



Phase 3 - Old Colwyn Promenade Coastal Defence & Active Travel

Works Specification - Draft

26 January 2026

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This document contains confidential information and proprietary intellectual property. It should not be shown to other parties without consent from us and from the party which commissioned it.

This works specification shall be read in conjunction with all related project drawings, specifications and standards. This works specification contains the site-specific appendices to supplement the standard specification of highway works. If any discrepancies arise between the standard specification of highway works and the site-specific appendices, the latter shall prevail.

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Executive summary

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 contract specific items:

- (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 contract specific Numbered Appendices listed in Appendix 0/3;
 - (iv) Appendix 0/5: Special National Alterations of the Overseeing Organisation of Wales
1. The relevant publication date of each page of the Specification for Highway Works is given in the Schedule of Pages and Relevant Publication Dates.
 2. An Additional Clause as indicated by a suffix 'A' in Appendix 0/5 is an alteration originating from the Overseeing Organisation of Scotland, Wales or Northern Ireland. An Additional Clause as indicated by a suffix 'AR' in Appendix 0/1 is a contract specific alteration.
 3. A Cancelled Clause as indicated by a suffix 'C' in Appendix 0/5 is an alteration originating from Overseeing Organisation of Scotland, Wales or Northern Ireland. A Cancelled Clause indicated by a suffix 'CR' in Appendix 0/1 is a contract specific alteration.
 4. Insofar as any of the contract specific 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.
 5. Any reference in the Contract to a Clause number or contract specific Appendix shall be deemed to refer to the corresponding Substitute Clause number or contract specific Appendix listed in Appendix 0/1, 0/2 or 0/5.
 6. 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.
 7. Any Appendix referred to in the Specification which is not used shall be deemed not to apply.
 8. Where a Clause in the Specification is prefixed by an # this indicates that this particular Clause has a substitute National Alteration for one or more of the Overseeing Organisations of Scotland, Wales or Northern Ireland. Substitute or additional National Clauses shall be used within countries to which they specifically apply and they are deemed to replace corresponding Clauses in the main text of the Specification as appropriate. The substitute National Clauses are located at the end of the relevant Series together with the additional National Clauses of the Overseeing Organisations.
 9. Other than where references to the Overseeing Organisation are made in the context of the Overseeing Organisation granting statutory or type approvals, the roles and functions of the Overseeing Organisation shall be undertaken by Conwy County Borough Council.

Where the Specification requires the provision of documentation to the Overseeing Organisation for statutory or type approval such documentation shall be provided to:

Conwy County Borough Council,
Environment, Roads and Facilities,
PO Box 1,
Conwy,
LL30 9GN

11. 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 Overseeing Organisation as stated in paragraph 10 above shall be further amended as follows:
 - (i) If any agreement, consent or approval required to be obtained from the Overseeing Organisation impacts on the health and safety of the general public, the environment or any property or equipment not owned or operated by the Contractor or the Design Build Finance and Operate concessionaire ², such agreement, consent, approval shall be obtained from Conwy County Borough Council ³.
 - (ii) Where the Specification provides for the Overseeing Organisation to require a test, waive the requirement for a test or alter testing frequency, the party to whom the Overseeing Organisation's roles and functions have been ascribed by paragraph 10 above shall exercise such decisions in accordance with the Secretary of State's requirements stated in the Contract ⁴.
12. Where Standards and other documents are incorporated into the Contract by reference the respective edition used shall be that which is current at the time of tender unless otherwise stated in the Specification.

SPECIFICATION FOR HIGHWAY WORKS - SCHEDULE OF PAGES AND RELEVANT PUBLICATION DATES

All pages of Manual of Contract Documents for Highway Works, Volume 1 (Specification for Highway Works), inclusive of all amendments up to **October 2022**, and all subsequent amendments.

Table 0.1: Schedule of Pages and Relevant Publication

Series/Appendix	Page Number	Publication Date
000	1 to 3	May 2014
000	6 to 7F	February 2016
000	4 to 5	October 2022
100	2, W1F, N2 to N11F	May 2014
100	N1	December 2014
100	1, 3 to 30F	April 2022
200	1 to 3F	February 2016
300	1	May 2001
300	4	November 2002
300	2 to 3, 5 to 6F	May 2008
400	1, 9 to 11, 13, 17 to 20, 21, 23F	May 2017
400	2 to 8, 12, 14 to 16, 22	March 2020
500	1 to 2, 4 to 39F, N1 to N2F	February 2020
500	3	March 2020
600	1 to 68, 70 to 77F, S1 to S4F, W1 to W4F, N1 to N5F	February 2016
600	69	February 2017
700	1 to 5, 8 to 36F, N1 to N4	February 2016
700	6 to 7, N5 to N6F	October 2022
800	1 to 42F	November 2021
900	1 to 83F, S1 to S3F, W1 to W2F, N1F	July 2021
1000	3 to 33	January 2020
1000	1 to 2, 34 to 58F	November 2021
1100	1 to 16F	February 2021
1200	5	May 2001
1200	2 to 3, W1F	August 2003
1200	1, 14 to 16F	May 2004
1200	4, 9 to 11, 13	May 2005
1200	12	November 2006
1200	6 to 7, N1 to N4F	November 2007
1200	8	May 2008
1300	N2F	November 2003
1300	3 to 4	November 2004
1300	1, 5 to 10, 12F	November 2005
1300	2, 11 and N1	May 2006
1400	2, N1F	May 2001
1400	1, 3 to 9F	May 2006
1500	1 to 31F	February 2017
1600	1, 4 to 5, 9, 15, 17 to 18, 24 to 26, 29 to 31, 35, 38, 49F	March 1998
1600	2, 6 to 8, 10 to 14, 16, 19, 27 to 28, 32 to 34, 36 to 37, 39 to 42, 44 to 48	November 2003
1600	3, 20 to 23, 43	November 2005
1700	2, 4, 6 to 7, 19, 24 to 27, 30 to 34	December 2014
1700	1, 3, 5, 8 to 18, 20 to 23, 28 to 29, 35 to 39F	March 2020
1800	1	August 2014
1800	2 to 39F	April 2021
1900	1 to 35F, S1 to S2F	August 2014

