FRAMEWORK AGREEMENT FOR THE PROVISION OF THE INSTALLATION OF TRAFFIC SIGNALS

VOLUME 3
WORKS SPECIFICATION

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Preamble to the Specification

1 Unless stated otherwise, the Specification referred to in the Tender shall be the "Specification for Highway Works", published by The Stationery Office (formerly HMSO) as Volume 1 of the Manual of Contract Documents for Highway Works, as modified and extended by the following:

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

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

(iii) The Numbered Appendices listed in Appendix 0/3;

(iv) Appendix 0/4 contains a list of standard drawings.

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

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

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

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

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

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

7 Any reference in 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, 0/2 or 0/5.

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

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

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

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

12 Other than where references to the *Project Manager* are made in the context of the *Project Manager* granting statutory or type approvals, the roles and functions of the *Project Manager* shall be undertaken by Somerset County Council, Economic and Community Infrastructure, Operations.

13 Where the Specification requires the provision of documentation to the *Project Manager* for statutory or type approval such documentation shall be provided to Somerset County Council, Economic and Community Infrastructure, Operations.

14 If the Specification is used in conjunction with a contract under which the *Contractor* is responsible for the design of any part of the Permanent Works, the delegation of the roles and functions of the *Project Manager* as stated in Paragraph 12 above shall be amended as follows:

i) If any agreement, consent or approval required to be obtained from the *Project Manager* impacts on the health and safety of the general public, the environment or any other property or equipment not owned by the *Contractor* or the Design Build Finance and Operate concessionaire, such agreement, consent, approval shall be obtained from Somerset County Council, Economic and Community Infrastructure, Operations.

ii) Where the Specification provides for the *Project Manager* to require a test, waive the requirement for a test or alter testing frequency, the party to whom the *Project Manager's* roles and functions have been ascribed by Paragraph 12 above shall exercise such decisions in accordance with the Secretary of State's requirements stated in the Contract.

15 For the purposes of the Specification and Works Information any reference to 'Overseeing Organisation', 'Engineer' or 'CA' shall mean *Project Manager*.

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Series 100 PRELIMINARIES

APPENDIX 0/1: CONTRACT-SPECIFIC ADDITIONAL, SUBSTITUTE AND CANCELLED CLAUSES, TABLES AND FIGURES INCLUDED IN THE CONTRACT

PART A: VOLUME 1 SPECIFICATION

List of Additional Clauses, Tables and Figures

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127AR	Accident Reporting
128AR	Advertising and Nameboards
130AR	Emergency Call-Out
170AR	Method Statements
171AR	General Environmental Requirements
172AR	Inspections by the *Project Manager*
179AR	Design of Equipment by *The Contractor*
570AR	Work on Existing Drains, Sewers and Manholes
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9000AR	CCTV Survey of Highway Drainage Systems

List of Substitute Clauses, Tables and Figures

Clause No. (etc)	Title
None	None

List of Cancelled Clauses, Tables and Figures

Clause No. (etc)	Title
None	None

Additional Clauses, Tables and Figures`

Clause No. (etc)	Title and written text
None	None

Substitute Clauses, Tables and Figures

Clause No. (etc)	Title and rewritten text
None	None

127AR	**Accident Reporting** All accidents which must be reported under the "Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1997" must be reported immediately to the *Project Manager* supervising the works. A copy of the subsequent written report to the Health and Safety Executive must also be provided.
128AR	**Advertising and Nameboards** 1. All rights to display advertising material on the site or on any placards, panels or hoarding erected in connection with the Works or the screening thereof, remain vested in Somerset County Council and a licence to display such materials must be obtained. All advertisements, *Contractor* and sub-contractor's nameboards to be erected within the site are to be submitted to the *Project Manager* for approval. 2. Advertisements and nameboards will not be allowed in the vicinity of traffic lanes where in the opinion of the *Project Manager* such would distract drivers or conflict with statutory traffic signs. All advertisements and nameboards within the Site shall be removed within 2 weeks of Completion of the Works. Nameboards providing directional information erected beyond the Site and within the highway shall only be erected with the consent of Somerset County Council.
130AR	**Emergency Call-Out** The *Contractor* shall display on Site a purpose made sign indicating the Company's full name and address and the telephone number of a contact person should an emergency arise on the Site. In the event of an emergency, the *Contractor* shall attend on site within one hour of the contact person having been informed of the nature of the emergency. The *Contractor* shall provide the *Project Manager* with

	evidence that such arrangements have been made and that the Police and Local Authority's representatives have been informed.
170AR	**Method Statements** 1. All work shall be carried out in accordance with written method statements that have received the consent of the *Project Manager*. The method statements shall include full details of the operations listed in Appendix 1/24. 2. The method statements shall be submitted 14 days before the construction of the relevant works. The *Project Manager* will reply within 7 days of receipt of a method statement. No associated work shall be carried out until full agreement is reached with the *Project Manager* over a particular method statement.
171AR	**General Environmental Requirements** Machinery with obvious defects, e.g. Plant which emits an unreasonable amount of noise or exhaust smoke, shall be withdrawn from service without delay. The *Contractor* shall take reasonable measures which shall include the provision and use of adequate screening in order to minimize the risk of disturbance. The *Contractor* shall take reasonable measures which shall include the provision and use of adequate water spraying equipment to minimise dust nuisance. The *Contractor* shall take all necessary measures to prevent mud and site material from being carried onto the public highway. In the event that detritus is carried onto the highway, immediate measures will be taken by the *Contractor* to remove it and restore the highway to its previous condition. All drains, sewers, outfalls, grips, ditches and watercourses shall be kept clear of any spoil, debris, other deposits or pollution arising directly or indirectly from the works. The *Contractor* shall not use any existing highway as a standing area for plant, vehicles, offices, sheds or for the storage of materials etc. He shall also ensure that the positioning of plant, vehicles, offices, sheds or materials etc on any other part of the site does not interfere

	with recognised visibility and other standards particularly at road junctions and accesses The *Contractor* shall comply with any specific requirements in Appendix 1/9 – Control of Noise and Vibration
172AR	**Inspections by the *Project Manager*** 1. For site inspection and approval, the *Contractor* shall give adequate notice in writing to the *Project Manager*. Where no period of notice is stated elsewhere in the Contract, such notice shall not be less than four hours of normal working time before the work is ready for final inspection. Forms shall be used where these have been especially provided for the purpose by the *Project Manager*. 2. The *Project Manager* will require reasonable time during normal working hours to carry out his inspection. 3. In the case of off-site work, the *Contractor* shall give the *Project Manager* at least seven days' notice in writing stating when such works are due to commence.
179AR	**Design Of Equipment By *The Contractor*** 1. Structures, structural elements and equipment designed by the *Contractor* for the permanent works shall be subject to Clause 106 of the Specification and shall comply with CDM 2015 Regulation. 2. Equipment designed by the *Contractor* for temporary works, including structures demolition, support systems and platforms used over or adjacent to highway, watercourse, footpath or other public right of way, or where failure could affect the integrity or safety of any personnel (public or construction) or structure, shall be considered as a temporary structure and subject to the requirements of this Clause. Works are to be designated as either Type A works or Type B works as described in section 4 of BD2/05. 3. Equipment designed by the *Contractor* shall follow the technical approval procedures given in Departmental Standard BD2, for which purposes the *Contractor* shall be deemed to be the Designer. The design specifications, requirements and constraints for equipment to be designed by the *Contractor* shall be as stated in Appendix 1/72 or 1/73 as appropriate.

	4. The *Contractor* shall complete a single Approval in Principle (AIP) for each element incorporating all equipment to be designed (Type B works only). 5. The *Contractor* shall complete check certificates for each element designated Type A works, and design and check certificates for Type B works. 6. Any 'Departures from Standard' that may be required for the AIP should be detailed on the standard form and attached to the AIP form. A Departure from Standard proforma/template will be provided by the *Employer* if required, however this should be discussed with the TAA and *Employer* prior to submission. 7. Three copies of the completed forms shall be passed to the *Employer* for acceptance and forwarding to the Technical Approval Authority (TAA). The *Contractor* shall allow 6 working weeks from submission of the completed AIP document for reviewing, amending and acceptance of the AIP. 8. All works included in the approved AIP shall be subject to a Category 2 Design Check in accordance with BD2. 9. If during the design or at the checking stage any alterations to the design criteria or Departures from Standard are required, a revised AIP incorporating the revisions and departures shall be submitted to the *Employer* for forwarding to the TAA. The *Contractor* shall allow an additional 4 weeks from submission for reviewing, amending and acceptance of the revised AIP. 10. The *Contractor* shall note that his checking team (as stated within the approved AIP) shall only be provided with a full set of detailed drawings prepared by the design team (i.e. no design calculations are to be passed to the checking team). The checking team is then to carry out a 'Category 2' level of check as defined in BD2. The checking team is to carry out the check independently, with only the necessary consultation and will produce its own separate design calculations. 11. The checking team will not be required to submit the detailed drawings or its design calculations with the Type A 'Check Certificate' but the Certificate must contain a schedule of such drawings. The Type A 'Check Certificate' must be completed and signed by the respective team leader in accordance with BD2 Annex C3.

	12. The Type B 'Design Certificate' and a 'Check Certificate' must be completed and signed by the respective team leaders in accordance with BD2 Annex C4. Both certificates must each be countersigned by a director of the *Contractor* (or a representative who has the written authority to sign on behalf of the *Contractor*). Three original copies of each certificate shall be submitted to the *Employer*. 13. The works detailed in the approved AIP shall not commence until submission and acceptance of the Design and Check Certificates. 14. Three copies of the completed Issue for construction drawings (IFC) shall be passed to the *Employer* for acceptance and forwarding to the Technical Approval Authority (TAA). The *Contractor* shall allow 4 working weeks from submission of the completed IFC drawings for reviewing, amending and acceptance of the IFCs. 15. All other Contractor designed elements (that are not covered above or elsewhere within the Works Information) must allow 4 weeks for drawing/technical approval, and the *Contractor* shall allow a further 2 weeks for any additional resubmissions or modifications.
570AR	**Work on Existing Drains, Sewers and Manholes** Where any Works are carried out in connection with existing drains, adequate precautions shall be taken to ensure that no earth, rubble or other foreign matter is introduced into the drains. In manholes, timber shall be placed across the benchings and any space between the boards shall be filled with sacking, which shall be kept in position until the connections, alterations or additions are completed. All material collected upon the boards and sacking shall be carefully removed and the board and sacking subsequently removed from the manholes. Where new connections are required to be made to existing highway drains or soakaways, the *Contractor* shall prove by CCTV survey that the downstream run is clear and fit for the purpose and shall undertake such improvement as may be required to the satisfaction of the *Project Manager.*
973AR	**Testing for Tar** 1. The *Contractor* is responsible for pre-works testing for the

	presence tar on all resurfacing/footway schemes involving the excavation/planing of 10 square metres or more of existing bound material. The investigation report for each site will identify any areas of tar-bound materials within the depth to be excavated/planed using the PAK marker test. Sites where tar is identified are referred to the *Project Manager* together with proposals for mitigating impact, for a decision as to if or how to proceed. No works shall be undertaken until such a decision has been made.
9000AR	**CCTV Survey of Highway Drainage Systems** 1. **Definitions** Definitions relating to CCTV survey of highway drainage systems are listed below:- (i) **CCTV** Closed Circuit Television used to carry out internal inspections and surveys of the drainage systems comprises a camera linked directly to a monitor and/or video recorder together with a means of moving the camera along the drain. (ii) **Catchpit** Access point that has a chamber base below the level of the outgoing pipe specifically to retain sediment and debris washed into the drainage system. (iii) **Confined space** Any place, including a chamber, trench, pipe or similar space where, by reason of its nature, there is a reasonable risk of explosion or asphyxiation. (iv) **Exfiltration** Escape of flow from the drain into the surrounding ground. (v) **Forced ventilation** The procedure of venting the drainage system by removing a number of chamber covers and using ducting, air jets and fans to force air into the system to purge potentially dangerous gases that may have accumulated within the system.

(vi) **Infiltration**
Inflow of groundwater to the drain.

(vii) **Pan and tilt camera**
A self-propelled camera with a directionally adjustable lens.

(viii) **Pre-cleansing**
The removal of silt and debris prior to the commencement of the survey.

(ix) **Rodding camera**
A CCTV camera that is moved along the drain using flexible rods. Such cameras are generally used to access small diameter pipes, 150mm or smaller, particularly those with bends.

2. **General Requirements**

2.1 General

Further to specification clause 509.5, drainage pipes installed as part of this contract up to and including 900 mm diameter shall be surveyed using CCTV after flushing and carrying out other tests.

Existing drainage shall be surveyed where indicated on the drawings as detailed in this clause and in Appendix 90/1. Pre-cleansing of existing drains shall be carried out where specified in Appendix 90/1

2.2 Hazards

The *Contractor* shall immediately inform the *Project Manager/Supervisor* of any damage to the drainage system that is a potential hazard.

Should an access chamber or gully grating be damaged during the survey, the *Contractor* shall provide temporary protection to the chamber and notify the *Project Manager/Supervisor* immediately.

2.3 Flows and blockages

The *Contractor* shall be responsible for dealing with the flow by means of temporary stoppers for limited periods, insofar as this can be achieved without causing flooding or pollution of receiving

waters.

Where there is a temporary increase in the flow rate in the drain, the *Contractor* shall either move to another survey location, or suspend operations until the flow has abated. The *Contractor* shall allow for costs associated with temporary flow increases resulting from natural causes.

Where a blockage is discovered in an existing drain, the *Contractor* shall immediately consult the *Project Manager/Supervisor* to determine what action is to be taken. The *Contractor* shall proceed to the next length to be surveyed unless otherwise instructed.

2.4 Site Accessibility

Should any restrictions be imposed on access to the whole site, or should the site only be available at certain periods of the day, these hours or periods are specified in the Schedule of Constraints in Appendix 1/13.

3. **Survey Reporting**

3.1 General

The content, type and number of copies of the survey report to be provided shall be as specified in Appendix 90/1

Where the Contract requires that items of the Survey Report shall be supplied to the *Project Manager/Supervisor* during the course of the survey, these items will be listed in Appendix 90/1.

On completion of the survey and as stated in Appendix 90/1, the *Contractor* shall supply, to the *Project Manager/Supervisor*, one clean set of plans showing that the chamber numbers coincide with the reports and video recordings for the inspection. The plans shall be annotated to show any variations in alignment and junction locations noted during the survey.

3.2 Video recording

Video recordings on Compact Disc or DVD shall be in MPEG format in accordance with BS EN ISO/IEC 11172-4:1997.

3.3 CCTV Photographs

	The *Contractor* shall provide 89 mm x 125 mm clear and concise, colour photographs for inclusion in all paper format reports Photographs shall be taken of each defect or in the case of old, poor quality drains at 10m intervals to indicate the general internal condition. Where photographs are not otherwise required, due to the pipe being new or the satisfactory internal condition of the existing pipe, at least 2 No. general condition photographs shall be taken for each drain length between access chambers. Photographs shall show the correctly adjusted monitor display, clearly and accurately. The location of the photograph shall be clearly identifiable by chamber start and finish number or pipe reference, survey direction, chainage, unique photograph number and date. The annotation shall be clearly visible in figures no greater than 5 mm and positioned remote from the photograph subject. The photographs shall be integrated into the body of the report alongside the relevant text. 4. **Quality** 4.1 General The *Contractor* shall ensure that the personnel undertaking the survey are competent in the interpretation of CCTV images of drains. 4.2 CCTV Picture quality-camera, video recording and monitor. The electronic equipment, camera and monitor shall be of such quality to enable the following to be achieved using the approved test devices: (i) The grey scale shall allow equal changes in brightness ranging from black to white with a minimum of five clearly recognisable stages. (ii) With the monitor control adjusted for correct saturation, the six colours plus black and white shall be clearly resolved with the primary and complementary colours in

order of decreasing luminance. The grey scale shall appear in contrasting shades of grey with no tint.

(iii) The background grid shall show squares of equal size without convergence or divergence over the whole picture. The centre circle shall appear round and have the correct height to width relationship (± 5%).

(iv) The live picture must be clearly visible with no interference and capable of registering a minimum number of television lines/picture height lines. The resolution shall be checked with the monitor colour turned down. In case of tube cameras this shall be 400 lines and for CCD type cameras 300 lines.

(v) The camera is required to provide similar results when used with its own illumination source and to ensure colour constancy; there shall be no variation of illumination during the survey of any one drain. However for larger drains greater illumination should be provided as necessary to provide the required definition.

A test device shall be provided on site at all times to enable practical demonstration of compliance with the above requirements. Test devices for the camera shall utilise the Marconi Resolution Chart No. 1. The details of any equivalent chart shall be submitted to the *Project Manager/Supervisor* for approval before work commences. Test devices for the video recorder and monitor shall be submitted in accordance with the above.

Correct adjustment of the recording apparatus and monitor shall be demonstrated by use of a test tape or similar approved device. Satisfactory performance of the camera shall be demonstrated by the recording of the appropriate test device for a minimum period of 30 seconds and by completion of a picture quality audit sheet at the commencement of each day.

The demonstration recordings shall be submitted to the *Project Manager/ Supervisor* for approval each day.

5 **Health & Safety**

5.1 General

The *Contractor* shall provide a method statement detailing the order and procedure for each survey together with a risk assessment for each survey. The *Contractor* shall provide use and maintain on site,

suitable and sufficient safety equipment and the necessary trained personnel in order to undertake the survey and maintain the safety and protection of employees, the general public and the systems and property of the *Project Manager/ Supervisor*.

5.2 Zone classification

The use of electrical equipment in potentially explosive atmospheres is governed by the Dangerous Substances and Explosive Atmospheres Regulations 2002 (SI 2002/2776).

Unless otherwise specified by the *Project Manager/Supervisor* all highway drainage systems are to be Classified as Zone 2 in accordance with Schedule 2 of the Dangerous Substances and Explosive Atmospheres Regulations 2002 (SI 2002/2776).

5.3 Known Hazards

Any known hazards associated with the sections of drain to be surveyed shall be stated in the pre-tender Health and Safety Plan and be incorporated into the *Contractor's* Health and Safety Plan. This information shall be used in the Risk Assessment before each survey is commenced.

6 Drain Condition Inspection

6.1 Survey

Unless separately specified in Appendix 90/1, the *Contractor* shall be responsible for removing and replacing all manhole or access chamber covers and the clearance of all equipment from the site on completion of the survey.

In the case of existing drains *the Contractor* shall make all reasonable effort to gain access to the drain. If, after a period of 15 minutes, access has not been attained, the *Contractor* shall move to the next survey location. The *Contractor* shall immediately report the difficulty to the *Project Manager/Supervisor.*

6.2 Equipment

The CCTV equipment shall be capable of surveying a length of drain up to 350 metres where the drain can be accessed from either end, up to 200 metres where a self-propelled camera is used and access is

	gained from only one end, or 30 metres where a rodding camera is used. The *Contractor* shall ensure that the equipment is in full working order and shall carry out quality checks in accordance with sub-Clause 9000.4AR prior to the commencement of each shift's survey. The camera shall incorporate a self levelling head and shall pass through the drain being surveyed in a stable manner. The *Contractor* shall ensure that all bonds, guide ropes and cables are supported away from the drain or manhole structures and all CCTV cables and/or lines used to record the camera's location within the drain are taut and maintained at right angles, where possible, to run through or over the measuring equipment. Each survey vehicle shall carry a range of equipment to control the flow within the drain during the survey. At least one item of each diameter from 100 mm to 600 mm shall be carried. 6.3 Survey abandonment Abandonment of the survey of any existing drain length shall be considered for the following reasons: (i) where the *Contractor* is unable to maintain acceptable picture quality for reasons of drain condition. The *Contractor* shall inform the *Project Manager/Supervisor* as soon as possible after setting up the equipment and continue with the survey of the next drain length, pending the decision of the *Project Manager/Supervisor* on the merits of continuing; (ii) where a situation occurs such that the *Contractor* considers his equipment to be at risk. The *Contractor* shall photograph the problem area, terminate the survey and, upon informing the *Project Manager/Supervisor* of the problem, proceed to the next survey length; (iii) where further progress is impossible. The *Contractor* shall photograph the situation causing the abandonment, abandon the survey of that drain length and inform the *Project Manager/Supervisor*. The *Contractor* shall then proceed to survey the same drain length from the opposite direction or proceed to the next section of drain to be surveyed as appropriate;

(iv) Where the *Contractor* is unable to locate the access point or is unable to gain access to the drain once the chamber has been located, or where the *Contractor* considers that it would be unsafe to access the drain due to the condition of the access chamber. The *Contractor* shall report the matter to the *Project Manager/Supervisor* immediately. The *Contractor* shall then proceed to survey the drain from the opposite direction or proceed to the next section of drain to be surveyed;

(v) where the *Contractor* is unable to survey from the chamber or continue the survey due to blockage, silt or high water level. The *Contractor* shall comply with the requirements of sub-Clause 9000.2 AR with regard to high flows or blockages. The *Contractor* shall then proceed to survey the drain from the opposite direction, or proceed to the next section of drain to be surveyed.

6.4 Buried chambers

Where buried chambers are encountered during the survey and the camera is pulled through the chamber, the camera shall be panned to view the internal condition of the chamber and any defects observed shall be recorded and submitted to the *Project Manager/Supervisor.*

6.5 Equipment recovery

The *Contractor* shall be responsible for all his costs relating to the recovery of or damage to camera systems and any other equipment in any drain forming part of the survey. The *Contractor* shall also be liable for any associated costs incurred by the *Project Manager/Supervisor* in the recovery of such equipment unless the *Contractor* can demonstrate that such loss was for reasons beyond the *Contractor's* control.

6.6 Camera position

The CCTV camera shall be positioned so as to minimise the risk of picture distortion. Where the drain is of a circular or regular cross-sectional profile, the camera lens shall be positioned centrally within the drain. A positioning tolerance of ± 10% of the vertical drain dimension shall be permitted.

6.7 Camera speed

The speed of the camera within the drain shall be limited to the following maximum speeds:

0.10 m/s for drains of diameter less than 200mm
0.15 m/s for drains of diameters of 200mm or larger but less than 310mm
0.20 m/s for drains of diameter 310mm and larger

The camera shall be stopped whenever defects are being recorded manually.

6.8 Linear measurement

At the start of each drain length to be surveyed, the length of the drain from zero chainage up to the cable calibration point shall be recorded and reported in order to obtain a full record of the drain length.

The meter reading entered onto the data display at the cable calibration point shall allow for the distance from the start of the Survey to the cable calibration point such that the meterage at the start of the survey is zero.

Where the survey continues through a manhole or other access point, the meterage shall be re-set to zero with the camera focused on the outgoing pipe entrance.

The CCTV monitor shall display an automatically updated record, in metres and tenths of a metre, of the camera position from the calibration point.
The *Contractor* shall use a suitable metering device that enables the accurate measurement of the cable length. The accuracy shall be to ± 1% or 0.3m whichever is the greater.

The *Contractor* shall demonstrate compliance with the tolerances above on a daily basis by completion of a linear measurement audit sheet and using either a cable calibration device or the taped measurement of the surface between chambers. Where the *Contractor* fails to comply with these tolerances, the *Contractor* shall provide a new measurement device and shall resurvey the lengths of drain undertaken within the defective device.

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

List of Additional Clauses, Tables and Figures

Clause No. (etc)	Title	Written on Page No following
None	None	

List of Substitute Clauses, Tables and Figures

Clause No. (etc)	Title	Rewritten on Page No following
None	None	

List of Cancelled Clauses, Tables and Figures

Clause No. (etc)	Title
None	None

Additional Clauses, Tables and Figures

Clause No. (etc)	Title and written text
None	None

Substitute Clauses, Tables and Figures

Clause No. (etc)	Title and rewritten text
None	None

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

PART A: VOLUME 1 SPECIFICATION

Clause No. (etc)	Title	Written on Page No following
None	None	

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

Clause No. (etc)	Title	Written on Page No following
None	None	

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:

Completed by	App. 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
Not Used	0/5	Special National Alterations of the Overseeing Organisation of Scotland/Wales/Northern Ireland
	0/6	Communications
		PRELIMINARIES
Not Used	1/1	Temporary Accommodation and Equipment for the *Project Manager*
Not Used	1/2	Vehicles for the *Project Manager*
	1/3	Communication System for the *Project Manager*
	1/4	Working and Fabrication Drawings
	1/5	Testing to be Carried Out by the *Contractor*
Not Used	1/6	Supply and Delivery of Samples to the *Project Manager*
	1/7	Site Extent and Limitations on Use
Not Used	1/8	Operatives for the *Project Manager*
	1/9	Control of Noise and Vibration
	1/10	Permanent Woks Design
	1/11	Temporary Works Design
	1/12	Setting Out and Existing Ground Levels
	1/13	Programme of Works
	1/14	Payment Applications
Not Used	1/15	Accommodation Works
	1/16	Privately and Publicly Owned Services and Supplies
	1/17	Traffic Safety & Management

Appendix 0/3 List 'A' (continued)

Completed by	App. No.	Title
	1/18	Temporary Diversions for Traffic
	1/19	Routing of Vehicles
Not Used	1/20	Recovery Vehicles for Breakdowns
	1/21	Information Boards
	1/22	Progress Photographs
	1/23	Risks to Health and Safety from Materials or Substances
	1/24	Quality Management System
Not Used	1/25	Temporary Closed Circuit Television (CCTV) System for the Monitoring of Traffic
Not Used	1/26	Temporary Automatic Speed Camera System for the Enforcement of Mandatory Speed Limits at Roadworks (TASCAR)
Not Used	1/27	Temporary Automatic Speed Camera System for the Enforcement of Mandatory Speed Limits at Roadworks (TASCAR) – Particular Requirements
Not Used	1/72	Design of Equipment by the *Contractor* (Type A Works)
Not Used	1/73	Design of Equipment by the *Contractor* (Type B Works)
		SITE CLEARANCE
	2/1	List of Buildings, etc. 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
		FENCING AND ENVIRONMENTAL BARRIERS
	3/1	Fencing, Gates and Stiles
		ROAD RESTRAINT SYSTEMS (VEHICLE AND PEDESTRIAN)
	4/1	Road Restraint Systems (Vehicle and Pedestrian)
Not Used	4/2	Information Required to Demonstrate Compliance of Road Restraint Systems to BS EN 1317-1, BS EN 1317-2, BS EN 1317-3 and DD ENV 1317-4:2002
		DRAINAGE AND SERVICE DUCTS
	5/1	Drainage Requirements
	5/2	Service Duct Requirements
Not Used	5/3	Surface Water Channels and Drainage Channel Blocks
Not Used	5/4	Fin Drains and Narrow Filter Drains

Appendix 0/3 List 'A' (continued)

Completed by	App. No.	Title
	5/5	Combined Drainage and Kerb Systems
Not Used	5/6	Linear Drainage Channel Systems
Not Used	5/7	Thermoplastics Structural Wall Pipes & Fittings
		EARTHWORKS
	6/1	Requirements for Acceptability and Testing etc. of Earthworks Materials
	6/2	Requirements for Dealing with Class U1B and Class U2 Unacceptable Materials
	6/3	Requirements for Excavation, Deposition, Compaction (Other than Dynamic Compaction)
Not Used	6/4	Requirements for Class 3 Material
Not Used	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	Topsoiling
	6/9	Earthwork Environmental Bunds, Landscape Areas, Strengthened Embankments
Not Used	6/10	Ground Anchorages, Crib Walling and Gabions
Not Used	6/11	Swallow Holes and Other Naturally Occurring Cavities and Disused Mine Workings
Not Used	6/12	Instrumentation and Monitoring
Not Used	6/13	Ground Improvement
	6/14	Limiting Values for Pollution of Controlled Waters
	6/15	Limiting values for harm to Human Health and the Environment

Completed by	App. No.	Title
		ROAD PAVEMENTS - GENERAL
	7/1	Permitted Pavement Options (Sheets 1, 2 and 3)
.	7/2	Excavation and Reinstatement of Existing Surfaces
Not Used	7/3	Surface Dressing (Sheets 1, 2 and 3)
	7/4	Bond Coats, Tack Coats and Bituminous Sprays
Not Used	7/5	In Situ Recycling: The Remix and Repave Processes
	7/6	Breaking Up or Perforation of Existing Pavement
Not Used	7/7	Slurry Surfacing Incorporating Microsurfacing (Sheets 1,2 and 3)
Not Used	7/8	Not Used
	7/9	Cold Milling (Planing) of Bituminous Bound Flexible Pavement
Not Used	7/10	Worksheet Proforma For Results of Testing for Constituent Materials in recycled Coarse Aggregate and Recycled Concrete Aggregate
Not Used	7/11 to 7/22	Various
		ROAD PAVEMENTS – CONCRETE AND CEMENT BOUND MATERIALS
Not Used	10/1	Plant and Equipment for the Construction of Exposed Aggregate Concrete Surface
		KERBS, FOOTWAYS AND PAVED AREAS
	11/1	Kerbs, Footways and Paved Areas
Not used	11/2	Access Steps
		TRAFFIC SIGNS
	12/1	Traffic Signs: General
Not Used	12/2	Traffic Signs: Marker Posts
	12/3	Traffic Signs: Road Markings and Studs

Completed by	App No.	Title
Not Used	12/4	Traffic Signs: Cones, Cylinders, FTDs and Other Traffic Delineators
	12/5	Traffic Signs: Traffic Signals
Not Used	12/6	Traffic Signs: Special Sign Requirements on Gantries
		ROAD LIGHTING COLUMNS AND BRACKETS
	13/1	Information to be Provided when Specifying Lighting Columns and Brackets
Not Used	13/2	Column and Bracket Data Sheets 1 and 2
Not Used	13/3	Instructions for Completion of Column and Bracket Data Sheets
Not Used	13/4	Information to be Provided when Specifying CCTV Masts
Not Used	13/5	Typical CCTV Mast Data Sheet
Not Used	13/6	Instructions For Completion of CCTV Mast Data Sheets
Not Used	13/7	Information to be Provided when Specifying Cantilever Masts
Not Used	13/8	Typical Cantilever Mast Data – (Sheet 1 and 2)
Not Used	13/9	Instructions For Completion of Cantilever Masts Data Sheets
		ELECTRICAL WORK FOR ROAD LIGHTING AND TRAFFIC SIGNS
	14/1	Site Records
Not Used	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
Not Used	15/1	Motorway Communications
Not Used	15/2	Cable Duct Requirements

Completed by	App. No.	Title
		PILING AND EMBEDDED RETAINING WALLS
Not Used	16/1	General Requirements for Piling and Embedded Retaining Walls
Not Used	16/2	Precast Reinforced and Prestressed Concrete Piles and Precast Reinforced Concrete Segmental Piles
Not Used	16/3	Bored Cast-in-Place Piles
Not Used	16/4	Bored Piles Constructed using Continuous Flight Augers and Concrete or Grout Injection through Hollow Auger Stems
Not Used	16/5	Drive Cast-in-Place Piles
Not Used	16/6	Steel Bearing Piles
Not Used	16/7	Reduction of Friction on Piles
Not Used	16/8	Non-Destructive Methods for Testing Piles
Not Used	16/9	Static Load Testing of Piles
Not Used	16/10	Diaphragm Walls
Not Used	16/11	Hard/Hard Secant Pile Walls
Not Used	16/12	Hard/Soft Secant Pile Walls
Not Used	16/13	Contiguous Bored Piled Walls
Not Used	16/14	King Post Walls
Not Used	16/15	Steel Sheet Piles
Not Used	16/16	Integrity Testing of Wall Elements
Not Used	16/17	Instrumentation for Piles and Embedded Walls
Not Used	16/18	Support Fluid
		STRUCTURAL CONCRETE
	17/1	Concrete – Classification of Mixes
	17/2	Concrete – Impregnation Schedule
Not Used	17/3	Concrete – Surface Finishes
	17/4	Concrete – General
	17/5	Buried Concrete
Not Used	17/6	Grouting and Duct Systems for Post-Tensioned Tendons
		STRUCTURAL STEELWORK
Not Used	18/1	Requirements for Structural Steelwork

Completed by	App. No.	Title
		PROTECTION OF STEELWORK AGAINST CORROSION
Not Used	19/1	Form HA/P1 (New Works) Paint System Sheet
Not Used	19/2	Requirements for Other work
Not Used	19/3	Form HA/P2 Paint Data Sheet
Not Used	19/4	Form HA/P3 Paint Sample Despatch List (Sheet 1 and 2)
Not Used	19/5	General Requirements
		WATERPROOFING FOR STRUCTURES
	20/1	Waterproofing for Concrete Structures
		BRIDGE BEARINGS
Not Used	21/1	Bridge Bearing Schedule
Not Used	21/70	Bearing Supply and Installation
		BRIDGE EXPANSION JOINTS AND SEALING OF GAPS
Not Used	23/1	Bridge Deck Expansion Joints 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
Not Used	25/1	Requirements for Corrugated Steel Buried Structures
Not Used	25/2	Requirements for Reinforced Soil and Anchored Earth Structures
Not Used	25/3	Requirements for Pocket – Type and Grouted Cavity Reinforced Brickwork Retaining Wall Structures
Not Used	25/4	Environmental Barriers
Not Used	25/5	Requirements for Buried Rigid Pipes for Drainage Structures
		MISCELLANEOUS
Not Used	26/1	Ancillary Concrete
Not Used	26/2	Bedding Mortar
Not Used	26/3	Cored Thermoplastic Node Markers

Completed by	App. No.	Title
		LANDSCAPE AND ECOLOGY
	30/1	General (Sheet 1, 2 and 3)
	30/2	Weed Control
	30/3	Control of Rabbits and Deer
	30/4	Ground Preparation
	30/5	Grass Seeding, Wildflower Seeding and Turfing
	30/6	Planting (Sheet 1 and 2)
	30/7	Grass, Bulbs and Wildflower Maintenance
	30/8	Watering
	30/9	Establishment Maintenance for Planting
	30/10	Maintenance of Established Trees and Shrubs
Not Used	30/11	Management of Water Bodies
Not Used	30/12	Special Ecological Measures
		MAINTENANCE PAINTING OF STEELWORK
Not Used	50/1	Form HA/P1 (Maintenance) Paint System Sheet (Sheets A and B)
Not Used	50/2	Requirements for Other work
Not used	50/3	Form HA/P2 Paint Data Sheet
Not Used	50/4	Form HA/P3 Paint Sample Despatch List (Sheet 1 and 2)
Not Used	50/5	General Requirements

List 'B'. This is a list of the Contract Specific numbered Appendices devised for this Contract. Those identified by the letters T or C shall be completed by the Tenderer or Contractor respectively.

Volume No.	Completed by	App. No.	Title
2	T	0/06	Employers Communications Plan

APPENDIX 0/4: LIST OF DRAWINGS INCLUDED IN THE CONTRACT

1. **Contract Specific Drawings shall be supplied to each Tenderer**

DRAWING NO.	REV	STATUS	DRAWING TITLE:

2. **Standard Drawings**

(i) Supplied to each Tenderer

(Can be found in Annex A following Appendix 0/4)

DRAWING NO.	REV	STATUS	DRAWING TITLE:
SD-0300-035	-	C	Fencing Pedestrian Guardrails
SD-0300-036	-	C	Fencing High Visibility Pedestrian Guardrails
SD-0500-001	-	C	Typical Gully to Gully Connection Detail
SD-0700-001	A	C	Pavement Construction Details 1 of 5
SD-0700-002	A	C	Pavement Construction Details 2 of 5
SD-0700-003	A	C	Pavement Construction Details 3 of 5
SD-0700-004	-	C	Pavement Construction Details 4 of 5
SD-0700-005	A	C	Pavement Construction Details 5 of 5
SD-0700-006	-	C	Reinforced Grass Tie In
SD-1100-001	-	C	Kerbing Types, Foundations & Backing Details - Sheet 1 of 3
SD-1100-002	-	C	Kerbing Types, Foundations & Backing Details - Sheet 2 of 3
SD-1100-003	-	C	Kerbing Types, Foundations & Backing Details - Sheet 3 of 3
SD-1100-004	-	C	Kerbing Types Typical Section Through Kerb & Channel
SD-1100-006	-	C	Kerb Arrangements - Sheet 1 of 2
SD-1100-007	-	C	Kerb Arrangements - Sheet 2 of 2
SD-1100-010	-	C	Construction Areas - Sheet 1 of 3
SD-1100-011	-	C	Construction Areas - Sheet 2 of 3
SD-1100-012	-	C	Construction Areas - Sheet 3 of 3 - Type G Kerbing - Deterrent Paving
SD-1100-018	-	C	Paving Slabs - Sheet 1 of 2
SD-1100-019	-	C	Paving Slabs - Sheet 2 of 2
SD-1100-020	-	C	Crossing Types - Sheet 1 of 2
SD-1100-021	-	C	Crossing Types - Sheet 2 of 2
SD-1100-025	-	C	Pedestrian Guardrail Refuge - 1m Radius

DRAWING NO.	REV	STATUS	DRAWING TITLE:
SD-1100-026	-	C	Pedestrian Guardrail Refuge - QHB
SD-1200-001	-	C	Post Width & Foundation Information
SD-1200-020	-	C	Cycle Markings - Cycle On/Off Slips - COS1
SD-1200-021	-	C	Cycle Markings - Cycle On/Off Slips – COS2
SD-1200-022	-	C	Cycle Markings - Cycle On/Off Slips – COS3
SD-1200-023	-	C	Cycle Markings - Cycle On/Off Slips – COS4
SD-1200-024	-	C	Cycle Markings - Cycle On/Off Slips – COS5
SD-1200-025	-	C	Cycle Markings - Cycle On/Off Slips – COS6
SD-1200-026	-	C	Cycle Markings - Cycle On/Off Slips – COS7
SD-1200-027	-	C	Cycle Bollards - Ensign
SD-1200-028	-	C	Cycle Bollards - Mini Ensign
SD-1200-040	C	C	Base Light Unit for Chevroflex Sign System

3. **Standard Drawings – Somerset County Council Traffic Signals Standard Details**
(ii) Supplied to each Tenderer
(Can be found in Annex B following Appendix 0/4)

DRAWING NO.	REV	DRAWING TITLE:
SCC-TS-SD001	D	Access Chamber Details and Retention Sockets
SCC-TS-SD002	C	Carriageway Loops Settiing Out and Construction Details
SCC-TS-SD003	B	Duct Layout
SCC-TS-SD004	B	Speed Discrimination Loops
SCC-TS-SD005	C	Typical Controller and Miscellaneous Equipment Cabinet Foundation Details
SCC-TS-SD006	C	Tactile Paving and Signal Poles General Setting Out Details
SCC-TS-SD010	C	Puffin Crossing Equipment Arrangement
SCC-TS-SD011	B	Toucan Crossing Equipment Arrangement
SCC-TS-SD012	B	Anti-skid Surfacing
SCC-TS-SD013	D	Signal Pole Layout
SCC-TS-SD014	C	Access Chamber Construction General Details
SCC-TS-SD015	D	Typical External Cabinet Details

DRAWING NO.	REV	DRAWING TITLE:
SCC-TS-SD016	D	Requirements for Chambers, Controllers and Cabinets
SCC-TS-SD017	C	Pole Retention Sockets
SCC-TS-SD018	C	Carriageway Loop Box

4. **Standard Drawings**
(ii) Brought into the Contract by Reference
Highway Construction Details (HCD) Published by the Stationary Office.

DRG. NO.	TITLE	DATE	ASPECT/ALTERNATIVE(S) REQUIRED IF NOT WHOLE DRAWING
Series F	Drainage		All relevant details from the series apply.
Series G	Loop Detectors		All relevant details from the series apply.
Series H	Fences, Stiles and Gates		All relevant details from the series apply.
Series I1	Underground Cable Ducts	May 04	Longitudinal Sections and Details of Transverse Ducts
Series I2	Underground Cable Ducts	May 04	Duct Trench Cross Sections and Details of Mandrel
Drawings MCX	National Motorway Communications System Installation Drawings		All relevant details from the series apply.

Note: Notwithstanding the dates given in 2(ii) above HCD's current at the time of Contract Award shall be applicable for this Contract.

