immediately prior to reinstatement. The holes shall be filled to within 50 to 75mm from the road surface with lean mix and topped off with well compacted bituminous instant repair material, which on completion shall be at the same level as the adjacent surface.

Appendix 33/2: Structural investigations

The overall purpose of investigation and testing is to complement inspections by providing more in-depth and targeted information, normally on pre-defined criteria, that improves understanding and/or diagnosis. For example, understanding can be improved by obtaining information on material properties to assist structural assessment (e.g. yield strength of steel or compressive strength of concrete), while diagnosis can be improved by obtaining information on deterioration mechanisms to assist maintenance planning (e.g. carbonation and chloride ion ingress).

Due to the unique nature of bridges and other highway structures, it is necessary to tailor the testing and investigations required to each specific structure at the time of the investigation. As such it will be necessary to amend the contents of this Appendix to suit the task in hand and to ensure a suitable and defined outcome in the form of a comprehensive report.

Guidance on testing and investigations can be found in the Inspection Manual for Highway Structures - Vol 1:TSO 2007.

A sample Appendix will include the following:

Background

1. A description of the need and objectives for the site investigations and tests shall be included. This will be in reaction to either a report received or an action that has occurred to the structure causing its integrity to be in doubt.

2. The main purpose of the site investigation is to provide a significant level of confidence in the condition of the structure by testing, sampling and visually inspecting at touching distance.

Investigations and testing

3. An initial list of investigation items required, including detailed locations of sampling and testing, shall be laid out, but with the proviso that these may change as the investigation unfolds. Early involvement between all parties is recommended in order to mitigate unknown issues resulting in subsequent changes.

Provision of report

4. A report, containing full details of the investigations and testing shall be provided by those undertaking the tests. The report shall be clearly set out and follow a logical sequence. It shall include, but not be restricted to:

   a. The objectives of the testing.

   b. Names of relevant personnel, stating its qualifications and experience.

   c. The date, time and prevailing weather conditions, including temperature, during the test.

   d. A full description of the equipment used including: details of calibration, accuracy, reliability and repeatability.

   e. A copy of the technique statement which shall include, but not be restricted to, methodology, location of measurements, location referencing system, grid size (where appropriate), number of measurements at each location and a copy of any risk assessment (where appropriate).

   f. The location referencing system shall be in sufficient detail to clearly identify the test locations and to enable the tests to be repeated at the same location, if required, in the future.

   g. The raw and, if appropriate, filtered test data.

   h. An interpretation of the data.

   i. Any other observations that are considered relevant.

   j. Videos, photos, diagrams and sketches, as appropriate, that support the above points and help the reader to understand details of the testing.

5. Results shall be presented in a format that can be clearly understood and related to the construction form, material and other pertinent characteristics of the structure. The interpretation of test results should use the data obtained from testing and any background material available. Where appropriate, a diagrammatic interpretation of the results shall be provided.

Detail of report content

Front cover

6. The front cover shall clearly state the project name and provide a unique reference for the report that can be used to reference any queries/comments.

Signature sheet

7. The signature sheet shall provide name, signature, position/job title, qualifications for the following:

   a. The person who has produced the report;

   b. The person reviewing or checking the report; and

   c. The approver of the report.

   In addition there should be an area for use by the *Client* for sign off to state who has reviewed and accepted the report on behalf of the *Client*.

Executive summary

8. A summary of the key issues, conclusions and recommendations. It shall enable the reader to obtain a clear understanding of the investigation and the test data obtained and shall contain a succinct interpretation with conclusions and recommendations.

Location plan

9. The location plan should be to minimum scale of 1:10,000. It shall enable the reader to clearly identify where the asset is and how to get there. Key road names/numbers, stations and other key features shall be shown. The asset under consideration shall be ringed and the name/asset identification number given.

Contents page

10. The contents page shall clearly list all main headings and appendices. Page numbers shall also be given.

Introduction

11. The introduction section shall provide the following details:

    a. *Client* brief.

    b. Aims of the investigation.

    c. Background to the report being commissioned.

    d. Detailed description of the structure.

    e. Photographs of the structure that clearly show the view over the structure and an elevation of the structure to aid identification. Where the elevations are significantly different, a photograph shall be provided for both.

    f. Detailed description of the elements of the structure being considered in the report.

    g. History of the structure. Existing Information

12. Existing information about the structure shall be listed here and shall include:

    a. Details of previous inspections

    b. Details of previous structural assessments

    c. Information about statutory undertaker's equipment on or in the vicinity of the structure

    d. Previous consultations undertaken.