Series/Appendix	Page Number	Publication Date
2000	1, 3 to 4F	May 2001
2000	2	November 2004
2100	1 to 2F	February 2016
2300	1	March 1998
2300	2 to 3F	May 2001
2400	1, 4, 7F	May 2005
2400	2	May 2006
2400	3, 5 to 6	May 2008
2500	1	May 2001
2500	2, 8, 11F	November 2003
2500	10	November 2004
2500	6 to 7, 9	May 2005
2500	5	May 2006
2500	3 to 4	November 2006
2600	2 to 4	November 2003
2600	5	November 2004
2600	6	May 2005
2600	7	November 2006
2600	1, 8F	March 2020
3000	4 to 7, 10, 12 to 17, 19, 22 to 27F	May 2001
3000	20	November 2004
3000	2 to 3	May 2006
3000	8 to 9, 11, 18, 21	May 2008
5000	1, 4 to 19F, S1F	May 2005
5000	2 to 3	November 2008
5700	1 to 30F	February 2020
Appendix A	1 to 4F	May 2014
Appendix B	1 to 3F	May 2014
Appendix C	1 to 2F	May 2014
#Appendix D	1F	May 2014
Appendix D (NI)	N1F	May 2014
Appendix E	1F	May 2014
Appendix F	1 to 60F	October 2022
Appendix G	Not used	
Appendix H	1	May 2004
Appendix H	2	November 2005
Appendix H	3	November 2006
Appendix H	4 to 9F	November 2008

0 Introduction

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

See the specification contained within this document for contract specific additional requirements.

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
601	Classification, Definitions and Uses of Earthworks Materials Sub-clauses 14a-14d added – see below
645	Armourstone and rip-rap New clause added – see below
Table 6/1	Acceptable Earthworks Materials: Classification and Compaction Requirements New grading requirements added for armourstone and rip-rap – see below

601 Classification, Definitions and Uses of Earthworks Materials

Definitions

Add:

14a Armourstone and rip-rap shall mean rock graded and tested in accordance with BS EN 13383-1 and BS EN 13383-2 for use in coastal defences or alternative gradings given in Appendix 6/16.

14b Rock for armourstone or rip-rap shall be natural, hard, sound homogenous, non-argillaceous rock of good durability. It shall be free from laminations and weak cleavage planes and shall be of such character that it shall not disintegrate or erode when exposed to frost attack or the actions of air, water, wetting and drying, freezing and thawing, and impact due to wave action. The rock shall have a monolithic structure and shall not contain cellular, honeycombed or other voids and shall be free from cracks, seams or similar defects. The rock shall not contain harmful materials such as iron pyrites, coal, mica, laminated material or any materials in sufficient quantity to adversely affect the strength and durability of the material. It shall be capable of being handled and placed without undue fracture or damage. It shall be free from coating of clays or other deleterious material.

14c The rock shall be granite, basalt, carboniferous limestone, feldsparitic, greywacke, dolerite or other material accepted by the *Supervisor*. The outermost layer of the rock revetement shall be granite. The rock supplied for any single grade shall be from a single quarry, unless mixed Micro Deval testing to BS EN 1097-1 : 2011 utilising samples from two interfacing combinations complies with the specification, source combinations and interfaces are minimal, plan extent of each source is maximised and the Contractor supplies proposals to the *Project Manager* for acceptance well in advance.

14d The properties of rock and testing are given in Table 6/1 as Grade 10A.

Add:

645 Armourstone and rip-rap

Quarry operation

1 Rock quality shall be carefully monitored throughout the quarrying process and the *Contractor* shall ensure that quarried materials are produced to the size, quality, weight and shape required. The *Contractor* shall ensure that damage to the armour rock during stockpiling, transportation and handling is kept to a minimum.

2 For each grade the contractor shall demonstrate that the method of selecting rocks in the quarry will meet the grading requirements by individually weighing a sample of 50 rocks from the initial production. A selection of these weighed rocks should be kept as examples if visual grading of the rocks is adopted.

Drop test

3 For cover layer in heavy gradings of 3-6t or heavier, or as stated in Appendix 6/16, a drop test shall be carried out to confirm the rock integrity. The drop test shall be carried out in accordance with the provisions of Annex X of BS EN 13383-1. The reduction in median weight shall be less than 5%.

Re-use of existing rock

4 Any existing rock which must be removed for the reconstruction of the revetment or is shown to be removed on the Drawings may be reused providing it satisfies these grading and property requirements, as accepted by the *Supervisor*.

Rock Placing

Core

5 Core may be placed in bulk by machine or end tipping.

Underlayer and rip-rap of light gradings

6 Rock underlayer and rip-rap may be placed in bulk by a machine, with care, to minimise disturbance to any already-placed rocks and to avoid damage to the rocks, surface below or the geotextile. Rocks shall be not be dropped from a height greater than 2m to avoid damage to the underlying geotextile.

7 Rock underlayer and rip-rap shall be placed to achieve a dense layer but shall not be compacted.

Cover layer and underlayer or rip-rap in heavy gradings

8 Rock cover layer shall be constructed by placing the rocks, individually by a machine with care ensuring a random orientation and weight distribution, and so that the structure has a void ratio of 35% to 40%.

9 Rock underlayer or riprap in heavy gradings shall be placed individually if the layer thickness shown on the drawings is stones thick.

10 The rocks shall be placed to achieve a minimum 'three-point support' and shall not be placed so that they can move or obtain their stability on a plane solely by frictional resistance prior to placing further rock. The rock shall be placed so that the adjacent faces of abutting rocks are not parallel and that each rock is stable against wave action.

11 In addition to the above, no rocks shall be dropped from a height greater than 2m during placement, to avoid damage to geotextile.

Sequence and timing

12 The timing and sequence of construction shall limit the damage by wave action of the exposed core and underlayer. The Contractor shall develop procedures to temporarily protect all construction faces in response to adverse weather or wave forecasts and during breaks in work on the revetment of more than 5 days.

Tolerances

13 The placing tolerances are given in Appendix 6/16

Table 6/1 Acceptable Earthworks Materials: Classification and Compaction Requirements

Add new grading 10A at the end of the table:

Class				General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)			Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested In Accordance With:	Acceptable Limits Within :-				
Armourstone and rip-rap	10	A	-	Uniformly graded rocks	General Fill	Any rock defined in clause 601, 14b and 14c.	(i) grading	BS EN 13383 part 1 – Clause 4	Lower = Appendix 6/16 Upper = NA	Not required	10	A	-
							(ii) shape	BS EN13383 Part 2 – Clause 7					
							(iii) crushed or broken surfaces	BS EN13383 Part 1 – Clause 4.4					
							(iv) minimum particle density	BS EN13383 Part 2 – Clause 4 and Clause 8					
							(v) resistance to breakage	Test with EN 1926:1999 annex A					
							(vi) resistance to wear	EN 1097 Part 1:1996 - Clause 7					
							(vii) water absorption	BS EN 13383 Part 2 – clause 8					
							(vii) resistance to salt crystallisation	EN 1367 Part 2 :1998 – clause 8					
							(viii) drop test	EN 1367 Part 1: 2013 – Annex C					