APPENDIX 0/6: COMMUNICATIONS PLAN

Communication Responsibilities (to include Traffic Management and communicating details of potential delays)

SCC	CONTRACTOR	WITH SCC APPROVAL
• MP	• Any residents associations	• The Media
• Cllr John Woodman	• Local Businesses	
• Affected SCC Members	• Taxi/bus companies	• District / Town Councils
• Somerset Direct	• Any Chamber of Commerce	
• Highways England	• Environment Agency	
• LTB	• Emergency services	
• Natural England	• Directly affected businesses and residents	
• English Heritage	• Parish/Town councils.	
	• Somerset Waste Partnership	
	• Haulage association	

Method (The quantity of communications will depend on the profile of each scheme and its location)

- **SCC, SSDC, Town, Parish Cllr briefings**
- **Chamber meetings**
- **Press releases**
- **Updated page on SCC website with Q&A**
- **Dedicated telephone contact number**
- **Letter drop to affected residents and businesses**
- **Social media**
- **Signage**
- **Our Somerset**
- **Your Somerset**
- **Face to face briefings**
- **Drop-in event before work begins**
- **Plans on display in a public location ie, library, community centre**
- **Q&A – briefing (public and reactive for Cllr Woodman)**
- **Members briefing sheet**
- **Face to face media briefings – BBC Somerset & Western Gazette**
- **Infographics, artist's impressions and videos to explain and promote the work**

Key Messages

- Major investment in improving and updating existing traffic signal provision
- Each scheme will seek to increase the capacity of the road network and improve traffic flow
- Improvements will seek to improve safer cycling and pedestrian facilities
- New signals will convert existing system to LED technology which will require less future maintenance and be extra low voltage and more energy efficient
- Works will be planned to minimise disruption as much as possible.
- We apologise for any short-term inconvenience

Date/Freq	Action	Audience	Method
Monthly	Regular updates	SCC, District Council – Operations, Commissioning, PMO & Comms	Board meetings
At start of project	Develop Q&A – including start date, key milestones, timescales, phasing dates, completion date, peak times of construction and potential traffic issues, alternative routes for walking, cycling, plans for mitigation, benefits, contact numbers including emergency	All	Q&As
At start of project and ongoing	Update the website with plans, maps, diversion routes, summary of works, Q&As, primary contact point		Website
At start of project	Summary and Q&As	MP SSDC Town council Chamber	Briefing
	Businesses open as usual / diversion routes / start date of works	All	Signage

Date/Freq	Action	Audience	Method
	Key messages, mitigation plans, timescales	Businesses & residents	Letter drop
	Update	Key stakeholders	As per contractors tender intentions
	Advise of works and where to find further information	Somerset Direct, Local Members and Stakeholders	Briefing
	Plans, timescales, summary & Q&A	BBC Somerset & Western Gazette	Face to face briefing
	Inviting all to view the plans in ASDA	All	Press release, infographic & Social media
	Summarise press release	SCC staff	Our Somerset
	Summarise press release	Stakeholders staff	Internal newsletters (SSDC, key businesses etc)
	Public exhibition	Local community	Plans and Q&A on display
		Your Somerset (distributed from 4 January)	
	Chamber of Commerce meeting	Businesses	
Ad hoc	Ad hoc traffic issues	All	Social Media

APPENDIX 1/3: COMMUNICATION SYSTEM FOR THE PROJECT MANAGER

1. The *Contractor* shall provide and maintain an approved communication system. It is likely that this will simply be a mobile phone contact available 24 hours a day.

APPENDIX 1/4: WORKING AND FABRICATION DRAWINGS

Electronic copies of all the detailed working and fabrication drawings prepared by or on behalf of the *Contractor* (if required) shall be submitted to the Employer for approval in accordance with the requirements of clause 104.

SERIES	DESCRIPTION OF WORK	MINIMUM PERIOD FOR SUBMISSION OF DRAWINGS
100	Traffic Management arrangements (Appendix 1/17)	Details/layouts at least 4 weeks prior to proposed installation or as otherwise required in accordance with Appendices 1/17 & 1/18
	Permanent Works Designed by the *Contractor*	Refer to Appendix 1/10
	Temporary Works Designed by the *Contractor* (Appendix 1/11)	Refer to Appendix 1/11
300	Pedestrian Guardrail	Details/layouts at least 4 weeks prior to proposed installation
400	Vehicle Restraint Systems & Parapet details, (Appendix 4/1)	Details/layouts at least 4 weeks prior to proposed installation
1700	Formwork details	Details/layouts at least 2 weeks prior to proposed erection/construction
2000	Waterproofing details	Details/layouts at least 4 weeks prior to proposed installation
2400	Brickwork, Stonework and Copings	Colour, fixings, installation and material for the brickwork, stonework and copings shall be agreed with the *Employer* at least 4 weeks prior to delivery and/or installation

Two copies of all detailed working drawings prepared by or on behalf of the *Contractor* shall be submitted to the *Project Manager*, unless otherwise indicated above, for their acceptance. This acceptance shall in no way relieve the *Contractor* of his responsibility for the work under the Contract.

APPENDIX 1/5: TESTING TO BE CARRIED OUT BY THE CONTRACTOR

Notes:

1. Unless otherwise stated, all sampling and testing in this Appendix shall be carried out by the *Contractor.*
2. Tests comparable to those specified in this Appendix will be necessary for any equivalent work, goods or materials proposed by the *Contractor* (See sub-Clause 105.4).
3. (N) indicates that a UKAS (formerly NAMAS) test report or certificate is required.
4. Unless otherwise shown in this Appendix, tests for work, goods or materials as scheduled under any one Clause are required for all such work, goods or materials in the Works.
5. Unless otherwise shown in this Appendix, test certificates for work, goods or materials as scheduled under any one Clause are required for all such work, goods or materials in the Works.
6. Where test certificates are identified, these shall be produced prior to the incorporation of that item into the Works.
7. Cube strength tests are not required for concrete complying with Clause 2602.

TABLE 1/5: TESTING TO BE CARRIED OUT BY THE CONTRACTOR

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 300 - Fencing					
306	Permanent fencing				Quality management scheme applies
	Concrete components	Cover to reinforcement	1 per consignment (maximum 1 per 100 components) (BS 1722)		
308	Gates and stiles				Quality management scheme applies
	Reinforced concrete posts	Cover to reinforcement	1 per consignment (maximum 1 per 100 components) (BS 3470)		
308 & 311	Preservation of timber	Full sapwood penetration	As required in sub-Clause 311.2(v)	Required for each batch	Quality management scheme applies
Series 400 – Road Restraint Systems (Vehicle and Pedestrian)					
402	Welding	Welding procedures (Manufacturer's tests)	(Every seven years)	Required	Quality management scheme applies
		Welder qualification (Manufacturer's tests)	Sub-Clause 402.7(iii)		
		Production testing (Manufacturer's tests)	Sub-Clause 402.7(iv)		
	Welded Joints	Destructive testing	Sub-Clause 402.7(v) and 402.7(vi)		
403	Anchorages and attachment systems for use in drilled holes	Ultimate tensile load (Manufacturer's tests)		Required	To provide well attested and documented evidence
404	Anchorages in drilled holes	On-site tensile load test	As required in appendix 4/1	Required	
	Post Foundations				
406	Vehicle parapets			Required	Quality management scheme applies
407	Anchorages and attachment systems for use in drilled holes	Ultimate tensile load (Manufacturer's tests)		Required	To provide well attested and documented evidence
409	Vehicle parapet components			Required	In accordance with manufacturer's installation manual.
410	Anchorages in drilled holes	On-site tensile load test	As required in Appendix 4/1	Required	
411	Pedestrian parapets and guardrails		Manufacturer's tests: yield proof of strength of material, ultimate strength and the extension at break.		

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 500 – Drainage and Service Ducts					
501	Pipes for drainage and service ducts				
	Vitrified clay				Product certification scheme applies
	Concrete-PC/SRC – Not exceeding 900 mm dia			See Note 2	Note 2 – Certificates required if product not quality marked bu a UKAS or equivalent
	Concrete-Prestressed – Not exceeding 900 mm dia				
	Iron-cast				
	Iron-ductile				
	UPVC				
	GRP				
	Plastics see Table 5/1				
	Corrugated steel	(Manufacturer's tests)		Required (AASHTO)	
	Corrugated steel bitumen protection – Not exceeding 900mm diam				
	Other materials			Required	BBA certification applies
503	Pipe bedding	Grading and fines content	1 per week (min of 3)	Required	
		Water-soluble sulphate content (N)	1 per source		
		Oxidisable sulfides (OS) content and total potential sulfate (TPS) content (N)	5 per source		
		Resistance to fragmentation	1 per source		

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 500 (continued) - Drainage and Service Ducts					
505	Filter medium backfill	Plastic index (N)	1 per source	Required	
		Resistance to fragmentation (N)	1 per source		
		Water-soluble sulphate content (N)	5 per source		
		Oxidisable sulfides (OS) content and total potential sulfate (TPS) content (N)	5 per source		
		Grading and fines content	1 per week (min of 3)		
		Permeability (N)	1 per source		
506	Sealing existing drains				
	Concrete				
	Grout				
507	Chambers				
	Precast concrete				Product certification scheme applies
	Corrugated galvanized steel	(Manufacturer's tests)		Required	Product certification scheme applies
	Manhole steps				
	Steel fitments				
	Covers, grates and frames				Product certification scheme applies
	Cover bolts				Quality Management scheme applies
508	Gullies and pipe junction				Product certification scheme applies
	Precast concrete				
	Clay				
	Cast iron and steel				
509	Watertightness of joints	Air test	All pipelines with watertight joints	Required	

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments

Series 500 (continued) - Drainage and Service Ducts					
512	Backfill to pipe bays	Grading	1 per 50 tonnes (min of 3)		
		Water-soluble sulfate content (N)	5 per source		
		Oxidisable sulfides (OS) content and total potential sulfate (TPS) content (N)	5 per source		
513	Permeable backing to earth retaining structures	Plastic index (N)	1 per source		
		Water-soluble sulfate content (N)	5 per source		
		Oxidisable sulfides (OS) content and total potential sulfate (TPS) content (N)	5 per source		
		Resistance to Frangmentation	1 per source		
		Grading and fines content	1 per 200 tonnes(min of 3)		
		Permeability (N)	1 per source		
	Precast hollow concrete blocks	(Manufacture's tests)		Required	
514	Fin Drains	(Manufacture's tests)		Required	BBA certification (or equivalent) applies
515	Narrow filter drains – granular fill			Required	BBA certification (or
	Geotextile, pipe and fittings	(Manufacture's tests)			equivalent) applies
	Granular Fill	Plastic index (N)	1 per source		
		Resistance to Fragmentation			
		Water-soluble sulfate content (N)	5 per source		
		Oxidisable sulfides (OS) content and total potential sulfate (TPS) content (N)	5 per source		
		Grading and fines content	1 per week		
		Permeability (N)	1 per source		
516	Combined drainage and kerb systems	Load Test	A minimum of 1 test and not less than 1 test per 1000m for each type and source	Required	Certification that the systems comply with Clause 516 is required.

Clause	**Work, Goods or Material**	**Test**	**Frequency of Testing**	**Test Certificate**	**Comments**
Series 500 (continued) - Drainage and Service Ducts					

517	Linear drainage systems		Load test	A minimum of 1 test and not less than 1 test per 1000m for each type and source	Required	Certification that the systems comply with Clause 517 is required.
Series 600 - Earthworks						
601 631 to 637 640	Acceptable material Class	General Description				
	1	General granular fill	Grading/uniformity coefficient	Twice a week		Testing to be in accordance with Appendix 6/1
			mc/MCV (N)	2 per 1000 m3 up to max of 5 per day		
			SMC of chalk (N)	Twice a week		
		1C only	Resistance to Fragmentation	Weekly		
	2	General cohesive fill	Grading	Twice a week		
			mc/MCV/PL Undrained shear strength (N)	2 per 1000 m3 up to max of 5 per day		Testing to be in accordance with Appendix 6/1
			SMC of chalk (N)	Twice a week		
			Bulk density (pfa) (N)	2 per 1000 m3 up to max of 5 per day		
	3	General chalk fill	mc (N)	2 per 1000 m3 up to max of 5 per day		
			SMC (N)	Daily		
	4	Landscape fill	Grading/mc/MCV (N)	Daily		
	5	Topsoil	Grading	Daily		
631 to 636	6	Selected granular fill	Grading/uniformity coefficient	1 per 400 tonnes		Testing to be in accordance with Appendix 6/1

Clause	Work, Goods or Material		Test	Frequency of Testing	Test Certificate	Comments
Series 600 (continued) - Earthworks						
640			PI/LL (N)	Daily		
			Resistance to Fragmentation	Weekly for on site material		
			omc/mc, mc or MCV (N)	1 per 400 tonnes		
			Organic matter / water soluble or total sulfate content (N)	Weekly		Testing to be in accordance with Appendix 6/1
			pH/chloride ion content (N)	Weekly		Testing to be in accordance with Appendix 6/1
			Resistivity (N)			
			Undrained and drained shear parameters (N)			Testing to be in accordance with Appendix 6/1
631 to 636 640	7	Selected cohesive fill	Grading/mc/MCV/bulk density (N)	1 per 400 tonnes		Testing to be in accordance with Appendix 6/1
			SMC of chalk (N)	Twice a week		
			PI/LL (N)	Daily		
			Organic matter / total or water soluble sulphate content (N)	Twice a week or daily where Sulfates are expected		
			Oxidisable sulfides (OS) and total potential sulphur content	Twice a week or daily where Sulfides are expected		
			pH/chloride ion content (N)	Weekly		
			Resistivity (N)			
			Undrained and drained shear parameters (N)			
			Permeability (N)			
	8	Miscellaneous fill	mc/MCV (N)	Daily		Testing to be in accordance with Appendix 6/1
	9	Stabilised materials	Pulverisation	1 per lane width per 200 m length		
			mc/MCV (N)			
			Bearing ratio (N)			
	Pulverised fuel ash		Chemical analysis	1 per consignment		Testing to be in accordance with Appendix 6/1
	Furnace bottom ash		Grading	1 per 300 tonnes		

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 600 (continued) - Earthworks					
601 cont	Fill adjacent to cementitious material or metallic items	Soluble sulphate content (N)			Testing to be in accordance with Appendix 6/1
602	Earthworks material beneath surface of a road or paved central reserve (i) Off site source (ii) On site source	Frost heave (N)	1 per source then monthly	Required	
609, 621	Geotextiles	Tensile load	1 per 400 square metres	Required	Specific requirements detailed in task order.
612	Compaction of fills				
	Method compaction	Field dry density (N)			
	End product compaction	Optimum mc (2.5kg rammer/vibrating hammer method) (N)	Each class or sub-class of material		
		Field dry density (N)	1 per 400 tonnes		
Series 700 – Road Pavements General					
705	Sub-base and Base material beneath surface of a road or paved central reserve	Frost heave (N)	1 per source then monthly		Material within the top 450mm of a pavement
Series 800 – Road Pavement – Unbound, Cement and Other Hydraulically Bound Materials					
801	Unbound sub-base material (other than slag) adjacent to cement bound materials, concrete pavements, structures or products	Soluble sulphate content (N)	1 per 400 tonnes or per location if less than 400 tonnes		
	Blastfurnace slag	Bulk density (N)	1 per 500 tonnes		
		Stability (N)			
		Sulphur content (N)			
	Steel slag	Bulk density	1 per 500 tonnes		

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 800 (continued) – Road Pavement – Unbound, Cement and Other Hydraulically Bound Materials					
803	Granular sub-base material Type 1	Grading Plastic index (N)	1 per 400 tonnes		
870AR	Upper and Lower Permeable Sub-base	10% Fines Value (N)	1 per source and then monthly		
		Soundness (N)	1 per source		
804	Granular sub-base material Type 2	Water absorption (N)			
		Grading	1 per 400 tonnes		
		Plastic index			
		CBR (N)	1 per source and then monthly		
		OMC/mc (N)			
		Density (N)			
		10% fines value (N)			
		Soundness (N)	1 per source		
		Water absorption (N)			
Series 900 - Road Pavements – Bituminous Bound Materials					
901	Aggregates for bituminous materials			Required	
925	Hardness	10% fines value (N)	Monthly		
		Impact value (N)	Monthly		
	Durability	Soundness (N)	1 per source		
		Water absorption (N)	Monthly		
	Cleanness	Sieve test (mass passing 75µm sieve) (N)	Monthly		Washing and sieving method to be used
	Shape	Flakiness index (N)	Monthly		
	Blastfurnace	Bulk density (N)	1 per 500 tonnes		
	Slag	Stability (N)			
		Sulfur content (N)			
	Steel slag	Bulk density			
	Coarse aggregate for Surface courses	PSV (N)	1 per source		
		AAV (N)			

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 900 – Road Pavement – Bituminous Bound Materials (continued)					
	Binders for bituminous Materials	Penetration (N)	1 per 750 tonnes		
		Softening point (N)	1 per 750 tonnes		
903 to 914, 916, 925, 926, 930, 932 to 934, 942	Bituminous mixtures	Grading (N)	1 per 100 tonnes (min 2 per day)		Change to 1 per 200 tonnes if quality is well within specified tolerances
		Binder content (N)			
929	Base and Binder course Macadams	In situ air void content (N) Refusal air void content (N) (PRD Test) Binder volume Grading (N) Binder content (N)	1 per 100 tonnes (min 2 per day)		
919	Surface Dressing				
922	Binder	Product identification	1 per product per source	Required	
		Vialit cohesion	1 per product per source	Required	
		Accuracy of spread	1 for each binder sprayer per week	Required	Not more than 6 weeks prior to start of work and 1 per week
		Rate of spread	Every 500 linear metres initially		Frequency to be reduced to daily after 3 satisfactory results, but not less than 1 test per lane per site
		Penetration at 25°C and 5°C (N)	Every delivery		For cutback binders as supplied, manufacturer's QA viscosity test results may be submitted

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 900 - Road Pavements – Bituminous Bound Materials (continued)					
922 (cont)	Chippings	Polished stone value (N)	Source approval	Required	Less than 6 months prior to work
		Aggregate abrasion value (N)	Source approval	Required	Less than 6 months prior to work
		Aggregate abrasion value (N)	Source approval	Required	Less than 6 months prior to work
		Grading (N)	1 per 200 tonnes		
		Binder Content (N)	1 per 200 tonnes		Coated chippings only
		Flakiness index (N)	1 per 200 tonnes		
		Accuracy of spread (N)	1 for each chipping spreader for every change of chipping size or source	Required	Initial test not more than 6 weeks prior to start of work
		Rate of spread	Every 500 linear metres initially		Frequency to be reduced to daily after 3 satisfactory results, but not less than 1 test per lane per site
	System	TAIT or BBA/HAPAS	System approval	Required	Not more than 6 months prior to start of work
	Rollers	Sprinkler bars working	Before work starts and daily during works		Needed when chipping pick up occurs
924	High Friction Surfaces				
	Aggregate	PSV (N)	1 per source and as required for coated chippings in Clause 915.3	Required	
	Checking and testing	Quality Control Check	As required in sub-Clause 924.5		
		System coverage	Sub-Clause 924.6		

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 900 - Road Pavements – Bituminous Bound Materials (continued)					
911	Rolled asphalt Surface course (design mix)	Stability value (N)	1 per source		
		Flow value (N)			
		Density (N)			
915 925	Coated chippings	Grading (N)	1 per stockpile		
		Binder content (N)	1 per stockpile		
		Flakiness index (N)	1 per source		
		PSV (N)	1 per source		
		AAV (N)	1 per source		
		Hot sand test (N)	1 per source		Frequency to be reduced to daily after 3
		Rate of spread (N)	Every 500 metres initially		Satisfactory results, but not less than 1 test per lane per site
942	Thin wearing course systems	General Properties		Required	The test certificate is in the form of a BBA HAPAS Certificate

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 1100 – Kerbs, Fooyways and Paved Areas					
1101	Precast concrete kerbs, channels, edgings and quadrants	Bending strength	Minimum of 8 per 1000 units of each product (BS EN 1340)		
1102	In situ asphalt kerbs	Grading	1 test per 500 metres laid	Required	
		Binder content			
1104	Precast concrete flags	Transverse strength	Minimum of 8 per 1000 m^2 of each product (BS EN 1339:2003)		
		Water absorption			
	Bedding – Granular material				
	Bedding – Mortar				
1107	Concrete block paving	Compressive strength	Minimum of 8 per 1000 m^2 of each product (BS EN 1338:2003)		
1108	Clay Pavers	Transverse breaking load	Minimum of 8 per 1000 m^2 of each product (BS EN 1344)		
		Skid resistance	Minimum of 8 per 1000 m^2 of each product (BS EN 1344)		

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 1200 – Traffic Signs					
1202	Permanent traffic signs			Required	Certification that the traffic sign is capable of passing the tests in BS 8442:2015 is required
1207	Anchorages in drilled holes to supports of traffic signs	Loading test on site (N)	10% of anchorages (unless otherwise stated in Task Order)	Required	
1210	Holding down bolts and anchorages to base of permanent bollards			Required	Certification that the holding down bolts and anchorages are capable of complying with the performance requirements of BS 8442:2015 is required
1212	Thermoplastic road marking materials	Tests specified in BS EN 1824			Quality management and product certification schemes apply Sampling procedures are given in BS EN 1824
	Pavement marking paints			Required (BS 6044)	Quality management and product certification schemes apply
1214	Permanent traffic cones and cylinders			Required	Certification that permanent traffic cones and cylinders have been tested and comply with BS 8442 is required
		Tests specified in BS 873 Part 8	2 of each size and category / type		
	Flat traffic delineators			Required	Certification that FTDs have been tested and comply with Clause 1214 is required
		Tests specified in Clause 1214			

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 1200 – Traffic Signs (continued)					
1214 (cont)	Other traffic delineators			Required	Certification that delineators have been tested and comply with Clause 1214 is required
		Tests specified in Appendix 12/4			
	Temporary cones, cylinders, FTDs and other delineators			Required	Certification that at least 1 in 500 of any batch of cones, cylinders, FTDs and other delineators to be used in the Temporary Works have passed the tests in Clause 1214 as appropriate is required.
1218	Detector Loops				
	Cable			Required	Certification that completed cables comply with DOT specification TR 2029 is required
	Epoxy Resin			Required	Certification that the epoxy resin complies with DOT specification MCH 1540 is required.
	Feeder Cable			Required	Certification that completed cables comply with DOT specification TR 2031 is required
	Joints	Pull test (4 kgf)	Each crimp		
	Installation	Series Resistance	Each loop	Required	Certification in accordance with DOT specification MCH 1540 is required.
		Insulation resistance			
		Inductance			
Series 1300 – Road Lighting Column brackets, CCTV Masts and Cantilever Masts					
1306	Anchorages in drilled holes to columns with flange plates	Loading test on site			

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 1300 – Road Lighting Column brackets, CCTV Masts and Cantilever Masts (continued)					
1310	Welding	Welding procedures (Manufacturer's tests)	Every seven years		Quality management scheme applies
		Welder's qualification (Manufacturer's tests)	Clause 1310 (7.1.3)		
		Production testing	Clause 1310 (7.1.4)		
	Welded joints	Destructive testing	Clause 1310 (7.1.5)		
Series1400 – Electrical Work For Road Lighting and Traffic Signs					
1421	Cable				Product certification scheme applies
1424	Lighting Units	Tests specified in Clause 1424	Each unit	Required	Product certification scheme applies Certification that the installation complies with BS 7671 (the IEE Wiring Regulations) is required.
	Networks	Tests specified in Clause 1424	Each network	Required	Certification that the installation complies with BS 7671 (the IEE Wiring Regulations) is required.
Series 1600 - Piling and Embedded Retaining Walls					
1606	Coatings for protection against corrosion	Adhesion	As required in Appendix 16/6		
1607	Reduction of friction on piles		As required in Appendix 16/7		
1608	Integrity Testing	Sonic Shock	As required in Appendix 16/8		
1609	Static load testing of piles		As required in Appendix 16/9		
1616	Dynamic Testing		Not required		

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 1700 – Concrete – Classification of Mixes					
1702	Cement				
1703 1704	Portland			Required (BS 12)	Certificate to be provided for each type of cement and from each source. Where cement is used for a period in excess of one month a new certificate shall be provided. Quality Management and product certification schemes apply.
	Portland – Blastfurnace			Required (BS 146)	
	Sulfate resisting Portland			Required (BS 4027)	
	Portland – pulverised fuel ash			Required (BS 6588)	
	Low heat Portland			Required (BS 1370)	
	High slag blast furnace			Required (4246)	
	Pulverised-fuel ash	Colour index	Monthly	Required (BS3892: Part 1)	Certificate to be provided monthly Product certification scheme applies
	Ground granulated blast furnace slag			Required (BS 6699)	Certificate to be provided monthly Product certification scheme applies
	Cements (all types)	Chloride content	Monthly per supplier		Tests to be carried out by the manufacturer and results included on the test certificates required above.
	Pulverised-fuel ash	Sulfate content	Monthly per supplier		
	Ground granulated blastfurnace slag	Acid-solube alkali content	Daily (PC) Weekly (pfaggbs)		
	Aggregates	Grading	Per delivery		Results of routine control tests by the manufacturer/supplier to be provided. Product Certification Scheme Applies
		Shell content (N)	Monthly		
		Flakiness Index (N)	Monthly		
		10% fines value (N)	Monthly		
		Drying shrinkage (N)	Once per source		
		Chloride content (N)	Per delivery		
		Sulfate content (N)	Monthly		

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 1700 - Concrete – Classification of Mixes (continued)					
	Blastfurnace slag	Bulk density (N)	Per source		
		Stability (N)	Per source		
		Sulfur content (N)	Per source		
1702 1703 1704	Water	Tests specified in BS EN 1008	Weekly (only for non-mains water)	Required	Refer to Claus 1702.3
		Chloride content	Once per source		Results of routine tests by water supplier acceptable
		Sulfate content	Once per source		
		Acid-soluble alkali content	Once per source		
	Admixtures	Chloride content	1 per batch	Required (BS EN 934-2)	
		Sulfate content	1 per batch		
		Acid-soluble alkali content	1 per batch		
1707	Concrete	Cube strength (N)	Reinforced Concrete: two cubes from each cast or each 20m^3 whichever is the more frequent		
			Mass concrete: two cubes from each cast or each 50m^3 whichever is the more frequent		
		Cube strength – special testing as described in Appendix 17/4	2 cubes from each of two samples of each batch		
		Density	Not Required		
		Modulus of Elasticity	Not Required		
	Fresh concrete	Workability (slump) Air Content Cement content Water/cement ratio	Each batch		
1709	Bridge Guard	Manufacturer's formulation	Per batch		
1710	Precast Structural Concrete Manufactures off-site	Cube strength (Manufacturer's tests)	One per cast for custom casts One per source for production casting		

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 1700 Concrete – Classification of Mixes (Continued)					
1710		Trial Panels	Two		Refer to Appendix 1/6 and Appendix 17/4
1712	Reinforcement				
				Required (BS 4449)	Product certification scheme applies
				Required (BS 4482)	
				Required (BS 4483)	
1713	Fabricated Reinforcement			Required	Certification that fabricated reinforcement complies with the routine inspection/ testing requirements of BS 8666 is required if the fabrication is not covered by a product certification scheme listed in Appendix B.
1716	Reinforcement jointing systems	Use is not envisaged. Engineer will advise testing requirement is used	As required in BS 7123		If used (BBA Roads and Bridges certificate or CARES certificate of product assessment or fully equivalent scheme apply)
1717	Reinforcement metal arc welding	Welding Procedure Approval (BS 7123)			Tests to be carried out by an independent testing body as specified in BS 8666
1726	Stainless steel bar			Required (BS 6744)	Product certification scheme applies.
1727	Inspection and testing of structures and components				Refer to Appendix 17/4
Series 1800 – Requirements for Structural Steel Work					
1801 1803	Structural steels to BS EN 10025, BS EN 10113, BS EN 10137, BS EN 10155, BS EN 10210		per cast	Required (Document as described in Appendix 18/1)	Structural steels to BS EN 10025, BS EN 10113, BS EN 10137, BS EN 10155, BS EN 10210

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 1800 – Requirements for Structural Steel Work (continued)					
1801 1803	Stainless steels to BS 970; BS EN 10084; BS EN 10087; BS EN 10095; BS EN 10027 and BS EN 10278		per cast	Required (BS 970; BS EN 10084; BS EN 10087; BS EN 10095; BS EN 10027 and BS EN 10278)	Intercrystalline Corrosion Test Required
	Stainless steel to BS EN 10029; BS EN 10048; BS EN 10051; BS EN 10258; BS EN 10259		per cast	Required (BS EN 10029; BS EN 10048; BS EN 10051; BS EN 10258; BS EN 10259)	
	Steel Plate	Ultrasonic Testing	As required in Appendix 18/1	Required	
	Bolts, nuts and washers				Quality management scheme applies
	All types except high strength friction grip	Test specified in BS4395: Part 2	As required in BS 4395: Part 2		
	High strength friction grip	Test specified in BS4395: Part 1 or Part 2	As required in BS 4395: Part 1 or Part 2		If the Contractor uses methods other than grit blasting or thermal metal spray for faying surfaces then a Slip factor test is required
	Tension Control Bolts	Test specified in JSS II-009-1981 or BS 4395	Test specified in JSS II-009-1981 or BS 4395	Required (BS 4483)	
	Welding electrodes				
	Covered steel			Required (BS EN 499)	

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 1800 – Requirements for Structural Steel Work (continued)					
	Welding electrodes (cont)				
	Wire			Required (BS EN 756; BS EN 760	
	Welding				
	Welding Procedures	Tests specified in BS EN ISO 15614 and Appendix 18/1	As required in BS EN ISO 15614 and Appendix 18/1		Results to be reported in accordance with BS EN ISO 15614
	Welder Qualification	Tests specified in BS EN 287: Part 1 and Appendix 18/1	As required in BS EN 287: Part 1 for each welder	Required (BS EN 287: Part 1)	Certificate to be in accordance with Annex B of BS EN 287: Part 1
	Butt weld 'run-off' plates	Destructive tests specified in BS 5400 Part 6 and Appendix 18/1	As required in BS 5400 Part 6 and Appendix 18/1		Applicable to butt welds in flat plate only
	Welds	Visual inspection as specified in Appendix 18/1	100%		
	Butt Welds	Non-destructive testing (Magnetic Particle Inspection)	100%		
	Butt welds in material > 12mm thick	Non-destructive testing (Ultrasonic Testing)	100%		In addition to MPI
	Fillet Welds	Non-destructive testing (Magnetic Particle Inspection)	10%		
	Flame cutting and shearing	Tests to demonstrate procedures comply with BS 5400 Part 6 and Appendix 18/1	1 test for each 1m of cut edge		
Series 1900 – Form HA/P1 (New Works) Paint System Sheet					
1903	Abrasives	Grading	Weekly or per Batch whichever is more frequent		
		Hardness			
		Contamination	Weekly		Samples to be tested for chlorides and sulphates using an approved method.

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 1900 – Form HA/P1 (New Works) Paint System Sheet (continued)					
1909	Galvanised Coatings	Tests specified in BS EN 22063	Per consignment		Areas to be tested in accordance with Clause 1910
	Aluminium Coating Material		Per batch	Required (BS EN 1301)	
	Zinc Coating Material			Required (BS EN 11792)	
	Sherardized Coatings	Tests specified in BS 4921		Per consignment	Engineer to select samples.
	Zinc electroplated coatings	Tests specified in BS 3382: Part 3		Per consignment	Engineer to select samples.
1910	Metal Spray Coatings	Tensile test specified in BS EN 22063	Two panels per day or 100m^2 whichever is more frequent		
		Grid Test specified in BS EN 22063	One Test Per type of excepted surface		
1911	Paints				
	Sample Paints	Colour Match	per system for intermediate coats, for finish coat per batch		In accordance with Appendix 19/5
	Samples 'A' and 'B'	Specific Gravity Colour Match Composition Application Characteristics	Per batch		In lieu of the provision of "A" and "B" samples in accordance with Clause 1912.1 and Appendix 19/4, the paint supplier shall provide a Certificate of Conformance for each type of paint to be used in the works. The Certificate of Conformance shall confirm that the paints supplied conform to the composition and/or properties against the original formulation issued by the paint manufacturer to the certifying body in order to satisfy the provisions of Clause 1912.2. 13 to17. No additional requirements.
2003	Permitted waterproofing systems		As required in appendix 20/1		Registration and BBA Roads and Bridges Agreement certification apply
	Additional bituminous protection	Tests specified in BS 594-1	1 per 15 tonnes*		Sampling to comply with BS 594-1

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 2100 – Bridge Bearing Schedules					
2101	Bridge Bearings	Test specified in Appendix 21/1	As required in Appendix 21/1		
Series 2400 – Brickwork, Blockwork and Stonework					
2401	Masonry cement			Required (BS EN 413-1)	Quality management scheme applies
		Chloride content (N)	Monthly		Tests to be carried out by the manufacturer and results included on the test certificate
2402	Sand			Required per consignment (BS EN 13139)	
		Chloride content (N)	Monthly		Tests to be carried out by the manufacturer and results included on the test certificate
2403	Water	Tests specified in BS EN 1008	Detailed in Task Order		
2404	Mortar admixtures			Required (BS EN 934-3)	
2405	Lime			Required (BS EN 459-1)	
2406	Bricks				
	Clay	(Soluble salt content Efflorescence Compressive strength Water absorption Initial rate of suction) (BS EN 771-1/TRL Report 447)	Detailed in Task Order		
	Calcium Silicate			Required (BS 187)	
	Concrete			Required (BS 6073: Part 1/BS EN 772-2)	

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 2400 - Brickwork, Blockwork and Stonework (continued)					
2407	Blocks				
	Clay	(Soluble salt content Efflorescence Compressive strength Water absorption Initial rate of suction) (BS 3921)	Detailed in Task Order		
	Concrete			Required (BS 6073: Part 1/BS EN 772-2)	
2408	Reconstituted stone		Detailed in Task Order		
2410 2411	Stainless steel				
	Wire/fabric			Required (BS EN 10088-1)	
	Bars			Required (BS 6744)	
	Ready mixed mortars			Required (BS 4721)	
	Mortars	Tests specified in Appendix A1 of BS EN 10521-1	1 set of tests per mix		
Series 2500 – Environment Barriers					
2505	Materials for reinforcing elements, prefabricated facing and capping units and washers				BBA Roads and Bridges Certification applies
	Carbon Steel Strip			Required (BS 1449 : Part 1 or BS EN 10025)	Silicon content and mechanical properties to be stated on the certificate
	Stainless Steel Strip			Required (BS 1449 : Part 2)	Mechanical properties to be stated on the certificate

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 2500 – Environment Barriers (continued)					
2502	Reinforcing bar for anchor elements			Required (BS 4449)	Tests scheduled under Clauses 1717 and 1909 are required for welding and galvanizing of anchor elements
	Materials for fasteners				
	Stainless steel			Required (BS 970: Part 1) (BS 6105)	
	Bolts, screws and nuts			Required (BS EN ISO 898, 24016, 24018, 24034)	Tests scheduled under Clause 1909 are required for hot dip galvanizing
Series 2600 - Miscellaneous					
2601	Bedding Materials			Required for each batch	Certification in accordance with Clause 2601 is required
	Bedding Mortar	Flow cone test (N)	Each batch		Laboratory Tests
		Flow between glass plates (N)			
		Compressive strength (N)			
		Expansion test (N)			
		Water absorption (N)			
		Elastic stability (N)	1 per source		
		Flow cone test Compressive strength	Each mix		Site control tests
2602	Ancillary Concrete				
2604	Plastic coating to fencing posts, gates and ancillaries			Required (BS 172: Part 16)	Certification by powder manufacturer and coating applicator is required

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 3000					
3001	General			Required in Appendix 30/1	Inspection Report
3005	Grass seeding, Wildflower seeding and turfing	Rate of spread of fertiliser	1 per 1000 square metres		
		Rate of spread of seeding	1 per 1000 square metres		
		Chemical analysis of fertiliser	1 per source		
		Grass seed germination and purity (Official Seed Testing Station tests)	1 per source and mix variety	Required prior to sowing	
Series 5000 – Maintenance Painting of Steelwork					
5003	Abrasives	Grading	1 per batch		Samples shall be selected by the Overseeing Organisation
		Hardness			
5073AR	Paint and similar protective coatings	Specific gravity	In accordance with Clause 5073AR		Compliance with BA 27 and BA 35
		Colour match			
		Composition			
		Application characteristics			

APPENDIX 1/7: SITE EXTENT AND LIMITATIONS ON USE

1. Extent of Site

1.1 The extent of the site will be shown on each individual project via the supply of suitable drawings.

1.2 Access to the sites shall be gained from the public highway.

1.3 Some signs included in Appendix 12/1 may be located outside of the Site but will be located on land owned by Somerset County Council.

2. Limitations on the Use of the Site

2.1 The *Contractor's* use of any area of the Site in his possession will be limited by the requirements of Clause 117 Traffic Safety and Management and the following conditions:

a. The *Contractor* shall not use the Site for any other purpose other than those connected with the Works.

b. The *Contractor's* use of any area of the Site in his possession shall be limited by the requirements and constraints as set out in Appendices 1/13, 1/16, 1/17 & 1/23 and the Special Requirements

c. The *Contractor* shall ensure that any temporary facilities, parked vehicles and plant, stockpiled material and the like are not situated within the site areas as to adversely affect users of the Public Highway.

d. The safety zone specified in Chapter 8 of the Traffic Signs Manual shall be maintained between the edge of any traffic lane and the works. The safety zone shall be clearly defined and kept clear of all equipment and materials.

e. The provision of areas to accommodate all principal offices, messes, stores, laboratories or workshops required under the *Contract* or otherwise by the *Contractor* shall be the responsibility of the *Contractor*. No principal offices, messes, stores or workshops shall be sited within the trunk road, motorway or other highway boundaries without the written consent of the appropriate authority.

f. All areas outside the limits of the Site which are used or occupied by the *Contractor* and the area of the Site shall be restored to their original condition on completion of the Works. Such restoration shall include any necessary reinstatement, re-soiling, seeding or planting.

g. The *Contractor's* attention is drawn to the possible use of any working area by the *Employer's* Term Maintenance Contractor whilst engaged in the provision, erection, maintenance and removal of emergency traffic safety or maintenance measures that may be necessary whilst the works are being carried out.

h. The *Contractor* shall not obstruct any lane, road junction vehicular or pedestrian access which has not been closed to traffic.

i. The *Contractor* shall allow for any working areas within the boundaries of the highway to be used by vehicles requiring to stop in an emergency. The *Contractor* shall inform the *Project Manager* and the Police of the name(s) and telephone number(s) of a responsible person(s) who can be contacted at any time in an emergency.

j. The *Contractor*, his agents, servants or workmen shall not erect nor allow his sub-contractors their agents, servants or workmen to erect within the Site any advertisement without the prior written approval of the *Project Manager*. Should any advertisement be erected without such approval, the *Project Manager* shall have power to order in writing the *Contractor* to remove it forthwith. If the *Contractor* shall fail to comply with such order within 24 hours of its delivery to him, the *Employer* shall be entitled to employ and pay other persons to carry out the same and all expenses consequent thereon or incidental thereto shall be borne by the *Contractor* and shall be recoverable from him by the *Employer* or may be deducted by the *Employer* from any monies due or which become due to the *Contractor*.

k. All advertisements, approved under the previous sub-clause, within the site shall be removed not later than the Completion Date, unless the *Project Manager* approves in writing any advertisement to remain for a further period.

l. The *Contractor*, or any agent or servant in his employ shall not give any information concerning the *Works* for publication in the press or radio, television or cinema screen or elsewhere without the written approval of the *Project Manager*.

m. The *Contractor* shall prevent trespass by his own or his sub-contractor's employees onto any property adjoining the site.

n. The *Contractor* shall ensure that no steps, ladders or other plant are left accessible so as to permit unauthorised access to the works.

o. The *Contractor* shall maintain the Site in a clean and tidy state by removing rubbish, demolished concrete and other debris arising from the works to a tip off Site. All materials and plant for the Works shall be stored neatly. On completion of the works the *Contractor* shall remove all surplus materials and leave the Site in a clean and tidy condition.

p. The *Contractor* shall note that traffic restrictions and traffic control required to carry out any necessary remedial works shall be to the standard required for the main works.

q. The programming of any remedial works required after the actual Completion Date shall be agreed with the *Project Manager* before commencement of those works.

r. Each goods vehicle used by the *Contractor*, his subcontractors or suppliers in connection with the Contract shall display the vehicle licence disc relevant to the

goods operator's licence under which the vehicle is operated or, in the absence of an operator's licence disc, shall carry documentation giving the operator's licence number, name and address.

APPENDIX 1/9: CONTROL OF NOISE AND VIBRATION

Noise Control

1. The *Contractor* shall employ the best practical means to minimise noise and vibration produced by his operations and shall have regard to the recommendations in BS5228: Part 1: 2009 (Noise Control on Construction and Open Sites) and any similar British Standard or Code of Practice which may be considered relevant.

2. The Local Authority has informally agreed that the following measures would be acceptable and these are given as a guide; however it is for the *Contractor* to seek the Local Authority's formal consent to his proposed methods of work and to the steps he proposes in order to minimise noise.