13. The source of the information shall be given along with some comment about its completeness and validity. If there is no information available then this shall be clearly stated.

Summary of inspections, investigations and defects

14. Full details of the current inspection or investigations undertaken as part of this study shall be given. Where the investigations are extensive, a summary with reference made to the full report shall be included as an appendix or as a standalone report.

15. Where previous inspections, investigations and testing have been undertaken, details shall be summarised in this section. Where inspections, etc have been repeated over a longer period, a comparison of the results shall be made to detect if there are any patterns or trends and also to help ascertain the rate of deterioration.

16. The facts shall be interpreted, and suggestions given for the cause of the defects if there are any contributing factors as to the cause of a specific defect, these shall also be stated.

Discussion

17. The author shall discuss the various scenarios and permutations which have been considered in the previous sections. There may be a number of combinations which are present and the issues surrounding each shall be discussed in more detail.

Conclusions

18. The author shall summarise the previous discussions succinctly and make its conclusions. The text shall reference the original commission and how the requirements in the

commission have been met. Where it enhances clarity, a summary of the options considered shall be presented in tabular form.

Recommendations

19. Clear and unambiguous recommendations shall be made.

Appendices

20. The appendices shall provide additional information that enhances the Reader's understanding of the issues discussed in the main body of the report. Reference to items contained in the appendices shall be made within the main body of the text. The reference should contain details of the appendix and the unique reference of the item being referred to, for example:

    a. Appendix A/Photograph ref 123; or

    b. Appendix B/Drawing number 1234/5/Rev D.

Suggested details of the contents of each of the appendices are given below

Typical appendix content

21. Photographs.

    a. Each photograph shall be given a unique reference number.

    b. A description of the detail each photograph is highlighting shall be given.

    c. Where photographs are presented on an A4 vertical page, no more than 2 photographs per page in landscape orientation shall be provided or one photograph per page if in portrait orientation.

    d. Each photograph provided shall be referenced within the main body of the text.

22. Results of investigations, testing, etc. Where the results of the investigation are extensive, key figures and other information which helps the reader's understanding of the issues concerned shall be provided.

23. Drawings/sketches. In general, drawings in preference to sketches shall be provided. Drawings shall be given a unique reference. Drawings shall be to an appropriate scale.

Appendix 33/3: Topographic surveys

1. Topographical surveys shall be conducted in strict accordance with the latest version (and future amendments) of 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).

r. 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.

s. Text markings on the road shall also be surveyed accurately.

t. Road signs shall include the relevant TSRGD Diagram Number.

u. 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.

v. Building supports and overhangs shall be shown.

w. 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.

x. 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.

y. 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.

z. Spot levels shall be shown on the Final Drawings to two decimal places at the following locations:

   i. 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.

   ii. Back of footways and at points of changes in directions of falls of footways.

3. 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.

4. 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.

5. 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.

6. The survey shall be produced in AutoCAD (2011 version and further updates during the life of the *contract*) at scales directed by the *Client* and delivered by e-mail.

7. 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 OS 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.

Appendix 33/4: Design

1. The *Contractor* shall provide Design Services, including cost estimates and all engineering drawings, as specified by the *Client*. Such Design Services might include, but not be limited to, the following:

    a. Road Renewal Schemes

    b. Structural Renewal Schemes in accordance with the following *BD2 – Technical Approval of Highway Structures (or subsequent amendments), IAN 124/11 – Use of Eurocodes for Design of Highway Structures* (or subsequent amendments) and the *Client*'s own specific design requirements, if any, as set out in the Task Order

    c. Local Network Improvement/Traffic Engineering Schemes

    d. Detailed Scheme Design

    e. Feasibility Studies

    f. Traffic Surveys and Modelling

    g. Drainage Design

    h. Lighting Design

    i. Structural Design

    j. Highway safety audits

2. The *Contractor's* designs shall comply with the requirements of:

    a. Any specific Task Order that may be given.

    b. The standards in the Technical Approval Schedule.

    c. The requirements of this Specification. Any further documentation provided by the *Client* in the *Client*'s Service Information

    d. The Design Manual for Roads and Bridges as published by HMSO

3. In the event of conflict between them, they shall be construed in the order of precedence set out above or as directed by the *Client*.