APPENDIX 0/3: LIST OF NUMBERED APPENDICES REFERRED TO IN THE SPECIFICATION AND INCLUDED IN THE CONTRACT

Numbered Appendix to be compiled and/or completed by:

(Co) Compiler compiles: Identified in the Notes for Guidance examples by the term 'Sample' included in their title

(Co/C) Compiler partially compiles and Contractor completes and returns to Overseeing Organisation

(C) Contractor completes and returns to Overseeing Organisation

(P) This indicates the Appendix is a national pro forma and format must not be altered

Series No.	Completed By	Appendix No	Title	Used (✓) or Not Used ()
0000			<u>INTRODUCTION</u>	✓
		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	✓
	(Co)	0/3	List of Numbered Appendices referred to in the Specification and included in the Contract.	✓
	(Co)	0/4	List of Drawings included in the Contract	✓
		0/5	Special National Alterations of the Project Managers of Scotland/Wales/Northern Ireland	
0100			<u>PRELIMINARIES</u>	✓
	(Co)	1/1	Temporary accommodation and equipment for the Project Manager	✓
		1/2	Vehicles for the Project Manager	
		1/3	Communication System for the Project Manager	✓
	(Co)	1/4	Working and Fabrication Drawings	✓
	(Co/C)	1/5	Testing to be carried out by the Contractor	✓
		1/6	Supply and Delivery of Samples to the Project Manager	✓
	(Co)	1/7	Site extent and limitations on use	✓
		1/8	Operatives for the Project Manager	
	(Co)	1/9	Control of Noise and Vibration	✓
		1/10	Structures to be designed by the Contractor	✓
		1/11	Structural Elements and Other Features to be Designed by the Contractor	✓
	(Co)	1/12	Setting Out and Existing Ground Levels	✓
	(Co/C)	1/13	Programme of Works	✓
	(Co)	1/14	Payment Applications	✓
		1/15	Accommodation Works	
	(Co)	1/16	Privately and Publicly Owned Services & Supplies	✓
	(Co)	1/17	Traffic Safety & Management	✓
	(Co)	1/18	Temporary Diversions for Traffic	✓
	(Co)	1/19	Routing of Vehicles	✓
		1/20	Recovery Vehicles for Breakdowns	
	(Co)	1/21	Information Boards	✓
	(Co)	1/22	Progress Photographs	✓

Series No.	Completed By	Appendix No	Title	Used (✓) or Not Used ()
	(Co)	1/23	Risks to Health and Safety from Materials or Substances	✓
	(Co)	1/24	Quality Management System	✓
		1/25	Temporary Closed-Circuit Television (CCTV) System for the monitoring of Traffic	
		1/26	Temporary Automatic Speed Camera System for the Enforcement of Mandatory Speed Limits at Road Works (TASCAR).	
		1/27	Temporary Automatic Speed Camera System for the Enforcement of Mandatory Speed Limits at Road Works (TASCAR) – Particular Requirements	
0200			<u>SITE CLEARANCE</u>	✓
	(Co)	2/1	List of Buildings, etc. to be Demolished or Partially Demolished	✓
	(Co)	2/2	Filling of Trenches and Pipes	✓
	(Co)	2/3	Retention of Material arising from Site Clearance	✓
	(Co)	2/4	Explosives and Blasting	✓
	(Co)	2/5	Hazardous Materials	✓
0300			<u>FENCING</u>	
	(Co)	3/1	Fencing, Gates and Stiles	✓
0400			<u>ROAD RESTRAINT SYSTEMS</u> (VEHICLE AND PEDESTRIAN)	✓
	(Co)	4/1	Road Restraint Systems (Vehicle and Pedestrian)	✓
	(Co)	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 1314-4:2002	✓
0500			<u>DRAINAGE</u>	✓
	(Co)	5/1	Drainage Requirements	✓
	(Co)	5/2	Service Ducts Requirements	✓
	(Co)	5/3	Surface Water Channels and Drainage Channel Blocks	✓
		5/4	Fin Drains and Narrow Filter Drains	
	(Co)	5/5	Combined Drainage and Kerb Systems	
		5/6	Linear Drainage Channel Systems	
	(Co)	5/7	Thermoplastics Structural Wall pipes and Fittings	✓
0600			<u>EARTHWORKS</u>	✓
	(Co)	6/1	Requirements for Accepting and Testing, etc. of Earthworks Materials	✓
		6/2	Requirements for dealing with Class UIB and Class U2 Unacceptable Material	✓
	(Co)	6/3	Requirements for Excavation, Deposition, Compaction (other than Dynamic Compaction) etc.	✓
	(Co)	6/4	Requirements for Class 3 material	
		6/5	Geotextiles used to separate Earthworks Materials	✓
	(Co)	6/6	Fill to Structures and fill above Structural Foundations	✓
		6/7	Sub-formation, Capping, Preparation and Surface Treatment of Formation	✓
	(Co)	6/8	Top soiling	✓
		6/9	Earthwork Environmental Bunds, Landscape Areas and Strengthened Embankments	
		6/10	Ground Anchorage's, Crib Walling and Gabions	
		6/11	Swallow Holes & Other naturally occurring Cavities & Disused Mine Workings	
		6/12	Instrumentation & Monitoring	
		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	
0700			<u>ROAD PAVEMENTS – GENERAL</u>	✓