3. The normal permissible working hours within the site are 07:00 – 19:00 (except for Sundays which will be 08:00 – 17:00)

   There is to be no working on public holidays. Consent for work outside these hours may be requested from the *Project Manager*. Consent is deemed unlikely to be approved for work between 23:30 and 06:30 hrs. Seven days notice is required from the *Contractor* when seeking such consent.

4. Without prejudice to the *Contractor's* obligations the *Contractor* shall comply in particular with the following requirements:

   (a) All vehicles and mechanical equipment shall be maintained in good and efficient working order and shall be fitted with effective exhaust silencers.

   (b) All compressors, generators and fans shall be "silenced" models fitted with properly lined and sealed acoustic covers which shall be kept closed whenever the machines are in use and all ancillary pneumatic percussive tools shall be fitted with mufflers or silencers of the type recommended by the manufacturers.

   (c) Machines in intermittent use shall be shut down in the intervening periods between work or throttled down to a minimum.

   (d) Where practicable, plant with directional noise characteristics shall be positioned to minimise noise at adjacent properties.

   (e) Static machines shall be sited as far away as practicable from inhabited buildings.

   (f) Where it is necessary to provide power for the running of traffic signals, pumps etc., at any time during the period 1900 to 0700 hours Monday to Saturday inclusive and all day on Sunday, then the sources of such power shall be from mains electricity except if the *Project Manager* agrees in writing that alternative plant may be used, after consultation with the Local Authorities.

(g) Good relations with people living and working in the vicinity of the works are important. People who are likely to be affected by the noise shall be informed, by letter drop or other appropriate means, of any works to be carried out between 1900-0700 hours and on weekends. Notification of the public shall take place at least one week prior to the commencement of Site works. The *Contractor* shall submit draft notifications to the *Project Manager* two weeks prior to the proposed delivery date.

5. The noise levels (see Note (i) below) scheduled below for periods outside normal working hours will only be permitted when consent has been given to exceptional working.

6. The ambient noise level, Leq (see Note (ii) below) from all sources when measured 2.0m above the ground at noise control stations shall either not exceed the appropriate level given in the Schedule or not exceed by more than 3dB(A) the existing ambient noise level, Leq (see Note (iii) below), at the control station measured over the same period, whichever is greater. The maximum sound level at any noise control station shall not exceed the level given in the Schedule. Exceptionally the *Contractor* may be given permission to carry out works which exceed the noise levels in the Schedule, provided that 7 days notice of the date and timing of these works is given to the *Project Manager* and the *Contractor* demonstrates that he intends to take all reasonable measures to mitigate the noise nuisance. After consultation with the Local Authority and any other interested bodies, a decision will be given within 4 days of receipt of notice.

SCHEDULE		**Total Noise Levels at Control Stations**		
Period	Hours	Ambient Noise Level, Leq measured at Control Station: dB(A)	Period of hours over which Leq is applicable	Maximum Sound Level (see Note (iv) below) measured at Control Station: dB(A)
Mondays to Fridays	06:30- 07:00	60	0.25	70
	07:00 – 19:00	70	0.25	80
	19:00 – 23:30	60	0.25	70
Saturdays	06:30- 07:00	60	0.25	70
	07:00 – 16:00	70	0.25	80

	16:00 – 23:30	60	0.25	70
Sundays	07:00 – 20:00	60	0.25	70
All equipment outside the above hours		40	-	45

Notes:

i) Noise levels relate to free field conditions. Where noise control stations are located 1m from facades of buildings, the permitted noise levels can be increased by 3dB(A).

ii) The ambient noise level, Leq, at a noise Control Station is the total Leq from all noise sources in the vicinity over the specified period.

iii) The existing ambient noise level, Leq, at a Control Station is the total Leq from all noise sources in the vicinity over the specified period.

iv) The Control Stations are to be 1m from the nearest outside wall of the nearest residential property to the source of the noise

v) Maximum sound level is the highest value indicated on a sound level meter which meets the requirements of BS EN 61672-1:2003 Type 1 or 2 set to SLOW response and frequency weighting A.

7. The *Contractor* shall provide the *Project Manager* with as much advance warning as possible of any emergency work that it is necessary to conduct outside of the above permitted working hours.

8. The *Contractor* shall furnish such information as may be required by the Local Authorities in relation to noise levels emitted by plant or equipment used or installed on the Site or which the *Contractor* intends to use or install on the Site and also afford all reasonable facilities to enable such Authorities to carry out such site noise-monitoring as may be necessary.

9. The *Project Manager* shall have the right to order the *Contractor* to cease using any item of plant insufficiently silenced or generating noise levels in excess of those specified.

10. Compliance with these conditions and the other requirements of the Contract will not of itself constitute any ground of defence against any proceedings instituted under Section 59 of the Control of Pollution Act 1974 (whereby any occupier of premises may complain to a Magistrate's Court of a noise nuisance).

Vibration Control

11. Prior to the start of construction works a scheme for noise and vibration monitoring, assessment and mitigation for all construction plant and processes shall be submitted to the local authority for approval allowing 2 weeks for approval. The method statement shall be prepared by competent persons and should include a schedule of premises containing people or equipment potentially sensitive to disturbance from vibration or any building or structure potentially at risk of damage from vibration. The schedule shall be submitted to the local authority for approval prior to the start of construction. The schedule shall include proposals for monitoring vibration levels,

where necessary, ensuring that where practicable, vibration levels do not exceed those specified below, vibration disturbance criteria, and details of mitigation or other remedial measures to be applied.

12. The results of any vibration monitoring will be made available to the local authority. Occupiers of nearby properties shall be informed in advance of the works taking place where relevant, including the duration and likely noise and vibration impacts. Potentially affected occupiers will also be notified of the helpline number.

13. Criteria and procedures for vibration control are specified for three purposes and assessed using three different sets of parameters:

- to protect the occupants and users of buildings from disturbance, for which Vibration Dose Values are assessed (VDVs are defined in BS 6841 and their application to occupants of buildings is discussed in BS 6472);
- to protect buildings and other structures from risk of physical damage, for which peak component particle velocities (PPVs) are assessed in accordance with BS 7385; and
- to protect particularly vibration-sensitive equipment and processes from damage or disruption, for which peak component acceleration, velocity or displacement are assessed as appropriate to each process or item of equipment.

It is recognised that in some buildings, two or three of the above sets of criteria may apply, and in those cases the criteria shall be evaluated separately. In establishing criteria, controls and working methods, guidance in BS 6472, BS 5228 and BS 7385 will be taken into account.

14. Vibration disturbance criteria

14.1 Subject to the specific requirements of the local authorities, the following minimum requirements, as specified in BS 6472:2008, and set out in table 1 below, will be met as far as practicable, to protect residents and users of buildings from nuisance and harm:

Table 1: vibration dose values

Building type	**Period**	**VDV (ms-1.75)**
Eligible dwellings [1]	08:00 to 23:00	0.40
	23:00 to 08:00	0.13
Residential, any period of intermittent vibration	-	PPV <0.28 (mm/s)
Educational establishments, offices and similar [2]	Over normal daily period of use	0.40
Commercial [3]	Over normal daily period of use	0.80

[1] Measured on a normally-loaded floor of any bedroom or living room. For this purpose, eligible
Dwellings include dwelling houses, residential institutions, hotels, and residential hostels.
[2] Measured on a normally-loaded floor of areas where people normally work. This category of receiver will include all areas where clerical work, meetings and consultations are regularly carried out e.g. Doctors' surgeries, day-care centres, but not shop floors of industrial premises.
[3] Measured on a normally-loaded floor of areas where people normally work. Commercial premises include retail and wholesale shops.
The VDVs set out in table 1 are those specified in BS 6472:2008 below which there is a 'low probability of adverse comment'.

14.2 The limits of vibration amplitude and resultant peak particle velocity in any vertical, radial or transverse axes shall not exceed the values in the following table when measured at the foundation of any building (please see para 15 for exception).

Period	Hours	Maximum Continuous Vibration
Monday – Saturday	06:30 – 07:00	2mm/ sec ppv
Monday – Saturday	07:00 – 22:00	4mm/ sec ppv
Monday – Saturday	22:00 – 23:30	2mm/ sec ppv
Sunday	00:00 – 24:00	2mm/ sec ppv

14.3 Vibration monitoring in terms of PPV and VDV will be undertaken simultaneously in 3 orthogonal axes and an alert will be issued in the event that a PPV or VDV threshold is exceeded. Vibration meters shall be capable of measuring vibration frequencies within the range 5 to 250 Hz and have a minimum sensitivity of at least 1 mm/sec ppv

14.4 Best practicable means will be used to control vibration levels so that the PPV measured at the base of any building or structure in accordance with BS 7385 does not routinely exceed a level of 5mm/s except for particularly sensitive buildings (see below) where the level should not exceed 3 mm/s.

14.5 Where any significant levels of vibration >2mm/sec ppv are likely to occur at the foundations of any property or structure the *Contractor* shall contact the owners of all such property to assure them that no structural damage will occur and an appropriate defects survey will be carried out. In addition an assessment of the vulnerability of that building will be carried out by an engineer or consultant experienced in the assessment of vibration damage to buildings in accordance with the relevant standards.

14.6 Works expected to generate peak component particle velocities above 5 mm/s will be notified to the local authority in the Method Statement and the measured vibration levels will not exceed the relevant thresholds given in both table 1 and figure 1 of BS 7385; part 2: 1993.

15. If vibration levels are predicted to exceed the criteria specified then vibration monitoring will be undertaken by a suitably qualified practitioner during the activity and the *contractor* will adopt alternative methods of working to reduce vibration levels as necessary. The monitoring programme will be agreed between the *Contractor,* the owner, and the local authority. This programme will include the location and frequency of readings and will identify to whom the results should be made available and agree trigger levels.

16. Where the trigger levels are reached and the results of the noise and vibration monitoring indicate that construction noise and vibration levels are in danger of exceeding the adopted threshold levels, and where this is confirmed to be as a result of site works, the site foreman will be informed immediately and works halted whilst the reasons for the exceedence are explored and additional mitigation measures put in place where required.

17. The *Contractor* shall liaise with the Scientific Services Department of Somerset County Council for any further advice on the monitoring and/or equipment required.

Dust Control

18. The *Contractor* shall ensure that adequate provision is made to damp down areas where activities are likely to create dust. Measures shall include the spraying by pressure hoses to suppress dust and also the provision of bowsers where appropriate.

19. Plant shall be sited and screened where necessary to minimise dust emission to adjoining areas.

20. All stockpiles and vehicles carrying dusty materials shall be covered to prevent the generation of dust.

21. The *Contractor* shall ensure that off-site observation and monitoring of dust takes place to confirm that steps are successful in minimising dust release from site.

22. The *Contractor* shall take all measures necessary to prevent spillage onto roads adjoining the Site and in wet weather shall prevent mud from the site being carried onto the highway.

23. Sweeping of paved and unpaved areas shall be undertaken when necessary to minimise dust.

24. Speed limits for vehicles on unmade surfaces shall be enforced to minimise dust entrainment and dispersion.

Waste Disposal

25. Under the Environmental Protection Act 1990 all those who produce, carry, keep or dispose of waste have a duty of care to ensure that waste is properly disposed of.

26. The *Contractor* shall ensure that all his/her waste carriers are registered with the appropriate waste regulation authority.

27. The burning of any type of waste on the site is prohibited.

28. The *Contractor* shall ensure that all lighting facilities are placed to limit the intrusion of light to adjacent properties.

29. The *Contractor* shall follow the WRAP Three stage Overall Strategy for Waste Minimisation and Management at all times unless prior approval is sought from the *Employer*.

    i. Waste Minimisation – reducing the quantity of waste before it comes on to site and avoiding unnecessary waste produced on site;
    ii. Waste Reuse – reusing material generated on site through both the demolition and construction phases;
    iii. Waste Management – minimising the quantity of waste generated that is sent to landfill, through segregation and recycling.

APPENDIX 1/10: PERMANENT WORKS DESIGN

All structural elements and other features that are to be designed by *The Contractor* must comply with CDM 2015 Regulations.

Unless stated otherwise, all structures and structural elements shall meet the requirements stated in the Manual of Contract Documents for Highway Works (MCHW). The contract drawings show the locations and details of structures and structural elements to be designed by the *Contractor*.

Design submissions shall, where applicable, consist of a full package of design information, including but not limited to the following:

a. Signed AIP or Accepted Design Statement
b. Signed Design and Check certification in accordance with BD 02/12
c. Complete set of Design Drawings
d. Fabrication drawings, where required.
e. Material schedules, e.g. Reinforcement Bar Bending Schedules
f. Completed Specification for each structure or structural element
g. Complete set of design and check calculations
h. Geotechnical Interpretive Report
i. Geotechnical Design Report
j. Inspection and Testing Plan / Schedule
k. Product Certification, where necessary

APPENDIX 1/11: TEMPORARY WORKS DESIGN

1 General

1.1 The *contractor* is responsible for the design and checking of all elements of temporary works required for the delivery of the scheme. This includes, but is not limited to:

- Traffic Management
- Piling Platforms
- Crane Platforms
- Temporary Access Arrangements
- Temporary Shoring to drainage trenches, and other excavations
- Temporary Lifting arrangements for Structural Components
- Temporary measures to prop / support structural components
- Design of Temporary access for properties and adjacent premises
- Keeping Earthworks free of water

APPENDIX 1/12: SETTING OUT AND EXISTING GROUND LEVELS

1 General

1.1 The setting out information described below will be made available for inspection during the tender period at the Somerset County Council's office:

Somerset County Council

Address: Traffic Control Team
Transport Development
The Crescent
County Hall
Taunton
TA1 4DY

Tel No.: 0300 1232224

1.2 The design of the *works* involved the use of MX for Highway design. The MX model consists of several filenames/models for this whole scheme and these can be obtained from *The Employer*. The method of setting out will be related to a system of co-ordinated setting out stations. Co-ordinates of the string lines as indicated on the drawings will be provided at 1m intervals.

1.3 Existing ground levels are related to the MX Digital Ground Model (DGM). Cross sections are computed on the DGM and *The Contractor's* attention is drawn to the following printouts that are available - typically: -

HALGN	Horizontal Alignments
VALGN	Vertical Alignments

1.4 All Permanent Ground Markers shall be carefully preserved except where construction requires their removal and before such removal the approval of *The Employer* shall be obtained.

1.5 *The Contractor* shall ensure that the position of all Permanent Ground Markers can be accurately located by fixing them by measurement to four reference points.

1.6 *The Contractor* shall establish *works* benchmarks of approved design so that the distance between adjacent *works* benchmarks does not exceed 200m. The *works* benchmarks shall be located within 60m of the site and the agreed value of each *works* benchmark shall be legibly recorded thereon. *The Contractor* shall check at two weekly intervals all such *works* benchmarks and Permanent Ground Markers and immediately notify *The Employer* in writing of any discrepancy in values.

1.7 *The Contractor* shall, as soon as practicable, supply *The Employer* with records in approved form relating to all reference pegs and *works* benchmarks and shall keep such records up to date monthly by formal notice to *The Employer*.

1.8 Where directed by *The Employer*, kerb and margin lines shall be set out independently and shall not be based on offsets from setting out lines. Line and level pegs shall be set out at intervals not exceeding 10m. They shall, where necessary, incorporate profile boards and be of a type that will not be disturbed during the laying of the kerbs, marginal strips or channels.

1.9 All pegs shall be painted such distinguishing colours as agreed with *The Employer*.

1.10 The Setting out information given for the *works* are in Local Grid co-ordinates. All station levels are Above Ordnance Datum (AOD).

1.11 Any reference to chainage in the Contract Documents shall be taken as reference to metres.

1.12 Where timber stakes are used to construct TBMs, these should be cast into ST1 concrete.

1.13 The setting out information should be read in conjunction with the relevant drawing package for each project. Setting out stations will be shown on the project drawings.

APPENDIX 1/13: PROGRAMME OF WORKS

1 Programme of Works

1.1 The *Contractor* shall provide a programme for the *works* in accordance with Clause 31.2 of the Conditions of Contract.

1.2 All programmes submitted should include Traffic Management Phases, critical path, time risk allowance and take account opf the effect on the overall Contract completion date of any revision to terminal float.

1.3 The *Contractor* shall provide the programme in electronic format compatible with Microsoft Project, produced as a result of a critical path analysis and must abide by the constraints below. It shall show the level of detail appropriate to each stage of the *works* and all activities and restraints, each of which shall be given a short title. All events shall be numbered and annotated with earliest and latest event dates.

1.4 The *Contractor* will be required to co-ordinate the programme for the *works* in liaison with other parties including those working on the highways network and statutory undertakers.

1.5 The Contractor shall provide a CPD certificate for the person responsible for the programme, showing evidence of Microsoft Project training (minimum of 2 days) prior to start of construction.

1.6 As the *works* progress, the programme should show both the original baseline programme and the current position. Only once a Compensation Event is agreed can the programme be amended and should be done from the latest agreed programme (which will include all agreed compensation events).

1.7 Each version of the programme should be given a unique version number.

1.8 The critical path should be shown on each submitted programme.

1.9 The Programme and the Activity Schedule should align with each other in accordance with Clause 31.4

2 Programme Details

2.1 In addition to the level of detail to be shown on the programme as required by Clause 31.2 the *Contractor* shall show as a minimum the following operations: -

2.1.1 **Level 1**

The contractor shall make allowances in his programme for compliance with statutory requirements and investigatory works. In particular, the programme should take into consideration the constraints as listed under paragraph 3 of this section

To be submitted with the Tender – outline programme

- Consultation and publicity, including notices to property owners
- Appointment of subcontractors and site personnel
- Applications for Temporary Traffic Orders
- Preparation and approval of Construction Method Statement

- NRSWA notices to Public Utilities involved (generally 12 weeks in advance of the construction work)
- Licences and permits from relevant authorities such as the Environment Agency, CRT, Internal Drainage Board, Natural England etc.
- Submission of documents in response to the requirements of Planning Conditions.

Level 1 programme to include the following elements:

i) Site Establishment

ii) Contractor Design elements (see appendix 1/10)

iii) Structures:
N/A

iv) Highways (inc Roadworks and Drainage)

a) Alterations to Statutory Undertakers apparatus and other publicly and privately-owned services.

b) Traffic Management measures including operation of site accesses, plant crossings and temporary diversions. Durations, method of traffic control and any overlap with other Traffic Management in use on the Project should also be shown.

c) Site Clearance
d) Fencing, walling foundations and walling
e) Drainage and Ducting
f) Earthworks, including flood compensation
g) Sub-Base
h) Kerbing
i) Base Course
j) Binder Course
k) Surface Course
l) New utility services
m) Footways and Cycleways
n) Permanent Traffic Signs
o) Hard and soft landscaping
p) Road Markings

v) **Traffic Signals**

a) Installation of equipment
b) Cabling and ducting
c) Loop cutting
d) Connection to supply
e) Testing

vi) **Road Lighting, and illuminated signs**

- f) Installation of columns
- g) Cabling and ducting
- h) Connection to supply

vii) **Completion of the Works**

- a) Completion of defect correction
- b) Removal of storages
- c) Removal of offices for Contractor
- d) Removal of offices for Client
- e) Handover of the site to the Client

2.1.2 Level 2

i) To be submitted for acceptance within 21 days of award of Contract – Construction Programme

ii) Requirements are as for Level 1

2.2 All activities, including mobilisation, constraints and float shall be shown. All activities shall be given a short title, numbered and annotated with the earliest and latest event dates.

2.3 The programme shall be supplied on paper and electronic format which is compatible with Microsoft Project.

3 **Schedule of Constraints - General**

3.1 Where applicable, the *Contractor* shall incorporate the following constraints into the Programme of *Works* (over and above those set out in table 1/13.1 at the end of this appendix):

a) Development of the Health and Safety Plan;
b) Acceptance periods for working and fabrication drawings (Appendix 1/4);
c) Site extents and limitations on use (Appendix 1/7);
d) Control of noise, especially during night working near residential property (Appendix 1/9);
e) Programming of Statutory Undertaker's works and Special Requirements in relation to Statutory Undertakers (Contract Data Part One, Appendix 1/16 and Annex A Special Requirements);
f) Phasing of traffic management and particular traffic management constraints (Appendix 1/17);
g) Compliance with the New Roads and Street Works Act;
h) Notice periods for contractor design approvals and resubmissions by *the Employer*.

i) Approval periods for design, laboratory testing, equipment and construction methods.

j) Permissible working hours (Appendix 1/9)

k) Submission and resubmission of drawings, documents, calculations and details for approval (Appendices 1/10 and 1/11)

l) Scheme specific constraints

m) Submission of quality Plan (Appendix 1/24)

n) Programme consideration for compliance and implementations in accordance with various Appendices.

3.2 Notwithstanding any other requirements, completion will not be certified until all works are complete, all traffic management removed and the carriageway fully reopened to traffic in a safe condition and to the satisfaction of the *Project Manager*.

3.3 Where works such as drainage or safety fencing is still being carried out, the *Contractor* shall not lay surface course in the adjacent lane until they are complete.

3.4 The *Contractor* shall make allowance in the programme for the ecological constraints .

3.5 The programme developed by *The Contractor* shall take full account of all technical requirements for the work involved.

3.6 Wind levels, snow and rain etc will limit work windows, and will produce restrictions to carry out work at certain times. The programme shall take full account of all requirements for weather constraints. *The Contractor* shall be deemed to have consulted the Meteorological Office at Yeovilton for weather details.

3.7 The programme shall take full account of routing vehicles and loading restrictions

Labour and Plant Returns

4.1 The *Contractor* shall complete labour/plant returns with resources allocated against the operations undertaken. These returns shall be on standard forms approved by the *Project Manager*. The resources associated in any Compensation Event in accordance with Clause 60.1 shall be detailed separately to other activities. This shall include any reduction in programmed resources.

APPENDIX 1/14: PAYMENT APPLICATIONS

Monthly Statements

1. Monthly Statements shall be submitted to the *Project Manager* in accordance with the Conditions of Contract. The assessment date for each Statement shall be the 15th day of each month.

2. The monthly statement shall be in Microsoft Excel electronic format together with a paper copy. The format of the application shall be such that items from the Activity Schedule are set out under the appropriate Schedule and Series headings and in a similar format to that of the Activity Schedule Part 1.

3. The actual cost for work done to date shall be shown under the relevant Series headings. Compensation event amounts shall be shown separately at the end of the document. The numbering of which should be agreed with the *Project Manager*. The amounts shown shall include a full break down of the *Contractor's* costs including details of time charge work, payments for sub-contracted work, materials, quantities, rates, prices, values, etc.

4. "Back up" calculations, plans, drawing lists etc shall also be supplied for each item once complete. This 'back up' information shall clearly state which Activity Schedule Item it relates to and the date initially submitted. If, for some reason the information is then amended between monthly statements, the changes must be highlighted clearly.

Spend Profile

5. The *Contractor* shall include with the first Monthly Statement a predicted 'spend profile' for the *Works* detailing the expected value of each Monthly Statement until completion. The *Contractor* shall update the spend profile with each Monthly Statement such that the *Project Manager* can within reason, accurately forecast spend for the next two months.

APPENDIX 1/16 : PRIVATELY AND PUBLICLY OWNED SERVICES AND SUPPLIES

1 General

1. Preliminary enquiries will be made with Statutory Undertakers and others for the determination of services present in the vicinity of the Works. The *Contractor* shall verify the location of all existing apparatus and equipment prior to any excavation works. Where such apparatus and equipment is affected or undermined by the works it shall be protected and supported using methods agreed with the apparatus and equipment owners and the *Project Manager*.
2. The *Contractor* shall make arrangements with the Statutory Undertakers and others concerned for the co-ordination of the *works* with all work which needs to be done by the Statutory Undertakers or their contractors concurrently with the Works. Compliance with the periods of notice given in this Appendix does not relieve the *Contractor* of his obligations.
3. The *Contractor* shall be responsible for making arrangements with the Public Services Authorities concerned for the phasing into his programme of works all work which has to be undertaken by those Authorities or their appointed agents which will be carried out concurrently with the Works.
4. The *Contractor* shall, at all times during the progress of the Works, afford facilities to the Public Services Authorities or their appointed agents for free access to their apparatus within the Site for whatever purpose may be required.
5. Private services to individual properties have not generally been listed or shown on the drawings. The *Contractor* shall make arrangements with the Statutory Undertakers and others concerned for the phasing of all necessary disconnection and diversions of private services affected by the Works.
6. The *Contractor's* attention is drawn to the Special Requirements relating to Statutory Undertakers in the Contract Documents.
7. Drawings received from service providers with apparatus in the area are available for inspection by prior arrangement at:

   Traffic Control Team
   Traffic & Transport Development
   The Crescent
   County Hall
   Taunton
   TA1 4DY

8. Protection of services will generally take the form of a 150mm concrete haunch over the relevant service.
9. Written orders will be placed by the *Project Manager* for items in Groups A to G, excluding E, prior to *Contract* award including £1 contracts for any works undertaken on BT Chambers.

10. Existing apparatus can only be abandoned when the relevant diversion is operational. The *Contractor* will be responsible for removing any redundant apparatus impeding the construction of the *works*.
11. Disconnected and redundant apparatus shall be removed by the *Contractor* only with the prior approval of the Authority concerned.
12. The names, addresses and telephone numbers and contact persons, where known, for the authorities with apparatus in and serving the locality are listed in Table 1 of this appendix.

App. 1/16 - Table 1

Name	**Address and Telephone No**	**Contact**
Western Power Distribution	Venture Way Office Priorswood Industrial Estate TAUNTON, TA4 8DG 01823 348506	
British Telecom PLC (Openreach)	BT Westbury on Trym Tel Exchange 10 Grange Court Road BRISTOL, BS9 4DP Tel 0117 962 9219	
Wessex Water (Water Supply)	Cornishway West Galmington Trading Estate TAUNTON, TA1 5NA Tel. 01823 225219	Simon Lipscombe
VSNL Telecommunications Ltd	McNicholas Construction Services Lismirrane Industrial Park Elstree Road Elstree, WD25 3EA Tel: 0208 236 6612	
Atkins Telecoms (Cable & Wireless)	220 Aztec West Almondsbury Bristol, BS32 4WE Tel: 01454 288808	
Somerset County Council Traffic Signals/Lighting	Upper High Street Taunton Tel: 01823 353010	Doug Phillps
Energis Communications	Streetworks Office P.O. Box 98 Warwick, CV34 6TN	

National Grid PLC	Asset Protection Team P.O. Box 3484 Warwick CV34 6TG Tel: 0800 731 2961	

Global Crossing (UK) Ltd. Orange PCS	Fujitsu Solihull Parkway Birmingham Business Park B37 7YU Tel: 0121 717 6000	
Level 3 Communications	Allcom Ltd 136 Hodges Street Springfield Wigan WN6 7JE	
NTL Communications	Unit 11 Shaw Business Park Silver Street Apsley Huddersfield HD5 9AG Tel: 08454541111	
Telewest (Virgin Media)	Cablephone House Small Heath Business Park Talbot Way Birmingham B10 0HJ Tel: 0870 888 3116	
Verizon Business	UK5 Room 2.37 UK Field Operations 2-6 Pancras Way London NW1 0QG	

Surf Telecom Mapping Centre Western Power Distribution Lamby Way Rumney CF3 2EQ		
Wales & West Utilities	Spooner Close Celtic Springs Coedkernew Newport NP10 8FZ 0292 0278500	Jeff Smale

2 Special Requirements relating to Statutory Undertakers

All orders with Statutory Undertakers will be placed by the *Employer* before contract award.

2.1 Western Power Distribution

2.1.1 Unless specified otherwise Western Power Distribution (WPD) will execute all works in connection with the alteration of its plant, with the following exceptions, which shall be carried out by the *Contractor.*

a) Trench excavation, duct laying, backfilling and permanent reinstatement as appropriate.

b) Construction/Raising/Lowering existing/proposed manholes/jointing chamber covers and frames.

c) Protection measures, including 'split-ducting' as specified or required for the *Contractor*'s construction method. Unless specified otherwise cover to top of new ducts shall be 900 mm.

2.1.2 All ducts will be supplied by WPD and the *Contractor* will be responsible for collection and delivery to site from the WPD depot.

2.1.3 For special requirements in relation to electricity generating and distribution companies refer to Annex A1 of Contract Data Part 1.

2.2 British Telecom PLC

2.2.1 Unless specified otherwise British Telecom will execute all work in connection with the alteration of its plant with the following exceptions, which shall be carried out by the *Contractor*.

(i) trench excavation, duct laying (to be split between BT and *Contractor),* slewing/lowering, backfilling and permanent reinstatement as appropriate.

(ii) Construction/Raising/Lowering existing/proposed manholes/jointing chamber covers and frames.

(iii) Protection measures where shown on the drawings or required for the *Contractor*'s construction method.

Unless specified otherwise cover to top of new ducts shall be 350mm in footway/verge and 600mm in carriageway for single way ducting. For multi way ducting unless specified otherwise cover to top of new ducts shall be 450mm in footway / verge and 600mm in carriageway.

All ducts will be provided by British Telecom and the *Contractor* will be responsible for acceptance and storage on site.

All of the above works to be carried out by the *Contractor* shall be carried out in accordance with British Telecom current specification LN550.

2.2.2 For special requirements in relation to British Telecommunications PLC refer to Annex A2 of Contract Data Part One.

2.3 Wessex Water

Unless specified otherwise Wessex Water will execute all work in connection with the alteration of its plant with the following exceptions, which shall be carried out by the *Contractor*.

(i) trench excavation, bedding / surrounding, backfilling and permanent reinstatement as appropriate.

(ii) Construction/Raising/Lowering existing/proposed manholes/jointing chamber covers and frames.

For special requirements in relation to water and sewerage companies refer to Annex A4 of Contract Data Part One.

2.4 Wales & West Utilities and GTC

Unless specified otherwise Wales & West Utilities and GTC will execute all work in connection with the alteration of its plant with the following exceptions, which shall be carried out by the *Contractor*.

(iii) trench excavation, bedding / surrounding, backfilling and permanent reinstatement as appropriate.

(iv) Construction/Raising/Lowering existing/proposed manholes/jointing chamber covers and frames.

For special requirements in relation to gas supply companies refer to Annex A5 of Contract Data Part One.

2.5 **Scottish & Southern Energy**

2.5.1 Unless specified otherwise Scottish & Southern Energy will execute all works in connection with the alteration of its plant, with the following exceptions, which shall be carried out by the *Contractor.*

a) Trench excavation, duct laying, backfilling and permanent reinstatement as appropriate.

b) Construction/Raising/Lowering existing/proposed manholes/jointing chamber covers and frames.

c) Protection measures, including 'split-ducting' as specified or required for the *Contractor*'s construction method. Unless specified otherwise cover to top of new ducts shall be 900 mm.

2.5.2 All ducts will be supplied by SSE and the *Contractor* will be responsible for collection and delivery to site from the SSE depot.

2.5.3 For special requirements in relation to electricity generating and distribution companies refer to Annex A1 of Contract Data Part 1.

2.6 **Others**

2.6.1 The *contractor* shall liaise with other owners of apparatus affected by the scheme for their specifc requirements.

APPENDIX 1/17: TRAFFIC SAFETY AND MANAGEMENT

1. Traffic Safety and Management Requirements

The traffic safety and management proposals, and any amendments thereto, which the *Contractor* submits to the *Project Manager* for consent shall be submitted a minimum of 5 working days prior to their proposed implementation. A Traffic Management Plan also needs to be submitted as part of the Construction Phase Plan.

[NB: Working days are defined for the purposes of this Appendix as Monday to Friday but excluding Bank Holidays.]

All temporary Traffic Management must comply with Section D3.5 / Table 3.3 of Chapter 8 of the Traffic Signs Manual Part 1: Design 2009, and with CDM 2015 Regulations. For the purposes of this contract these works will be given a relaxation in respect of the distances between sites down to 1km.

These proposals shall include the following details:-

i) Phasing of the Works

ii) Drawings for each phase of the Works showing traffic management layout including as appropriate:

- a) position and details of temporary traffic signals and signs
- b) widths of lanes and details of road markings
- c) working areas
- d) safety zones
- e) cross overs
- f) road lighting
- g) pedestrian facilities
- h) works access
- i) junction layouts
- j) bus stops, bus and taxi waiting and bus turning areas
- k) Any roads requiring temporary closure, banned manoeuvres or suspended parking or loading bays..

iii) Timing of Operations.

2. Consultations

The consultations referred to in Clause 117.3 to be undertaken by the *Contractor* shall include the following organisations:

i) The Somerset County Council, including Transporting Somerset (for details of affected bus operators).

ii) The Somerset Ambulance Service.

iii) The Devon & Somerset Fire & Rescue Service.

iv) The Somerset Local Authorities Civil Contingencies Unit.

v) The Statutory Authorities, British Telecom, Wales & West Utilities, Western Power Distribution, Scottish and Southern Energy and Wessex Water

vi) South Somerset District Council – including off street Parking Team

vii) Avon & Somerset Police Authority

viii) Environment Agency

3. Traffic Safety and Control Officer

The *Contractor* shall appoint a Traffic Safety and Control Officer as described in Clause 117.19.

4. **Restrictions on One Way Shuttle Working/Lane closures to Roundabouts or approach roads to roundabouts**

i) Temporary traffic signals shall comply with 'Specification for Portable Traffic Signal Control Equipment for use at Roadworks' TR2502A published by the Highways Agency.

ii) Sections of one-way shuttle working shall not normally be more than 150 metres long and never more than 250 metres long. Adjacent sections of one-way working shall be a minimum of 1000m apart.

iii) Not withstanding para above, two-way working shall be maintained

on principal roads <u>without exception</u> between the following times:

(i) From 12.00 noon on the weekday immediately preceding any Bank Holiday to 8.00 a.m.

on the weekday immediately following any Bank Holiday, with the

exception of (ii) below.

(ii) 12.00 noon Christmas Eve to 8.00 a.m. on the Monday immediately following New Year's Day.

At all other times the *Contractor* shall endeavour to construct the works in such a manner that two-way working may be maintained on principal roads where practicable.

iv) Further details regarding the use of portable temporary traffic signals on the highway are given in Appendix 12/5

5. **Notice Requirements**

Notice required by the *Project Manager* for him to arrange for the following (where required):-

i.) Amending or making traffic orders: 2 months

ii.) Authorising of non-prescribed signs: 2 months

iii.) Authorising temporary traffic signals after approval of the *Contractor's* proposals by the *Project Manager.*

iv.) For Shuttle Working 10 working days

v.) For Fixed Term/Junction and Haul Route Working 20 working days

vi.) Moving signs to be compatible with the state of the works as described in Clause 117.11 10 working days

[NB: working days are defined for the purposes of this Appendix as Monday to Friday but excluding Bank Holidays.]

6. **Details of Events That Could Have a Bearing on the Works**

The *Contractor* shall allow in his proposals for the effects of traffic associated with all major public events, details of which are to be obtained from the Police and the relevant district Authority.

7. **Temporary Diversions for Traffic**

Any temporary diversion for traffic shall be made operative in advance of any interference with the existing arrangements and shall be maintained to the standard stated in Appendix 1/18 and in accordance with Clause 118.

8. **Access to Properties affected by the Works**

Unless specified otherwise in the Schedule to Appendix 1/17 or elsewhere, pedestrian and vehicular access shall be maintained to all properties and land served by Highways, Private Roads or Other Ways affected by the Works. Business 'Open as usual' signs or similar shall be used where necessary.

9. **Highway Authorities**

Public roads, footways, footpaths and bridleways are under the authority of Somerset County Council.

10. **Signs for Road Works**

Contractor to provide, and erect, the following temporary signs, mounted on 'A' frames, 2 weeks in advance of the commencement of the works. Locations should be agreed by the *Project Manager*. Signs to be removed once sign SCC1 has been erected and agreed with

the *Project Manager.*

	Sign No
	SCC2

Sign Layout Details				**Mounting and Construction Details**			
Width	:		mm	Number of posts	:		
Height	:		mm	Post Size	:		mm
Area	:		m^2	Post Thickness	:		mm
Diagram No.	:			Post A Type			mm
x-ht	:		mm	Post B Type			mm
Approximate Scale 1	:			Post C Type			mm
Reflectivity	:	Class - 1		Post D Type			mm
Background	:	YELLOW		Mounting Height	:		mm
Border	:	BLACK		Lateral Clearance	:	Back of footway/cycle	
Symbol/Chevron	:			Foundation Type	:		
Destinations	:			Excavation	:		m^3
Route Numbers	:			Concrete	:		m^3

Patch/Panel Colours			
P1	YELLOW	P2	BLACK
P3		P4	

Illumination Requirements		
Illumination Required	:	No

Notes: to be placed on A frames

Scheme Drawing Number

SCC1

Location/Metrage		**Schedule Sheet Number**		**Revision**
				-

APPENDIX 1/18 : TEMPORARY DIVERSIONS FOR TRAFFIC

1. **Temporary Diversions for Traffic Specified by the Employer**
Temporary diversions may be required on specific sites under certain circumstances.

2. **Temporary Diversions for Traffic Specified by the *Contractor***

A request for a temporary road closure shall be submitted to the *Project Manager* two months in advance of the closing of the highway to traffic. The request shall include a reason for the closure with a statement of the benefits that are anticipated to accrue for the project, the road users and the *Employer.*

Should the request be approved, all of the costs of the closure, excluding the costs of the Order, will be borne by the *Contractor.*

(i) Notice Requirements

Notice required by the *Project Manager* for him to arrange for:

a) Amending or making traffic orders:2 months;
b) Authorising of non-prescribed signs: 2 months;
c) Authorising temporary traffic signals: 2 months;
d) all changes to any of the traffic management measures to be notified in writing as 1(ii)(b) above (at least 14 days).

3. **General**

(ii) Any Temporary Diversions for Traffic Specified by the *Contractor* must comply with clause 118.

(iii) All Temporary Diversion for Traffic specified by the *contractor* must comply with Chapter 8 of the Traffic Signs manual and with CDM 2015 Regulation.

(iv) A Traffic Management Plan shall be submitted as part of the Construction Phase Plan if any temporary diversions are required.

(v) Any proposals for the Temporary Diversions of traffic shall be forwarded to the *Project Manager* with plan of diversionary routes, and proposed signage as below:

Description	**Drawing No or Ref**	**Construction / Design Requirements**	**Maintenance Requirements (including timescale for responsibility)**	**Remarks (including Constraints and Reinstatement Details)**
Site Location etc	Drawing	Temporary Diversion to be designed by the *Contractor* to carry the anticipated traffic whilst maintaining the smooth running of the goods loading and unloading for all tenants.	Maintain in a safe condition. Maintain all necessary temporary signage, road markings and crossing point for pedestrians etc for the duration of the closure.	Reinstate to original condition including planting of new trees.

APPENDIX 1/19 : ROUTEING OF VEHICLES

1. Permitted Access Routes To and From the Site(s)

1.1. Permitted access routes to and from the sites during the various stages of the works shall be via principle routes if possible or the highest road classification possible to each particular site.

1.2. Works access to/egress from the permanent works site will only be permitted via the designated access/exit points detailed on the *Contractor's* traffic management drawings.

1.3. The access/egress requirements are to be consistent with the various phases of traffic management as scheduled in Appendix 1/17.

2. Removal of Dirt and Materials from the Highway

2.1 The *Contractor* is to ensure that adequate facilities are available on site at all times to remove any dirt or accumulation of mud from off the highway, or any other surfaced area, as a result of the *works*.

APPENDIX 1/21 : INFORMATION BOARDS

1. Provision

Type A1 Information Boards and Type A2 Information Boards, including posts shall be provided and erected by the *Contractor* at locations to be agreed with the *Project Manager (likely to be on each approach to a junction)*

2. Information Board Type A1 (Scheme name and details)

Approximate size 1050x750, sheet aluminium Class 1 reflectorised, erected on 76mm dia poles. Border to be black, background colour to be yellow. Text to be black (x-height 50). To read:

Xx Traffic Signal Improvement

Completion in ……..
<Contractor's Tel No.>

and include Somerset County Council Logo, the Heart of the South West Local Enterprise Partnership Logo and DfT Logo

3. Information Board Type A2 (Apology)

Approximate size 1050x750, sheet aluminium Class 1 reflectorised, erected on 76mm dia poles. Border to be black, background colour to be yellow. Text to be black (x-height 50). To read:

Xx Traffic Signal Improvement

Somerset County Council apologise for any delays due to the implementation of this scheme

4. Protection

Information Boards, including posts, shall be fully protected during erection, dismantling, transit and whilst temporarily stored. Any damage occurring shall be made good by the *Contractor* to the satisfaction of the *Project Manager*. Signs shall be secured to post with anti-theft bolts.