4. Unless otherwise instructed by the *Client*, the *Contractor,* in undertaking a design commission, shall:

    a. Employ value engineering techniques to deliver the optimum design solution, continually looking for opportunities to reduce costs.

    b. Submit design proposals to the *Client* for acceptance and incorporate such hold points into the design process as may be necessary to enable the *Client's* comments to be incorporated.

    c. Design proposals shall include, as necessary, all relevant engineering drawings, calculations, product specifications and method statements.

    d. Consult and attend meetings with all relevant authorities, stakeholders and other

interested parties (including others within the *Client*'s organisation).

e. Advise the *Client* of others' requirements and incorporate them into the design, as appropriate.

f. Liaise closely with statutory undertakers, including the detailed coordination of work programmes.

g. Make provision in the programme for the *Client* to raise the necessary authorisations and payments to statutory bodies.

h. Regularly provide updated cost estimates, employing appropriate risk management techniques and allowances.

i. Provide supporting information to enable the *Client* to liaise with the media and manage any publicity in relation to the design.

j. Arrange for all necessary checks to be carried out in accordance with all relevant standards, including independent design checks where appropriate.

5. Temporary works designs shall follow a similar technical approval procedure as for permanent works and shall be accompanied by design and check certificates appropriately signed.

6. The *Contractor* shall discuss the requirements for the design 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.

7. Where works require access to, or have the potential to affect, operational railways, the approval process for the specific track operator shall be followed in addition to the *Client*'s requirements. The *Contractor* shall make suitable allowance within its programme for obtaining these approvals.

8. Where 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.

9. Road lighting designs shall comply with the relevant parts of BS 5489 and BS EN 13201 and all electrical designs shall comply with BS 7671 and adhere to recognised codes of best practice such as those issued by the Institution of Lighting Professionals (e.g. Guidance Notes for the Reduction of Obtrusive Light; Code of Practice for Electrical Safety in Highway Electrical Operations).

10. The *Contractor* shall be responsible for providing the *Client* with sufficient information to enable others to produce as-built drawings.

11. As directed by the *Client,* the *Contractor* will be required to undertake public engagement and consultation activities in relation to scheme design proposals. The activities will include but not be limited to:

a. Preparation of consultation material

b. Delivery of material to residents / others

c. Organising public discussion of the proposals and *Client* briefings

d. Reporting on the outcome

e. Co-ordinate with contractor regarding ongoing design work.

f. Identify and collate pre-construction information.

g. Prepare and update the Health and Safety Plan.

Appendix 33/5: Project management

1. As directed by the *Client,* the *Contractor* may be required to provide project management services applied at a strategic level (e.g. the delivery of a programme of various schemes) or at an individual scheme level. The *Contractor* is expected to be familiar with the latest project management techniques and software applications.

Appendix 33/6: Investigations (General)

1. The *Contractor* shall undertake investigations as specified by the *Client* which might include, but not be limited to:

    a. Arranging for specialist organisations to obtain site samples, testing, interpretive reporting and the verification of invoices for payment by the *Client*.

    b. Reviews of studies by others.

    c. Arranging for specialist organisations to undertake geotechnical investigations, provide interpretative reporting and the verification of invoices for payment by the *Client*.

    d. Arranging for specialist organisations to undertake non-invasive surveys the identify and map underground utilities apparatus.

Appendix 90/1: CCTV survey of highway drainage system

General requirements

1. The location of the surveys shall be detailed by the *Client* within the Task Order.
2. Pre-cleansing shall be carried out in accordance with Series 500.
3. Traffic management for CCTV survey works shall comply with the requirements of this specification.
4. The working hours for CCTV survey works shall be in accordance with the instruction given in the Task Order.
5. The *Contractor* shall be responsible for clearing any blockages found during the Task Order works.

Survey reporting

6. The content of the survey report, including number of copies and types should be agreed with the *Client* before commencement of any works.
7. The CCTV survey video and photograph recording format shall be digital.
8. Changes to the coding used for the survey should be specified.
9. All defects, features and drainage system condition information shall be recorded on video by the *Contractor* and stored on the *Client's* hosted asset and streetworks permit management system.
10. Photographs of the site shall take pictures before, during and upon completion of the works.
11. The format for the presentation of survey photographs is to be specified.
12. The format for the presentation of photograph negatives where different to the specification

Coding of Survey Information

13. All defects, features and drainage system condition information shall be photographed by the *Contractor* and stored on the *Client's* hosted asset and streetworks permit management system.

Drain condition surveys

14. Where the removal and replacement of all manhole or access chamber covers will be undertaken by the *Client's* Representative, this should be stated