Series No.	Completed By	Appendix No	Title	Used (✓) or Not Used ()
	(Co)	7/1	Permitted Pavement Options (Schedules 1, 2, 3, 4 and 5)	✓
	(Co)	7/2	Excavation, Trimming and Reinstatement of Existing Surfaces	✓
		7/3	Surface Dressing Performance Specification Sheets 1, 2 & 3	
	(Co)	7/4	Bituminous Sprays	✓
		7/5	In-Situ Recycling: The Remix and Repave Processes	✓
		7/6	Breaking up or Perforation of Existing Pavement	✓
		7/7	Slurry Surfacing Incorporating Micro-surfacing (Sheets 1, 2 & 3)	
		7/8	Not used	
	(Co)	7/9	Cold-Milling (Planning) of Bituminous Bound Flexible Pavement	✓
		7/10	Worksheet proforma for results of testing for constituent materials in Recycled Aggregate and Recycled Concrete Aggregate	
		7/11	Overband and Inlaid Crack Sealing Systems	
		7/12	Arrester Beds	
		7/13	Saw-Cut and Seal Bituminous Overlays on Existing Jointed Concrete Pavements	
		7/14	Preparation of Jointed Concrete Pavements prior to Overlaying and Saw-Cut and Seal of Bituminous Overlay	
		7/15	Saw-Cut crack and Seal existing Jointed Reinforced Concrete Pavements	
		7/16	Cracking and Sealing of existing Jointed Un-reinforced Concrete Pavements and CBM Road bases	
		7/17	Cracking Plant and Equipment Progress Record	
		7/18	Site Specific Details and Requirements for Cold Recycled Bitumen Bound Material	
		7/19	Site Specific Details and Requirements for Recycled Cement Bound Material	
		7/20	Site Specific Details and Requirements for Inducing Cracks	
		7/21	Surface Dressing – Recipe Specification (Sheets 1, 2 and binder Data Sheet)	
		7/22	Repair to Potholes	
1000			<u>ROAD PAVEMENTS – CONCRETE & CEMENT BOUND MATERIALS</u>	
		10/1	Plant and Equipment for the Construction of Exposed Aggregate Concrete Surface	
1100			<u>KERBS, FOOTWAYS AND PAVED AREAS</u>	✓
	(Co)	11/1	Kerbs, Footways and Paved Areas	✓
		11/2	Access Steps	
1200			<u>TRAFFIC SIGNS</u>	✓
	(Co)	12/1	Traffic Signs – General	✓
		12/2	Traffic Signs: Marker Posts	
	(Co)	12/3	Traffic Signs, Road Markings and Studs	✓
		12/4	Traffic Signs: Cones, Cylinders, FTD's & Other Traffic Delineators	
	(Co)	12/5	Traffic Signs: Traffic Signals	✓
		12/6	Traffic Signs: Special Sign Requirements on Gantries	
1300			<u>ROAD LIGHTING COLUMNS AND BRACKETS, CCTV MASTS AND CANTILEVER MASTS</u>	✓
	(Co/C)	13/1	Information to be provided when Specifying Lighting	✓

Series No.	Completed By	Appendix No	Title	Used (✓) or Not Used ()
			Columns and Brackets	
	(Co/C)	13/2	Typical lighting Column and Bracket Data Sheets 1 & 2	✓
		13/3	Instructions for Completion of Column & Bracket Data Sheets	✓
		13/4	Information to be provided when Specifying CCTV Masts	✓
		13/5	Typical CCTV Mast Data Sheet	
		13/6	Instructions for Completion of CCTV Mast Sheets	
		13/7	Information to be provided when specifying Cantilever Masts	
		13/8	(Specification for Highway Works) Typical Cantilever Masts Data Sheets 1 and 2	
		13/9	(Specification for Highway Works) Typical Cantilever Masts Data Sheets 1 and 2	
1400			<u>ELECTRICAL WORK FOR ROAD LIGHTING AND TRAFFIC SIGNS</u>	✓
		14/1	Site Records	✓
	(Co)	14/2	Location of Lighting Units & Feeder Pillars	✓
		14/3	Temporary Lighting	✓
	(C)	14/4	Electrical Equipment for Road Lighting	✓
	(C)	14/5	Electrical Equipment for traffic Signs	✓
1500			<u>MOTORWAY COMMUNICATIONS</u>	
		15/1	Motorway Communications	
		15/2	Cable Duct Requirements	
1600			<u>PILING AND EMBEDDED RETAINING WALLS</u>	✓
	(Co)	16/1	General Requirements for Piling and Embedded Retaining Walls	✓
		16/2	Precast reinforced and pre-stressed Concrete Piles and Precast Reinforced Concrete Segmental Piles	
		16/3	Bored Cast-in Place Piles	
		16/4	Bored Piles Constructed using Continuous Flight Augers and Concrete or Grout Injection through Hollow Auger Stems	
		16/5	Driven Cast-in-Place Piles	
		16/6	Steel Bearing Piles	
		16/7	Reduction of Friction on Piles	
		16/8	Non-Destructive Methods for Testing Piles	
		16/9	Static Load Testing of Piles	
		16/10	Diaphragm Walls	
		16/11	Hard/Hard Secant Pile Walls	
		16/12	Hard/Soft Secant Pile Walls	
		16/13	Contiguous Bored Pile Walls	
		16/14	King Post Walls	
	(Co)	16/15	Steel Sheet Piles	✓
		16/16	Integrity Testing of Wall Elements	
		16/17	Instrumentation for Piles and Embedded Walls	
		16/18	Support Fluid	
1700			<u>STRUCTURAL CONCRETE – SEASIDE STRUCTURES</u>	✓
	(Co)	17/1	Schedule for the specification of Designed Concrete	✓
		17/2	Concrete – Impregnation Schedule	
	(Co)	17/3	Concrete – Surface Finishes	✓
	(Co)	17/4	Concrete – General	✓
		17/5	Buried Concrete	
		17/6	Grouting and Duct Systems for Post-tensioned Tendons	

Series No.	Completed By	Appendix No	Title	Used (✓) or Not Used ()
	(Co)	17/7	Precast Concrete	✓
1700			<u>STRUCTURAL CONCRETE – PROMENADE STRUCTURES</u>	✓
	(Co)	17/1	Schedule for the specification of Designed Concrete	✓
		17/2	Concrete – Impregnation Schedule	
	(Co)	17/3	Concrete – Surface Finishes	✓
	(Co)	17/4	Concrete – General	✓
	(Co)	17/5	Buried Concrete	✓
		17/6	Grouting and Duct Systems for Post-tensioned Tendons	
	(Co)	17/7	Precast Concrete	✓
1800			<u>STRUCTURAL STEELWORK</u>	✓
		18/1	Requirements for Structural Steelwork	✓
1900			<u>PROTECTION OF STEELWORK AGAINST CORROSION</u>	
		19/1	(Specification for Highway Works) Form HA/P1 (New Works) Paint System Sheet	
		19/2	Requirements for Other Works	
		19/3	(Specification for Highway Works) Form HA/P2 Paint Data Sheet	
		19/4	(Specification for Highway Works) Form HA/P3 Paint Sample Dispatch List, sheets 1 & 2	
		19/5	General Requirements	
2000			<u>WATERPROOFING FOR STRUCTURES</u>	
		20/1	Waterproofing for Concrete Structures	
2100			<u>BRIDGE BEARINGS</u>	
		21/1	Bridge Bearing Schedule	
		22/1	Not Used	
2300			<u>BRIDGE EXPANSION JOINTS AND SEALING OF GAPS</u>	
		23/1	Bridge Deck Expansion Joints Schedule	
		23/2	Sealing of Gaps Schedule (Other than in Bridge Deck Expansion Joints)	
2400			<u>BRICKWORK, BLOCKWORK AND STONEMASONRY</u>	
		24/1	Brickwork, Blockwork and Stonemasonry	✓
		24/4	Seawall Repairs	✓
2500			<u>SPECIAL STRUCTURES</u>	
		25/1	Requirements for Corrugated Steel Buried Structures	
		25/2	Requirements for Reinforced Soil and Anchored Earth Structures	
		25/3	Requirements for Pocket – Type and Grouted Cavity Reinforced Brickwork retaining Wall Structures	
		25/4	Environmental Barriers	
		25/5	Requirements for Buried Rigid Pipes for Drainage Structures	
2600	(Co)		<u>MISCELLANEOUS</u>	✓
		26/1	Ancillary Concrete	
		26/2	Bedding Mortar	
		26/3	Cored Thermoplastic Node markers	
		26/4	Street Furniture	✓
		26/10	Artwork	✓
		26/11	Environment Mitigation	✓
3000			<u>LANDSCAPE AND ECOLOGY</u>	✓
		30/1	General, sheets 1,2 &3	
	(Co)	30/2	Weed Control	✓
		30/3	Control of Rabbits and Deer	