5. Removal

All Information Boards, including posts, shall be carefully dismantled and removed by the *Contractor* at the expiry of the *Defects Correction Period.*

APPENDIX 1/22: PROGRESS PHOTOGRAPHS

1. Location

   The location for general view photographs is to be agreed in advance with the *Project Manager*. Wherever practical, general view photographs shall be taken from the same location, in the same direction and using the same camera/lens combination, on each visit.

   Other photographs are to be sufficient to capture the current work activities and include, where possible plant, labour and materials and a close-up image of each point of work.

2. Type

   Good resolution digital images.

3. Number

   A set of photographs shall consist of 6 no. general view, different photographs and an estimated 15 no. daily work activity photographs, on CD–rom storage.

4. Referencing and storage

   General view photographs shall be referenced by date and location in the format of *yyyymmdd- location*. Separate folders shall be created for each location, hence, on completion of the works, each location would have a complete set of progress photograph stored in its dedicated folder. A plan shall be submitted showing the place and direction for each photograph.

   Daily work activity photographs shall be referenced *yyyymmdd-Area-Work Activity* where the Areas will be agreed in advance with the *Project Manager*. Typically, this might be *20190618 – Trenchard Way West – Drainage.* Separate folders shall be created for each day, hence, on completion of the works, a photographic record of daily progress is complete. A plan shall be submitted showing the agreed Areas.

5. Aerial/Ground

   Ground

6. Frequency

   General view photographs - weekly

   Work activity photographs - daily

7. Remarks

Additional photographs shall be taken at the instruction of the *Project Manager*.

APPENDIX 1/23: RISKS TO HEALTH AND SAFETY FROM MATERIALS OR SUBSTANCES

1.0 General

1.1 This Appendix is directed at measures to protect the public from exposure to substances hazardous to health.

1.2 The *Contractor's* attention is drawn to the fact that many common building materials that would not usually be considered hazardous to health might in certain circumstances become so, e.g. cement dust raised by grinding or cutting of concrete components.

1.3 Under the COSHH (2002) Regulations, it is the responsibility of the *Contractor* to ensure that working practices, protective measures, monitoring and control measures are in place to minimise risks to the workforce and the general public.

1.4 The *Contractor* shall undertake sufficient inspections and actions to ensure any hypodermic needles or similar hazardous items that may have been discarded throughout the site are identified and removed to the satisfaction of The Employer, including provision for a suitable means of disposal.

1.5 The following materials have been identified as potentially hazardous to the health of the public:

i) Weed killer

ii) Dust caused by cutting of paving slabs or blockwork units;

iii) The *Contractor's* attention is drawn to the presence of oil and diesel residue in drainage runs;

2.0 Assessment of Risk Measures to Prevent or Control Exposure

2.1 The *Contractor* shall provide *The Employer* with details of the measures to be taken to prevent or control the exposure of the public with the substance to acceptable levels.

2.2 Each specialist contractor shall provide *The Employer* with details of potentially hazardous substances, their associated risks, and the mitigating measures to be taken to prevent or control the exposure of the public to hazardous substances, to acceptable levels.

2.3 Details provided are to include:

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1.4 The Contractor shall undertake sufficient inspections and actions to ensure any hypodermic needles or similar hazardous items that may have been discarded throughout the site are identified and removed to the satisfaction of The Employer, including provision for a suitable means of disposal.

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2.2 Each specialist contractor shall provide *The Employer* with details of potentially hazardous substances, their associated risks, and the mitigating measures to be taken to prevent or control the exposure of the public to hazardous substances, to acceptable levels.

2.3 Details provided are to include:

i.) Restrictions in relation to traffic management measures.

ii.) Restrictions in relation to working practices.

iii.) Measures taken to protect members of the public.

iv.) Monitoring to be undertaken.

3.0 Minimum Restrictions and Measures to be Taken

3.1 With regard to materials identified in section 1.0 above and any other material hazardous to health:

i.) Spraying shall not take place within 6m of locations where the public might rightly have access, unless the public are protected from the effects of spraying in those areas in a manner that shall be subject to the approval of The Employer.

ii.) When wind speeds are in excess of 0.5m/s but less than 5m/s spraying shall not take place within 16m upwind of locations where the public might rightly have access, unless the public are protected from the effects of spraying in those areas in a manner that shall be subject to the approval of The Employer.

iii.) When wind speeds are in excess of 5m/s spraying shall not take place.

iv.) Spraying shall not take place in conditions when airborne spray materials would be difficult to see, e.g. in mist, fog or at night.

v) Signs to warn the public shall be positioned at suitable locations. Signs are to comprise black lettering, 75mm high, on a yellow background and are to bear the legend:

'WARNING - MATERIALS HAZARDOUS TO HEALTH BEING USED IN CONSTRUCTION WORKS'.

vi.) Temporary fencing shall be used to prevent unauthorised access into areas where hazardous substances are being used, or (in the case of asbestos formwork) removed.

APPENDIX 1/24: QUALITY MANAGEMENT SYSTEMS

Quality Plan

1. The *Contractor* shall institute and operate a quality management system complying with BS EN ISO 9001:2000 and Clause 104. The quality management system shall be described in a Quality Plan that shall be submitted to the *Project Manager* for acceptance.

   The Quality Plan shall cover the following items:

   (i) *Contractor's* organisation and management
   (ii) *Contractor's* method statements and construction procedures
   (iii) *Contractor's* construction quality control
   (iv) Supplier's Quality Plan

2. Quality Plans shall conform with the requirements tabulated in Table 1/24 of this Appendix.

Development of the Quality Plan

3. The Quality Plan shall be developed to incorporate the particular requirements of the *works*. Developed Quality Plan items (i) and (iii) above shall be submitted to the *Project Manager* for acceptance at least 14 days prior to commencement of the *Works*. The *Contractor* shall submit the remaining developed items of the Quality Plan prior to commencement of any related *work* or activity and to a timetable included in item (i).

Method Statements

4. The *Contractor* shall produce all Method Statements required for the safe execution of the *works* and to the satisfaction of the *Project Manager*. Method Statements shall be produced for the following activities (where applicable):

   - Site facilities, establishment, maintenance and removal
   - Site Access for Vehicles
   - Each phase of traffic management, (including the installation, alteration and removal of any Temporary Safety Barriers)
   - Location, alteration and protection of Statutory Undertakers equipment
   - Working adjacent to live services
   - Installation, maintenance and removal of Temporary Works (Clause 178AR)
   - Installation, maintenance and removal of equipment designed by the *Contractor* (Clause 179AR)
   - Construction of permanent structures or structural elements
   - Safety fencing works including construction of any plinths, etc.
   - Demolition
   - Fencing

- Drainage
- Excavation works including temporary support;
- Embankment construction
- Pavement construction, kerbing and markings
- Signing, lighting and signals
- Concrete testing and repairs
- Use of materials containing isocyantes
- Slit trenches for Retaining Walls
- Hot works (specifically cutting,welding, thermic lance)
- Concrete saw cutting, grinding, scabbling
- Working over water
- Any others required in the Pre-construction Information - Volume 8

APPENDIX 1/24: QUALITY MANAGEMENT SYSTEMS – TABLE 1/24

ITEM	REQUIREMENTS	GUIDANCE NOTES
Contractor's **Organisation and Management**	This section of the Quality Plan shall include:	Numbers cross refer.
	1. Definition of the *Contrac*t and its documentation.	
	2. The organisation of the Contract, including the line of command and communication links between parties involved in the *Contract*.	2. An annotated chart is an effective means of illustrating the organisational relationship.
	3. Names, roles, responsibilities and authority of principals and key personnel.	3. These will include the roles commonly attributed to the Contracts Manager, Site Agent/Contractor's *Project Manager*, Management Representative for Quality, Sub-agents, General Foreman, Foreman, Chief and Senior Engineers and Contract Quantity Surveyor.
	4. Control of liaison and meetings with third parties.	4. e.g. meetings with the police, statutory undertakers, local authorities, landowners and others.
	5. Identification of the *Contractor's* own staff responsible for overseeing each major activity.	5. Particular reference is to be made to the main *Contractor's* staff responsible for sub-contracted activities.

APPENDIX 1/24: QUALITY MANAGEMENT SYSTEMS – TABLE 1/24 (Continued)

ITEM	REQUIREMENTS	GUIDANCE NOTES
Contractor's **Organisation and Management (cont'd)**	6. The main *Contractor's* control of sub-contracts.	6. This must include the assessment of the sub-contractor's quality assurance and quality control capabilities, the identification and implementation of additional controls needed on them to fulfil the *Contractor's* obligations in respect of quality assurance, monitoring arrangements and the review and acceptance of "deliverables".
	7. Document control.	
	8. Programme for submission of method statements and Organisation's Quality Plans. The Quality Plan shall identify procedures (which may be part of the *Contractor's* general procedures) that cover topics listed below. Copies of these procedures shall be made available to the *Project Manager* on request.	8. Adequate time shall be allowed for the *Project Manager* to examine these plans prior to commencement of the activity.
	9. The quality plans for sub-contractors and suppliers of work, goods and materials which are the subject of quality management schemes.	9. Organisation's QPs are required for schemes listed in Appendix A of the SHW. Organisation's QPs should be based on the model.
	10. Procedure for the preparation, review and adjustment of programmes for the effective progression of the Works and the recording of this.	
	11. Control and approval of purchases of materials.	

ITEM	REQUIREMENTS	GUIDANCE NOTES
Contractor's **Organisation and Management (cont'd)**	12. Control of off-site activities (where appropriate). 13. Procedures for the regular review and recording by the *Contractor* of the quality of the Works. 14. Control of personnel selection, based on their care, skill and experience. 15. Management review/audits to monitor and exercise adequate control over the implementation of the quality plan. 16. Any other relevant item.	

APPENDIX 1/24: QUALITY MANAGEMENT SYSTEMS – TABLE 1/24 (Cont'd)

ITEM	REQUIREMENTS	GUIDANCE NOTES
Contractors **Method Statements and Construction Procedures**	This section of the Quality Plan shall include	
	1. Detailed method statements for each major activity whether directly controlled or subcontracted.	1. Method statements are required for the Principal activities e.g. - site clearance -safety road restraint system – probably subject to an Organisation's QP - drainage - earthworks – sub-divided as appropriate - landscaping - pavement construction – for each layer of flexible construction - each structure (Retaining Walls)– by its main elements - lighting and communications cabling - each traffic management operation - major service diversions - traffic signals installation Method statements may be quite brief but should describe each stage of the construction, identify the plant and materials to be used, temporary works, safety measures, working space considerations, and where appropriate the requirements for skilled labour and / or special supervision etc.

APPENDIX 1/24: QUALITY MANAGEMENT SYSTEMS – TABLE 1/24 (Cont'd)

ITEM	REQUIREMENTS	GUIDANCE NOTES
Contractors **Method Statements and Construction Procedures (continued)**		Where work is subject to environmental control, e.g. temperature, noise control, working hours, traffic conditions etc, these should be stated. Hold points should be identified i.e. the stages at which checks are necessary before continuing. The authority for release of the hold point shall be identified.
	2 Identify the relevant construction procedures in the *Contractor's* own Quality Management System (and provide copies on request).	2. These procedures invoked by method statements will typically include, from the quality controls required by the *Contractor's* construction quality control: - Control, identification and traceability of materials, including any materials or samples temporarily or otherwise removed from site for testing or other reasons. - Procedure for the prevention of inadvertent use, installation or covering up of non-conforming work. Other corporate and / or contract – specific work instructions to be applied.

ITEM	REQUIREMENTS	GUIDANCE NOTES
Contractor's **Construction Quality Control**	This section of the Quality Plan shall include:	
	1. Statement of the *Contractor's* organisation for quality control. The quality plan shall identify procedures (which may be a part of the *Contractor's* general procedures) that cover the topics listed below. Copies of these procedures shall be made available to the *Project Manager* on request. 2. Arrangements for "receiving" and "in-process" testing. 3. Control of test laboratories. 4. Control of test, measuring and inspection equipment. 5. Document control.	1. These statements would normally be expected to include: (i) the responsibility for the initiation and updating of the Quality Plan. (ii) responsibility of the 'Management Representative' for quality for monitoring compliance with it. (iii) responsibility for the adequacy of the quality records produced. 5. These controls should include their identification, traceability requirements, control of document issues and their status. They should also include the control of documents recording the verification review, approval, release and amendment of the works.

APPENDIX 1/24: QUALITY MANAGEMENT SYSTEMS – TABLE 1/24 (Cont'd)

ITEM	REQUIREMENTS	GUIDANCE NOTES
Contractor's **Construction Quality Control (continued)**	6. Procedure for monitoring and recording the inspection, test and approval status of the constructed/installed work.	6. These should also identify "hold points".
	7. Procedures for tests and inspections for the purpose of the *Contractor* certifying that prior to covering up, each part of the Works is complete and conforms to the Contract.	7. These procedures should identify the proforma and/or database to be used for recording the inspection and test results, and the proforma to be used for recording the certification of compliance of all items of the Works by authorised key personnel. Each submission should be separately identified.
	8. Procedure for the review of work submitted for review but not accepted as conforming to the Contract.	8. These procedures should include options for identification of non-conforming work and proposals for reworking and remedial work.
	9. Procedure for the collation of quality records as identified in BS EN ISO 9001, and the provision of copies when requested by the *Project Manager*.	9. Reference should be made to those records listed in the SHW Appendix H.

APPENDIX 1/24: QUALITY MANAGEMENT SYSTEMS – TABLE 1/24 (Cont'd)

ITEM	REQUIREMENTS	GUIDANCE NOTES
Organisations' Quality Plans	The Quality Plan shall include: 1. Definition of the product or service to be provided. 2. The organisation organogram shall describe the line of command and stating the name of the senior manager responsible for the contracted Work and the name of the Organisations on-site management representative. Contact addresses, telephone numbers etc. shall be provided. 3.* Identification of the relevant parts of the Organisations quality system relevant to the produce or service being provided. (Copies to be provided to the *Project Manager* on request). 4. The control of personnel selection (at works and on site), including special requirements for skilled personnel e.g. certification of welders, training of operatives, experience requirements etc.) Specific procedures for the following: 5.* Receipt and examination of certificates of conformity and test results for purchased products.	Numbers cross refer. 2. An annotated chart is an effective means of illustrating the organisation structure. This must address all activities, including those sub-let. Names of any sub-contractors and organisations involved in the production shall be provided. 3. It is important for the *Project Manager* to be aware of the Organisations quality control procedures, in order to decide on its own level of inspection and testing. 4. The Organisations shall provide evidence that the training and experience requirements given in the appropriate Quality Assessment Schedule are being met. CVs may be appropriate.

APPENDIX 1/24: QUALITY MANAGEMENT SYSTEMS – TABLE 1/24 (Cont'd)

ITEM	REQUIREMENTS	GUIDANCE NOTES
Organisations' Quality Plans (continued)	6.* Product identification and traceability	5. Each piece or bundle of delivered product shall be indelibly marked and where appropriate, the lot identification shall be included on each package.
	7.* Handling, storage, packaging and delivery to Site and storage and handling to Site.	7. Instructions for repair of damaged products may be needed.
	8. Quality records.	8. These shall include documents to demonstrate the achievement of the requirement standard, e.g. site logs, records of visits, records of verification, review and release, certificates of conformity and records of all design modifications to products and specifications.

Items marked * Where available and appropriate, copies of the Supplier's quality system/general procedures may be acceptable.

APPENDIX 2/1: LIST OF BUILDINGS, ETC. TO BE DEMOLISHED OR PARTIALLY DEMOLISHED

1. General

1.1 *The Contractor* shall within 2 weeks prior to completion of the *works* remove all debris (including unwanted bituminous materials), rubbish and all other discarded items of litter whether arising from the *works* or deposited by others prior to and/or during *The Works* to ensure that the whole site is left in a pristine condition. This should be undertaken for the Site Extent as identified in Appendix 1/7.

1.2 The Area of General Site Clearance will be shown on the scheme drawings.

1.3 Materials to be retained arising from site clearance are stated in Appendix 2/3.

1.4 All voids left by items of site clearance to be treated appropriately and back filled to a suitable standard with a material agreed by *The Employer*.

1.5 Where part of any existing fence or railings are to be removed, the severed end/s shall either be made good as approved by *The Employer* or tied into new fencing as detailed in Appendix 3/1.

2. Traffic Signs and illuminated bollards

2.1 For details of existing traffic signs within the general site clearance area that are to be retained and/or reused, and existing traffic signs outside the general site clearance area that are to be removed, refer to the scheme drawings

2.2 All existing illuminated traffic sign luminaire units and bollard illumination units that are in the general site clearance area are to be permanently disconnected, removed and recycled. All redundant underground lighting cables are to be removed and recycled.

2.3 Redundant existing sign foundations shall be removed in full unless otherwise directed by *The Employer*. The remaining void shall be treated appropriately and back filled to a suitable standard with a material agreed by *The Employer*.

2.4 All existing sign posts and foundations whose sign face is to be removed to store for re-use, are to be removed and recycled.

3. Structures to be Demolished

3.1 Details of any specific structures which are to be demolished, removed from site and recycled where possible will be provided in the scheme drawings.

3.2 Whilst undertaking the demolition of the above structures and site clearance in general, the *Contractor's* attention is drawn to Appendix 1/23, Risks to Health and Safety from Materials and Substances.

APPENDIX 2/2: FILLING OF TRENCHES AND PIPES

1. **General**

1.1 The following items are to be treated as follows:

Item Description	Drawings to be provided on a scheme to scheme basis	Required Treatment
Gully Pots		Abandoned gully pots shall be broken out in full. Any remaining void below carriageway formation shall be backfilled with general fill material complying with Clause 601 and compacted in compliance with Clause 612 MCHW Volume 1 of the Specification for Highway Works.
Catchpits or Manholes		Redundant/abandoned catchpits or chambers shall be broken out to at least carriageway formation level. Any remaining void below carriageway formation shall be backfilled with general fill material complying with Clause 601 and compacted in compliance with Clause 612, MCHW Volume 1 of the Specification for Highway Works. Any chambers left in place below carriageway formation level shall be filled with ST2 concrete in compliance with Clause 2602.
Sealing, Removal or Grouting of Existing drain.		Existing drains no longer required that are within 1m depth of carriageway formation level shall be broken out. The remaining void below carriageway formation shall be backfilled with general fill material complying with Clause 601 and compacted in compliance with Clause 612, MCHW Volume 1 of the Specification for Highway Works. Existing drains no longer required and not within 1m of carriageway formation level shall be sealed with ST2 concrete, in compliance with Clause 2602 MCHW Volume 1 of the

Item Description	Drawings to be provided on a scheme to scheme basis	Required Treatment
		Specification for Highway Works, or removed and replaced with general fill material complying with Clause 601 and compacted in compliance with Clause 612 MCHW Volume 1 of the Specification for Highway Works, or grouted with a 1:10, cement: pfa mix. Level. If the abandoned drain is below existing pavements that are not to be excavated are in all cases to grouted (ST2 concrete or cement:pfa grout mix) as detailed above.
Linear Drainage Channel		Abandoned Linear Drainage Channel shall be broken out in full. Any remaining void shall be backfilled with general fill material complying with Clause 601 and compacted in compliance with Clause 612 MCHW Volume 1 of the Specification for Highway Works.
Voids left by the removal of the stumps and roots from trees and shrubs		Stumps and roots from trees, bushes and hedges shall be grubbed up or blasted in accordance with Clause 203 and disposed of by the Contractor. Holes left by removal of the stumps or roots shall, within one week, be filled with acceptable material, as defined in Clause 601 and Table 6/1, and be compacted in compliance with Clause 612 and Table 6/4.

APPENDIX 2/3: RETENTION OF MATERIAL ARISING FROM SITE CLEARANCE

1. **Items for retention arising from Site Clearance**

Description	Details	Location	Delivered To
Existing Traffic Signal Controller	N/A	Per scheme	To be taken to term maintenance contractor's store
Existing Traffic Signal heads, push button units, overhead detection	Depending on the condition of existing equipment there may be requirement to retain – each scheme will inform this	Per scheme	To be taken to term maintenance contractor's store

2. **Notes:**

2.1 All other materials arising from site clearance/demolition become the property of *The Contractor*. If not re-used *The Contractor* is responsible for its recycling/disposal.

2.2 Statutory Undertakers apparatus which is made redundant by the works and requires removal for the construction of the works shall be dealt with in a manner which *The Contractor* shall agree with the Relevant Statutory Undertaker. For Statutory Undertakers information and requirements, refer to Appendix 1/16.

2.3 All existing illuminated traffic sign luminaire units and bollard illumination units that are in the site clearance area are to be permanently disconnected, removed and recycled. All redundant underground lighting cables are to be removed and recycled.

2.4 For reinstatement of voids left by removal of equipment, refer to Appendix 2/1.

APPENDIX 2/4: EXPLOSIVES AND BLASTING

1. General

1.1 The use of explosives and blasting is not permitted.

APPENDIX 2/5: HAZARDOUS MATERIALS

1. General

1.1 *The Contractor*, on the discovery of any materials that may be considered hazardous, must clear the site immediately of personnel and, in the first instance, contact Environmental Health Department at the appropriate District Council and then *The Employer* (in that order).

1.2 In the event of an obvious emergency, or if discovered out of normal working hours, *The Contractor* is to contact the Police immediately on 999, explain the emergency and then ask them to contact the Environmental Health Officer for the appropriate District Council.

1.3 On no account is *The Contractor* to ignore, cover up or otherwise touch or attempt to move any suspicious substance, container or item until he has been instructed by the appropriate District Council, the Police or any other such official body that they may call in or advise *The Contractor* to contact.

1.4 Where work involves contact with water, it may have been contaminated by rats. Should such contamination get into your system by means of a scratch, cut or prick of your skin, or by way of your mouth or eyes, it may cause a disease known as 'Weil's Disease'.

1.5 The *Contractor* should ensure that personnel should never eat, drink or smoke, or touch their lips, with hands that have been in contact with water which may have been contaminated by rats, until they have cleaned their hands.

1.6 Potential hazards that may be encountered include, but are not limited to, asbestos, lead paint, contaminated ground, guano etc. Where the presence of such hazards is known, the details will be shown on the contract drawings. *The Contractor* should ensure that detail of the management of potential hazards is included within the Construction Phase Plan.

APPENDIX 3/1: FENCING, GATES AND STILES

1.0 Temporary Fencing

1.1 Temporary fencing to be provided in accordance with clause 302 and 303 of the Specification for Highway Works.

1.2 Temporary fencing may be required to form protection during construction works. Protection requirements shall be in general accordance with BS 5837:2005 and shall use 2.4m high Heras temporary fencing. All temporary fencing is to be removed on completion of all construction works.

1.3 Set out and erect to the alignment with straight lines or smoothly flowing curves. The tops of posts shall follow the profile of the ground. All fixings shall have components that are securely fixed.

1.4 All fence bolts, screws and nuts shall comply with the requirements of sub-clause 305.1 of the Specification for Highway Works.

1.5 All Contractor design must comply with CDM 2015 Regulation and the Principal Designer to be kept fully informed.

2.0 Permanent Fencing: General

2.1 The following schedule details the abbreviations used for Permanent Fencing and provides a Section Reference where further requirements are detailed.

Ref	Full Name	Section Reference
TH	Timber Hoarding	Refer to Section 3 below
TPW	Timber Post and Wire Fence	Refer to Section 4 below
CLF	Chain Link Fence	Refer to Section 5 below
TKR	Timber Knee Rail Fence	Refer to Section 6 below
TPR	Timber Post and Rail Fence	Refer to Section 7 below
PSF	Palisade Fence	Refer to Section 8 below
WMF	Welded Mesh Fence	Refer to Section 9 below

ACG	Access gates	Refer to Section 10 below

3.0 **Permanent Fencing: Timber Hoarding (TH)**

3.1 Timber Hoarding shall be 2.44m high and have ST2 concrete foundations.

3.2 For further details refer to Standard Detail Drawing Number SD-033-43

4.0 **Permanent Fencing: Timber Post and Wire Fence**

4.1 All Timber Post and Wire Fencing shall have ST2 concrete foundations in accordance with MCDHW Drg. No. H13 and other associated drawings.

4.2 The requirements for joining Timber Post and Wire Fencing to existing hedges, fences and to other structures shall be in accordance with sub-clause 306.1 of the Specification for Highway Works.

4.3 Where a Timber Post and Wire Fence is to butt up against a structure or retaining wall, the post shall be pushed tight up against the structure and concrete placed on the remaining three sides of the post. The volume of concrete used for the post foundation shall be the same as that detailed on MCDHW Drg. No. HCD H13 and other associated drawings.

5.0 **Permanent Fencing: Chain Link Fence**

5.1 Chain Link Fencing shall have ST2 concrete foundations in accordance with BS1722 Part 1.

5.2 Where a Chain Link Fence post is to butt up against a structure or retaining wall, the post shall be pushed tight up against the structure and concrete placed on the remaining three sides of the post. The volume of concrete used for the post foundation shall be the same as that detailed in BS1722-1 for the relevant size of post.

5.3 Chain Link Fencing shall have Wire Mesh, as detailed in Section 9 below.

6.0 **Permanenrt Fencing: Timber Knee Rail Fence**

6.1 Timber knee rail fence shall be in accordance with Standard Detail Drg. No. SD-0300-037.

7.0 Permanent Fencing: Timber Post and Rail Fence

7.1 All Timber Post and Rail Fencing shall have ST2 concrete foundations in accordance with MCDHW Drg. No. HCD H3 and H15.

7.2 The requirements for joining Timber Post and Rail Fencing to existing hedges, fences and to other structures shall be in accordance with sub-clause 306.1 of the Specification for Highway Works.

7.3 Where a Timber Post and Rail Fence is to butt up against a structure or retaining wall, the post shall be pushed tight up against the structure and concrete placed on the remaining three sides of the post. The volume of concrete used for the post foundation shall be the same as that detailed on MCHW Drg. No. HCD H3 and H15.

8.0 Permanent Fencing: Palisade Fence

8.1 Palisade Fencing shall have ST2 concrete foundations in accordance with BS1722 Part 12.

8.2 Where a Palisade Fence post is to butt up against a structure or retaining wall, the post shall be pushed tight up against the structure and concrete placed on the remaining three sides of the post. The volume of concrete used for the post foundation shall be the same as that detailed in BS1722-12 for the relevant size of post.

8.3 All Palisade Fencing components shall be hot dipped galvanised in accordance with BSEN1461, and where necessary to match existing palisade fencing powder coated in accordance with BSEN13438.

8.4 Where existing Palisade Fencing panels are to be reused, all panels shall be inspected for damage prior to re-erection, and any damage (including damage to the galvanised coating) made good in accordance with BS1722 Part 12.

9.0 Permanent Fencing: Welded Mesh Fence

9.1 Welded mesh fence 2.4m high in accordance with British Standard BS 1722 Part 12 2006.

10.0 Permanent Fencing: Access Gates

10.1 Access Gates shall match the specification of the adjacent permanent fencing to which it is connected

10.2 All Access Gates shall have ST2 concrete foundations in accordance with the relevant standard or drawing.

10.3 Chain Link Access Gates shall have Wire Mesh, as detailed in Section 14 below.

10.4 Where an Access Gate post is to butt up against a structure or retaining wall, the post shall be pushed tight up against the structure and concrete placed on the remaining three sides of the post. The volume of concrete used for the post foundation shall be the same as that detailed in the Bridtish Standard for the relevant size of post.

10.5 All Access Gates shall include a locking mechanism and a coded padlock.

11.0 Timber Quality

11.1 All timber used for fencing and gates shall comply with sub-clause 304.3 of the Specification for Highway Works.

12.0 Preservation of Timber

12.1 All timber used for fencing shall comply with sub-clause 311.2(i) of the Specification for Highways Works.

13.0 Fittings

13.1 All bolts, screws and nuts shall comply with the requirements of sub-clause 305.1 of the Specification for Highway Works.

14.0 Wire Mesh for Permanent Fencing

14.1 Wire Mesh shall be Zinc Alloy Coated, of a diamond pattern and comply with BS1722 Part 1.

14.2 The Wire Mesh shall be fixed on the highway side of the fence.

APPENDIX 4/1: ROAD RESTRAINT SYSTEMS (VEHICLES AND PEDESTRIANS)

PEDESTRIAN GUARDRAIL

1. **Location**

1.1 The locations and arrangements of Pedestrian Guardrail will be shown on the scheme drawings and on Standard Detail Drawing Nos. SD-0300-035 & SD-0300-036

2. **Other Details**

2.1 Only those firms registered with an approved certification body for Road Restraint Systems (Vehicle and Pedestrian) in accordance with Appendix A of the Specification for Highways Works will be permitted to erect Pedestrian Guardrails.

2.2 All Pedestrian Guardrail is to be Class 2 Galvanised Steel in accordance with BS 7818:1995 and Clause 411 of the Specification for Highway Works.

2.3 The standard length of Pedestrian Guardrail units is 2m. No units shall exceed 2m in length. 1m long Pedestrian Guardrail units shall be used on radii less than or equal to 5m. No units shall be smaller than 1m in length. In certain locations, Pedestrian Guardrail units will need to be specially made to the required length.

2.4 All Pedestrian Guardrail units shall be 1m high.

2.5 The infill bar arrangement within the Pedestrian Guardrail unit shall be one of the following types. The type to be used in each location is shown on the scheme drawimgs

Type	Angle of Infill Bars
V2	2.5 degrees to 5 degrees
V4	5 degrees to 14 degrees
V8	Greater than 14 degrees

2.6 Where a Pedestrian Guardrail unit is to butt up against a structure or retaining wall, the post of the Guardrail Unit shall be pushed tight up

against the structure and concrete placed on the remaining three sides of the post in accordance with Standard Detail Drawing No's. SD-0300-035 (Pedestrian Guardrail), SD-0300-036 (High Visibility Pedestrian Guardrail).

3. **Testing**

3.1 The *Contractor* shall supply details of proposed Road Restraint Systems in accordance with Clause 401, 402 and 403 of the Specification for Highway Works, including test reports and certification of proposals.

3.2 The *Contractor* shall complete site testing in accordance with Appendix 1/5.

VEHICLE RESTRAINT SYSTEMS

4**. Location**

4.1 The locations, performance requirements and arrangements of Vehicle Restraint Systems (VRS) are shown on the contract drawings.

5. **Other Details**

5.1 VRS systems are Permanent Works Designed by The *Contractor* in accordance with Appendix 1/10.

5.2 Only those firms registered with an approved certification body for Road Restraint Systems (Vehicle and Pedestrian) in accordance with Appendix A of the Specification for Highways Works will be permitted to erect Road Restraint Systems.

5.3 For details of existing and proposed services, refer to the contract drawings. No vehicle restraint systems are anticipated to be within filter drains.

5.4 The *Contractor* shall submit for acceptance specific details of all proposed system layouts, including exact post locations, in a format to be agreed with the *Project Manager* / *Supervisor*. Documentation shall be submitted a minimum of 2 weeks prior to the commencement of any works which the type of system selected may affect.

5.5 Working width requirements contained within this contract are inclusive of vehicle intrusion. The *Contractor* shall provide confirmation that the working width of any proposed system conforms with this requirement.

6. Testing

6.1 The *Contractor* shall supply details of proposed Vehicle Restraint Systems in accordance with Clause 401, 402 and 403 of the Specification for Highway Works, including test reports and certification of proposals.

6.2 The *Contractor* shall complete site testing in accordance with Appendix 1/5.

APPENDIX 5/1: DRAINAGE AND SERVICE DUCTS

1. Basis of Hydraulic Design

Hydraulic Design– The design of the stormwater drainage design shall be in accordance with DMRB and in particular Volume 4 HD33/96.

Design shall ensure that pipe flow velocities are a minimum of 0.75 m/s at any point in the system and not greater than 2.5 m/s at outfalls.

Run-off coefficients used will be as follows:

Pavement Areas:	0.90
Non Pavement Areas:	0.30

Roughness coefficients (ks values) used in the design of the stormwater drainage system will be as follows:

Filter Drains (ks):	0.23mm
Carrier Drains (ks):	0.60 mm

Storage requirements:

1 in 100 year return period

Time of Entry– The minimum global time of entry shall be 5 minutes.

Storm water Attenuation – Any new or modified drainage will, generally, discharge into existing, positive drainage systems.

No attenuation is proposed at any outfall.

The details of any modified drainage networks connecting to outfalls are shown on the contract drawings

Minimum Pipe Diameters– The minimum pipe diameter shall be 150mm, which includes all gully connections. Gully connections to be provided in accordance with Clause 508.7 of the MCHW Volume 1 Specification for Highway Works.

Continuous Drainage– Where the longitudinal gradient of the road is less than 0.5% a continuous drain shall be provided such as a combined kerb drainage system.

Minimum Cover to Drains– The preferred minimum cover to carrier drains, measured from finished ground level to the pipe soffit, will be 1.2m. The absolute minimum cover to carrier drains and pipe culverts will be 0.9m unless a 150mm concrete bed and surround is used. The minimum cover to filter drains will be 0.9m.

Manhole Spacing– Maximum distance between new manholes shall not be greater than 90 metres. Where existing lengths of pipe are to be utilised, the distance between accesses may be greater than 90 metres and may remain as the existing length between chambers.

Gully Spacing – Where used, all gullies provided shall be trapped in accordance with Clause 508.1 of the MCHW Volume 1 Specification for Highway Works.

The spacing of gullies will be based on the principles set out in HA 102/00 Spacing of road gullies.

Double gullies to be provided at low points

Design Flood Flow Width – The maximum flooded width of carriageway shall be 1.0m, adopting a 1:5 year storm return period.

2. Permitted Alternative Pipe and Bedding Combinations

The allowable pipe and bedding types for each carrier pipe shall be in accordance with HA 40 "Determination of Pipe and Bedding Combinations for Drainage Works" and as shown in table 5.2.1 and 5.2.2. Alternatives can be permitted to Clause 501 table 5/1 subject to the agreement of the Employer.

Table 5.2.1 For Carrier pipes

Pipe Diameter (mm)	Pipe Group No	Vitrified Clay					Precast Concrete	Ductile Iron	GRP		Flexible/Thermoplastic	
		L	95	120	160	200	Strength Class 120 units as per BS5911-1:2002	K9	5 kN/m2	10 kN/m2	PVCu	PP/PE
150	6	-	-	-	ASBFN	ASBFN	ASBFN	S	S	S	ST	ST
150	5	-	-	-	ASBFN	ASBFN	ASBFN	S	S	S	ST	ST
225	5	-	-	-	ASBFN	ASBFN	ASBF	-	-	-	ST	ST
225	6	-	-	-	ASBF	ASBFN	ASBF	-	-	-	ST	ST
300	5	-	-	-	ASBFN	ASBFN	ASB	S	S	S	ST	ST
300	6	-	-	-	ASBFN	ASBFN	ASB	S	S	S	ST	ST
300	7	-	-	-	ASBF	ASBFN	ASB	S	S	S	ST	ST
300	10	-	-	-	ASBF	ASBFN	AS	S	S	S	S	S
375	5	-	-	-	ASBFN	ASBFN	ASB	-	-	-	ST	ST
375	7	-	-	-	ASBFN	ASBFN	ASB	-	-	-	ST	S
450	5	-	-	ASBF	ASBFN	-	ASB	-	-	-	ST	ST
500	5	-	ASB	ASBF	ASBFN	-	-	S	S	S	ST	ST
500	6	-	ASB	ASBF	ASBFN	-	-	S	S	S	ST	ST

Pipe Diameter (mm)	Pipe Group No	Vitrified Clay					Precast Concrete	Ductile Iron	GRP		Flexible/Thermoplastic	
		L	95	120	160	200	Strength Class 120 units as per BS5911-1:2002	K9	5 kN/m2	10 kN/m2	PVCu	PP/PE
525	5	-	-	-	-	-	ASB	-	-	-	ST	ST
600	5	A	ASB	-	-	-	ASB	S	S	S	ST	ST
900	5	-	-	-	-	-	ASB	S	S	S	ST	ST
900	6	-	-	-	-	-	ASB	S	S	S	ST	S
900	7	-	-	-	-	-	ASB	S	S	S	ST	S
900	8	-	-	-	-	-	ASB	S	S	S	S	S
900	9	-	-	-	-	-	AS	S	S	S	S	S

Table 5.2.2 For Filter Drains

Drain Type (Lower Trench) Refer to HCD Drg F2	Drain Type (Surface Level)	Pipe Diameter (mm)	Pipe Group Number	Vitrified Clay					Precast Concrete	Thermoplastic	
				L	95	120	160	200	Strength Class 120 units as per BS5911-1:2002	Structured Wall	SRD 41
H		225	1	-	-	-	y	y	y	y	-
H		225	2	-	-	-	y	y	y	y	-
H		300	1	-	-	-	y	y	y	y	y

y = permitted pipe type

2 **Connections to Existing Drainage**

Connections to existing drains will be in accordance with clause 506.1 and 506.2 of the MCHW Volume 1 Specification for Highway Works.

3 Requirements for sealing, removal or grouting of existing drains

The treatment of redundant manholes should be in accordance with Appendix 2/2 of this specification.

4 **Existing land drains**

Not applicable

5 **Mole drains**

Not applicable

6 **Backfilling of mole drains**

Not applicable

7 **Chamber Types**

Manhole chambers and collection chambers will be constructed in accordance with drawings F3, F4, F5, F6, F25 & F26 and the catchpits will be constructed as per drawing F11 and F12 in the MCHW Volume 3 Highway Construction Details. The minimum chamber diameter will be 1050mm.

8 **Requirements for Concrete to Cast In-situ Chambers**

Not applicable

9 **Requirements for Corrugated Galvanised Steel Chambers**

Not applicable

10 **Requirements for Testing Chambers for Foul and Surface Water Drains**

Requirements for testing chambers for foul and surface water drains for water tightness will be in accordance with clause 507.8 of the MCHW Volume 1 Specification for Highway Works. Carrier, foul and filter drain surveys by Closed Circuit Television (CCTV) will be in accordance with clause 509.5 of the MCHW Volume 1 Specification for Highway Works.

11 Details of Chamber Covers, Gratings and Frames

All chamber covers, gratings and frames shall be in accordance with BS EN 124 & shall be Class D 400 units. They shall incorporate a permanent non-rock feature either triangular point suspension or machined faces. Precast concrete chamber shall comply with BS 5911-3:2010 and BS EN 1917:2002.

The finished ground surface within the 1m radius of the centre of each chamber or chamber cover will be planar and will not have gradient exceeding 10%.

At chambers, except for unavoidable circumstances, the deviation of incoming flows in relation to the axis of the outfall pipe will not be less than 90 degrees.

The last chamber downstream of any section of filter drain shall be a catchpit in accordance with MCHW HCD F-11. All other chambers on the highway drainage network will be manholes or catchpits.

All catchpits and manholes will have a minimum internal diameter of 1050 mm and will be constructed with heavy-duty cover slabs. The distance between chambers on a drainage run will not exceed 90m. Chambers shall be sized in accordance with the clause 507 of the MCHW Volume 1 Specification for Highway Works and Vol. 3, MCHW Highway Construction Details.

Where existing and proposed drainage manhole chamber covers are located within the proposed carriageway within the site extents, the chamber cover is to have the same skid resistance as the adjacent surface.

12 Gully grating

Gully gratings, kerb type gully covers and frames shall comply with BS EN 124 and will be in accordance with clause 508 of the MCHW Volume 1 Specification for Highway Works. Gullies to have minimum waterway area of 1200cm^2 with grating bars running perpendicular to the kerb.

13 Requirements for Gullies

The upper surface of gully gratings shall be flat. Slots in gratings or between gratings and frames shall not be orientated parallel to the direction of traffic. All gratings and frames shall be supplied in a fine cast (uncoated) condition as per Clause 508.5, of the MCHW Volume 1 Specification for Highway Works. Frames shall be bedded on mortar complying with sub-Clause 507.16 of the MCHW Volume 1 Specification for Highway Works.

All gully grating and frames shall be positioned with grating bars running perpendicular to the kerb and incorporate a captive hinge system to prevent

unauthorised removal. Gratings will be hinged in the direction of travel.

14 Setting existing covers and gratings

The *Contractor* will carry out all adjustments to existing chamber cover levels where necessary as a consequence of the works in compliance with Clause 507.18, 508.8 of the MCHW Volume 1 Specification for Highway Works and drawing numbers HCD F4 and F5.

15 Details of in situ concrete gullies

Gullies shall be trapped as described in gully schedule and be in accordance with Estate Roads in Somerset Specification Construction Notes (available on request). All ST concrete referred to Clause 508 of the MCHW Volume 1 Specification for Highway Works shall comply with clause 2602.