Series No.	Completed By	Appendix No	Title	Used (✓) or Not Used ()
	(Co)	30/4	Ground Preparation	✓
	(Co)	30/5	Grass Seeding, Wildflower Seeding and Turfing	✓
	(Co)	30/6	Planting, sheets 1 & 2	✓
	(Co)	30/7	Grass, Bulbs and Wildflower Maintenance	✓
	(Co)	30/8	Watering	✓
	(Co)	30/9	Establishment Maintenance for Planting	✓
		30/10	Maintenance of Established Trees and Shrubs	
		30/11	Management of Waterbodies	
		30/12	Special Ecological Measures	

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

Contract Specific Drawings Supplied to Each Tenderer

Refer to Outgoing Drawing Register

Brought into the Contract by Reference

HCD published by HMSO as Volume 3 of the Manual of Contract Documents for Highway Works

As-built Drawings

The Contractor shall provide full size marked up drawings on the as built construction, using red ink and stamped AS-BUILT. The drawings shall be provided in PDF electronic format by email. These are to be provided within 3 weeks of completion of the *Works*.

1 Preliminaries

APPENDIX 1/1: TEMPORARY ACCOMMODATION AND EQUIPMENT FOR THE PROJECT MANAGER

Accommodation Required

1. The temporary accommodation and equipment detailed in this Appendix shall be ready 7 days before the date of commencement of the Works. The site accommodation for the exclusive use of the Project Manager and his staff, to be provided in compliance with Clause 101, shall be of at least the size(s) listed below. The buildings may be serviceable purpose built or prefabricated temporary buildings.

Temporary Accommodation Dimensions

Floor	Area (m ²)
Main Office	20
Toilets	2

Duration of Time Accommodation Required

2. As per sub-clause 101.2.
3. Accommodation will be available for use by the Project Manager and his staff at all times for the period in which the Works are ongoing.

Locations of Accommodation

4. The offices for the Project Manager shall be either a separate building sited adjacent to the Contractor's office or part of the Contractor's office. The site of the accommodation shall be approved by the Project Manager and shall be cleared of all vegetation and topsoil. The area shall be trimmed to falls and naturally draining to prevent water lodging beneath the floors of offices. A nearby hardstanding shall be provided for the parking of at least 2 vehicles for the exclusive use of the Project Manager and his staff. The Contractor shall provide a suitable ramped entrance.
5. The construction of the buildings shall be approved by Project Manager. The buildings(s) shall have windows of adequate area for light and ventilation and windows receiving direct sunlight during working hours shall be fitted with venetian blinds. Main office floors shall be wood boarding covered with heavy duty thermoplastic floor covering. The height from floor to ceiling shall be not less than 2.4m. Lighting shall be by approved fluorescent tubular or LED fittings provided with perspex diffusers and shall conform to the IES recommended lux values. Alternatively, the form and standard of lighting shall be agreed with Project Manager. The building(s) shall be lockable and two sets of keys shall be supplied to the Project Manager.

Water Supply and Drainage: General

6. The Contractor shall make arrangements with the local water authority for the provision of a suitable water supply. The cold rising main shall be connected directly to each sink, each wash basin, the cistern of WC's urinals and water heaters. The hot water from each of the heaters shall be connected to each sink. All necessary drainage and overflow pipes shall be provided. Low level WC suites, urinals, 560mm x 400mm wash basins and stainless steel sink units 500mm x 500mm x 180mm with one drawer underneath and cupboard with sliding doors below shall be provided.
7. All foul water drainage wherever practicable shall be connected to the local foul drainage network system subject to the Contractor gaining approval from Welsh Water. Where it is not practicable to

connect the drainage with the local sewer system, in agreement with the Supervisor and Local Authority, other arrangements for the disposal of sewage shall be made by the Contractor. Surface water drainage shall be discharged into a local watercourse or soakaway.

Electric Installations and Supply: General

8. The Contractor is to make arrangements with the local electricity supply authority for the provision of suitable electricity supplies. All electrical work shall comply with the requirements of the local electricity authority, the Institute of Electrical Engineers (IEE), and the Local Fire Authority Office. Wiring shall be concealed in the construction wherever practicable. The central fuse box for the principal supply shall be located in the Engineers office. Space heating shall be by 3KW convector type heaters, screwed to the wall throughout and fed from switched 13amp socket outlets. The minimum room temperature to be maintained in all offices shall be 19°C during working hours. During warmer weather all reasonable efforts shall be made to ensure the temperature does not exceed 22°C.

Fittings and Furnishings of Accommodation, and other Equipment Required

9. The Contractor is to allow for all items contained within the following schedule. The items are to be new and unused, except in the case of furniture, which may be used provided they are in a high quality condition. The fittings and furnishings shall revert to the Contractor on completion of the contract.
10. All electrical equipment supplied to be complete and fitted with an appropriate, fused plug.
11. Fire-fighting equipment shall be provided in all offices as required by the local fire officer.

Communications Equipment

12. The Contractor shall provide a broadband internet connection for the Project Manager and their staff.
13. The connection must be reliable and have a minimum speed of 10Mbps.
14. Either WIFI or minimum 3 RJ45 network ports shall be provided.

Schedule of Items to be provided with temporary accommodation

Item	Quantity
1.5m x 1.0m office desk with lockable drawers	2
2.4m x 1.2m table	2
Upholstered office chairs (stackable)	4
4 drawer lock-up steel filing cabinet with keys	1
1.7m x 1.0m x 0.5m cupboard with shelves	2
Waste paper basket	1
3kW Electric Convector Heater	1
13 amp twin power outlet socket (in addition to those required for the heaters)	2
Coat hooks	4

APPENDIX 1/4: WORKING AND FABRICATION DRAWINGS

- Working and fabrication drawings, together with relevant accompanying calculation, are required for the following elements of work:

Table 1.1: Working and Fabrication Drawings

Series	Description of Work	Minimum period for submission of drawings
100 – Temporary Works	Detailed working drawings for all temporary works in connection with the project.	21 days
300 - Fencing	Details of handrail and guardrail fabrication and fixings	14 days
1200 – Traffic Signs (Also for pedestrian areas)	Sign Plate Designs and fixings.	14 days
1700 – Structural Concrete (Seaside Structures)	Fabrication drawings for pre-cast concrete elements to include reinforcement scheduling. (Refer to Appendix 1/10 for Contractor's design) Fabrication drawings and reinforcement schedules for in-situ concrete outfall protective slabs (Refer to Appendix 1/10 for Contractor's design. Refer to drawings 3525 for slab design).	21 days

- All detailed working and fabrication drawings together with relevant accompanying calculations shall be submitted to the Project Manager for his acceptance or approval prior to commencement of the related works.

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

- Where, in this document, a manufacturer's name is quoted, it is for description purposes only and similar items obtained from other manufacturer's may be acceptable subject to the Project Manager's approval.
- The contractor is responsible for conducting the tests listed in the Table below in accordance with Clause 105.
- The testing laboratory shall be UKAS accredited.

Testing to be carried out by the Contractor

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 300					
306	Permanent Fencing				Quality management scheme applies
	Concrete components	Cover to reinforcement	1 per consignment (maximum 1 per 100 components) (BS 1722)		[Tests/samples should not normally be required]
308	Gates and stiles				Quality management scheme applies
	Reinforced concrete posts	Cover to reinforcement	1 per consignment (maximum 1 per 100 components) (BS3470)		[Tests/samples should not normally be required]
308 & 311	Preservation of timber	Full sapwood penetration	As required in sub-Clause 311.2(v)	Required for each batch	Quality management scheme applies [Tests/Samples should not normally be required]
Series 400					
402	Welding	Welding procedures (Manufacturer's tests)	(Every seven years)	Required	Requirements here are applicable only to systems not falling under the Construction Products Regulation (CPR). Quality management scheme applies
		Welder qualification (Manufacturer's tests)	As required in sub-Clause 402.6(iii)		
		Production testing (Manufacturer's tests)	As required in sub-Clause 402.6(iv)		
	Welded joints	Destructive testing	[See sub-Clauses 402.6(v) and 402.6(vi)]		
	Wire rope terminals	Tensile tests (Manufacturer's tests)	(Annually and when production technique changed)	Required	To provide evidence of tests by a testing laboratory [See NG 403.15] Requirements here are applicable only to systems not falling under the CPR
403	Anchorage and attachment systems for use in drilled holes	Ultimate tensile load (Manufacturer's tests)		Required	To provide well attested and documented evidence [See Ng 403.5]
404	Anchorage in drilled holes	Loading test on site	As required in contract specific Appendix 4/1	Required	
	Post foundations			Required	
Series 400 (continued)					

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
406	Vehicle parapets			Required	Quality management scheme applies - applicable only to systems not falling under the CPR.
407	Anchorage and attachment systems for use in drilled holes	Ultimate tensile load (Manufacturer's test)		Required	To provide well attested and documented evidence for systems not falling under the CPR. [See NG 407.2]
409	Vehicle parapet posts	Production testing as specified in BS 6779-1 1998 (AmdNo 14290, 21 March 2003) (Manufacturer's tests)		Required	Certification in accordance with Clause 409 is required for systems not falling under the CPR.
410	Anchorage in drilled holes	On-site tensile load test	As required in contract specific Appendix 4/1	Required	
Series 500					
501	Pipes for drainage and service ducts			Required	Product certification scheme or equivalent applies for products not falling under the Construction Products Regulation (CPR) [Appropriate contract compliance testing should be scheduled for all products including those falling under CPR]
	Vitrified clay				
	Concrete-PC/SRC	Not exceeding 900 mm dia		Required	
	Concrete-Prestressed				
	Iron-cast				
	Iron-ductile				
	PVC-U			Required	
	GRP				
	Plastics. See Table 5/1				
	Corrugated Steel		(Manufacturer's tests)	Required (AASHTO)	
	Corrugated steel bitumen protection	Not exceeding 900 mm dia			
	Other materials			Required	Product Acceptance Scheme or equivalent applies
503	Pipe bedding	Grading and fines content		Required	[Appropriate contract compliance testing should be scheduled for all products including those falling under CPR]
		Water-soluble sulfate (WS) content (N)			
		Oxidisable sulfides (OS) content and total potential sulfate (TPS) content (N)			
		Resistance to fragmentation (N)			
Series 500 (continued)					

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
505	Filter medium backfill	Plastic index (N)	1 per source*		<i>[For bedding types not falling under the Construction Products Regulation (CPR). Results of routine control tests from the factory production control system operated by the producer to be provided - see BS EN 13285] [Appropriate contract compliance testing should be scheduled for all products including those falling under CPR]</i>
		Resistance to fragmentation (N)	1 per source*		
		Water-soluble sulfate (WS) content (N)	5 per source		
		Oxidisable sulfides (OS) content and total potential sulfate (TPS) content (N)	5 per source		
		Grading	1 per 500 tonnes*		<i>[For bedding types not falling under the (CPR), results of routine control tests from the factory production control system operated by the producer to be provided - see BS EN 13285] [Appropriate contract compliance testing should be scheduled for all products including those falling under CPR]</i>
		Permeability (N)	1 per source*		
506	Sealing existing drains				<i>[Appropriate tests/samples should be scheduled where not included under other Clauses]</i>
	Concrete				
	Grout				
507	Chambers				Product certification scheme or equivalent applies
	Precast concrete				
	Corrugated galvanised steel	(Manufacturer's tests)		Required	Product certification scheme or equivalent applies
	Steel fitments				
	Covers, grates and frames				Product certification scheme or equivalent applies
	Cover bolts				Quality management scheme or equivalent applies
508	Gullies and pipe junction				For products not falling under the (CPR) product certification scheme or equivalent applies.
	Precast concrete				
	Clay				
	Cast iron and steel			<i>[Appropriate contract compliance testing should be scheduled for all products including those falling under CPR]</i>	
Series 500 (continued)					
509	Watertightness of joints	Air test	All pipelines with watertight joints	Required	