16 Requirements for Filling of Pipe Bays and Verges

Not applicable

17 Requirements for Permeable Backing

Not applicable

18 Cleaning of chambers, gullies and drains

During the progress of the Works all existing chambers and gullies shall be kept clean and free from obstruction. On completion of the whole of the Works, all chambers, gullies and drains within the site extent shall be flushed (by low pressure high volume jetting) from end to end with water and left free from obstructions.

Catchpit chambers shall be left clean and free from silt. All carrier, foul and filter drains, but excluding all fin and narrow filter drains, shall be surveyed by Closed Circuit Television (CCTV) in accordance with the relevant requirements of Series 9000 of the Specification for Highway Works (MCHW 5.9, Parts 1 to 5).

19 Cleaning of Existing drainage system

The *Contractor* shall clean existing drainage systems in accordance with Clause 520 of the MCHW Volume 1 Specification for Highway Works.

Initial attempts to clear blocked drains prior to jetting, shall be undertaken by hand rodding and any debris and silt removed by the operation shall be removed off Site. The *Contractor* shall report any localised blockages that cannot be cleared by rodding

to the Employer.

At each chamber all mud and vegetation in the vicinity of the chamber likely to impede the flow of water shall be removed. After lifting the cover or grating the chamber shall be cleansed of all water, detritus, debris and silt, refilled with clean water to the outlet level, and all covers and gratings replaced and evenly bedded.

Gullies and chambers not cleaned for whatever reason, blocked connections and broken or cracked covers, gratings or frames shall be marked to aid subsequent identification and notified to the Employer.

The *Contractor* shall dispose of all surplus water, debris and arising from the works off Site at a licensed tip.

20 **Requirements for rapid setting bedding materials**

Not Applicable

21 **Cleaning of existing/new drainage systems using low pressure high volume jetting**

The *Contractor* shall clean existing drainage systems in accordance with Clause 521 of the MCHW Volume 1 Specification for Highway Works, where applicable.

22 **Deposition of materials**

Limiting distance for deposition of materials will be in accordance with sub-Clauses 503.4, 503.5, 505.4 and 505.5 of the MCHW Volume 1 Specification for Highway Works.

23 **Requirements for geotextiles**

Not Applicable

APPENDIX 5/2: SERVICE DUCT REQUIREMENTS

1.0 Duct Construction

1.1 Ducts shall not be laid within 500mm of safety fence foundations or filter drains except for crossing purposes unless required specifically by the drawings.

1.2 Duct, trench and bedding details for ducts in footway/verge shall be as detailed in HCD Volume 3 Type L (F2) and in accordance with table 5/2-2 of this appendix. A brightly coloured identification tape shall be installed in accordance with SHW Clause 1421 bearing the appropriate legend.

1.3 Traffic Signal and CCTV ducts shall be H.D.P.E / M.D.P.E smooth bore (internal and external), rigid 5mm thick walled high-density polyethylene, coloured orange and with white lettering, 9mm high at 1m centres stating "Traffic Signals". Flexible ducting is not acceptable.

1.4 Ducts in carriageways and or vehicle crossings shall be Type A Shallow Ducts installed by open trench methods as detailed in HCD Volume 3 (I2), trench reinstatement shall be as per drawing SD-0700-002.

1.5 Collars should be used to join consecutive lengths of ducts. They should axially align and firmly hold the ducts. Joins between sections of ducts shall have any burrs removed and the ends shall be chamfered.

1.6 Where multiple ducts are run together separation should be provided by means of purpose made spacers. The spacer shall ensure that there is sufficient room for collars – nominally 20mm separation. Spacers shall not cause damage to the ducts and cables either during installation or service.

1.7 Strapping should be provided to ensure that multiple ducts and spacers are not disturbed during installation, backfilling and in service. The strapping would typically be installed at 1000mm intervals.

1.8 Purpose made, combined, spacer/clip arrangement may be used as an alternative to separate spacer and strapping, provided that *The Contractor* can demonstrate that the spacer/clip is capable of retaining ducts in place during installation and service.

1.9 Existing Carriageway reinstatements shall be as described in Appendix 7/2. Backfilling shall be in accordance with SHW Clause 505, bedding and surrounding of pipes shall be in accordance with SHW Clause 503.3 and concrete should be ST4 to SHW 503.6.

1.10 Ducts in the verge and or footways shall be installed by open trench. Existing footway reinstatements shall be as described in Appendix 11/1. Trenches shall be backfilled in accordance with SHW Clause 1531.

1.11 The dimensions and depths of ducts shall be as shown on the contract drawings schedules. Ducts shall not be backfilled until inspected and approved by *The Employer* on site. Ducts shall be kept as straight as possible and follow the routes described on the Drawings.

1.12 On completion of cabling, ducts shall be left with a draw rope in place and re-sealed with split plugs, or a suitable alternative material, to adequately seal the ducts against the ingress of foreign matter. It is the responsibility of *The Contractor* to ensure that all duct runs are clear of obstructions before the installation work begins.

1.13 Each traffic signal electrical feeder pillar shall be provided with a new single phase supply, via a 117mm external diameter black duct, from a mains electrical supply. The 117mm external diameter black duct shall incorporate slow bends and a draw rope.

2.0 **Other Requirements for Access/Duct Inspection Chambers**

2.1 All chamber covers shall be to BS EN 124 Grade B125, except any chambers subject to vehicular traffic which shall be to BS EN 124 Grade D400 a chamber lifting key will also be supplied.

2.2 Access chambers / Duct Inspection chambers shall be of the type and size specified on the drawings listed in clause 1.0 above, SCHEDULES 5/2-3 5/2-4 and in the Somerset County Council Traffic Signal Standard Details.

2.3 A proprietary modular access chamber former and ducting system may be used. Any proposed system shall be approved by *The Employer*.

2.4 Access chamber formers shall be of solid pre-formed modular construction. The chamber formers/chambers shall be installed in accordance with the Somerset County Council Traffic Signal Standard Details and to the manufacturer's instructions.

2.5 Access chambers shall have a smooth concrete finish in the base of the pit, with suitable drainage allowed for, and shall be thoroughly cleaned and swept of construction debris prior to cable pulling.

2.6 All access chambers shall be supplied with a skid resistant cover and frame. Skid Resistance Values of the cover shall be a minimum of 68 (wet).

2.7 The cover and frame shall be tested in accordance with BS EN124. A strength of less than 12.5 tonne wheel loading will not be permitted in any location.

2.8 The cover and frame assembly shall fit snugly inside the access chamber to provide height and tilt adjustment at surface level. The cover and frame shall be supplied complete with an integral locking facility and keyway closer caps and shall be marked 'Traffic Signals'.

2.9 The chamber formers shall be surrounded with type ST2 concrete to a minimum thickness of 150mm. The frame shall be concreted into the surround in the same pour, and finished to the correct final level/crossfall (see the Somerset County Council Traffic Signal Standard Details). If this is not possible the concrete pour shall be stopped at a minimum depth of 150mm below the top of the chamber former. When the frame is to be installed any spoil must be cleared off the concrete surround. The final pour shall be carried out to provide a 'key' between the frame and the chamber surround. No concrete shall be placed above the level of the signal pole retention sockets openings, and no concrete shall be allowed to enter the socket.

2.10 Carriageway loop access covers and frames shall conform to BS EN 124 Class D400 and shall be installed in accordance with the standard details. They shall be positioned at the correct distance from the kerb face. This allows sufficient room for the slot cutting machine to correctly cut into the box (see the Somerset County Council Traffic Signal Standard Details).

2.11 The chambers shall be positioned in accordance with the design drawings listed in Clause 1.0 above.

2.12 Access chambers (other than carriageway loop chambers) shall not be located within the extent of tactile paving or on trafficked carriageway.

3.0 **Ducting System**

3.1 A proprietary modular ducting system shall be used that is compatible with the access chamber system. The proposed system shall be approved by *The Employer*.

3.2 No preformed bends shall be permitted along the duct runs that restrict the ability to feed the cables through the duct.

3.3 Ducts shall be sealed by means of pre-formed plastic end-caps prior to the pulling of traffic signal cables. Expanding foam sealant at every access chamber shall be used upon completion of the installation to prevent vermin and flooding of the duct network.

3.4 Where it may be necessary to lay ducts in the carriageway with less than 750mm cover, *The Employer* shall be consulted on requirements.

3.5 Where it may be necessary to lay ducts in the footway/verge with less than 450mm cover, *The Employer* shall be consulted on requirements.

3.6 Mains power supply cables shall not be housed within the traffic signal ducting.

3.7 Ducts between the controller/MECs are to be 6x100mm ducts.

4.0 **Colour Coding of Ducting and Cabling**

4.1 The colour of traffic signals related ducts to be installed shall be orange in colour.

4.2 Traffic signals related cabling shall be orange in colour.

4.3 Marking/warning tape, where used on traffic signals installations shall be yellow with a black legend.

4.4 The colour of communications ducts to be installed shall be light grey in colour.

4.5 Communications cabling shall be light grey in colour.

4.6 Marking/warning tape, where used on communications installations shall be yellow with a black legend.

4.7 These colours are based upon HS(G) 47 - Avoidance of Danger from Underground Services and the National Joint Utilities Group - Guidelines on the Positioning and Colour Coding of Utilities' Apparatus.

5.0 **Bridge Service Duct details**

5.1 Not Used.

APPENDIX 5/5: COMBINED DRAINAGE AND KERB SYSTEMS

1. General

1.0 The *Contractor* is to advise the Employer of his preferred method of combined kerb and drainage system for the scheme. Combined drainage and kerbing system to be installed in accordance with Clause 516 of the MCHW Volume 1 Specification for Highway Works and with the particular requirements of this appendix.

1.3 The combined kerb and drainage system units laid to radii less than 30m shall use purpose made radii blocks as appropriate. Units shall not deviate in line or level by more than +/- 3mm from the alignments given in the contract. Should a two-part system be utilized, the same tolerances shall apply to the bottom unit as apply to the top.

1.4 The kerb up stand shall be 125mm unless indicated otherwise. The profile shall match the adjacent new/existing kerbs e.g. the front face of unit is to be battered back from the channel at an angle of 12.5 to 15 degrees to the vertical where adjacent to HB2 kerbs, and shall be grey in colour

1.5 Units shall be to a minimum load classification of D400.

1.6 Units shall be laid on a concrete bed in accordance with the manufactures specification.

1.7 Units shall be designed for a 1:5 year storm return period with a flow width of 1.0m. Further details are shown on the scheme drawings.

1.8 Silt traps shall be provided at the recommendation of manufacturers.

1.9 All outfalls shall be un-trapped unless otherwise stated.

1.10 Combined drainage and kerb systems shall conform to BS EN 1433:2002

1.11 Access units to be installed at head of combined kerb and drainage system run. Access covers and frames are to be hinged in the direction of traffic.

1.12 Outlet from access chamber to be 150 diameter pipe

1.13 Testing of the combined drainage and kerb system shall be in accordance with Appendix 1/5.

APPENDIX 6/1: REQUIREMENTS FOR ACCEPTABILITY AND TESTING ETC OF EARTHWORKS MATERIAL

1 Acceptable Limits for Fills

All earthworks materials shall comply with the requirements of Table 6/1 classes 1A, 1B, 1C.

1.2 The acceptable limits for the earthworks materials and the testing required are detailed and defined in the following tables:
Table 1/5 Testing Requirements
Table 6/1 Classification and Compaction Requirements
Table 6/1.1 Grading Requirements

1.3 Required classes of earthworks materials to construct the Works are given on the drawings.

2 Requirements for Determining Acceptability

2.1 The *Contractor* shall be responsible for determining the acceptability of earthworks material and shall carry out all necessary testing as detailed in Appendix 1/5 and Table 6/1 to demonstrate the proposed materials meet the requirements of the Specification. The *Contractor* shall be responsible for the classification of materials. The classification and confirmation of imported material shall be carried out by The *Contractor* in accordance with Table 1/5, Table 6/1 and Table 6/1.1.

2.2 Additional chemical tests shall be carried out by The *Contractor* on any suspected Class U1B or Class U2 material encountered during excavation and as required by the relevant regulation Authority or The Employer.

2.3 Additional classification tests may be required by the Employer if the imported material varies significantly.

2.4 The classification and confirmation of acceptability of the earthworks materials shall be carried out by The *Contractor* at the point of deposition for imported materials.

2.5 If, in the opinion of the Employer, the material has altered its classification or become unacceptable for whatever reason, The *Contractor* shall repeat the classification and acceptability tests given in Table 6/1 and Appendix 1/5. The rate of further testing required shall be sufficient to ensure the correct classification of the materials, taking into account the variation of their properties.

2.6 The *Contractor* shall submit two copies of all test results to the Employer within 24 hours of the tests being completed.

2.7 Source approval testing is required for all imported fill materials. To obtain source approval The *Contractor* shall notify The Employer of the location of the proposed source and provide details of the proposed material including the location, supplier, material type proposed for import, volume of material available, whether it will be from a stockpile or excavation. The *Contractor* shall carry out a full range of the tests detailed in Tables 1/5 and 6/1 for the class of fill on at least 3 representative samples to demonstrate compliance. The Employer may additionally request a site visit to observe the proposed source prior to providing approval of the source.

2.8 Two copies of all test results and their interpretation to material Class shall be submitted to The Employer for approval within 24 hours of the tests being completed.

2.9 The *Contractor* shall maintain full records relating to the export or import of fill materials to the site, including the disposal of Class U materials to licensed facilities.

3 Not Used

4 Not Used

5 Requirements for Groundwater Lowering or Other Treatment

5.1 Construction areas shall be kept free of groundwater, infiltration and the effects of weather, and every measure shall be taken to ensure that the sub-grade is protected.

5.2 In the presence of groundwater, The *Contractor* shall undertake excavation works with pumps installed in sumps in close proximity to the excavation to ensure any groundwater encountered can be pumped away from the working area without resulting in saturation of other material that is to be excavated or jeopardising the stability of slopes and excavation. The sump shall be lined with geotextile and partially filled with Type B filter material to prevent washing out of fines from the adjacent soils.

6 Not used

7 Not used

8 Permitted Use of Rapid Assessment Procedure for Material Acceptability

8.1 The use of the rapid assessment procedure for material is not permitted

9 Requirements for Removal of Material off Site or Retention of Surplus Material on Site

9.1 Any unacceptable Class U1A material shall be utilised in landscape areas or disposed off to a suitably licensed tip.

9.2 Requirements for dealing with Class U1B and Class U2 material are detailed in Appendix 6/2. Waste transfer notices shall be provided to The Employer for all material removed from the site.

10 Not Used

11 Not Used

12 Not Used

13 Not Used

14 Requirements for the Assessment of the Effects of Water Soluble (WS) sulphate, oxidisable sulfides and total potential sulphate in Accordance with TRL Report 447, Test Nos. 1 to 5

14.1 For materials to be deposited within 500mm of concrete or metallic elements the requirements of clauses 601.14 and 601.15 respectively shall apply.

15 Not Used

TABLE 6/1: Acceptable Earthworks Materials : Classification and Compaction Requirements (See footnotes)

Class				General Material Description	Typical Use	Permitted Constituents (All subject to requirements of Clause 601)	Material Properties for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)				Compaction Requirements in Clause 612
							Property (See Exceptions in Previous Column	Defined and Tested in Accordance with:	Acceptable Limits		
									Lower	Upper	
General Granular Fill	1	A		Well graded granular material	General Fill	Any material, or combination of materials, other than material designated as Class 3 in the Contract (Properties (i), (ii) and (iv) in next column, shall not apply to chalk). Recycled aggregate	(i) grading	BS1377: Part 2	Tab 6/1.1	Tab 6/1.1	Tab 6/4 Method 2
							(ii) uniformity coefficient	see Note 5	10	-	
							(iii) moisture content (see Note 4)	BS 1377: Part 2	omc-2%	omc+2%	
							(iv) Moisture Condition Value (MCV) provided grading complies with Fig 1 of TRL Report 273	Clause 632	8.5	-	
							(v) SMC of chalk	Clause 634	-	20%	
	1	B		Uniformly graded granular material	General Fill	Any material, or combination of materials, other than chalk and material designated as Class 3 in the Contract. Recycled aggregate	(i) grading	BS1377: Part 2	Tab 6/1.1	Tab 6/1.1	Tab 6/4 Method 3
							(ii) uniformity coefficient	see Note 5	-	10	
							(iii) moisture content (see Note 4)	BS 1377: Part 2	omc-2%	omc+2%	
	1	C		Coarse granular material	General Fill	Any material, or combination of materials, other than material designated as Class 3 in the Contract. (Properties (i) and (ii) in next column, shall not apply to chalk). Recycled aggregate	(i) grading	BS 1377: Part 2	Tab 6/1.1	Tab 6/1.1	Tab 6/4 Method 5
							(ii) uniformity coefficient	see Note 5	5	-	
							(iii) 10% Fines	Clause 635	50kN	-	
Landscape Fill	4			Various	Fill to landscape areas	Any material or combination of materials other than peat or surplus topsoils	(i) grading	BS1377: Part 2	-	-	See Clause 620 and App 6/1
							(ii) moisture content (see Note 4)	BS 1377: Part 2	-	-	
							(iii) Moisture Condition Value (MCV)	Clause 632	-	-	
	4	P		Various	Fill to	Any material or	(i) grading	BS1377: Part 2	-	-	See Clause 620 and

					landscape areas	combination of materials including Peat	(ii) moisture content (see Note 4)	BS 1377: Part 2	-	-	App 6/1
							(iii) Moisture Condition Value (MCV)	Clause 632	-	-	
Topsoil	5	A		Topsoil, or turf existing on site	Topsoiling	Topsoil or turf designated as Class 5A in the Contract	(i) grading	Clause 618	-	Clause 618	Not Applicable
	5	B		Imported Topsoil	Topsoiling	General purpose grade complying with BS 3882	(i) grading	BS 3882: General purpose grade	-	-	
							(ii) soil reaction (pH)	BS 3882	6.5	8	
							(iii) stone content	BS 3882: General purpose grade	-	-	
							(iv) stone size	BS 3882: General purpose grade	-	-	
							(v) electrical conductivity	BS 3882	-	2000 micro-Siemens/ cm	
							(vi) phosphorus	BS 3882	45ppm	-	
							(vii) potassium	BS 3882	240ppm	-	
							(viii) magnesium	BS 3882	80ppm	-	
							(ix) nitrogen	BS 3882	2%	-	
							(x) organic matter	BS 3882	2%	-	
							(xi) cadmium	see App 6/8	-	15mg/kg	
							(xii) copper	see App 6/8	-	130mg/kg	
							(xiii) lead	see App 6/8	-	2000mg/kg	
							(xiv) mercury	see App 6/8	-	20mg/kg	
							(xv) nickel	see App 6/8	-	70mg/kg	
							(xvi) zinc	see App 6/8	-	300mg/kg	
							(xvii) water soluble boron	see App 6/8	-	3mg/kg	
							(xviii) arsenic	see App 6/8	-	40mg/kg	
							(xix) chromium (total)	see App 6/8	-	1000mg/kg	

Selected Granular Fill	6F2			Selected granular material (fine grading)	Capping	Any material, or combination of materials, other than unburnt colliery spoil argillaceous rock and chalk. Recycled aggregate. Property (vi) in the next column shall not apply if Class A (asphalt) content is 20% or less.	grading	BS1377: Part 2	Table 6/1.1	Table 6/1.1	Tab 6/4 Method 6
							optimum mc	BS1377: Part 4 (vibrating hammer method)	-	-	
							mc	BS1377: Part 2	Optimum mc – 2%	Optimum mc	
							Los Angeles coefficient	Clause 635	-	50	
							Class A (asphalt) content	Clause 710	-	50%	
							Bitumen content	BS EN 12697-1 or BS EN 12697-39	-	2.0%	
Selected Granular Fill	6	I		Selected well graded granular material	Fill to reinforced soil and anchored earth structures	Natural gravel, natural sand, crushed gravel, crushed rock, crushed concrete, slag, chalk, well burnt colliery spoil or any combination thereof except that chalk shall not be combined with any other constituent. None of these constituents shall include any argillaceous rock. (Properties (i), (ii) and (v) in the next column shall not apply to chalk.) (Properties (viii), (ix), (x), (xi), (xii), (xiii) and (xiv) only apply when metallic reinforcing or anchor elements, facing units or fastenings are used.) Recycled aggregate except recycled asphalt	(i) grading	BS1377: Part 2	Tab 6/1.1	Tab 6/1.1	Tab 6/4 Method 2
							(ii) uniformity coefficient	See Note 5	10	-	
							(iii) Saturated Moisture Content (SMC) of chalk	Clause 634	-	20%	
							(iv) moisture content (see Note 4)	BS 1377: Part 2	□omc - 2%	□omc + 2%	
							(v) effective angle of internal friction (□') and effective cohesion (c')	Clause 636	□□' = 35 c' = 0 TBC by proprietary system designer	-	
							(vi) coefficient of friction and adhesion (fill/elements)	Clause 639	TBC by proprietary system designer	-	
	6	J		Selected uniformly graded granular material	Fill to reinforced soil and anchored earth	Natural gravel, natural sand, crushed gravel, crushed rock, crushed concrete, slag, chalk, well	(i) grading	BS1377: Part 2	Tab 6/1.1	Tab 6/1.1	Tab 6/4 Method 3
							(ii) uniformity coefficient	See Note 5	5	10	
							(iii) Saturated Moisture Content (SMC) of chalk	Clause 634	-	20%	

						burnt colliery spoil or any combination thereof, except that chalk shall not be combined with any other constituent. None of these constituents shall include any argillaceous rock. (Properties (viii), (ix), (x), (xi), (xii), (xiii) and (xiv) in the next column only apply when metallic reinforcing or anchor elements, facing units or fastenings are used.) (Properties (i), (ii) and (v) in the next column shall not apply to chalk.) Recycled aggregate except recycled asphalt	(iv) moisture content (see Note 4)	BS 1377: Part 2	omc - 2%	omc - 2%	
							(v) effective angle of internal friction (□') and effective cohesion (c')	Clause 636	□□' = 35 c' = 0 TBC by proprietary system designer	-	
							(vi) coefficient of friction and adhesion (fill/elements)	Clause 639	TBC by proprietary system designer	-	
							(viii) water soluble sulphate (WS) content	TRL Report 447, Test No 1	-	0.30 gms/litre as SO4	
							(ix) oxidisable sulfides (OS) content	TRL Report 447, Tests Nos 2 and 4	-	0.06% as SO4	
							(x) chloride ion content	BS EN 1744-1	-	0.025%	
							(xi) pH value	BS1377: Part 3	6	9	
							(xii) sulphide and hydrogen sulphide	Standard textbook of qualitative inorganic analysis BS 812-103:3 7	-	rapid blackening of lead acetate paper	
							(ii) uniformity coefficient	See Note 5	5	-	
							(iii) plasticity index	BS1377: Part 2	-	6	
							(iv) Optimum Moisture Content (omc)	BS 1377: Part 4 (vibrating hammer method)	□	-	
							(v) moisture content (see Note 4)	BS1377: Part 2	omc - 2%	omc + 1%	
							(iii) 10% Fines	Clause 635	100kN	-	
							(vii) resistivity	Clause 637	2000 ohm cm	-	

						(viii) water soluble sulphate (WS) content	TRL Report 447, Test No 1	-	0.30 gms/litre as SO4	
						(ix) oxidisable sulfides (OS) content	TRL Report 447, Tests Nos 2 and 4	-	0.06% as SO4	
						(x) chloride ion content	-	-	0.025%	
						(xi) pH value	BS 1377: Part 3	6	9	
						(xii) sulphide and hydrogen sulphide	Standard textbook of qualitative inorganic analysis	-	Rapid blackening of lead acetate paper	
	6	N		Selected well graded granular material	Fill to structures	Natural gravel, natural sand, crushed gravel, crushed rock, crushed concrete, slag, well burnt colliery spoil or any combination thereof . None of these constituents shall include any argillaceous rock. Recycled aggregate except recycled asphalt	(i) grading	BS 1377: Part 2	Tab 6/1.1	Tab 6/1.1	End product 95% of maximum dry density of BS1377 Part 4 (vibrating hammer method)
							(ii) uniformity coefficient	See Note 5	10	-	
							(iii) 10% Fines	Clause 635	50kN	-	
							(iv) undrained shear parameters (c and □)	Clause 633	-	-	
							(v) effective angle of internal friction (□') and effective cohesion (c')	Clause 636	□□' = 35 c' = 0	-	
							(vi) permeability	Clause 640	10-6 m/s	-	
							(vii) moisture content (see Note 4)	BS1377: Part 2	To enable end product compaction		
							(viii) slope stability test (where required in App 6/6)	Clause 610	App 6/6		

Selected Granular Fill	6	P		Selected granular material	Fill to structures	Natural gravel, natural sand, crushed gravel, crushed rock, crushed concrete, slag, chalk, well burnt colliery spoil or any combination thereof . None of these constituents shall include any argillaceous rock. (Properties (i), (ii) and (ix) in next column shall not apply to chalk). Recycled aggregate except recycled asphalt	(i) grading	BS 1377: Part 2	Tab 6/1.1	Tab 6/1.1	End product 95% of maximum dry density of BS1377: Part 4 (vibrating hammer method)
							(ii) uniformity coefficient	See Note 5	5	-	
							(iii) SMC of chalk	Clause 634	-	20%	
							(iii) 10% Fines	Clause 635	50kN	-	
							(v) undrained shear parameters (c and □)	Clause 633	-	-	
							(vi) effective angle of internal friction (□') and effective cohesion (c')	Clause 636	□□' = 35° c' = 0	-	
							(vii) permeability	Clause 640	10-6 m/s	-	
							(viii) moisture content (see Note 4)	BS1377: Part 2	To enable end product compaction		
							slope stability test (where required in App 6/6)	Clause 610	App 6/6		

Footnotes to Table 6/1:

1. App = Appendix
2. Tab = Table
3. Where in the Acceptable Limits column reference is made to App 6/1, only those properties having limits ascribed to them in Appendix 6/1 shall apply. Where Appendix 6/1 gives limits for other properties not listed in this Table such limits shall also apply.
4. Where BS 1377: Part 2 is specified for mc, this shall mean BS 1377: Part 2 or BS 812: Part 3 as appropriate
5. Uniformity coefficient is defined as the ratio of the particle diameters D60 to D10 on the particle-size distribution curve, where: D60 =particle diameter at which 60% of the soil by weight is fine D10 =particle diameter at which 10% of the soil by weight is finer.
6. Landscape fill shall generally be in a condition that permits it to be transported, deposited, trafficked and shaped by

earthworking plant and which will permanently maintain the required earthwork contours. Class 4 material shall be of such a size that it can be deposited in horizontal layers each not exceeding 450mm loose depth. Isolated boulders up to 0.085 cu m volume may be incorporated in Class 4 fill material provided that the compaction requirements are met. No stone exceeding 0.015 cu m volume shall be placed less than 1.3 metres below the finished earthworks outline of the landscape fill.

TABLE 6/1.1: Grading Requirements for Acceptable Earthworks Materials (See footnotes)

Class	Percentage by Mass Passing the Size Shown																					
	Size (mm)																Size (microns)					
	500	300	200	150	125	90	75	37.5	28	20	14	10	6.3	5	3.35	2	1.18	600	300	150	75	63	2
1A		100			95-100																	<15	
1B					100																	<15	
1C	100				10-95													0-25				<15	
4	100																					10-100	
6F2					100	80-100	65-100	45-100				15-60		10-45				10-50				0-12	
6I & 6J					100		85-100				25-100					15-100		9-100				<15	
6N & 6P							100															<15	

Note : Uniformity coefficient is defined as the ratio of the particle diameters D60 to D10 on the particle size distribution curve, where D60 = particle diameter at which 60% of the soil by weight is finer and D10 = particle diameter at which 10% of the soil by weight is finer.

APPENDIX 6/2: REQUIREMENTS FOR DEALING WITH CLASS U1B AND CLASS U2 UNACCEPTABLE MATERIALS

1 In the event that a visual assessment of the excavated soils suggests the presence of Class U1B and/or Class U2 materials, The Employer shall be informed immediately and work shall be temporarily suspended in the area where the suspect soils are located.

2 Appropriate contamination testing shall be agreed with *The Employer* and the results reviewed to assess the appropriate course of action prior to the re-commencement of works in the area where the suspect materials were identified.

3 If any contaminated material, requiring off site disposal, is encountered, this shall be tested taking into account guidance from an environmental chemist. Thereafter actions for the appropriate disposal of such contaminated material shall be discussed and agreed with the Environment Agency. If any material is stored whilst being tested, it shall be stored in a manner that does not result in environmental pollution.

4 Class U1B and Class U2 material removed from site shall be transported by a licensed waste carrier to a suitably licensed waste facility. Waste transfer notices shall be provided to *The Employer* for all material taken off site.

APPENDIX 6/3: REQUIREMENTS FOR EXCAVATION, DEPOSITION AND COMPACTION (OTHER THAN DYNAMIC COMPACTION)

1 Drawings

1.1 Earthworks related information is given on the scheme drawings.

2 Blasting

2.1 Blasting shall not be permitted.

3 Not used

4 Not used

5 Embankment Construction

i) To ensure proper compaction of any embankment edges an increase in width of 0.5m to 1.0m from the finished sub-soil profile on each side is required. The embankment shall then be trimmed back to the final profile.

ii) Embankments shall be constructed in accordance with Clause 608 of the Specification for Highway Works. The works shall be protected against weather in accordance with the relevant sub-clauses.

Topsoil stripping shall be carried out over the full extents of earthworks, full pavement construction and full footway construction. All areas of embankment foundations shall be proof-rolled prior to fill placement. Soft spots in embankment foundations shall be defined as areas where the soil does not support the roller weight during proof-rolling, or where the soil shear strength is Cu < 40 kPa. The extent of soft spots shall be determined by inspection during proof-rolling. The proof-rolling shall consist of at least one pass of a smooth-wheeled vibratory roller having a minimum mass per metre roll width of 2100 kg, or other suitable method agreed with The Employer. The soft spots shall be treated by a suitable method agreed by the Employer.

6 Compaction

i General

a) Compaction of fills shall be carried out in accordance with Clause 612 of the Specification for Highway Works and the sub clauses of the appendix.

ii Method Compaction

a) Extra compaction of the top 600mm is required for the full width of the new embankment in accordance with Clause 612.10(ii).

b) Drainage materials shall be backfilled and compacted in accordance with clause 505.

c) The frequency of field density testing shall be in accordance with Table 1/5.

iii End product compaction

a) Nuclear surface density gauge (NDG) calibrated for the materials on site may be used for measuring field dry density /moisture content in place of sand replacement tests (SRT) subject to a calibration on each material type. However, sand replacement tests and laboratory moisture content determinations shall be required at a ratio of 1 SRT to10 NDG readings to maintain checks on calibration. The Contractor is required to provide the method and calibration data to The Employer prior to use on site of a nuclear surface density gauge.

APPENDIX 6/7: SUB-FORMATION AND CAPPING AND PREPARATION AND SURFACE TREATMENT OF FORMATION

1 If a capping layer is required, the thickness of capping material for full construction pavement is 600mm.

2 The preparation and surface treatment of formation, including tolerances, shall be in accordance with Clause 616.1 as for formation.

3 Permitted classes of capping are highlighted in Appendix 6/1, Table 6/1.

4 Preparation of formation on existing sub base material shall be in accordance with the requirements of Clause 616 for the preparation of formation on non sub-base material.

APPENDIX 6/8: TOPSOILING

1.0 Topsoil

1.1 Topsoil Analysis

The existing topsoil is to be analysed by a registered soil analyst to be recommended by the chosen contractor. All soil samples shall be collected in accordance with BS 3882.
The soil analyst shall provide a report detailing the make up and suitability of topsoil throughout the site to ensure that the quality of topsoil is fit for purpose. The report shall also include the soil analyst's recommendations.

All material proposed for use throughout the scheme shall be Class 5A material, 'topsoil reclaimed from site' as detailed in table 6/1 of the Classification Requirements or Class 5B material 'Imported Topsoil' if Class 5A material is insufficient.

1.2 Drawing References

For all proposed topsoil depth and extent information, refer to the scheme drawings.

1.3 **Topsoil Stockpiles -** Location of topsoil stockpiles shall be agreed on site by *The Employer*. The maximum stockpile height shall be 1m and the maximum stockpile width shall be 4m.

No other materials shall be placed on top of topsoil stockpiles and no construction plant shall pass over stockpiles. All compaction and contamination shall be prevented.

Before the stockpile is constructed, a protective, permeable geotextile shall be laid to the existing surface to keep the topsoil separate.

1.4 Surplus Topsoil

Not used

1.5 Imported Topsoil

As paragraph 1.1

1.6 Spreading Topsoil

Topsoil shall be laid in 150mm maximum depth layers in line with finished depths as identified on the scheme drawings. Each layer shall be gently firmed before spreading the next.

Do not compact topsoil

1.7 **Finished Levels of Topsoil after Settlement**

Topsoil is to be laid to a 25mm maximum height above adjoining paving or kerbs. Topsoil to proposed shrub/hedge areas to be spread to a 50mm depth higher than adjoining grass areas but shall remain unchanged within the root spread of existing trees.

Do not compact topsoil. Ensure a friable texture of separate visible crumbs is preserved.

1.8 **Handling Topsoil**

Notice regarding the presence of aggressive weeds shall be given and instructions obtained before topsoil is moved.

The selection of mechanical plant shall be made with a view to minimising disturbance, trafficking and compaction.

Avoid contamination and do not mix topsoil with subsoil, stone, hardcore, rubbish or material from demolition work, or other grades of topsoil.

Keep multiple handling of topsoil to a minimum.

Handle topsoil in the driest condition possible. Do not handle during or after heavy rainfall or when topsoil is wetter than the plastic limit.

APPENDIX 6/9: EARTHWORK ENVIRONMENTAL BUNDS, LANDSCAPING AREAS, STRENGTHENED EMBANKMENTS

1. **Earthwork Environmental Bunds**

Earthwork environmental bunds shall be formed using Class 2 or Class 4 material. Compaction of Class 4 fill shall be in accordance with the requirements of Appendix 6/1 and SHW Clause 620.

Refer to Appendix 6/8 for topsoiling requirements.

2. **Landscape Areas**

Refer to Appendix 30/1 – 30/12 and the scheme drawings.

3. **Strengthened Embankments**

Not used.

APPENDIX: 6/14: LIMITING VALUES FOR POLLUTION OF CONTROLLED WATERS

No surface or groundwater contaminants in the materials are anticipated at the site. In the event that a visual assessment of excavated soils during the Works by the Contractor suggests the presence of contamination The Employer shall be informed immediately and work temporarily suspended in the area concerned.

Appropriate contamination testing shall be agreed with The Employer to assess the appropriate course of action including as required the determination of limiting values for contamination to prevent the pollution of controlled waters.

APPENDIX 6/15: LIMITING VALUES FOR HARM TO HUMAN HEALTH AND THE ENVIRONMENT

No contaminants in the materials that could harm health or the environment are anticipated at at the site. In the event that a visual assessment of excavated soils during the Works by the Contractor suggests the presence of contamination The Employer shall be informed immediately and work temporarily suspended in the area concerned.

Appropriate contamination testing shall then be agreed with The Employer to assess the appropriate course of action including as required the determination of limiting values for contamination to prevent harm to human health and the environment.

APPENDIX 7/1: PERMITTED PAVEMENT OPTIONS

1 General

1.1 For pavement type details, refer to each scheme drawing.

1.2 High Friction surfacing shall be provided at the locations detailed on the drawings. The underlying surface course shall be designed to ensure adhesion of the high friction surface (HD 37/99 clause 9.10 refers).

1.3 Vibratory rollers shall not be used for compaction of surfacing materials over bridge decks.

Permitted Pavement Options – Schedule 1 (To be provided for each scheme)

Schedule 1: Permitted Pavement Options			
Drawing Ref.	**Pavement Type**	**General Requirements**	**Permitted Pavement Options**

2 General Requirements – Schedule 2

Schedule 2A: General Requirements – Area covered by Drawings Books 1 to 5		
Grid for checking surface levels of pavement courses [702.4]:	Longitudinal dimension:	10m
	Transverse dimension:	2m
Surface regularity [702.5, Table 7/2]	Category of Road:	A
Interval for measurement of longitudinal regularity [702.7]		300m
Interval for measurement of transverse regularity [702.8]		20m

3 Permitted Construction Materials – Schedule 3

Schedule 3: Permitted Construction Materials – Type A		
Pavement Layer	**Material Ref.**	**Thickness (mm)**
Surface Treatment	-	-
Concrete surface slab	-	-
Surface Course	-	-
Binder Course	-	-
Base	-	-
Upper roadbase	-	-
Lower roadbase	-	-
Total Thickness	-	-

Schedule 3: Permitted Construction Materials – Type AA		
Pavement Layer	**Material Ref.**	**Thickness (mm)**
Surface Treatment	-	-
Concrete surface slab	-	-
Surface Course	-	-
Binder Course	-	-
Base	-	-
Upper roadbase	-	-
Lower roadbase	-	-
Sub base	-	-
Regulating	-	-
Total Thickness	-	-
Capping	-	-

* Indicates layer thickness at the full depth for this pavement.

Schedule 3: Permitted Construction Materials – Type BB		
Pavement Layer	**Material Ref.**	**Thickness (mm)**
Surface Treatment	-	-
Concrete surface slab	-	-
Surface Course	-	-
Binder Course	-	-
Upper roadbase	-	-
Lower roadbase	-	-
Sub base	-	-
Regulating / Binder	-	-
Regulating / Base	-	-
Total Thickness	-	-
Capping	-	-

* Indicates layer thickness at the full depth for this pavement.

Schedule 3: Permitted Construction Materials – Type D		
Pavement Layer	**Material Ref.**	**Thickness (mm)**
Surface Treatment	-	-
Concrete surface slab	-	-
Surface Course	-	-
Binder Course	-	-
Base	-	-
Upper roadbase	-	-
Lower roadbase	-	-
Sub base	-	-
Regulating / Base	-	-
Total Thickness	-	-
Capping	-	-

* Indicates layer thickness at the full depth for this pavement construction.

Schedule 3: Permitted Construction Materials – Type DD		
Pavement Layer	**Material Ref.**	**Thickness (mm)**
Surface Treatment	-	-
Concrete surface slab	-	-
Surface Course	-	-
Binder Course	-	-
Pavement Reinforcement		-
Base	-	-
Upper roadbase	-	-
Lower roadbase	-	-
Sub base	-	-
Foundation Reinforcement	-	-
Regulating	-	-
Total Thickness	-	-
Capping	-	-

* Indicates layer thickness at the full depth for this pavement construction.

Schedule 3: Permitted Construction Materials – Type HFSG		
Pavement Layer	**Material Ref.**	**Thickness (mm)**
Surface Treatment	-	-
Concrete surface slab	-	-
Surface Course	-	-
Binder Course	-	-
Base	-	-
Upper roadbase	-	-
Lower roadbase	-	-
Sub base	-	-
Regulating	-	-
Total Thickness	-	-
Capping	-	-

Schedule 3: Permitted Construction Materials – Type HFSB		
Pavement Layer	**Material Ref.**	**Thickness (mm)**
Surface Treatment	-	-
Concrete surface slab	-	-
Surface Course	-	-
Binder Course	-	-
Base	-	-
Upper roadbase	-	-
Lower roadbase	-	-
Sub base	-	-
Regulating	-	-
Total Thickness	-	-
Capping	-	-

Schedule 3: Permitted Construction Materials – Type HFSR		
Pavement Layer	**Material Ref.**	**Thickness (mm)**
Surface Treatment	-	-
Concrete surface slab	-	-
Surface Course	-	-
Binder Course	-	-
Base	-	-
Upper roadbase	-	-
Lower roadbase	-	-
Sub base	-	-
Regulating	-	-
Total Thickness	-	-
Capping	-	-

4 General Requirements for Construction Materials – Schedule 4

Schedule 4: General Requirements For Construction Materials	
Clause	**Requirement**
	None

5 Requirements for Construction Materials – Schedule 5

Schedule 5: Requirement for Construction Materials			
Material Ref.	**Clause**	**Description**	**Requirement**
Capping	Refer to Appendix 6/7 for details		
Type 1	803	Type 1 unbound mixture	Mixtures containing crushed gravel course aggregate are not permitted - minimum CBR [803.8]: n/a - trafficking trial [803.8]: n/a

Schedule 5: Requirement for Construction Materials			
Material Ref.	**Clause**	**Description**	**Requirement**
REG	907	Regulating Course	Permitted materials for Regulating course are AC32 dense base 40/60 des or AC20 dense bin 40/60 des complying with Clause 929.
HFS (Red)	924	High Friction Surfaces	Type Classification 1 [924.3, Table NG 9/24] Required declared PSV category = $\geq PSV_{68}$ Required maximum AAV category = AAV_{10} Colour = Red for resin based system.
HFS (Grey)	924	High Friction Surfaces	Type Classification 1 [924.3, Table NG 9/24] Required declared PSV category = $\geq PSV_{68}$ Required maximum AAV category = AAV_{10} Colour = Grey for resin based system.
HFS (Buff)	924	High Friction Surfaces	Type Classification 1 [924.3, Table NG 9/24] Required declared PSV category = $\geq PSV_{68}$ Required maximum AAV category = AAV_{10} Colour = Buff for resin based system.
AC20	929	Dense Binder Course Asphalt Concrete	Material is AC20 dense bin 40/60 des - Void content at refusal is not to be monitored in the permanent works - Resistance to permanent deformation classification: Class 2 - Resistance to permanent deformation is not to be monitored in the permanent works

Schedule 5: Requirement for Construction Materials			
Material Ref.	**Clause**	**Description**	**Requirement**
AC32	929	Dense Base Course Asphalt Concrete	Material is AC32 dense base 40/60 des - Void content at refusal is not to be monitored in the permanent works - Resistance to permanent deformation classification: Class 2 - Resistance to permanent deformation is not to be monitored in the permanent works
TSC	942	Thin Surface Course Systems	Traffic Count [942.1-Commercial Traffic in each lane]: 3120cv per day. Site classification: C Single carriageway non event sections G Gradient >5%, longer than 50m L Roundabout J Approach to roundabout K Approach to traffic signals, pedestrian crossing Required declared PSV category: PSV_{68} Required maximum AAV category: AAV_{10} Resistance to permanent deformation is Level 3 Road/Tyre noise level is Level 3 A surface macrotexture measurement is required The interval and frequency of macrotexture measurements shall be 10 per 250m Initial texture depth shall be in accordance with Table 9/3 Surface Macrotexture Performance Guarantee shall be provided for a

Schedule 5: Requirement for Construction Materials			
Material Ref.	**Clause**	**Description**	**Requirement**
			period of 2 years from the date of the Contract completion Surface Integrity requirements shall be in accordance with Clause 942.15
Sand Carpet	2003	Red Sand Carpet	BS EN 13108-4:2006 Recipe type F with 5% of total mix in-organic red oxide (as part of the filler content)
Geogrid 1	-	Geogrid	Refer to Appendix 6/5 (Not Used)
Geogrid 2	-	Geogrid	Refer to Appendix 6/5 (Not Used)
Reinforced Grass	-	Reinforced Grass	Refer to Appendix 11/1 – reinforced grass, construction Type H

6 Thin Surface Course Systems: Information to be provided by the *Contractor* – Schedule 6

6.1 The *Contractor* shall provide the following information with his tender:

i) A copy of the British Board of Agrément HAPAS Roads and Bridges Certificate or Certificates for the Thin Surface Course System or systems that are proposed for use in the works, together with a copy of the Installation Method Statement associated with each Certificate.

ii) For any Certificate that covers several variants of one Thin Surface Course System, proposed variant or variants of the system to be used in the Works. *[variants of a system occur from any option that results in different values being reported on the Certificate for one or more properties, and could involve changes in nominal maximum aggregate size, aggregate type, aggregate grading, binder type, binder content, fibres or other additives type and rate of spread of bond coat]*

iii) If requested, or if the Thin Surface Course System is not produced under a Sector Scheme, the proposed component materials to be used in the Thin Surface Course System and their proportions for each proposed system.

iv) Proposed source or sources of coarse aggregate together with statement of properties including Polished Stone Value, Aggregate Abrasion Value, Los Angeles Coefficient and flakiness index.

v) If regulating material is to be used, evidence of its deformation resistance either independently or in combination with the Thin Surface Course System.

7 Binder Data Requirements – Schedule 7

7.1 The following data shall be provided to *The Employer* for modified binders as required in sub-Clauses 937.4 and 943.4. The data should not be more than 12 months old. A table in which the binder data may be recorded is given at the end of this section.

i) Binder Samples
Bituminous binders shall be sampled from the delivery according to BS EN 58. For modifiers blended with the other component materials of the mixture at the mixer a simulated binder shall be prepared. Such modifiers are generally less intimately mixed with the bitumen and less well dispersed throughout the mixture than when pre-blended. Evidence that the simulated binder offers the same performance as the binder produced when the modifier is added at the mixer shall be provided.

ii) Penetration
Binder penetration at 25ºC (BS EN 1426), 100g 5 seconds, and at 5ºC, 200g 60 seconds, before and after hardening in the Rolling Thin Film Oven Test (RTFOT) in accordance with BS EN 12607-1, or alternatively, after RTFOT and after RTFOT and Ageing in accordance with Clause 955.

iii) Product Identification Test and Rheological Properties
Results for the binder(s) proposed shall comprise rheological data for each binder in the form of complex shear (stiffness) modulus (G*) and phase angle (δ) determined in accordance with Clause 956 for binder as supplied, after RTFOT and after RTFOT and Ageing in accordance with Clause 955.

iv) Storage Stability Test
All binders shall be stored strictly in accordance with the manufacturer's instructions. Polymer modified binders claimed to remain homogeneous in storage without agitation shall be tested for storage stability in the manner described in Clause 958. The mean of the differences in softening point between the top and bottom samples, of not less than five pairs of such samples shall not exceed 5ºC. Manufacturers of pre-blended modified binders shall state what precautions are necessary to ensure that adequate homogeneity is maintained during storage.

v) Photomicrograph
A typical photomicrograph of the modified binder and binder using ultra-violet or other technique to provide maximum contrast of the polymer structure to the

binder before modification shall be supplied together with details of sample penetration techniques.

vi) Cohesion
Vialit Pendulum cohesion test curve of the binder, in accordance with Clause 957 for the binder as supplied, after RTFOT and after RTFOT and Ageing in accordance with Clause 955.

vii) FRAASS Brittle Point
FRAASS Brittle Point measured using BS EN 12593 shall be provided on the binder as supplied, after RTFOT and after RTFOT and Ageing in accordance with Clause 955.

Summary of Binder Data

Manufacturer of binder:	Product name		
Binder type:		Batch ref:	
Binder source:			
Softening point difference in storage stability test			
Test	Supplied binder	After RTFOT	After Ageing
Penetration at 25 ºC 0,1mm (100g and 5 secs)			
Penetration at 5 ºC 0,1mm (200g and 60 secs)			
Vialit pendulum cohesion see Clause 939 maximum peak value J/cm^2	#	#	#
Product identification test	#	#	#
Complex shear (stiffness) modulus (G*) and phase angle (δ) data. See Clause 928			
Fraass brittle point			
Other properties the *Contractor* considers useful			

Where indicated with # the *Contractor* shall attach a graphical output to this schedule.

8 Mixture Data Requirements - Schedule 8

8.1 The following data should be provided to *The Employer* for materials designed in accordance with Clause 901.17 and 929 in respect of the proposed mixture.

I. Saturation Ageing Tensile Stiffness (SATS) ratio – as described in Clause 953

APPENDIX 7/2: EXCAVATION,TRIMMING AND REINSTATEMENT OF EXISTING SURFACES

1 Construction Joint between New and Existing Pavements

1.1 The tie-in details between new and existing pavements are shown on Standard Detail Drawing No.s SD-0700-001 to SD0700-005.

2 Running on Temporary Surfaces and Forming of Ramps

2.1 Where, in the course of the construction, *The Contractor* proposes to temporarily run traffic on a road surface that is either higher or lower than the adjacent surface, the transverse transition between the two levels shall be at the rate of 1 in 15 or shallower. Traffic shall not be permitted to cross longitudinal joints where there is a level difference between adjacent surfaces. Temporary ramps shall be formed to raised or lower ironwork to the same rate. Ironwork shall not be left higher than 50mm above nor lower than 50mm below the level of the adjacent running surface outside permitted working periods. *The Contractor* shall allow in his rates for modifying and re-modifying the level of the ironwork as appropriate as the work progresses to comply with this requirement.

3 Trench Reinstatement

3.1 For details of trench reinstatement in bituminous pavement, refer to Standard Detail Drawing No. SD-0700-002.

APPENDIX 7/4: BOND COATS, TACK COATS AND OTHER BITUMINOUS SPRAYS

1 General

1.1 Location: A bituminous tack or bond coat is required on all existing and planed surfaces immediately prior to the placing of inlays/overlays including vertical faces of the longitudinal and transverse joint interface with existing surfacing.

1.2 *The Contractor's* attention is drawn to the fact that a tack or bond coat is required when laying thin surface course systems. The tack or bond coat shall be designed as an integral part of the approved proprietary thin surface course system, refer to Clause 942. Details of the material are to be made available to *The Employer* for approval in advance of the works.

1.3 Surface Preparation shall be carried out in accordance with BS594987, or for certified products, in accordance with the BBA HAPAS certificate. Before spraying is commenced the surface shall be free of all loose material and standing water.

1.4 Masking of street furniture: The kerbs, concrete edge channels, gully gratings and frames, manhole covers, frames and street furniture shall be masked using self-adhesive masking material before application starts and removed prior to the completion of the works.

1.5 Bond or tack coats shall be applied at the rates detailed in the BBA HAPAS certificate, or in the absence of such certificates, in accordance with Table 3 of BS594987.

1.6 Blinding material shall consist of hard clean crushed lime aggregate or slag fine aggregate or sand containing not more than 15% by mass retained on a 6.3mm sieve. It shall be distributed over the sprayed area and left.

2 Information to be Provided by The *Contractor*

The Contractor shall provide the following information prior to commencement of the work:

a) The product *The Contractor* proposes to use together with their data sheets, product identification data and cohesivity data as specified. This can be specified on the binder data sheet contained within this Appendix.

b) For each product a copy of the BS EN ISO 9001 certificate showing the name of the manufacturer, the name of the certification body and the reference number and date of the certificate.

c) The spraying equipment proposed and a test certificate.
d) The source or sources of the blinding material proposed.

e) Contingency plans in the event of any breakdown.

f) The results of any other tests or other data *The Contractor* considers would assist *The Employer* in assessing the technical merit of the treatment such as:

i) Tackiness test and / or trafficability time and methods of test

ii) Breaking time test results for different weather conditions and substrates

iii) Test results for bond to newly laid concrete (from a BBA / HAPAS certificate if available). The data supplied should not be more than 6 months old

Binder Data Sheet – Appendix 7/4	**Bond Coats, Tack Coats and Other Bituminous Sprays**	
Manufacturer of Binder:	Product Name:	
Binder Type	Batch No.:	
Binder Grade Conventional Intermediate Premium Super-premium Non-tack Other		
Binder Source →	**Recovered Binder**	**Recovered Binder after Ageing Test**
Test ↓	Recovered in accordance with Clause 955	Aged in accordance with Clause 955
Penetration at 25°c 0,1mm (100g 5 sec)		
Penetration at 5°c 0,1mm (200g 60 sec)		
Vialit pendulum cohesion see Clause 957 maximum peak value J/cm^2	The *Contractor* shall attach a Report and graphical output to this schedule as specified in Clause 957.	The *Contractor* shall attach a Report and graphical output to this schedule as specified in Clause 957.
Product identification test. **The provision of data for identification and ageing is optional**	The *Contractor* shall attach a	The *Contractor* shall attach a

for unmodified bituminous emulsions to BS 434 and for bitumen to BS EN 12591 and cutback bitumen to BS 3690. Complex shear (stiffness) modulus (G*) and phase angle (δ) data. See Clause 956.	Report and graphical output to this schedule as specified in Clause 956.	Report and graphical output to this schedule as specified in Clause 956.
Other properties the *Contractor* considers useful: Minimum binder content Binder temperature range for spray application Emulsion Properties and Viscosity Break time Breaking Agent type Weather limits – information from binder manufacturer: road or air temperatures; humidity; wind chill adjustment; tolerance of surface dampness; et cetera. Temperature max; Temperature min: Other:		

APPENDIX 7/6: BREAKING UP OR PERFORATION OF EXISTING PAVEMENT

1 Breaking up and Perforation of existing pavement areas

1.1 For locations showing the treatment to the existing hard paved areas, refer to the sheme drawings.

1.2 Existing pavements to be retained that are beneath areas of new construction shall have 100mm diameter holes punched through the bitumen or cementitious layers at 1.0m centres such that the pavement structure is broken up sufficiently to permit free drainage and root penetration.

APPENDIX 7/9: COLD-MILLING (PLANING) OF BITUMINOUS BOUND FLEXIBLE PAVEMENT

1 General

1.1 Cold milling is required where tying some pavement types into the existing pavement.

1.1 Cold milling requirements are dependent on the pavement type and are shown on the scheme drawings.

APPENDIX 11/1: KERBS, FOOTWAYS AND PAVED AREAS

General

1.1 Kerbing, footway and paved area details are shown in the drawing package and standard detail drawing numbers SD-1100-001 to 026.

1.2 All footway surfacing and paved block units shall be laid to true levels and crossfalls, as detailed in the setting out information contained within Appendix 1/12 and as agreed on site by the *Employer*.

1.3 All Kerbing shall be set out in accordance with the setting out information contained in Appendix 1/12, and clause 1101.5 of the Specification for Highway Works.

2 Kerbing (including Channel Blocks)

2.1 Kerb upstands are shown on drawing number SD-1100-001, 002, 004, 006, 025, 026

2.2 Channel Blocks shall be installed flush with the adjacent footway surface, and as shown on Standard Detail Drawing No. SD-1100-002.

2.3 Kerbing radius work shall comply with the following:

i) Radius of 12m or less – Kerbs manufactured to an appropriate radius.
ii) Radius between 12m and 20m – Straight kerbs of a consistent length in the range 450 to 600mm.
iii) Radius of 20m or greater – Straight kerbs.

2.4 All Kerbs shall be precast concrete, grey in colour with a standard finish. Where specified the Kerbing, Footway and Paved Areas Series Drawings, a precast concrete grey in colour textured finish kerb shall be provided. The textured finish is to be approved by *The Employer* prior to works commencing.

2.5 All Channel Blocks shall be precast concrete and grey in colour.

2.6 All Kerb and Channel Block units shall comply with the performance levels outlined in BS EN 1340.

2.7 Kerbing and Channel Blocks shall be laid in accordance with BS 7533:6

2.8 Kerbing and Channel Blocks shall be arranged to minimise cutting. Where cutting and/or trimming is required, cut pieces shall not be less than 300mm in length.

3 Footway/Cycleway Construction – Flexible Surfacing (Construction)

3.1 Flexible Footway/ Cycleway Surfacing materials shall be made and laid in accordance with BS5949:87.

3.2 Where a red coloured flexible footway/ cycleway surface is required, a red pigment is to be added to the footway surface course. The exact colour is to be agreed on site with the Employer.

4 Footway/Cycleway Construction – Concrete Surfacing (Construction Type F)

4.1 The Concrete Surfacing shall be made of ST5 concrete. The Concrete Surfacing shall have a U1 with a 'brushed' finish and the outer edges shall be rounded off to a radius of approximately 5mm.

4.2 *The Contractor* shall provide temporary formwork around the perimeter of the Concrete Surfacing which is capable of supporting the concrete until it has cured. This formwork will be removed once the concrete has cured.

4.3 Movement joints shall be provided within the Concrete Surfacing at 6m centres, and as agreed on site by *The Employer*. These shall stretch the full width and depth of the Concrete Surfacing.

4.4 The movement joints shall be filled with softwood timber, which shall be preserved in accordance with sub-clause 311.2(i) of the Specification for Highway Works.

5 Verge Construction – Reinforced Grass (Construction Type H)

5.1 Reinforced Grass shall consist of precast concrete paving units, earth brown in colour, and the individual units shall have the dimensions shown on Standard Detail Drawing No SD-1100-010.

5.2 The concrete used for the paving units shall have a minimum Compressive Strength class of C28/35 when tested in accordance with BS EN 1339, the Characteristic Bending Strength shall be Class 3 to Table 5 of BS EN 1339, and the Water Absorption shall be Class 2 to Table 4.1 of BS EN 1339.

The perforations shall be filled with Class 5 topsoil in accordance with Clause 618 of the Specification for Highway Works, levelled off 30mm below the top surface of the paving and sown with road verge grass mix as detailed on the Landscape Series Drawings.

The grass seed shall be sown while the soil is still loose after filling. After the grass seed has been sown, it shall be covered with a further layer of Class 5 topsoil up to the top level of the paving.

6 Footway/Cycleway Construction – Blister, Ladder and Corduroy Paving Flags (Footway Construction Types K and L)

6.1 Crossing point types and construction details for Ladder, Corduroy and Blister paving are shown on Standard Detail Drawings No. SD-1100-017 to 021.

6.2 Blister, Ladder and Corduroy Paving Flags shall be precast concrete and comply with the performance levels outlined in BS EN 1339.

6.3 Blister, Ladder and Corduroy Paving Flags shall be laid in accordance with BS 7533:4 and 'Guidance on the use of textile paving surfaces www.dft.gov.uk'.

6.4 Blister, Ladder and Corduroy Paving Flags shall be arranged to minimise cutting. Where cutting and/or trimming is required, cut pieces shall not be smaller than a quarter of the original plan size of the flag.

6.5 Blister Paving Flags shall be red in colour at controlled crossing points and buff in colour at uncontrolled crossing points, and the individual flags shall have the dimensions on Standard Detail Drawing No SD-1100-018.

6.6 Blister Paving Flags shall be installed across the full width of the dropped bullnosed kerb (BN), with the rear edge of the Blister Paving arrangement at 90 degrees to the direction of crossing.

6.7 Ladder and Corduroy Paving Flags shall be either buff or grey in colour and the individual flags shall have the dimensions and arrangements shown on Standard Detail Drawing No. SD-1100-018.

6.8 Corduroy Paving Flags shall be installed at 90 degrees to the direction of travel, be either buff or grey in colour.

APPENDIX 12/1: TRAFFIC SIGNS: GENERAL

1 General

1.1 Details of any existing signs to be removed, retained or re-used are shown within the drawing package.

1.2 Sign and post erection details are shown on Standard Detail Drawing No.'s SD-1200-001, 027, 028 and 040.

2 Sign Plates and Faces

2.1 Sign plates shall be constructed of and covered with a material that complies with BSEN12899-1:2007.

2.2 Sign plates shall be stiffened using aluminium channel stiffeners. These stiffeners shall be capable of supporting the sign plate and where necessary spanning the gap between the posts.

2.3 Sign face material shall be of plastic coating type and shall comply with the requirements of BSEN12899-1:2007.

2.4 Sign face material shall have Retro-Reflective Characteristics RA2 in accordance with BSEN12899-1:2007.

2.5 Where existing sign faces are to be reused, any redundant fixing holes are to be securely plugged with an appropriately coloured and sized plastic plug.

2.6 All existing sign faces that are to be reused shall be cleaned thoroughly with warm water before being re-erected.

3 Sign Posts

3.1 Sign posts shall be hollow tubular steel sections treated as described in BSEN12899-1:2007 and Clause 1204 of The Specification for Highway Works.

3.2 Sign posts shall be galvanised in accordance with BSEN1461 and topped with an Aircraft Grey coloured watertight cap.

4 Sign Erection and Installation

4.1 The locations and orientations of all proposed signs will be shown in the drawing package. The exact locations and orientations are to be agreed on site with *The Employer* prior to installation.

4.2 Foundation types will be detailed within the drawing package. These should be cross referenced with the relevant Standard Detail Drawing

4.3 All posts shall be provided with base plates as detailed on Standard Detail Drawing No. SD-1200-001.

4.4 Posts are to be spaced as directed by *The Employer*. Post A is always the post nearest to the carriageway, Post B (if required) is the next post from the carriageway.

4.5 The lateral clearance is measured from the edge of the sign face to the edge of carriageway. The minimum lateral clearance is 450mm.

4.6 The mounting height is taken to be the minimum vertical clearance from ground level to the underside of the sign.

4.7 Signs shall be fixed to posts using sign clips, universal channel clips or similar clips that are approved by *The Employer*. Single and double faced finger post signs shall be fixed using anti-rotation clips.

4.8 Signs mounted back-to-back shall have two uniclip halves used together, or for signs not exceeding 0.3m in any dimension back-to-back sign clips or similar clips that are approved by *The Employer*.

4.9 If *The Contractor* wishes to use any other method of fixing then the prior approval of *The Employer* must be obtained.

4.10 Following the erection of signs, *The Employer* shall provide *The Contractor* with a schedule of maintenance numbers. *The Contractor* shall provide and affix to each sign a label showing the maintenance number in 75mm high black characters on white reflectorised background. The characters shall be arranged vertically. The label shall be located on the rear of the sign plate with the lower edge 50mm above the lower edge of the sign. Before the label is affixed the rear of the sign plate shall be cleaned and primed. After fixing the label shall be sealed. Materials and methods of fixing shall be in accordance with the label manufacturers instructions.

4.11 All posts erected within a footway or footway/cycleway shall have a white reflective band fitted to it. This band shall be 100mm in width, extend around the full circumference of

the post, be mounted 1.5m above ground level, have an adhesive back, and have Retro-Reflective Characteristics RA2 in accordance with BSEN12899-1:2007.

5 Temporary Sign Coverings

5.1 Any traffic sign erected at such a time that its legend does not relate either wholly or in part to the traffic movement and route in operation, shall have its sign face securely covered with one of the materials in sub-Clause (i) and (ii) of this Clause until such time as its legend is applicable.

i) for plate signs: A cover plate compatible with the plate signs material, or a covering of a suitable, opaque, non damaging material, or, for covering periods of up to one year, a self adhesive plastic film to support the temporary sign face sheeting;
ii) for other traffic signs: A covering of a suitable, opaque, non damaging material.

5.2 Cover plates shall be suitably fixed to give a 10 mm minimum air gap between the sign face and cover plate. The fixing method shall not cause damage or staining to the sign face. Any holes remaining in the finished sign face after removal of the plate shall be filled with a suitable material, of a colour to match that part of the face.

5.3 Where self adhesive plastic film is used it shall be compatible with the sign face materials and be applied and removed in compliance with the manufacturer's instructions.

5.4 Any loose covering used must be sufficiently opaque to prevent reflection and legibility of the covered sign and be securely fastened to the back of the sign. Under no circumstances shall tape or other adhesive material be applied to the face of the sign. Sufficient space shall be left between the covering and the face to permit air flow over the sign.

5.5 Traffic signs which are to be covered shall not be erected on trafficked highways without the covering in place

5.6 Removal of any covering shall be carried out with the minimum disturbance to traffic.

6 Existing and Proposed Signs Schedule

6.1 The sign diagram numbers shown refer to the Traffic Signs Regulations and General Directions 2016

6.2 During the currency of the Contract it may be necessary for The Employer to issue a revised Signs Schedule. Prior to commencement of manufacture *The Contractor* shall consult *The Employer* on this matter.

6.3 The "New Roundabout Ahead", "New Traffic Signals Ahead" and "New Road Layout Ahead" signs to diagram number 7014 and 7014v shall remain in position for a period of

3 months after completion of the works. *The Contractor* shall be responsible for removing these signs and associated posts and foundations after receiving written approval from *The Employer* to do so. Upon removal *The Contractor* shall make good the footway surface or grass verge as agreed with *The Employer*.

6.4 Post type abbreviations shown on the Schedule Sheets are:-

- LB Large Base Post (Illuminated signs only)
- ST Straight Post
- LC Light Column
- RP Recycled Plastic

7 Footway/Cycleway Bollards

7.1 Sign plates shall be constructed of and covered with a material that complies with BSEN12899-1:2007.

7.2 Sign face material shall have Retro-Reflective Characteristics RA2 in accordance with BSEN12899-1:2007.

7.3 The locations and orientations of all proposed bollards, will be shown on within the drawing package. The exact locations and orientations are to be agreed on site with *The Employer* prior to installation.

7.4 Bollard colours to be black with retroreflective banding in white. The height above ground should be 1012mm with a main stem diameter of 150mm. The maximum width to be 280mm with a sign face diameter of 150mm.

7.5 Foundation fixing to be a below-ground Socket System, with anti-left locking device. The socket to be embedded on 100mm of gravel for drainage purposes.

7.6 A hole size of approximately 400mm dia by 600mm deep.

7.7 A keyhole plug is required for extra security.

7.8 White reflective banding is required around the bollard (2no.)

8 Solar Internal Illuminated Bollards

8.1 Sign plates shall be constructed of/covered with a material that complies with BS 8408:2005.

8.2 The entire bollard unit must comply with BS 8442:2006 (retro reflective self righting bollards).

8.3 The entire bollard unit must comply with BS EN 12767-2:2007 (passive safety).

8.4 The battery must be housed below ground for capacity and extra safety reasons.

8.5 The unit must have a minimum of 120 days reserve power.

8.6 The battery life for the unit must be guaranteed for a minimum of 5 years.

8.7 All bollards shall comply with the current "Traffic Signs Regulations and General Directions"; the "Traffic Signs Manual", and to BS 873.

8.8 The entire unit must achieve a minimum lateral clearance of 450mm.

8.9 The locations and orientations of all proposed bollards will be shown within the drawing package. The exact locations and orientations are to be agreed on site with *The Employer* prior to installation.

APPENDIX 12/3: TRAFFIC SIGNS: ROAD MARKINGS AND STUDS

Permanent road markings

1.1 The locations of road markings will be shown within the drawing package.

1.2 All permanent white markings shall be of white thermoplastic material to BS EN 1871, as described in Clause 1212.2.

1.3 All permanent yellow markings shall be of primrose thermoplastic material to BS EN 1871, as described in Clause 1212.2.

1.4 All permanent and temporary road markings shall be reflectorised in accordance with BS EN 1436:2007 and as shown in the table below:

Condition	Type	Colour	Class
Dry	Permanent	White	R4
Dry	Permanent	Primrose	R3
Dry	Temporary	White/ Primrose	R3
Wet	Permanent	White/ Primrose	RW3

1.5 All permanent road markings shall have minimum skid resistance of 55 in accordance with Class S3 to BS EN 1436:2007.

1.6 Temporary removable road marking material when laid on permanent carriageways shall be in accordance with BS EN 1790 and be capable of removal without damage to the carriageway surfacing.

1.7 All markings are to comply with the Traffic Signs Regulations and General Directions 2016 and The Traffic Signs manual, Chapter 5, 2019 edition.

1.8 Any conflicting road markings are to be removed as agreed by *The Employer*.

1.9 Raised separation line to Diagram 1049.1 to have 20mm gaps at 5m centres for drainage purposes.

Temporary Covering/ Removal

2.1 Temporary covering of road markings shall be at locations and using materials approved by *The Employer*.

2.2 Where existing road markings would contradict temporary diversion routes, the complete marking shall be removed.

SIGN SCHEDULES

APPENDIX 12/5: TRAFFIC SIGNS – TRAFFIC SIGNALS

1 Scope of Traffic Control Works

1.1 The traffic control works shall include for the supply, installation and commissioning of Traffic Signals and associated works to include the following:

i) Supply of Traffic Signal Equipment as detailed in the drawing package and schedule of equipment
ii) Installation of Traffic Signal Equipment as detailed in the drawing package and schedule of equipment
iii) Supply and installation of a new Traffic Signal / Toucan Crossing / Puffin Crossing controllers
iv) Supply and installation of CCTV cameras as detailed with the drawing package and specification
v) Supply and installation of multicore and feeder cable in line with the information provided within the drawing package and specification (cable schedule to be developed by the specialist signal contractor in line with the drawing package and specification).
vi) Removal of all existing traffic signal equipment

1.2 The existing traffic signal installations are connected to the County's UTMC or RMS systems and it is the intention to re-utilise the existing communications system (ADSL / PSTN / Fibre). This element of the work will be arranged and funded by Somerset Council although there may be requirement for the *Contractor* to provide additional ducting over and above the information contained within the drawing package. This will be charged as an addition using contracted rates.

1.3 The majority of new refurbishments will require a new power supply, and this will be arranged and funded by Somerset Council although there may be requirement for the *Contractor* to provide additional ducting over and above the information contained within the drawing package. This will be charged as an addition using contracted rates. The *Contractor* will be required to supply and install a suitable feeder pillar as per the information contained within the drawing package and specification.

1.4 The traffic signal junctions will likely require a new configuration as the method of operation will be upgraded perm installation. It will be the responsibility of Somerset Council to provide the new configuration and will undertake the Factory Acceptance via an existing supplier contract.

1.5 The traffic signal junctions will be fitted with the MOVA control system with some also fitted with the UTMC control system. Somerset Council will arrange and fund any

validation of each of these systems via an existing supplier contract. This will include setting up of the UTMC database and provision of MOVA datasets. The *Contractor* will be required to provide the UTMC and MOVA equipment and license as detailed within the schedule of equipment.

1.6 The *Contractor* will be expected to set up any new CCTV cameras whereas Somerset Council will set up the database at County Hall. The *Contractor* should demonstrate operation of the CCTV camera locally at the signal installation.

1.7 The *Contractor* will be responsible for maintenance of any new traffic signal installation for a minimum period of one year as detailed in Section 4 of this appendix.

2 Approved Suppliers and Contractors

Specialist Traffic Signal Contractor

2.1 The supply and installation of traffic control equipment in Somerset shall only be undertaken by a Specialist Traffic Signal Installation Sub-Contractor approved by the TCU. A competency check will be carried out by the TCU to check that the Specialist Traffic Signal Installation Contractor/Sub-Contractor complies fully with the TA84/06 'Code of Practice for Traffic Control and Information Systems for All-Purpose Roads'. In order for the TCU to carry this check out, relevant CV's and training records of all personnel who will be employed by the Specialist Traffic Signal Installation Contractor/Sub-Contractor shall be submitted to the Highway Authority so that approval for the personnel can be given.

2.2 A list of approved Traffic Signal equipment suppliers, installation and maintenance contractors are:

Dynniq UK
Hazelwood House
Lime Tree Way
Chineham Business Park
Basingstoke
RG24 8WZ

Motus Traffic
342 Coleford Road
Darnall
Sheffield
S9 5PH

Siemens Mobility, Traffic Solutions
Sopers Lane
Poole
Dorset

BH17 7ER

3 Traffic Signal Specification

3.1 The supply and installation of traffic control equipment in Somerset shall only be undertaken with reference to Somerset Technical Advice Note 11/17 Specification & Guidelines for the Design, Installation and Maintenance of Traffic Signals in Somerset (latest version) which effectively forms this Appendix 12/5.

4 Scope and Extent of Maintenance and Handover Requirements

4.1 The *Contractor* shall employ sufficient qualified technical staff to enable the installation and maintenance of the new installation to be performed in a satisfactory manner.

4.2 Full CV profiles of all persons to be employed on the maintenance of the new traffic signals, shall be submitted to The Employer by The *Contractor* prior to any works commencing on site.

5 Maintenance Requirements

5.1 The Maintenance Period is defined as 'the 12 month period following the issue of the Final Site Acceptance Test Certificate and when the installation has completed 30 fault free days of operation leading up to the end of the 12 month period'. If the installation has not run fault free for 30 days then the Maintenance Period will be extended until the installation does run fault free for 30 days.

5.2 The Maintenance Period shall not be deemed to have started until a Final Site Acceptance Test Certificate has been issued by The Employer. Furthermore the Maintenance Period will not be deemed to have commenced until all items on the snagging list are resolved to the satisfaction of The Employer.

6 Lamp Changing

6.1 The *Contractor* is required to change lamps as and when required. The aspects supplied under this contract will be of LED construction.

7 Actions in the Event of Defects Occurring at the New Traffic Signal Installation

7.1 The Employer will monitor the new traffic signal installation via the RMS and report any faults direct to The *Contractor*.

7.2 The *Contractor* shall set up, at his own expense, a fault management system. The system must be able to receive, process and subsequently notify back to The Employer that a fault has been cleared. This can be a manual system.

7.3 The *Contractor* shall provide an out of hours fault reporting facility; out of hours are considered to be Mon to Fri 19:00 to 06:59, Saturday and Sunday all day.

7.4 The *Contractor* shall be responsible for meeting the following fault attendance requirements:

Fault Type	Notification	Attendance by:	Damage Repair within:
URGENT FAULT	Before 12:00hrs noon	16:00hrs same day	24hrs from Attendance
	12:00hrs to 18:00hrs	08:00hrs following day	24hrs from Attendance
	18:00hrs to midnight	16:00hrs following day	24hrs from Attendance
LAMP FAULT	Anytime	24hrs from being notified	24hrs from Attendance (but within signal heads mounted on gantries or Faults requiring armoured cable replacement within five Working Days).
LESS URGENT FAULT	Before 12:00hrs noon	12:00hrs following day	Five Working Days from Attendance (but for Faults requiring slot-cutting work within ten Working Days).
	12:00hrs to 18:00hrs	18:00hrs following day	
	18:00hrs to midnight	24:00hrs following day	

7.5 Any site attendance by The *Contractor* where a fault is not rectified must be reported to The Employer detailing the problem found.

7.6 Emergency Cover - Operates outside normal contract hours, seven days per week and is limited to the following:

- Gas explosion or prevention.
- An accident causing danger to the public.
- Other major dangerous situations.

7.7 The *Contractor* is expected to make all effort to be on site as soon as possible.

7.8 If The *Contractor* fails to comply with the fault attendance requirements above, then The Employer will instruct Somerset County Councils Term Maintenance Contractor to repair the fault. The full cost of this work, plus administration fee, will be payable by The *Contractor.* This applies to each individual fault reported to the Traffic Control Centre.

7.9 Full repair to URGENT faults shall be carried out by the end of the following contract day of notification of the fault to The *Contractor*.

7.10 Full repair to NON-URGENT faults shall be carried out within 40 contract hours of notification of the fault to The *Contractor*.

7.11 Under the terms of the 'Contract for the Maintenance of Traffic Control Equipment and Installations', financial penalties are imposed if any fault is not attended or repaired within the time specified. Full details of the penalties are available from The Employer.

7.12 It shall be the responsibility of The *Contractor* to supply any traffic management measures required to undertake the maintenance in a safe and effective manner.

7.13 A Fault Report is created identifying the Fault and its respective Fault Type together with the response time required. The *Contractor* carries out repairs to Traffic Signal and Ancillary Equipment whenever a Fault Report is generated.

7.14 When all work necessary to rectify and clear the reported Fault resulting from the issue of a Fault Report has been carried out by the *Contractor* the *Contractor* completes a Fault Clearance Report.

7.15 An Urgent Fault is defined as: -

a) All signals unlit or;
b) Signals failing to change or;
c) Signals giving conflicting indications or;
d) Pushbutton tactile and/or audible devices not working or;
e) Signals damaged and in a dangerous condition or;
f) Red lamp failure or;
g) Indicative green arrow failure at locations where there is only one IGA or filter arrow or;
h) Detection Faults that are not cable, loop or joint Faults or;
i) UTC and MOVA data transmission Faults or;
j) Lamps stuck on dim;

k) Defective signals which although not falling into any of the above categories will produce excessive queues and which have produced demonstrable abnormal traffic conditions which require urgent attention;
l) Head out of alignment.

7.16 A Lamp Fault is defined as: -

One signal aspect, one Wait indicator or one regulatory sign unlit when it should normally be illuminated. If two or more signal aspects or wait indicators are unlit then two or more Fault Reports will be issued.

7.17 A Less Urgent Fault is defined as a Fault that is neither an Urgent Fault or a Lamp Fault.

7.18 Damage Repair, Attendance and Notification are defined as follows:-

- "Damage Repair" means the complete restoration of the signal unit to perfect working condition;

- "Attendance" means to attend the site and commence action necessary to make the Traffic Signal and Ancillary Equipment safe and restore operation;

- "Notification" means the time in which the Fault Report is made available to the *Contractor*.

7.19 Where, in the opinion of SCC, a Fault occurs at any site that requires Attendance within a response time that is shorter than that set out above then he instructs the *Contractor* to provide an Emergency Response.

7.20 If the Fault reoccurs within 24 hours of the work being completed, then, unless the reoccurrence was clearly due to activity beyond the control of the *Contractor,* the Fault is re-reported as a continuation of the original Fault.

7.21 Where the *Contractor* responds to a Fault Report in accordance with the contract and no Fault whatsoever is found, the *Contractor* updates the Fault Management System specifying that the Fault has been cleared. No reimbursement of the *Contractor's* costs will be made.

7.22 Where the Fault Report indicates that Traffic Signal and Ancillary Equipment is in a state that is dangerous to the public (for any reason) then the *Contractor* makes the equipment safe (notifying the Service Manager accordingly) within the timescales set out for Urgent Faults unless the state is considered to be an emergency and as such the *Contractor*

attends and makes safe in accordance with this contracts Emergency Attendance procedures.

8 Hand-Over Inspection

8.1 The Employer or The *Contractor* shall organise and co-ordinate the Hand-Over Inspection. The Hand-Over Inspection will be carried out after the Maintenance Period has elapsed, in accordance with the preceding.

8.2 The inspection shall be attended by representatives from The *Contractor*, the Highway Authority Traffic Control Engineer, Somerset County Council's Term Maintenance Contractor and The Employer. The installation will be inspected and tested to ensure that it is in a safe and suitably fault free condition to be taken over by the Highway Authority.

8.3 Where faults are found during the Hand-Over Inspection, The Employer will prepare a list of those faults. The list of faults will be sent to The Employer and Contractor for rectification.

8.4 The *Contractor* shall have 30 working days in which to remedy the faults reported, except where the requirements of the Term Maintenance Contract require a more urgent repair time. If the faults are not rectified in that time period The Employer shall have the right to repair the reported faults using the Highway Authority's Term Maintenance Contractor. The Promoter will be liable to reimburse the Highway Authority for all reasonable costs associated with this action.

8.5 The Hand-Over Inspection will not commence until The Employer has the appropriate documentation is in place.

8.6 When the installation has passed the Hand-Over Inspection in accordance with the above, the Highway Authority will take over the maintenance of the traffic signal installation under its Term Maintenance Contract.

Installation Documents

Title
Slot Cutting Measurement Certificate
Cable Schedule - Extra Low Voltage (ELV)
Cable Schedule - Low Voltage (LV)
Cable Core Schedule
Signal Installation Electrical Test Certificate
Checklist for Installation Site Records
Traffic Signal Site Acceptance Certificate
Equipment Power Consumption Certificate
OMCU Installation Details Certificate

SLOT-CUTTING MEASUREMENT CERTIFICATE

Junction Location .....

Site Reference No ..... Sheet ..... of ..... Date of Measurement .....

Loop Identity	Slot-cutting (metres)		Underkerbs (No.)	Notes
	Flexible Pavement	Rigid Pavement		
Totals				

Signed ..... for and on behalf of ..... the *Contractor*

Signed ..... for and on behalf of *The Employer*

CABLE SCHEDULE - EXTRA LOW VOLTAGE (ELV)

Junction Location .....

Site Reference No ..... Date ..... Sheet..... of .....

Cable No.	No. of Cores	From	To
E1			
E2			
E3			
E4			
E5			
E6			
E7			
E8			
E9			
E10			
E11			
E12			
E13			
E14			
E15			
E16			
E17			
E18			
E19			
E20			

Signed ..... for and on behalf of ..... the *Contractor*

Signed ..... for and on behalf of *The Employer*

CABLE CORE SCHEDULE

Junction Location .....

Site Reference No ..... Sheet ..... of ..... Date of Measurement .....

Cable Core Colour	Cable Identity		Cable Core Colour	Cable Identity	
	Phase	Function		Phase	Function

Signed ..... for and on behalf of ..... the *Contractor*

Signed ..... for and on behalf of *The Employer*

SIGNAL INSTALLATION ELECTRICAL TEST CERTIFICATE

The tests detailed below are to be carried out prior to accepting the installation. Tests 2(a) and (b) are to be witnessed by *The Employers Representative*.

Installation Details

Junction/Location Reference ……..

Drawing No ..... Issue No ..... Date .....

Electricity Board cut-out fuse ..... Amps (recommended minimum rating, 30A).

Main switchfuse ..... Amps to be cartridge type to SS 1361 or 88.

Maximum prospective fault current ..... Amps at supply position.

Lamp circuit fuse ..... Amps to be cartridge type to BS 1361 or 88.

1. Insulation Tests (Minimum Test Voltage 500 VDC)

a) Multicore PVC/SWA cables.

Minimum resistance between cores ..... M ohms) if less than 10 M ohms
) record details
Minimum resistance between all cores and earth .....M ohms) overleaf.

b) Inductive loop and feeder cables

Minimum resistance to earth ..... M ohms (If less than 10 M ohms record details overleaf).

2. Line Earth Loop Impedance Test

a) Measured at controlled main earth terminal ..... ohms.

b) Measured at each single pole as detailed below.
(Maximum permissible values as per table
41B1 and B2 of IEE Regs ..... ohms).