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
			<i>[As required in contract specific Appendix 5/1 for partly watertight joints]</i>		
512	Backfill to pipe bays	Grading	1 per 50 tonnes (min of 3)*		<i>[Acceptance testing can be scheduled for bedding types not falling under the Construction Products Regulation (CPR)]</i> <i>[Appropriate contract compliance testing should be scheduled for all products including those falling under CPR]</i>
		Water-soluble sulfate (WS) content (N)	5 per source*		
		Oxidisable sulfides (OS) content and total potential sulfate (TPS) content (N)	5 per source*		
513	Permeable backing to earth retaining structures	Plastic index (N)	1 per source*		<i>[Acceptance testing can be scheduled for bedding types not falling under the CPR]</i> <i>[Appropriate contract compliance testing should be scheduled for all products including those falling under CPR]</i>
		Water-soluble sulfate (WS) content (N)	5 per source		
		Oxidisable sulfides (OS) content and total potential sulfate (TPS) content (N)	5 per source		
		Resistance to fragmentation (N)	1 per source*		
		Grading	1 per 200 tonnes (min of 3)*		
		Permeability (N)	1 per source*		
	Precast hollow concrete blocks	(Manufacturer's tests)		Required	
514	Fin Drains	(Manufacturer's tests)		Required	Product Acceptance Scheme (or equivalent) applies
Series 500 (continued)					
515	Narrow filter drains				
		Geotextile, pipes and fittings	(Manufacturer's tests)	Required	Product Acceptance Scheme (or equivalent) applies
		Granular fill	Plastic index (N)		

Clause	Work, Goods or Material		Test	Frequency of Testing	Test Certificate	Comments
			Resistance to fragmentation (N)			<i>[Acceptance testing can be scheduled for bedding types not falling under the Construction Products Regulation (CPR)]</i>
			Water-soluble sulfate (WS) content (N)	5 per source		
			Oxidisable sulfides (OS) content and total potential sulfate (TPS) content (N)	5 per source		
			Grading	1 per 200 tonnes (min of 3)8		
			Permeability (N)	1 per source*		
516	Combined drainage and kerb systems		Load test			
517	Linear drainage systems		Load test			
518	Thermoplastics structured wall pipes and fittings		(Manufacturer's tests)		Required	Product Acceptance Scheme or equivalent applies
Series 600						
601, 631 to 637, 640	Acceptable material				Required	<i>[Acceptance testing can be scheduled for materials not falling under the Construction Products Regulation (CPR)]</i>
	Class	General Description				
	1	General granular fill	Grading/uniformity coefficient	Twice a week*		
			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 (N)	Weekly*		
Series 600 (continued)						
601, 631 to 637, 640 (cont)	Class	General Description				[Cross reference should e made to any requirements in contract specific Appendix 6/1]
	1	General granular fill	Grading/uniformity coefficient	Twice a week		
			Mc/MCV (N)	2 per 1000m³ up to a max of 5 per day		

Clause	Work, Goods or Material		Test	Frequency of Testing	Test Certificate	Comments
			SMC of chalk	Twice a week		
	4	Landscape fill	Grading/mc/MCV (N)	Daily*		
	5	Topsoil	Grading	Daily*		
	6N	Selected well granular fill	Grading/uniformity coefficient	1 per 400 tonnes*		
			PI/LL (N)	Daily*		
			Resistance to fragmentation (N)	Weekly for on-site material*		[LA category but not for Class 6F4 and 6F5]
			SMC (N)	Weekly*		
			omc/mc, mc or MCV (N)	1 per 400 tonnes*		
			Organic matter/water soluble sulfate (WS) (N)	Weekly*		[At least 5 tests per source for sulfur compounds over the course of the contract in accordance with TRL Report 447, tests 1-5]
			Oxidisable sulfides (OS) and total potential sulfate (TPS) content (N)	Weekly*		
			pH/chloride ion content (N)	Weekly*		
			Resistivity (N)	[As required]		
			Undrained and drained shear parameters (N)	[As required]		[Cross-reference should be made to any requirements in Appendix 6/1]
			Effective drained shear parameters	1 per 400 tonnes*		Designer to provide confining pressures
			Permeability	1 per 400 tonnes*		
			Density	1 per 400 tonnes*		
			Effective angle of internal friction (ϕ')	1 per 800 tonnes*		
	6F 5	Selected granular material (coarse grading - imported onto the site)	Size designation and overall grading category	1 per week*		[Acceptance testing can be scheduled for materials not falling under the Construction Products Regulation (CPR)] [Appropriate contract compliance testing should be scheduled for all products including those falling under CPR]
			Maximum fines and oversize categories	1 per week*		
			Volume stability of blast furnace slag	6 monthly		
			Volume stability of steel (BOF and EAF) slag	6 monthly		
			Other aggregate requirements	Annex C of BS EN 13242		
			Laboratory dry density and optimum water content	1 per 400 tonnes*		
631	Sub-grade	In-situ CBR	To be confirmed by contractor	30m centres offset 15m between lanes	Required	Testing to comply with IAN 73.06
Series 600 (continued)						
601, 631 to 637, 640 (cont)	Class	General Description				
	Pulverised fuel ash		Chemical analysis	1 per consignment*		[As appropriate to properties stated in Table 6/1 or contract specific Appendix 6/1]
	Furnace bottom ash		Grading	1 per 300 tonnes*		[At least 5 tests per source for sulfur compounds over the course of the contract in
	Fill adjacent to cementitious material or metallic items		Water-soluble sulfate (WS)	1 per 400 tonnes or per		

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
		content, oxidisable sulfides (OS) content and total potential sulfate (TPS) contact (N)	location if less than 400 tonnes*		<i>accordance with TRL Report 447, tests 1-5]</i>
645	Armourstone	Grading (n)	Tests per rock grade. One test at the beginning of the works and a second test during the works to be selected by the PM	Required	Testing to be carried out in accordance with the relevant standards as specified in Appendix 6/1
		Shape (N)			
		Crushed or broken surfaces (N)			
		Minimum particle density (N)	One test for source approval. Additional during the works to be selected by the PM	Required	
		Resistance to breakage (N)			
		Resistance to wear (N)			
		Water absorption (N)			
		Resistance to salt crystallisation (N)			
		Drop test	1 for each heavy grade, or as required in 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 every four months* As required	Required	<i>[Acceptance testing can be scheduled for materials not falling under the Construction Products Regulation (CPR)]</i> <i>[Appropriate contract compliance testing should be scheduled for all products including those falling under CPR]</i>
609, 621	Geotextiles	Tensile load Permeability Pore size	1 per 400 square meters*	Required	<i>[Requirements should be given in contract specific Appendix 6/5 or 6/9 as appropriate]</i>
612	Compaction of fills			Required	
	Method compaction	Field dry density (N)	<i>[As required]</i>		
	End product compaction	Optimum mc (2.5 kg rammer/vibrating hammer method) (N)	Each class or sub class of material*		
		Field dry density (N)	1 per 400 tonnes*		
Series 600 (continued)					
622, 638, 639	Earthworks for reinforced soil and anchored earth structures	Redox potential	5 locations within the affected area*	Required	<i>[Acceptance testing can be scheduled for materials not falling under the Construction Products Regulation (CPR)]</i> <i>[Appropriate contract compliance testing should be scheduled for all products including those falling under CPR]</i>
	Drainage layers	Grading Chemical analysis	1 per 400 tonnes*		