3. Residual Current Device protecting all circuits */13A sockets only - Instantaneous operation YES*/NO when tested in accordance with 17th Edition on Site guide of the IEE Regulations. Designed minimum tripping current ..... mA.

(*delete as appropriate)

Pole *Number	Earth Loop Impedance	Distance from Controller	Nominal Calculated Value*	Remarks

*Note

a) Where push buttons have been provided, the earth loop impedance test is to be carried out at the normal signal pole top position and at the push-button unit - maximum reading is to be recorded;

b) The maximum value of Earth Loop Impedance recorded at any signal pole will normally not exceed 1 ohm, plus the value recorded at the controlled earth terminal. However, on very large installations where long cable runs are involved this value may be exceeded provided it relates to the nominal calculated value, and is below the maximum permissible given at 2(b). The actual overall earth loop impedance value will in almost every instance be lower than the nominal calculated value due to parallel earth paths. Typical values for 16 core 1 mm^2 PVC/SWA/PVC cable to BS 6346, Table 17 are: Core resistance 18.1 ohms/Km, steel wire Armour resistance 3.5 ohms/km, thereby producing a nominal series loop resistance of 2.16 ohms/100 metres.

Remarks

The Contractor.....*The Employer*.....

Signature ⋯..... Signature .....

Name .....Name⋯.....

Date ..... Date .....

Checklist for Installation Site Records

Site Name ……

Site Reference Number ……..

All of the following documents are to be supplied prior to the Hand-over Inspection and prior to acceptance by the Highway Authority. All items shown with an asterisk must be supplied prior to the Site Acceptance Test commencing.

	To Be Supplied
Signal equipment schedule*	
Controller configuration file (hardcopy) *	
Controller configuration file (electronic copy)	
FAT documentation (provided by SCC nominated contractor)	
Green conflict test certificate *	
Loop resistance schedule*	
Cabling schedule *	
Electrical Completion Certificate and ELI schedule *	
Earth Loop Impedance test schedule for poles and controller *	
Interim Site Acceptance Test certificate	
Final Site Acceptance Test certificate	
MOVA dataset (electronic copy) – (provided by SCC)	
Fully updated As-Built drawing (electronic copy provided)	
Junction staging diagram	
Stage 1 Safety Audit (provided by SCC)	
Stage 2 Safety Audit (provided by SCC)	
Stage 3 Safety Audit (provided by SCC)	
All exception responses to Safety Audits (provided by SCC)	

Copy of site diary	
Pre-Construction Health and Safety Plan	
Construction Phase Health and Safety Plan	

TRAFFIC SIGNAL SITE ACCEPTANCE CERTIFICATE

Tests	**Signed**	**Remarks**
Factory Acceptance Test (SCC to provide)		
Site Acceptance Test		

Documents	**Provided**	**Remarks**
Slot Cutting Measurement Schedule		
Cable Schedule - Extra Low Voltage (ELV)		
Signal Installation Electrical Test Certificate		
Manufacturers Handbooks for Equipment		
OMCU Installation Details Certificate		

Equipment	**Provided**	**Remarks**
Access Devices		
Configuration (Provided by SCC)		

Outstanding defects to be corrected by the *Contractor* within 5 working days of commissioning.

NB: This form to be completed by *The Employer*.

Signed ..... for and on behalf of the ..... the *Contractor*

Signed ..... for and on behalf of *The Employer*.

EQUIPMENT POWER CONSUMPTION CERTIFICATE

Power Supply Requirements of Equipment to be supplied.

a) Average power consumption of controller, detection and lamps (including wait lamps and internally illuminated Regulatory box sign lamps).

..... Watts

b) Peak Current ..... Amps

c) Electricity Supply Company Cut-out fuse rating ..... Amps

OMCU INSTALLATION DETAILS CERTIFICATE

S.C.N./SITE:
INSTALLED BY:
COMMISSIONED BY:

Phase	Description	Type
1a		
2b		
3c		
4d		
5e		
6f		
7g		
8h		

Det	Description
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	

Det	Description
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	
27	
28	
29	
30	
31	
32	

Date:
Time:
Site telephone no:
B.T. line/GSM connected: Y/N

Comments:

Dimming: Y/N
Rack used: Y/N Size:

APPENDIX 13/1: INFORMATION TO BE PROVIDED WHEN SPECIFYING LIGHTING COLUMNS AND BRACKETS

1 Location

1.1 Types and locations of new street lighting columns and brackets are shown on the scheme drawings.

2 General Lighting Column and Bracket Specification

a) All components and brackets supplied must be manufactured by a company accredited under the quality assurance scheme BS EN ISO 9001: 2008 and the *Contractor* must, when requested to do so, supply to the Service Manager a copy of the appropriate accreditation documentation prior to any purchases or erection of lighting columns and brackets under the contract.

b) All columns and brackets shall be manufactured, supplied and installed in accordance with the requirements of BSEN40 with a minimum design life of 40 years. All columns shall have a minimum wall thickness to the base of the column of not less than 5mm irrespective of design criteria. 8 metre columns shall have a minimum shaft diameter of 114.3mm, 10 metre / 12 metre columns shall have a minimum shaft diameter of 139.7mm.

c) Design of the columns shall include for a sign loading of 0.3 m^2 x 1.8 shape Coefficient for 5m / 6m columns and 1.0m^2 for 8m/10m/12m columns.

d) All lighting columns and brackets shall carry a unique identification mark which indicates the name of the manufacturer, the year of manufacture and an identification number to enable details of the column and bracket to be determined throughout the design life of the column. This information shall be clearly visible after erection of the column.

e) The lighting columns and brackets shall be manufactured from steel which meets the requirements of BSEN40-5 2000. All columns shall be of tubular steel design and shall be manufactured from the following: -

   i) Hot finished circular hollow sections to EN10210 Part 1 Grades S235, S275 & S355 JOH;

   ii) Cold formed circular hollow sections without subsequent heat Treatment to the dimensional requirements of EN10219 Part 2 and the chemical and mechanical properties of EN10219 Part 1 Grade S235, S275 & S355 JOH.

f) The finished feedstock material shall comply with the yield, tensile and elongation requirements of the required grade specified in BSEN10025: 1993 Table 5.

g) The thickness of the circular hollow section used in the manufacture of the columns shall be purchased such that the negative tolerance is limited to –6%.

h) The manufacturer shall provide suitable scale drawings detailing the appearance and all measurements including tube diameters of the proposed columns and brackets. These shall be submitted for approval prior to the delivery of any columns or erection of such under the contract.

i) The column base to shaft joint shall be of a swaged and welded construction with an internal centralising washer.

j) The lighting column base compartment shall comply with the requirements of BSEN40 and shall have a minimum opening of: -

i) 500 mm x 100 mm (clear opening) for 5 m and 6 m columns;
ii) 600 mm x 115 mm (clear opening) for 8m 10m and 12m columns;
iii) 500 mm x 115 mm (clear opening) for twin door columns.

k) Door openings shall be free from irregularities and burrs and all doors shall have a suitable earthing lug on their internal face.

l) The door shall be wrap around with a single clamp fixing arrangement , M8 tri-head stainless steel bolts and 'y' type locking bar.

m) The same pattern of door lock is to be used throughout on all columns supplied and the door shall come assembled on the column.

n) The thread on the column door mechanism must be greased to ensure the lock can be freely moved at any time and to prevent rusting.

o) All columns shall be provided with and earth lug at the bottom left-hand side of the gear compartment to fit the earth wire.

p) All lighting column welding procedures must be approved in accordance with the requirements of BSEN288 and all welders must be approved to the requirements of BSEN287. Welding is then carried out in accordance with BSEN1011.

q) Brackets where used shall be side entry with a welded gusset and have a 0.5m 1.0metre or 1.5 metre projection with 2^{o} constant rise. Brackets shall only be provided by the same manufacturer as the columns unless supplied for decorative columns.

r) There shall be no sharp edges within the columns or bracket arms which could damage electrical cables either during installation or while in service.

s) A full length baseboard 15mm thickness at least equivalent to the door size of treated hardwood shall be provided and fixed in the base compartment and shall be of sufficient size to accommodate all control equipment and service cut-outs.

t) Columns and brackets shall be structurally designed to be capable of Accepting lanterns with the following minimum weight and windage area: -

5 m post top	10.0kg	.08m^2
6 m post top	10.0kg	.08m^2
8 m post top	15.0kg	.13m^2
10 m post top	15.0kg	.13m^2
12 m post top	15.0kg	.13 m^2
5m side entry (0.3m projection) hockey stick	10.0kg	.08 m^2
6m side entry (0.75m projection)	10.0kg	.08 m^2
8m side entry (1.25m projection)	15.0kg	.13m^2
10m side entry (1.5m projection)	15.0kg	.13m^2
12m side entry (1.5m projection)	15.0kg	.13m^2
5m mid-hinged raise & lower	10.0kg	.08m^2
6m mid-hinged raise & lower	10.0kg	.08m^2
8m mid-hinged raise & lower	15.0kg	.13m^2
10m mid-hinged raise & lower	15.0kg	.13m^2

Terrain category 11 for 5m & 6m columns, Terrain category 1 for 8m, 10m & 12m columns. 10 min Mean Wind Velocity 23.5 m/sec. Maximum Altitude 174 Metres. Rationalised Wind Factor 429 n/mm^2. Rationalised Wind Region Medium.

u) All columns shall be galvanised to BSEN1461 and shall be free from imperfections including porosity. Galvanising shall be fettled and rasped to remove all spikes and sharp edges and leave a smooth finish prior to finishing application. Minimum coating thickness 90 μm.

v) Columns supplied under this specification will be periodically checked for compliance with the specifications.

w) Manufacturers recommendations shall be adhered to regarding method of off-loading, storing and assembling the columns and brackets and for securing the brackets to the columns.

x) Root Protection A

i) Pre-treat galvanised external and internal surface of the root to 250mm above ground level with a "T" Wash application to be fully in accordance with Technical Data Sheet (shop applied).

ii) Apply one coat of PPA571 thermoplastic cross-linked copolymer to the external and

internal surface of the column root to 250mm above ground level providing a uniform thickness of not less than 600μm colour Black (shop applied).

y) Root Protection B

i) Pre-treat galvanised external and internal surface of the root to 250mm above ground level with a "T" Wash application to be fully in accordance with Technical Data Sheet (shop applied).

ii) Apply one coat 2 pack extended cure epoxy M.I.O to the external and internal surface of the root to 250mm above ground level minimum dry film thickness 100μm (shop applied).

iii) Apply one coat Epidac 2 Glass Reinforced Epoxy to the external surface of the root to 250mm above ground level minimum dry film thickness 200μm (shop applied).

z) All lighting columns shall be packed at contact points for transport and storage to protect the finish.

aa) All columns, brackets and associated equipment shall be manufactured within the E.E.C.

bb) When supplying root protection A (thermoplastic finish) the minimum gauge steel requirement specified in SS04 Section 12b) above may revert to standard design requirements to suit the specified loadings.

cc) 8 / 10 / 12 metre columns shall be designed to carry the following additional loads but shall not carry any of the sign loading listed above in SS04 Section cc)

i) Twin Hanging Baskets with a wet soil weight of 20kg for each single basket mounted at 2.5m above ground level.

OR

ii) Single Banner loaded on spring mounted banner arms 2.032 metres high x 0.762 metres mounted 2.1 metres from ground level to bottom of banner.

OR

iii) Christmas Decoration 1.5m^2 x 30% solid weighing 20kg mounted 2.100 from ground level to bottom of decoration.

dd) Proposed surface finishes around columns to be as set out in Appendix 14/4, Sections 10 (Reinstatement) & 17 (Reinstatements).

3 Aluminium Columns

a) All columns shall comply with BSEN 40 -1,3 & 6 and where specified will meet the requirements of the Highways Agency Department Standard BD94/07.

b) Columns shall be manufactured from a 6000 series aluminium alloy, which of marine grade.

c) The design of the column shall take into account maximum requirements for weight / windage of lantern requirements as per wind loadings stated in BSEN 40.

d) Columns shall be extruded in one piece to form a continuously tapered conical shape.

e) Columns shall be reinforced at the door opening by a strengthening tube by a CE Certified screw welded reinforcement profile, in compliance to EN40-3-3 type 5, to ensure there are no weak points.

f) Doors are to be laser profiled flush fitting with a stainless steel triangular lock and be fully interchangeable.

g) The columns are to be fitted with a channel rail with internal slip nuts to enable the adjustment of the hardwood backboard.

h) Columns are to be fitted with a separate stainless steel earth terminal located in the door aperture area.

i) The cable entry slot will be of a minimum size of 150 x 75mm and will be fitted with a cable protection sleeve.

j) The root section will be protected with a thermoplastic polymer, which will be applied by a heat system to the outer and inner surfaces of the root section, with a plastic base protector.

k) Columns are supplied in a brushed finish.

l) Where there is a requirement for passive safety then the documents BD 94/07 TA89/05 and EN12767 are considered in the calculation of the column.

m) When being used for passive safety columns shall meet the requirements of BSEN12767:2007 and be classified 100LE2 or 100NE2.

n) Certificates of conformity shall be supplied to the Service Manager upon request.

4 Passively Safe Columns and Brackets

a) Columns and brackets shall be designed to comply with BS EN 12767:2007 (Passive safety of support structures for road equipment – requirements, classification and test method) and TA 89/05 of the Design Manual for Roads and Bridges and shall be installed on all appropriate sites. The Service Manager shall advise the *Contractor* of sites where passively safe columns are to be employed.

b) An effective and safe system of automatic disconnection of the electricity supply to passively safe columns designed to fit into an underground chamber installed adjacent to the column and complying with TA 89/05 shall be adopted and shall be approved by the Service Manager prior to installation. The chamber and chamber cover must be selected to suit the application and take into account the load-bearing requirements of each particular site location. The connection box contained within the chamber must be capable of sealing to a minimum of IP67 and as required by BSEN60529. The electrical terminations shall be suitable for cables of between 6mm^2 and 35mm^2 and afford electrical isolation and protection.

5 Protection against corrosion for Standard Columns and Column Brackets, Wall / Pole Brackets, Traffic Sign Posts and Feeder Pillars

a) Steel columns, posts and/or bracket arms and all exposed ferrous metal shall, before leaving the factory of manufacture, be protected against corrosion by the process of hot dip galvanising on both internal and external surfaces in accordance with BSEN 1461 and be free from imperfections including porosity. Galvanising shall be fettled and rasped to remove all spikes and sharp edges and leave a smooth finish prior to any paint application.

b) The thickness of the galvanised coating shall not be less than 90 microns.

c) Steel columns and illuminated traffic sign posts are to be galvanised with the base compartment doors removed, which shall then be galvanised separately.

d) The external and internal galvanised surface below finished ground level and to a height of 250mm above finished ground level of all columns and posts shall be finished in accordance with Section 3 x) & 3 y).

e) Subsequent to delivery to the *Contractor* the *Contractor* shall ensure that all units have a smooth finish to the whole surface area with no gouges, irregularities, flaking of the finished galvanised coating or any damage that will either detract from the aesthetic appearance of the unit or indeed impact upon the life expectancy of the unit. If the *Contractor* is in any doubt as to the acceptability of units they are to seek advice from the Service Manager prior to removal of that unit from the *Contractor's* depot for installation.

6 **Lantern Details**

See Appendix 14/4

7 **Door Openings**

Shall be orientated such that operatives working inside the column base compartment are facing the direction of oncoming traffic, unless otherwise directed by the *Project Manager*

8 **Traffic Sign Posts**

Standard (Conventional) Posts

a) All posts shall be tubular steel either with an identical cross section over its length or large base type to BS 873. The manufacturer shall be registered with and certified by either BSI Quality Assurance Services or Lloyds Registered Quality Assurance Ltd for the manufacture, supply and verification of columns under their Quality Assessment Schedule to BSEN 9000 - 9004.

b) All posts shall be manufactured from steel which meets the requirements of BSEN 40. All columns shall be of tubular steel design and shall be manufactured from either: -

i) Hot finished circular hollow sections to EN10210 Part 1 Grade S275 JOH or S355 JOH or;

ii) Cold formed circular hollow sections without subsequent heat treatment to the dimensional requirements of EN10219 Part 2 and to the chemical and mechanical properties of EN10219 Part 1 Grade S275 JOH or S355 JOH. The hot finished tube stock material shall comply with the yield, tensile and elongation requirements of the correct grade specified in BSEN 10025:1993 Table 5. The thickness of the circular hollow sections used in the manufacture of the columns shall be purchased such that the negative tolerance is limited to – 4%.

c) The *Project Manager* shall be informed as to the origin of the steel tube used in the fabrication of posts prior to each delivery of stock to the *Contractor* and may at his discretion refuse to accept the installation of traffic sign posts from any consignment delivered to the *Contractor* for subsequent use within this contract either without this information or where the tube originates from an unacceptable source.

d) The post base to shaft joint of large base posts is to be formed by either: -

i) The hot shrunk interference method or;

ii) hot swaged and welded construction with an internal centralising washer.

e) The large base posts shall have a compartment in the base designed to accommodate the fused cut-out assembly and any other isolation and switch gear as appropriate. The minimum dimensions of the base door opening shall be 500mm x 95mm and shall be oval shaped top and bottom. A baseboard of hardwood substantially non hygroscopic of not less than 15mm thickness of a suitable size shall be fixed securely with adequate space left at the bottom for accommodation of all cable terminations and service cut-outs after installation of the isolation and switch gear. A non ferrous metal electrical earth terminal shall be fixed to the interior of the base compartment in an easily accessible position and to the satisfaction of the Service Manager. The base compartment door shall be type oval shaped top and bottom and have a 'Y' type bar fixing mechanism operated by a tri headed screw. A cable access slot of not less than 75mm x 150mm high shall be provided approximately 150mm below finished ground level.

f) Posts shall be root mounted unless otherwise indicated by the *Project Manager* within individual project specifications. Where base plate posts are specified the minimum size of base plate shall be 150mm x 150mm. The minimum post shaft outside diameter shall be 76mm although other post diameters shall be called up dependant upon individual installation specifications.

g) All posts shall be manufactured to meet the structural design criteria but additionally shall be constructed with a minimum root and base wall thickness of 5mm.

h) All posts, before leaving factory of manufacture, shall be protected against corrosion in accordance with paragraph 12 above.

i) All posts shall be capped and sealed. Post caps shall be of the rigid plastic drive-in type and when fitted shall prevent the ingress of water in accordance with BS 873 Clause 5.3. The caps shall be permanently fitted to the posts by either using high bond adhesive or by drilling both cap and post and installing aluminium rivets and washers in at least three locations an equal distance around the top of the post. All caps shall be coloured traffic grey.

APPENDIX 14/1 : SITE RECORDS

General

1. Any amendments to the design drawings must be noted and plotted accurately on the design drawings and passed to the Employer at the end of the project. These amendments will then be used by SCC to create an as-built drawing.

2. Electrical Completion Certificates

2.1 For all Electrical apparatus installed on site a completion certificate will be provided to the *Project Manager.* All equipment will remain the sole responsibility of the principal contractor until the electrical completion certificates have been submitted and approved by the *Project Manager.*

2.2 The Completion Certificate will have all the relevant information on each unit to prove the apparatus is installed to BS7671 and is deemed "safe" at the point it was tested.

2.3 The Electrical Test certificates will be submitted with an as-built drawing detailing the lighting columns and sign unit referenced in such a way that the *Project Manager* can easily reference between the units on site and the completion certificates supplied.

APPENDIX 14/3: TEMPORARY LIGHTING

Any lighting which has to be disconnected and/or removed prior to the new system becoming operational, requires the PRIOR written approval of the *Project Manager*.

Any temporary lighting system shall achieve compatible glare control and illuminance levels on the highway with that of the existing installation.

Such a temporary lighting installation shall also require the prior approval of the *Project Manager*. Any submission for the approval of the *Project Manager* shall be submitted by the *Contractor* at least 7 working days before the planned implementation date.

APPENDIX 14/4 : ELECTRICAL EQUIPMENT FOR LIGHTING UNITS

1 Power Supply

Power supply to street lighting columns and illuminated signs will be provided by the DNO through an order placed directly with the DNO by the *Employer*.

2 Lanterns and Lamps

The lanterns shall be compatible with the columns, spigots and brackets specified in Appendix 13/1 and are detailed on the scheme drawings.

The lanterns specified for the road lighting installation achieve the design criteria of compliance with BS5489-2:2013 Part 2 and BSEN13201-2 : 2013 Category ME2 & S3, at the locations indicated on the Drawings taking into account the IP rating of the lantern and an overall lumen depreciation and lantern maintenance factor of 0.82.

Should the *Contractor* wish the *Project Manager* to approve a different lantern the *Contractor* must provide the *Project Manager* with fully accredited photometric data, design calculations and all other details of the alternative lanterns proposed. The *Contractor* shall also provide the *Project Manager* with full details of any redesign of the lighting column positions and service cable network that may be necessary to retain compliance with the original design criteria.

Alternative lanterns offered for approval shall incorporate a flat glass or low profile (curved tempered glass) bowl and the optical compartment shall be sealed to IP66. They shall provide a photometric performance in line with low threshold increment (LTI) parameters as defined in BS5489-2:2013

Internal wiring and earthing of lanterns and component parts shall be in accordance with the specification and also with the Somerset County Council Installation Specification.

2 Ancillary Equipment

(i) Clause 1416

Reference	Item	Manufacture	Catalogue/ Type No	Other Reference	Requirements
All lighting Column lanterns	Double Pole Isolators	Lucy Trojan Mini 2	32mA Switch Fuse, Fuse and Fuseholder	Or equivalent approved	6A HBC fuse to BS 88.

(ii) Clause 1419

3 **Lamps**

a) LED Modules will be replaceable in either 8, 16 or 24 LED Clusters. The Colour temperature will be the 6200K for Cool White and 4250K For Warm White. The lamp manufacturer shall also rate the lamps to provide no less than the following performance factors:-

i) 8, 16, 24, 32, 40,and 48 watt and versions.

Time Operated	Lamp Lumen Factor	Lamp Survival Factor
100,000hrs	0.90	0.90 (min)

ii) 56, 54,72, 80, 88, 96, 104, 112, 120, 128, 136, 144 watt versions

Time Operated	Lamp Lumen Factor	Lamp Survival Factor
100,000hrs	0.90	0.90 (min)

b) Photometric distribution shall not be influenced by the failure of one or more LEDs.

c) LED Clusters shall be truly flat and not located on a cured surface.

d) LED Modules Shall be supplied with a warranty of 1 for 1 replacement of any failures which have served for less than 10 Years of operation. The date of installation as detailed on the Lighting Database will determine the start of the guarantee. A failure is classified as an LED module were 25% of the LEDS are extinguished. For an 8 Module unit this would be two LEDs.

e) The Minimum Performance Criteria For and LED Module with a current of 350mA is detailed in the following table:

Nom W / Lamp Type	Rated Luminous Efficacy lm/W (100hrs)	LLMF @ 100,000hrs	Cool Correlated Colour Temp. Tc (K) / Colour Rendering (Ra)	Warm Correlated Colour Temp. Tc (K) / Colour Rendering (Ra)	Extended Warranty – Total Duration
8W (1x8W) LED Cluster	102	0.9	6200 / 80	4250 / 96+	10 Years
16W (2x8W) LED	107	0.9	6200 / 80	4250 / 96+	10 Years

Cluster					
24W (3x8W) LED Cluster	116	0.9	6200 / 80	4250 / 96+	10 Years
32W (4x8W) LED Cluster	118	0.9	6200 / 80	4250 / 96+	10 Years
40W (5x8W) LED Cluster	124	0.9	6200 / 80	4250 / 96+	10 Years
48W (6x8W) LED Cluster	124	0.9	6200 / 80	4250 / 96+	10 Years
56W (7x8W) LED Cluster	135	0.9	6200 / 80	4250 / 96+	10 Years
64W (8x8W) LED Cluster	137	0.9	6200 / 80	4000 / 100	10 Years
72W (9x8W) LED Cluster	138	0.9	6200 / 80	4000 / 100	10 Years
80W (10x8W) LED Cluster	139	0.9	6200 / 80	4000 / 100	10 Years
88W (11x8W) LED Cluster	140	0.9	6200 / 80	4000 / 100	10 Years
96W (12x8W) LED Cluster	141	0.9	6200 / 80	4000 / 100	10 Years
104W (13x8W)	134	0.9	6200 / 80	4000 / 100	10 Years

LED Cluster					
112W (14x8W) LED Cluster	135	0.9	6200 / 80	4000 / 100	10 Years
120W (15x8W) LED Cluster	136	0.9	6200 / 80	4000 / 100	10 Years
128W (16x8W) LED Cluster	137	0.9	6200 / 80	4000 / 100	10 Years
144W (18x8W) LED Cluster	139	0.9	6200 / 80	4000 / 100	10 ears

5 **LED Driver**

i) The LEDs and Driver shall be protected against overheating by an over temperature sensing system.

ii) The LED shall be only be driven by a constant current supply in series configuration – Parallel driving is strictly prohibited.

iii) It shall be possible to vary the drive current to the following setting 350mA, 500mA, 700mA

6 **Capacitors**

a) These shall be totally enclosed and proofed against condensation and fitted with safety leak devices and shrouded to prevent live parts being exposed. They shall be totally compatible with associated circuit equipment and lamp. The capacitor shall correct the power factor to not less than 0.85 lagging and shall be fitted with an earth stud with clamping washers of non-ferrous material. They shall comply with BS EN 61048 and BS EN 61049 as appropriate.

b) They shall be guaranteed for a period of at least three years from the approved date of the installation.

7 Isolation Units, Service Cut-Outs And Fuses

a) Each lantern circuit shall be protected by a high breaking capacity (HBC) type fuse of the correct rating for the circuit it is protecting which complies with BS 88: Part1: 1975 Class Q1 and with the standardised performance requirements for industrial fuse links specified in BS 88: Part 2.

b) The fuse assembly shall be enclosed within a substantial plastic drip proof enclosure incorporating a 32 ampere double pole switch, marked On/Off with red/green mechanical indication and providing positive contact indication.

c) The enclosure shall have a transparent cover in order for the switch position to be externally identified and which can be secured by means of a padlock to prevent unauthorised operation of the switch. It shall be fitted with a device to prevent withdrawal of the fuse without prior operation of the unit to the 'switch off' position.

d) Service cut-outs shall consist of a substantial moulded plastic drip proof enclosure with separate shrouded terminals for live, neutral and earth conductors. They shall incorporate a fuse carrier suitable for a fuse to BS 88 and be designed primarily for use in street lighting columns and suitable for terminations or looping-in of the cables used. Terminals shall be large enough to take the service cables specified in straight terminations or looped services.

8 Cut Out Service/ Control Gear Boxes

a) Cut out service/control gearboxes shall be constructed from heavy gauge fire retardant uv stabilised and impact resistant G.R.P. They shall have minimal internal dimensions of 220mm x 170mm x 90mm and be constructed with a full size door hung on stainless steel hinge pins. The door shall be fitted with a tri-head lock latching onto a built-in lock plate. A foam 'O' ring shall be fitted in a pre-formed recess to form a dust proof seal. The whole box shall be sealed to IP65 of BS EN 60529.

b) Cut out service/control gear boxes shall be supplied with two factory drilled 20mm holes complete with grommets in the base of the box.

c) A backboard of hardwood or other substantial non-hygroscopic material with a minimum thickness of 12mm shall be fitted in each box and shall be of sufficient size to accommodate all the control equipment, service cable and termination cut outs.

d) Boxes are to be provided with a non-ferrous earth terminal fitted inside of the unit and adjacent to the backboard.

e) Each box shall have a pre-formed and waterproof danger warning sign and notice on the outside door in compliance with BS 5378.

9 **Switching (Photo-electric Controllers)**

a) All parts shall comply with the relevant sections of BS 5972 and shall be manufactured to a quality level of ISO 9002, BS 5750 or equivalent. They shall be offered in one-part, two-part and miniature versions as required.

b) The physical construction of the PEC shall be of a design capable of withstanding conditions of temperature and humidity likely to arise in the UK. All components shall be capable of operating within the temperature range of -20C to +70C.

c) PEC units shall provide class 2 protection against electric shock and when mounted externally shall provide a minimum protection to IP 67 against the ingress of dust and moisture.

d) The seal provided between the PEC unit and the NEMA socket must provide a measure of protection to Ipx4.

e) The PEC cover shall be of conical design and finished so as to minimise accumulation of dirt and facilitate ease of maintenance.

f) The translucent conical cover shall provide light transmission characteristics that will not vary by more than 1% over the guaranteed lifetime of the unit.

g) The PEC control circuit shall be fully electronic and the switching mechanism should be capable of controlling an inductive load of 10 amperes on a 240V 50Hz. supply to provide a continuous load handling capability of at least 3 x 400 watt SON.

h) The PEC shall be designed to operate on a 230V 50 Hz. AC supply having possible variation of + or – 10% from normal voltage. A transformer power supply shall be utilised with the transformer capable of passing a 1.5 kV flash test and providing a voltage regulation of 20% or better. Alternatives to the above may be agreed with the *Project Manager* as long as the voltage regulation and flash test criteria are met.

i) The PEC control switch shall be activated by a photo transistor or a photo diode filtered to approximate the CIE photopic curve to ensure zero drift from the calibrated light level throughout the guaranteed lifetime. The PEC on/off switching ratio shall be set at 1:0.5 and the switch-on level pre-set at 70 lux for use with highway lighting units and 100 lux for use with illuminated traffic signs. The switch-on levels shall be indicated on each individual PEC unit in a manner approved by the *Project Manager*.

j) No thermal components shall be used within the PEC control circuit.

k) The evening to evening spectral drift of the switch on level shall be within 10% of the stated value regardless of cloud cover or variation in infrared levels.

l) A time delay of 20 to 30 seconds shall be incorporated into PEC switch operation to prevent spurious operation due to transient effects.

m) The PEC unit shall be capable of performing at least 6000 switching operations at maximum load under normal conditions.

n) The PEC shall be so constructed as to withstand such handling and vibration from Transportation, storage and from that expected during normal use throughout the guaranteed lifetime.

o) The average daily power consumption of a one part PEC shall not exceed 0.25 watt and two part PEC's 1.0 watt.

p) The PEC shall be designed to fail in the on mode. If a triac or other semi-conductor switching device is fitted a method of ensuring that the load remains switched on to the on state shall be provided in the event of an overload destroying the device.

q) The PEC circuit must be designed so as to comply with all European directives and regulations on electromagnetic interference.

r) A combination of relay and triac operating in parallel mode or equivalent shall be included in the PEC circuit design.

s) A suppresser shall be fitted internally between the live (L) and neutral (N) supply within the PEC unit. The working voltage of the suppresser must not be less than 275 Volts RMS.

t) Where the PEC is supplied in two-part format the control unit shall be sealed to IP 22 and shall incorporate a test switch for checking the equipment during daylight hours. The unit shall automatically reset or switch off the load on the next switching cycle of the sensor. The detector unit shall be sealed to IP 67 and its cover shall be of conical design. The sensor head shall incorporate a heater to eliminate condensation and maintain the sensor electronics within their operating temperature range. All cable connections between the sensor head and the control unit shall be adequately screened to minimise the effects of external electrical interference.

u) PEC units shall have a guaranteed life of at least twelve years from the date of installation. The date of manufacture shall be indicated on each individual PEC unit, shown in a manner approved by the Service Manager. The guarantee period shall be based upon testing and component mean time between failures and the supplier shall, when requested by the *Project Manager*, provide such supportive testing records and/or written evidence to

support such life expectancy guarantees. The PEC guarantee shall include for all costs, including labour and replacement, associated with any replacement.

v) All night / part night operations.

10 **Radio Interference**

a) Control equipment shall be designed and installed so that the operation of the lighting installation does not produce an unacceptable level of radio interference. Limits of interference shall not exceed those given in BS EN 55015. The recommendations of CP 1006, The Control and Suppression of Radio Interference, shall be adhered to.

11 **Lanterns**

All lanterns for new or replacement installations shall: -

i) be of a type approved for use by the *Project Manager* and shall be to BS EN 60598. Replacement lanterns shall, unless otherwise agreed with the *Project Manager*, provide the same photometric performance and distribution and shall be selected from the Service Manager's approved materials stock list;

ii) be of sound construction and capable of being easily dismantled for maintenance and repair purposes;

iii) be suitable for the type of light source specified;

iv) be designed for remote or integral control gear as specified;

v) be wired between the Nema socket and terminal block with colour coded cable;

vi) to be such as to prevent moisture which may collect in the bracket arm from entering the interior of the lantern and shall be supplied complete with suitable lamp holders and ready wired from lamp holder to connector block with 33/0.30mm tinned copper wire suitably insulated on hygroscopic heat resisting material and designed for ease of wiring;

vii) have the means of supporting the lamp designed such that the position of the lamp in the lantern relative to the optical equipment remains substantially the same under all normal conditions throughout its life;

viii) All lamp control gear contained within the lantern shall be guaranteed for 10 years from the date of installation of the unit;

ix) Have a minimal optical compartment sealing of IP66 to BS EN 60529 and, where applicable, a minimum control gear compartment sealing of IP43 to BS EN 60529;

x) The control gear shall be housed in a separate compartment to the Led but within the luminare body and not located above the LEDs to avoid mutual heating. The control gear compartment shall incorporate a heat sink into the casting with the gear in direct contact to minimise the temperature of the components.

xi) The LED Module thermal management shall be by heat sinking only with a direct path to the outer surface and with no fans pump or liquids. Fins located on the upper surface of the luminare shall not be used

xii) The luminare shall be equipped with surge protection device giving protection of up to 10kV.

xiii) The luminare shall be capable of mounting at zero degrees inclination. In this position the optic must not emit any light in the upper hemisphere.

xiv) The luminare shall be capable of variable inclination to maximise performance for luminace design.

xv) The control gear compartment shall be accessible with simple tools, such as a hexagon key. Tool-less entry shall be possible as an option.

xvi) The control gear compartment shall be secured with Stainless steel fixings in order to prevent corrosion.

xvii) Luminare shall be capable of being equipped with a NEMA socket, miniature photocell or CMS antenna, and stand-alone dimming controls. Penetration into the control gear compartment shall be into a flat casting feature to ensure reliable sealing.

xviii) The Photometric distribution shall be variable though the use of modules with different lenes to optimise photometric distribution.

xix) Glass protectors, where used shall be self-cleaning option.

12 **Reinstatement**

a) The *Contractor* will carry out temporary and permanent reinstatements in accordance with the HAUC specification for the reinstatement of Openings in the Highways, Third Edition 2010. Please also refer to point 17 – Reinstatements

b) Where temporary reinstatements are used the *Contractor* shall carry out permanent reinstatement within the timescales defined within the Service Information.

c) The *Contractor* shall be responsible for ensuring that all reinstatements carried out on behalf of the DNO's are carried out in accordance with this clause.

13 Referencing of Lighting Units

a) Any obstructions or vegetative growth around the unit should be cleared and removed from site where appropriate to a distance of one metre from the unit in any direction.

b) Referencing shall be 50mm high stencilled approximately 1.25m above ground level facing the carriageway where practical or unless otherwise directed by the Service Manager. The referencing shall be painted black on a white background. References fixed to overhead line poles may be fixed onto an aluminium base plate nailed to the pole. In all other circumstances the use of plastic adhesive referencing is not acceptable with the exception of Belisha Beacon Posts consisting of three references: -

i) Belisha Beacon unit;
ii) post light; and
iii) lighting unit.

c) Where an existing reference is to be changed it shall be permanently obliterated before applying the new reference.

d) Illuminated bollard shells shall have a 50mm high reference stencilled onto the rear face of the shell. Additionally, the unit reference shall be repeated on an adjacent top kerb face to the bollard.

14 Earthing

a) The whole of the installation shall be earthed in accordance with the requirements of the current IEE Regulations and to BS 7430:1998 Code of Practice for Earthing and to the satisfaction of the DNO.

b) Earthing of Lighting Units shall be carried out in PVC insulated 300/500 v grade cable having copper conductors complying with BS 6004. The conductor size shall not be less than 1.5mm^2 csa and the insulation shall be coloured green/yellow.

c) The "final" earth lead between the main earthing terminal and the earthing point of the source of energy (supply earthing terminal) shall be PVC insulated 300/500 v grade having a copper conductor size of not less than 6mm^2 csa and colour coded green/yellow. Sufficient length shall be allowed for final connection to the earthing point of the source of energy (supply earthing terminal).

d) Earthing connections, where appropriate, shall be made onto earth terminals/studs provided for that purpose using eye type terminal ends. All such connections and joints shall be crimped, with the appropriate size terminal and used with the correct sized earth continuity conductor. Where substantial copper or other non-ferrous clamping terminals are not provided in the equipment, it is the responsibility of the *Contractor* to supply and fit them.

e) The *Contractor* shall not carry out work on "live" cables or conductors.

15 Electrical Testing of Equipment and Commissioning

a) The *Contractor* will test all cables in accordance with tests laid down in the current edition of the IEE Regulations and shall carry out any further tests specified by the DNO. All tests shall be carried out to the complete satisfaction of the Service Manager.

b) Remove the access door/panel as appropriate and test and isolate the electrical supply

c) Upon satisfactory completion of the tests, the *Contractor* shall issue a signed Certificate to the *Project Manager* on the prescribed forms of the IEE. The installation will not be accepted as complete until such Certificates are issued.

d) The *Contractor* shall, at his own expense, provide all Labour, Equipment and Materials and apparatus for such tests, including any requirement for a second visit to the site to complete Earth Loop Impedance Tests subsequent to the provision of services by the appropriate DNO. An Earth Loop Impedance Test shall be carried out in accordance with IEE Regulation to ensure that the impedance of the earth fault loop will permit compliance with the requirements of BS 7671.

e) The *Contractor* shall inform the supply authority when the installation is complete and the tests taken, and pay any charges levied by the supply authority in respect of inspection.

f) The DNO shall be responsible for making the final connection between the LV cable supplied under this contract and the DNO service cut-outs.

16 Switching Control

a) The internal wiring shall be in accordance with point 15 below and include for any heat resistant sleeving in areas where high temperatures may be present.

b) Where the lantern will be one of a pair mounted on a double arm bracket the *Contractor* shall fit two PEC's: one in each lantern's nema socket. Separate isolators for each lamp circuit shall be installed appropriately and permanently marked to show which circuit the isolator switches.

17 **Internal Wiring of Illuminated Lighting Unit**

a) Wiring between the terminal block in the lantern and the components in the base of the column/sign/termination box shall be single core PVC insulated and sheathed and (as appropriate) 3-core PVC insulated and sheathed cable of 300/500 v grade with copper conductors and complying with BS 6004 and the insulation shall be colour coded to the following: -

Photo-cell	live Brown	)	
Photo-cell	neutral Blue	)	3 core
Photo-cell	load Yellow	)	
Lampholder	live Brown	)	Single core
Lampholder	neutral Blue	)	

b) The following standardisation of conductor sizes is required: -

Description	**Circuit and Protective Conductor csa**
Columns up to 7m mounting height, signs and wall/pole brackets	$1.5mm^2$
Columns over 7m mounting height and up to 13m mounting height	$2.5mm^2$
Conductor from the main earthing terminal (consumer's earthing terminal) to the earthing point of the source of energy (supply earthing terminal – usually fused termination cut-out)	$6.0mm^2$

c) All wiring must: -

i) be carried out in a neat and workmanlike manner;

ii) be routed clear of equipment attached to the base board and bunched as appropriate by means of a minimum of 4 No. plastic cable ties;

iii) not foul the door or the door aperture and not impede access to equipment;

iv) be handled carefully so as not to damage the sheathing of cables when pulled through bracket tubes;

v) be clamped in the lantern;

vi) be fitted with heat resistant sleeving wherever necessary in the lantern;

vii) retain the outer sheath or sleeving intact to as near as possible to each terminal;

viii) be continuous between components containing no connections of any kind.

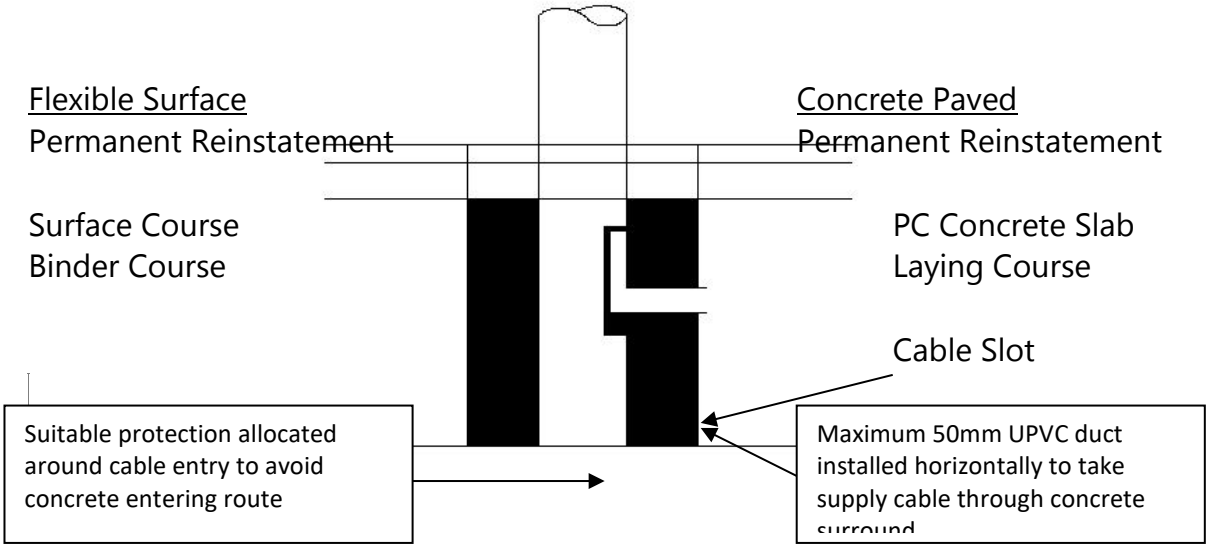
d) As far as possible, surface installations should be avoided to minimise vandalism. Any surface cabling must be protected against damage by earthed metallic conduit or other equivalent means, unless such protection is inherent in the construction of the cable.

18 Final Leads (Final Tails)

a) The final "live" and "neutral" leads shall be PVC insulated and PVC sheathed 300/500 v grade each having a copper conductor size of not less than 4mm^2 csa and complying with BS 6004 and correctly colour coded to the earthing point of the source of energy (supply earthing terminal).

19. REINSTATEMENTS

Reinstatements shall be carried out in accordance with the HAUC specification for the reinstatement of openings in highways Third Edition 2010

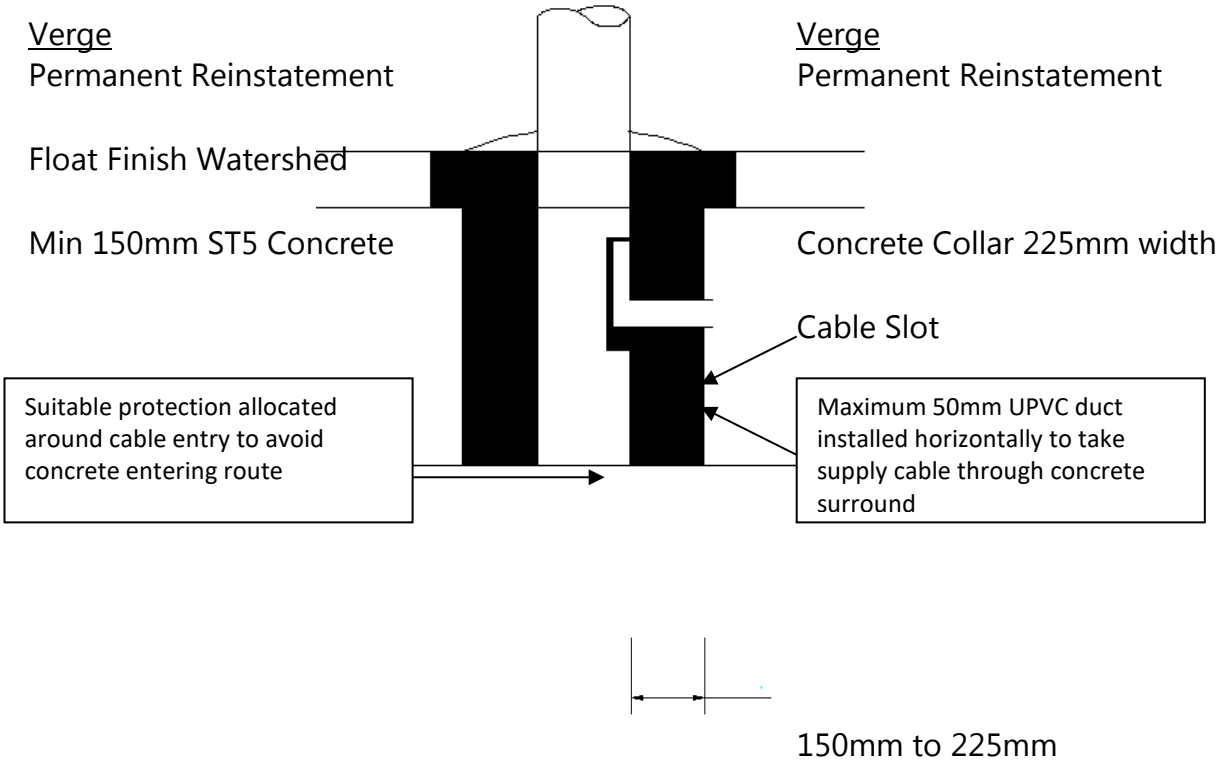


Backfill
Concrete backfill shall be ST5
Concrete complying with Clause 2602 well compacted by vibration

Concrete Panel
Nominal 50mm thick precast concrete flags shall conform to BS EN 1339 and shall be laid in accordance with BS7533-4, to the required cross falls

Flexible Surface
Flexible surfacing for footways and paved areas shall be made and laid in compliance with BS594-

1, 2, BS4987-1, 2, BS1446 or BS1447 for the material required to match the existing. Surfacing shall be laid to true levels and cross falls and is of a thickness to match the existing.



APPENDIX 14/5 : ELECTRICAL EQUIPMENT FOR TRAFFIC SIGNS, ILLUMINATED BOLLARDS AND PRIVATE CABLE NETWORKS ON ADOPTABLE HIGHWAY ELEMENTS

TRAFFIC SIGNS

1. All traffic sign posts shall comply with the specification described in Appendix 13/1 and all internal wiring and connections to illuminated traffic signs and bollards shall be carried out in accordance with Section 2 of Appendix 14/4

2. **Traffic Sign Lanterns**

a) All external lighting units shall comply with BS EN 12899-1 and Chapter 11 of the 'Traffic Signs Manual'.

b) 'Type A' specification lanterns shall: -

i) consist of a wedge shape head unit manufactured from die cast LM6-M aluminium pre-treated and powder coated which dovetails directly into purpose made post top or through brackets for both single or back to back options as required, also manufactured from die cast LM6-M aluminium pre-treated and powder coated polyester to a minimum thickness of 150 microns;

ii) be sealed to not less than IP 56;

iii) include a purpose designed high specular polished, anodised aluminium reflector for a light distribution fully conforming to BS EN 12899-1 and integral lamp control gear;

iv) to be fitted with a 5mm uv stabilised polycarbonate lens supported in a cast alloy frame with anti-tamper concealed hinges and accessed via a single rebated M8 stainless steel captivated tri-head fixing screw;

v) have all exposed fixing screws and any inserts manufactured from stainless steel;

vi) include a lamp control gear tray easily removed by single handed operation without the use of any tools;

vii) include a non ferrous electrical earth terminal on both the head and frame assembly;

viii) include a pre-wired one piece miniature photocell in accordance with the contents of this materials specification and be pre-set for 100 lux switch on;

ix) be available for fixing on either 76mm or 89mm o.d. posts, or other sizes requested by the Service Manager, with further bracketry options for banding or attaching to columns, posts and wall plate fixings;

x) be provided with a single 11 watt PL compact fluorescent lamp or alternatively illuminated by 4 x LED's through two drivers with a total circuit watts of 8w.

c) 'Type B' specification lanterns shall: -

i) comply with Material Clauses 1 to 10 inclusive above;

ii) be provided with twin 11 watt PL compact fluorescent lamps or alternatively illuminated by 14 x LED's through two drivers with a total circuit watts of 16w.

d) Other Category Lighting Units shall: -

i) be constructed from extruded aluminium or steel bodies with a powder coated finish;

ii) be fitted with vandal resistant light panels and incorporate galvanised steel bracket arms of the appropriate outreach. Where required arms are to be capable of extension adjustment to allow for centralising units parallel with the sign faces from offset posts. Brackets or lantern spigots shall be capable of fixing to either 76mm or 89mm o.d. posts;

iii) be fitted with stainless steel screws, nuts and washers;

iv) be fitted complete with twin fluorescent or high pressure mercury vapour discharge lamps with each unit being capable of single lamp operation.

3. PRIVATE CABLE NETWORKS

(a) Cables shall be laid in ducts under all carriageways, vehicular crossings, driveways and where they are laid across or within 500mm of filter drains. The duct shall be surrounded with 50mm of Grade ST2 concrete.

(b) Elsewhere, cables shall be laid on a bed of sand 75mm deep and be covered with 75mm of sand before general reinstatement of the trench. The sand shall pass through a 2mm BS sieve. The trench shall be free of water when the sand and cable are laid in it. Where deemed necessary by the *Project Manager*, interlocking cable tiles shall be provided and laid along the centre line of the cable at a depth of 150mm below the surface.

(c) Where not laid in ducts, the cables shall be laid in trenches slightly "snaked" and without sharp bends or kinks.

(d) Cables following the same route shall, unless otherwise instructed by the *Project Manager*, occupy the same trench with a clearance of 50mm between the outer sheath of the cables.

(e) Power cables shall not be installed within 500mm of communication cables, unless otherwise agreed by the *Employer.*

(f) Cables shall only be laid when the ambient temperature is and has been above 0°c for the previous 24 hours or special precautions approved by the *Project Manager* have been taken to maintain the cables above this temperature to avoid risk of damage during handling.

(g) Cables shall not be bent to an internal radius of less than 12 times the external diameter of the cable or less than the radius recommended by the manufacturer whichever is the greater.

Service ducts (where specified and required) shall comply with Clause 501 of the Specification for Highway Works and shall be to the dimensions identified in table One unless specified otherwise for particular circumstances by the *Project Manager*.

Additionally the colour of the service ducting shall be appropriate to its category (Orange) in accordance with HSG47 – Avoiding danger from underground services (table in point 80).

Table One

Location	**Min depth of cover**	**Type/Size of Duct**
Verge/Field	500mm	UPVC 100mm internal diameter
Footway	500mm	UPVC 100mm internal diameter
Footway (Heavy Vehicle Crossings)	500mm	UPVC 100mm internal diameter
Carriageway (150mm (Longitudinal) GS	750mm	Duct always required. 100mm or internal diameter UPVC Rigiduct or Earthenware or Equivalent
Carriageway (150mm (Crossings) GS	750mm	Duct always required. 100mm or internal diameter UPVC Rigiduct or Earthenware or Equivalent

The works require the *Contractor* to supply and deliver cable /conduit /duct /termination cut-outs /glands/ joints/ marker blocks and all other ancillary works required to undertake the works.

The Contractor will excavate, taking all necessary precautions to avoid damage to services and property and lay the cable/duct c/w surround accordingly, which may include cutting and jointing of the duct. A suitable marker tape is to be supplied and laid within the trench.

The cable is then threaded through the cable as required. *The Contractor* shall supply, install and secure a nylon draw rope at each end of the duct and marker blocks are to be supplied and used where appropriate.

Trench is then to be backfilled and reinstated

CABLES

Unless otherwise approved, cables shall have separate neutral and earth conductors with copper conductors 600/1000v grade, PVC insulated, PVC sheathed, SWA, PVC sheathed to BS 6346 or suitable approved alternatives. All conductors shall be of equal cross sectional area.

The cable sizes and types for each circuit are described in table two.

The method of connecting the conductor to the remainder of the system shall be such that an effective, permanent and non-corroding connection is achieved.

The cables offered shall have an earth continuity conductor other than the armouring which shall provide means of earthing in compliance with the current edition of IEE Regulations.

Cable Terminations

Appropriately sized glands will be fitted where needed together with bonding clamps, bushes, lock nuts and shrouds.

The *Contractor* shall supply and install sufficient cable to accommodate cable termination and cable tails for connecting into cut-outs. The ends of the cable should be sealed where termination does not proceed immediately following installation

Circuit supply points shall be fitted with an appropriate means of providing separate isolation for the private cable networks circuit(s) it supplies and the lighting unit(s) attached. Where more than 1 circuit is supplied from any circuit supply point the SWA of both cables must be bonded together and appropriately connected to the main earthing terminal of the circuit supply point.

Circuits that have been identified as having more than one unit shall be looped from the previously identified unit in table Two (read from left to right). Looped connections shall be incorporated into the previous private supply units cut-out terminals and not separately fused. The SWA of the cable shall be connected to the SWA of the previous connection via the cable gland bonding clamp of both cables and appropriately connected to the main earthing terminal of the unit being looped from.

All works will require electrical testing of cable loops and/or joints subsequent to installation/backfilling where appropriate prior to cable termination. *The Contractor* will also undertake electrical testing on completion of the works prior to reconnection of the supply.

Upon completion of works the *Contractor* provides the *Project Manager* with detailed 'as built' drawings of ducting route, joint positions and all other information necessary to determine the location of the cable runs.

The *Contractor* will provide on completion all necessary documentation and test certificates including a comprehensive account of works undertaken and materials supplied and used in constructing the works.

Cable Joint

If applicable and appropriate the *Contractor* will be required to excavate appropriately to enable the joint to be carried out. Cutting and preparation of the cable ends prior to jointing will be required.

On completion backfill and reinstate with an appropriate joint marker block being supplied and laid as appropriate.

The joint shall be insulated by a semi-rigid, cold curing epoxy compound capable of being used under all reasonable temperatures anticipated on site.

Each jointing unit shall be complete with a transparent mould, epoxy resin, plastic funnels, sealing tape, copper earth strip and instructions for use.

The mould shall be transparent to make final inspection of the joint easy immediately before pouring the resin. It must be constructed of material that is insulating and resin. For easy assembly onto the joint, the mould must be in two pieces which can be united by a positive fastening, leaf free tongue and groove provided with four parts onto which four pouring funnels are a firm press fit. Each funnel shall have an integral locking device to prevent it being inadvertently removed from the mould.

The entry ports shall be adaptable to allow the mould to be cut at six clearly defined steps not less than 10mm (top) not greater than 30mm (main).

The epoxy resin used to fill the mould shall be a two part cold curing type that will be compatible with PVC insulation as used in power cables. It shall be compounded in such a manner that the colour change in the mixture will indicate when the two parts are adequately mixed.

The containers for the epoxy resin shall be of a type that will permit mixing of two parts without exposing them to touch or to contamination.

The conductors shall normally be jointed with an approved ferrule and compressing tool, alternatively the use of a spring connector where design allows wire insertion from both ends and work upon the expanding spring principle will be acceptable.

The armour continuity shall be of copper strip not less than half the cross-sectional area of the largest conductor. The armour wires of each cable are terminated within the joint and clamped to a metal ferrule of cadmium plated steel or brass. Connections between terminated armour wires should be by means of copper strip, secured by worm drive clips.

Other types of joint may be submitted by *the Contractor* for consideration by the *Project Manager* BUT *the Contractor* shall provide all relevant information regarding the alternative, including a practical demonstration. The alternative shall only be used by the *Contractor* on the written approval of the *Employer* for each alternative.

The DNO shall be responsible for making the final connection between the LV cable as supplied under this Contract and the DNO's live service.

APPENDIX 17/1: SCHEDULE FOR THE SPECIFICATION OF DESIGNED CONCRETE

1. General

1.1 The requirements for structural concrete are scheduled on the following pages of this Appendix.

1.2 Use of high cement content may require additional reinforcement to control early thermal cracking. The design assumes a temperature rise equivalent to 400 kg/m3 of CEM I in summer conditions. If the proportion of cement replacement exceeds 40% or the concrete is poured during winter temperatures then higher cement contents may be acceptable. Use of mix designs with cement content exceeding 400 kg/m3 shall be agreed with the designer.

1.3 The consistence of the fresh concrete should be specified by the *Contractor* so that it is suitable for their requirements relating to the handling and placing conditions.

Requirement	Mix Reference A
Location	All locations except where described below.
DC-class (where appropriate)	
Compressive Strength Class of Concrete	40/50
Minimum Cement Content (kg/m^3)	380
Maximum Free Water/Cement Ratio	0.35
Required Group or Type and Class of Cement or Combination (where a DC-class has not been specified)	N/A
Maximum Aggregate Size, mm	20
Chloride Content Class	Cl 0,40
For Lightweight Concrete, the Density Class or Target Density	N/A
For Heavyweight Concrete, the Target Density	N/A
Consistence Class	*
Special Type or Class of Cement or Combination	CEM III/A, CIIIA
Required Source/Special Type of Aggregate	N/A except as below
Maximum Cement Content (kg/m^3)	550
Required Admixture	None
Air Entrainment Required	No
Minimum or Maximum Temperature of Fresh Concrete °C	5°C-30°C
Sampling and Testing	Refer to App 1/5 and BS EN 206-1
Other Requirements	Course aggregate to be approved crushed stone with colour to be agreed with *Employer* from a single quarry. The surface temperature of the formwork against which any concrete is to be poured should be greater than 0ºC and rising prior to any concreting taking place.

*Consistency Class and allowable limits should be specified by the *Contractor* and advised to the *Employer* 28 days prior to commencement of concrete operations.

APPENDIX 17/2: CONCRETE – IMPREGNATION SCHEDULE

1 **Requirements**

1.1 Surface impregnation is not required. See Appendix 17/4 for anti graffiti coating.

1.2 All Contractor design must comply with CDM 2015 Regulation and the Principal Designer to be kept fully informed.

APPENDIX 17/4: CONCRETE – GENERAL

1 Sampling and Testing

1.1 Sampling and testing to be in accordance with BS EN 206-1 and Appendix 1/5. Identity testing is not required.

2 Construction Joints

2.1 Construction joints are shown on the drawings and should be prepared in accordance with clause 1710. Retarding agents shall not be used.

3 Tolerance on positioning of concrete

3.1 All precast and insitu concrete shall comply with the allowable dimensional variations outlined in clause 1710.8.

4 Reinforcement

4.1 All steel reinforcement to be Type B500B reinforcement in accordance with BS 4449:2005.

4.2 Steel reinforcement throughout the structures can be adjusted and cut, provided that the full anchorage length identified on the drawings is maintained. Anchorage may be obtained from straight lengths of steel or hooks or bends. The effective anchorage length of a hook or bend should be measured from the start of the bend to a point four times the bar diameter beyond the end of the bend, and may be taken as the lesser of 24 times the bar diameter, or for a hook eight times the internal radius of the hook, or for a 90 degree bend four times the internal radius of the bend.

5 Local adjustment of reinforcement

5.1 The *Contractor* shall allow for local adjustment of reinforcement. This is particularly relevant in the vicinity of any pile / foundation interface, starter bars, weep pipes in the walls and any other drainage pipes through the foundations.

6 Anti graffiti coating

6.1 All finally exposed concrete and brickwork faces shall be covered with a 'paint on' anti-graffiti coating in accordance with Appendix 24/1.

APPENDIX 17/5: BURIED CONCRETE

Requirements for buried concrete will be detailed on the scheme drawings

APPENDIX 20/1: WATERPROOFING FOR CONCRETE STRUCTURES

1. WATERPROOFING BELOW GROUND SURFACES

1.1 Waterproofing below ground surfaces (except where shown otherwise on the drawings) is identified on the drawings as bitumen paint to clause 2004 and 2006

1.1.1 Waterproofing shall be a proprietary material to specification clause 2004.4. A minimum of two coats shall be applied in addition to any required primer.

1.2 Surfaces to be Treated

1.2.1 The surfaces to be treated are indicated in detail on the drawings. The *Contractor* shall continuously monitor the coverage rate, and make available daily records of the start/finish weights and area covered for each period of spray operation.

1.3 Application

1.3.1 Surfaces shall be prepared and the waterproofing system shall be installed in accordance with the manufacturer's instructions and approved by the *Employer*. Sharp arises on concrete shall be ground down to a smooth profile suitable for the receipt of the waterproofing membrane.

2 PRIMING IS REQUIRED

3. WATERPROOFING CONCRETE SURFACES

3.1 Waterproofing to other concrete faces is identified on the drawings as waterproofing to clause 2003 and 2005

3.2 Waterproofing To Inclined and Vertical Surfaces

Waterproofing to inclined and vertical surfaces shall be a Proprietary Waterproofing System complying with specification clause 2003.1 for waterproofing concrete bridge decks. The system shall be capable of being spray applied and shall be applied in a minimum of two coats and be at least 2mm thick. The material used must be capable of bonding to previous applications of the same material. Spray applied systems shall have a current British Board of Agrément Roads and Bridges Certificate and a current PWS (Permitted Waterproofing System) registered with the *Employer.*

4. TESTING OF WATERPROOFING

8.7 The *Contractor* shall continuously measure the adhesion of the fully cured membrane

to the deck. Two tests shall be required per 100m2 of sprayed membrane, or one test per spraying session if the sprayed area during the session is less than 50m2. The *Contractor* shall make available the test values together with their location. The *Contractor* shall reinstate the test areas including primer, if necessary. If the tests indicate the adhesion to below 0.7Nmm2 then the spraying operation shall be suspended while further investigation is undertaken. Areas of waterproofing where the adhesion fails to meet this value shall be removed and resprayed by the *Contractor* at his own expense.

4.2 The *Contractor* shall test the finished waterproof membrane surface for porosity and pinholes, and the *Contractor* at his own expense shall rectify all imperfections. The *Contractor* shall make allowance in his programme of works for such testing.

4.3 Porosity and pinhole testing shall be carried out using a high voltage direct current pinhole detector. In addition to the manufacturer's instructions for use, the following requirements and conditions apply:

1. the instrument to be operated 13.5kV;
2. the earth lead is not to be more than 10m;
3. movement/expansion joints shall not be crossed when testing;
4. earthing with screws set into substrate or exposed reinforcement to be used;
5. when a leakage path has been found its position shall be marked with a permanent marker;
6. the instrument is not to be used on wet or damp surfaces; and
7. the equipment shall have a current certificate of compliance/calibration.

APPENDIX 23/2: SEALING OF GAPS SCHEDULE (OTHER THAN IN BRIDGE DECK EXPANSION JOINTS)

1 REQUIREMENTS

1.1 Gaps and areas to be filled in accordance with the Contract Drawings.

1.2 Joint filler is to be pre-formed compressible closed cell polyethylene sheet or expanded polystyrene as shown on the drawings.

1.3 Polysulphide joint sealant shall be two part and colour red to match brickwork red stonework or grey to match the concrete or grey stonework as appropriate. Where a joint is brick to brick sealant shall be red, where a joint is brick to concrete sealant shall be grey.

1.4 Sealant to comply with BS EN IS0 11600:2003. The joint sealant is to be approved by the *Employer*.

1.5 Cord sealing strips shall comprise closed cell polyethylene and shall have a diameter 10mm larger than the gap into which they shall be placed.

APPENDIX 24/1: BRICKWORK, BLOCKWORK AND STONEWORK

1 REQUIREMENTS – BRICKWORK AND BLOCKWORK GENERAL

1.1 For the purpose of this Appendix, clay masonry units shall mean 'bricks' and vice versa. Aggregate concrete masonry units shall mean 'blocks' and vice versa.

1.2 All facing bricks shall be selected by the *Contractor* to colour to be advised by *Employer* as below, and to be agreed with *Employer*.

1.3 Mortar shall be designation (ii) to Clause 2404 colour to be agreed with the *Employer* from trial panels.

1.4 Bricks to be in accordance with EN 771-1:2003 Type HD units with methods of testing in accordance with BS EN 772 (all parts). A description and designation of a clay masonry unit shall be provided by the *Contractor* in accordance with clause 6.1.2 of BS EN-771-1:2003 and where stated as to be 'declared' in the above code, within one month of the commencement of the works. In addition minimum requirements as follows:

1.4.1 Type of unit: HD.

1.4.2 Dimensions and tolerances: As clause 5.3.1, Nominal size 215 * 102 * 65mm for standard sizes (special sizes as shown on drawings).

1.4.3 Freeze/thaw resistance category and its basis, (see 5.3.6): Designation F2.

1.4.4 Compressive Strength not less than 50 N/mm^2.

1.4.5 Configuration: solid.

1.4.6 Tolerances (as clause 5.3.1).

1.4.7 Gross and net dry density and tolerances (as clause 5.3.3): Gross dry density not less than 1600 Kg/m^3.

1.4.8 Water absorption (as clause 5.3.7): Not more than 10% by weight.

1.4.9 Initial rate of water absorption (as clause 5.3.8).

1.4.10 Thermal properties (no requirements).

1.4.11 Category of active soluble salts, (as clause 5.3.9): Designation S2 required.

1.4.12 Moisture movement and its basis, (no requirements).

1.4.13 Reaction to fire, (no requirements).

1.4.14 Water vapour permeability, (see 5.3.12).

1.4.15 Bond strength, (as 5.3.13 assuming element subject to structural requirements).

1.5 Bricks all retaining walls shall be as follows:

1.5.1 Dark red engineering type colour (Class A) laid in English bond. Exact brick to be selected by the *Contractor* and to be agreed with *Employer.*

1.6 Bricks for all retaining wall copings shall be as follows:

1.6.1 Header Course (on edge): Staffordshire blue (Class A) smooth face.

1.7 Aggregate concrete masonry units (blocks) shall comply with the requirements of BS EN 771-3:2003. A description and designation of aggregate concrete masonry units shall be provided by the *Contractor* in accordance with clause 6.1 of EN-773-1:2003 and where stated as to be 'declared' in the above code within one month of the commencement of the works. Minimum requirements as follows:

1.7.1 Dimensions and tolerances: As clause 5.2, Nominal size 440* 215 * 100mm.

1.7.2 Maximum gross dry density not more than 1100kg/m3, with moisture content of 3% by weight added to provide the equilibrium value (see clause 5.4.1)

1.7.3 Compressive Strength not less than 3.6 N/mm2

1.7.4 Configuration: solid.

1.8 The *Contractor* shall construct a trial panel for each type of brick 2.0m long by 1.0m wide within one month of the commencement of the works. The Assessment of visual acceptability shall be in accordance with Annex B of BS EN 771-1:2003.

1.9 Stainless steel cast-in slots (to consist of both elements, ties cast into the brickwork at one end and the slot at the other, and the slot cast into the concrete wall) shall be Type 1 in Figure 9 BS EN 845:2003 and described in clause 3.1.20 in BS EN 845:2003. Ties to be cast in at maximum spacing of 900mm horizontally and 450mm vertically. Wall ties shall be staggered by 450mm on each row of ties. Where ties are less than 250 from any end face, opening or other corner, spacing should be 250mm horizontally and vertically around the perimeter of the face. The *Contractor* to provide all information where BS EN 845:2003 states this is to be 'declared' within one month of the commencement of the works.

1.10 Any other wall ties shall consist of ties (cast into the brickwork at one end and brickwork/blockwork at the other) and shall be as shown as Type 1 to 4 in Figure 4 BS EN 845:2003 and described in clause 3.1.8. Ties to be Grade 304 as minimum (18/8), to be minimum 200mm long and cast in at maximum spacing of 900mm horizontally and 450mm vertically, staggered on alternate rows. Where ties are less than 250 from any end face, opening or other corner, spacing should be 250mm horizontally and vertically around the perimeter of the face. The *Contractor* to provide all information where BS EN 845:2003 states this is to be 'declared' within one month of the commencement of the works.

1.11 At all movement joints brickwork shall be provided with debonded wall ties at 450mm vertical centres.

1.12 Stainless steel wire if used shall be to BS EN 10088, flattened profile, with a minimum characteristic tensile strength of 500 N/mm^2. Individual strips to be two 4mm diameter main reinforcing wires with inline welded wires at 95mm centres.

1.13 Bonding for brickwork shall be English bond unless shown otherwise.

1.14 Overhand work not permitted.

1.15 All exposed pointing shall be bucket handle finish. Pointing to be slightly recessed and carried out as the work proceeds.

1.16 In facework to concrete the cavity between the bricks and concrete is to be completely filled with mortar.

1.17 Polysulphide sealant in accordance with Appendix 23/2.

2 Anti-Graffiti Protection system for brickwork

3.1 The exposed surfaces of all brickwork shall be coated with an anti-graffiti protection system as follows or equivalent:

(i) Permeable and fully reversible water based coating suitable for all masonry surfaces. The coating shall be applied in two coats applied by brush to surface dry areas. Total consumption minimum of 0.3 litres per square metre. The coating shall be a water based wax emulsion (silicon free) consisting of microcrystalline vegetable waxes of between 10% and 30%. The coating shall be semi translucent without any specific smell and be biodegradable.

(ii) Typical manufacturer /supplier: Tensid UK plc, AGS Graffi Coat 1

APPENDIX 30/1: GENERAL

1.0 **General**

1.1 **Notices to *The Employer* -** *The Contractor* shall give 48 hours notice to *The Employer* of the intention to commence any of the following operations:

i) Subsoil treatment
ii) Topsoil cultivations
iii) Grass seeding and turfing
iv) Planting
v) Mulching
vi) Tree felling
vii) Arboricultural works
viii) Application of pesticides

1.2 **Use of Peat -** Peat shall not be used.

1.3 **Use of Pesticides -** A record of all pesticide use shall be maintained by *the Contractor*. The record shall include information including name of pesticide, name of operative, location of site and weather conditions. A copy of the record form shall be submitted to *The Employer*.

1.4 **Bird Nesting Season -** The bird nesting season to apply for this contract is between 1st March and 31st July. No tree felling or vegetation clearance shall take place during this time.

1.5 **Inspection Reports -** The *Contractor* shall provide works inspection reports as required by *The Employer.*

APPENDIX 30/2: WEED CONTROL

1.0 **Weed Control**

1.1 **Weed control generally -** There shall be no weed tolerance throughout the site. Do not damage adjacent grass, plants or trees during weeding operations. Removal of species shall be in line with those listed in Volume 1 of the Specification for Highways Works, Series 3000, Clause 3002.

1.2 **Weed control with winter herbicide -** A suitable residual soil acting herbicide shall be used during the winter. All operations shall be completed before the end of March. The recommended time period shall be allowed for the herbicide to take effect before dead weeds are cleared.

1.3 **Weed control with summer herbicide -** A suitable foliar acting herbicide shall be used during the summer. The recommended time period shall be allowed for the herbicide to take effect before dead weeds are cleared.

1.4 **Hand weeding -** Hand weeding shall be carried out to vigorous weeds. These weeds shall be removed entirely, including roots. The minimum amount of soil shall be removed. There shall be minimal disturbance to plants, bulbs and mulched surfaces. Once roots have been removed, rake to a neat, clean condition. All mulch shall be reinstated to the original depth.

APPENDIX 30/3: CONTROL OF RABBITS AND DEER

1.0 **Rabbit Control**

1.1 **Rabbit control -** *The Contractor* shall carry out rabbit control when instructed by *The Employer*.

1.2 **Rabbit proof fencing -** All shrub and hedgerow planting stock to be protected with rabbit proof fencing to agreed manufacturer's specification.

1.3 **Clearance of rabbits -** *The Contractor* shall maintain the areas to be planted free of rabbits for the period as instructed by *The Employer*.

1.4 **Replacement of plants damaged by animals -** *The Contractor* shall replace the damaged plants during the contract period as instructed by *The Employer*.

APPENDIX 30/4: GROUND PREPARATION

1.0 **Clearance**

1.1 **Site clearance -** Before existing vegetation and topsoil stripping takes place, *the Contractor* is to ensure that the site is cleared of all rubbish, debris and vegetation in accordance with the 200 series appendices. All tree/hedge and shrub removal shall be carried out in accordance with BS5837:2012.

1.2 **Removing small trees, shrubs, hedges and roots -** Before work begins, *the Contractor* shall clearly mark all trees to be removed (refer to existing vegetation retained and removed drawing series (Landscaping Series Drawings). All small trees, shrubs and hedges affected by the scheme proposals shall be cut down with all roots cleanly 'grubbed' and disposed off site without undue disturbance to the soil.

1.3 **Felling large trees -** Large trees are those with girth sizes over 100mm. All trees to be removed shall be clearly marked for removal by *the Contractor* (refer to existing vegetation retained and removed drawing series (Landscaping Series Drawings). Trees shall be felled as close to the ground as possible before grinding out all tree stumps and roots. Large trees shall be felled as small sections to avoid damage to adjacent trees.

1.4 **Vegetation clearance -** All grass and other herbaceous vegetation shall be cut to a height of between 50-75mm height with all arisings being removed from site.

1.5 **Subsoil treatment -** All planting areas shall be ripped, using a ripping tine or subsoil plough. The minimum depth of treatment shall be 450mm. All subsoil finished levels shall be in accordance with proposed topsoil depths as shown on proposed landscaping and topsoil plan drawing series (Landscaping Series Drawings).

APPENDIX 30/5: GRASS SEEDING, WILDFLOWER SEEDING AND TURFING

1.0 **Grass seeding and turfing**

1.1 **Grass seeding sowing period -** Grass seed shall be sown between mid March to early October.

1.2 **Locations of fine tilth soil -** All areas of soil to grassland (neutral and road verge) as identified on landscaping and planting plan drawing (Landscaping Series Drawings), shall be reduced to a fine tilth to the upper 50mm.

1.3 **Seed mixtures -** Refer to drawing (Landscaping Series Drawings) for all proposed seed mixtures.

1.4 **First cut of grass areas -** All grass shall be cut when it reaches a height of 75mm and when it is reasonably dry. Before cutting, the *Contractor* shall remove debris, litter, and stones and earth clods larger than 25mm in any dimension. The first cut shall be carried out using a cylinder mower. 3 No. cuts during the growing season shall be carried out before the grass areas are accepted as completed.

APPENDIX 30/6: PLANTING

1.0 Planting

1.1 **Plant schedule -** Refer to planting schedule drawing (if applicable) for all proposed planting information including species type and sizes etc.

1.2 **Mycorrhizal inoculant -** Mycorrhizal inoculant shall be applied to roots of bare root plants before planting and backfilling operations take place.

1.3 **Plant provenance -** All plant stock shall be of local provenance. Origin and provenance have the meaning as given in the National Plant Specification.

1.4 **Plant inspection at source –** *The Employer* shall inspect all planting stock at the source nursery before an order is made to ensure the highest quality material is secured.

1.5 **General fertiliser -** A general fertiliser shall be applied to all tree pits and shrub beds. The fertiliser shall be spread evenly immediately before cultivation at a rate of 30g/m^2. Typical Fertiliser Content shall Consist of:

Nitrogen (N) 3.5%
Phosphorous (P) 2.1%
Potassium (K) 3.4%
Organic Matter 95%

1.6 **Time of planting -** Deciduous trees and shrubs shall be planted between late October and late March providing ground and weather conditions are favourable. Evergreens, herbaceous plants and native shrub mixes shall be planted during September/October or April/May. Container grown plants shall be planted at any time provided ground and weather conditions are favourable. Adequate watering and weed control shall be provided.

1.7 **Tree pits and hedging trenches -** Refer to Landscaping and Topsoil Plan drawing series (Landscaping Series Drawings). for locations of all tree pits. All arisings shall be removed from hard surfaces and grassed areas and removed from site.

1.8 **Tree pit drainage -** Refer to drawings (Landscaping Series Drawings) for tree pit detail sections. The bases of all tree pits shall be broken up to a suitable depth to allow free drainage prior to the tree being planted and material being backfilled.

1.9 **Timber mulch -** Timber mulch shall be applied to the base of planting stock in the following areas; all trees in areas of soft planting.

All landscape bark mulch shall be free of pests, disease, fungus and weeds. Preparation before laying mulch shall include clearance of all weeds and watering the ground thoroughly. All mulch shall be laid to 50mm depth.

1.10 **Plant protection** – Climbing plants to be protected using Spiral Tree Guard – see landscaping and topsoil Plan series (if applicable) for plant locations.

1.11 **Plant Climbing support system**:

Wire and Eye climbing support system to be fixed to acoustic fence for support of wall climbing plants.
Vine Eyes screwed into timber acoustic fence 2m apart, with galvanised wire to be fed in between eyes and then tightened using internal tension mechanism. Wire to be run horizontal at regular intervals in relation to fence height, to ensure 5 runs in total.

Galvanised H/T Wire 3.15mm
Vine Eyes, 75mm
Galvanised steel wire support system with internal tension mechanism by chosen manufacturer.

1.12 **Tree planting locations -** The exact tree pit locations shall be agreed on site by *The Employer*.

1.13 **Climbing Plant locations** – Climbing plants to be planted 150mm clear of acoustic wall supporting structure with roots spreading outwards. Branches shall be lightly secured to supports. Plants to be planted at 7500mm centres as shown on Landscaping and Topsoil Plan drawings (if applicable).

1.14 **Bulb Planting** – The conditions of bulbs shall be firm, entire, not dried out or shrivelled. Bulbs shall be free from pests, disease and fungus. When planting bulbs, the top of the bulb shall be to a depth of approximately twice its height and the base shall be in contact with the bottom of the hole. Backfill will finely broken soil lightly firmed to ground level.

1.15 **Replacement of defective trees and plants -** Defective plants shall be replaced by the contactor within 12 months of contract completion. Replacements shall match the size of adjacent or nearby plants of the same species or match the original specification, whichever is the greater.

1.16 **Maintenance period -** *The Contractor* shall carry out maintenance of new planting for 12 months from the time of new planting completion.

APPENDIX 30/7: GRASS, BULBS AND WILDFLOWER MAINTENANCE

1.0 **Grass Maintenance**

1.1 **Areas of grass to be maintained –** All grass to be maintained within the site extents shown on drawings numbers (if applicable) for a period of 12 months from the date of contract completion.

1.2 **Cutting around trees and plants -** Mowing machinery shall not be used closer than 100mm around tree stems or bases of shrubs. Use nylon filament rotary cutters and other hand held mechanical tools carefully to avoid damage to bark.

1.3 **Maintenance of grassed areas -** Turf shall be maintained in a manner appropriate for the intended use. All grass shall be maintained as a healthy, vigorous sward, free from disease, fungal growth, discolouration, scorch and wilt. All waterlogging and compaction of grass areas shall be prevented while any damage caused by trampling, abrasion or scalping shall be made good by *the Contractor.*

All grass edges shall be maintained to be neat and well defined, in clean straight lines or smooth flowing curves. Litter and fallen leaves shall be removed regularly to maintain a neat appearance.

1.4 **Grass cutting -** Refer to the Soft Landscape Management Plan for the grass cutting regime frequency.

1.5 **Cutting arisings -** All grass cutting arisings shall be removed from site by *the Contractor*.

APPENDIX 30/8: WATERING

1.0 **Watering**

1.1 **Establishment period -** *The Contractor* shall be responsible for watering all planting stock to ensure establishment and continued healthy growth for 12 months from the completion.

1.2 **Watering generally -** The full depth of topsoil shall be watered. The application shall be even and without damaging or displacing plants or soil. The frequency of watering shall be as necessary to ensure establishment and continued thriving of planting including all trees. The application shall be increased during dry summer periods.

APPENDIX 30/9: ESTABLISHMENT MAINTENANCE FOR PLANTING

1.0 **Planting Maintenance**

1.1 **Plants and planting areas to be maintained -** All plants and planting areas are to be maintained for a 12 month period from the date of contract completion.

1.2 **Disposal of used tree stakes, tubes, guards and ties** - Once all associated material has fulfilled its role, it shall be removed from site and appropriately disposed of by the maintenance contractor.

1.3 **Mulch maintained -** Mulch shall be maintained and topped up as required.

1.4 **Weed control** - Weeds shall be controlled throughout the whole scheme for the duration of the maintenance contract. Refer to Appendix 30/2 for method of weed control.

1.5 **Maintenance to individual trees** - All trees identified in Tree Removal and Protection Plan and the Landscaping and Topsoil plan drawing series (Landscape Series Drawings) shall be maintained and inspected every 6 months.

Weed control to individual trees - Weed control to all trees shall be hand weeding.

APPENDIX 30/10: MAINTENANCE OF ESTABLISHED TREES AND SHRUBS

1.0 **Tree and Shrub Maintenance**

1.1 **Plants and planting areas to be maintained -** All plants and planting areas are to be maintained for a 12 month period from the date of contract completion.

1.2 **Arisings** - All maintenance arisings shall be removed from site.

1.3 **Overgrown shrubs -** All overgrown shrubs shall be coppiced back to 300mm of the base in late winter. The wound surface shall be smooth and angled to allow run-off.

1.4 **Maintenance to individual trees** - All trees identified in Tree Removal and Protection Plan and the Landscaping and Topsoil plan drawing series (if applicable) shall be maintained and inspected every 6 months.

1.5 **Crown lifting** - All crown heights to trees close to pedestrian footways shall be maintained to 1800-2000mm from footway surface level to ensure clear views below trees are maintained. Remove whole branches back to the stem, or cut lower portions of branches back to lateral or sub-lateral buds or branches. Do not leave stumps.