Clause	Work, Goods or Material		Test	Frequency of Testing	Test Certificate	Comments
		Reinforcing elements	Coeff of friction	Each type of element with each type of fill*		
		Anchor elements	Adhesion			
624	Ground anchorages		Proof loading	As required In contract specific Appendix 6/10	Required	
626	Gabions				Required	
	Fill	Grading	1 per 400 tonnes*			
		10% fine values (N)				
	Geomesh	[As appropriate to properties stated in contract specific Appendix 6/10]		1 per 400 square metres*		
	PVC coated wire				Required (ASTM G23)	
642	Earthworks materials for corrugated steel buried structures		Constrained soil modulus (M*)	3 on each side of each structure*	Required	
645	Armourstone and rip-rap		Grading Shape Crushed or broken surfaces	1 for each rock grade Additional test for each change of source		
Minimum particle density Resistance to breakage Resistance to wear Water absorption Resistance to salt crystallisation			For each source of material a minimum of 1 set of tests. Production tests for established quarry. Tests for every 100,000t	Required		
			Drop test	1 for each heavy grade, or as required in Appendix 6/16.		
Series 700						
710	Constituent materials in recycled aggregate and recycled concrete aggregate		Quality control	As required by the 'Quality Protocol for the production of aggregates from inert waste'	Required	[See NG 710.1 and NG 710.2]
711	Overbanding and inlaid crack sealing systems				Required	Product Acceptance Scheme or equivalent applies
Series 800						
801, 803, 804, 805, 806	General Requirements for unbound mixtures for adjacent to cement bound materials, concrete pavements, structures or products		Water-soluble sulfate (WS) content (N)	1 per 400 tonnes or per location if less than 400 tonnes*	Required	[Acceptance testing can be scheduled for materials not falling under the Construction Products Regulation(CPR)]
			Oxidisable sulfides (OS) content and total potential	1 per 400 tonnes or per location if less		[Appropriate contract compliance testing should be scheduled for all products]

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
	Unbound mixtures beneath surface of a road or paved central reserve	sulfate (TPS) content (N)	than 400 tonnes*		including those falling under CPR]
		Frost heave (N)	1 per source*		
		Grading and fines content	1 per week*		
		Plastic index (N)			
		Resistance to fragmentation (N)	6 monthly*		
		Resistance to wear - micro-Deval test			
		Resistance to freezing and thawing (magnesium sulfate soundness) (N)	1 per source*		
		Water absorption (N)	[As required]		
		Volume stability of blast furnace slags	6 monthly		
		Volume stability of steel (BOF and EAF) slags	6 monthly		
		CBR (N)	1 per source and then monthly*		
		OMC/mc (N)	[As required]		
		Density (N)	[As required]		
		Water absorption (N)	[As required]		
821, 822, 823, 830, 831, 832, 834, 835, 840	Cement and other Hydraulically Bound Mixtures (HBM)	Tests for control and checking of HBM	Tests specified in Table 8/14 and Table 8/15	Required	
		Coefficient of linear expansion	[As required]		
		Tests for laboratory mixture design	Test specified in Clause 880		
Series 900					
901, 925, 937, 938, 943	Aggregates for bituminous materials			Required	
	Resistance to fragmentation (hardness)	Resistance to fragmentation (N)			
		Soundness (N)			

Clause	Work, Goods or Material		Test	Frequency of Testing	Test Certificate	Comments
		Resistance to freezing and thawing (durability)	Water absorption (N)			
		Cleanness	Sieve test (mass passing 0.063 mm sieve) (N)			
		Shape	Flakiness index (N)			
		Blastfurnace slag	Bulk density (N)			
			Soundness (N)			
			Dicalcium silicate disintegration (N)			
			Iron disintegration (N)			
		Steel slag	Bulk density			
			Volume stability (N)			
	Coarse aggregate for surface courses	Resistance to polishing (PSV) (N)				
		Resistance to surface abrasion (AAV) (N)				
	Binders for bituminous materials					
903 to 907, 909 to 912, 914, 916, 925, 926, 929, 930, 937, 938, 941, 943, 946 to 948	Bituminous mixtures	Grading (N)	For Audit Test purpose only			
		Binder Content (N)				
929	Base and Binder Course Asphalt Concrete (Design Mixtures)	Permanent Works - In situ air void content (N)	[As required]			
		Permanent Works - Refusal air void content (N)				
		Permanent Works - Deformation resistance				
		Deformation resistance (design)	[As required]			
		Stiffness (design)				
Series 900 (continued)						
930	EME 2	Permanent works - In situ air void content (N)	[As required]			
		Richness modulus (design)	[As required]			
		Duriez (design)				

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments	
		Deformation Resistance (design)				
		Stiffness (design)				
911	Rolled asphalt surface course (design mix)	Stability value (N)				
		Flow value (N)				
		Density (N)				
915	Coated chippings	Grading (N)				
		Binder content (N)				
		Flakiness index (N)				
		Resistance to polishing (PSV) (N)				
		Resistance to surface abrasion (AAV) (N)				
		Hot sand test (N)				
		Rate of spread (N)				
921	Surface macrotexture	Volumetric Patch (N)	[As required]	Required		
924	High friction surfaces	Quality control checks	As required in sub-Clause 924.5	Required	Product Acceptance Scheme or equivalent applies	
		System coverage	As required in sub-Clause 924.6			
		Aggregate	Resistance to polishing (PSV) (N)			
937	Stone mastic asphalt (SMA) binder course and regulating course	Permanent Works - In situ air void content (N)	[As required]			
		Permanent Works - Deformation resistance				
		Binder drainage test (design)	[As required]			
		Deformation resistance (design)				
942	Thin surface course systems	General properties		Required	Product Acceptance Scheme or equivalent applies	
943	Hot Rolled Asphalt surface course and binder course (performance- related design mixtures)	Permanent Works - In situ air void content (N)	[As required]			
		Permanent Works - Deformation resistance				
		Deformation resistance (design)	[As required]			
Series 900 (continued)						
918	Slurry surfacing incorporating microsurfacing					
		Binder				
			Product Identification			
			Vialit cohesion			
			Rate of spread			

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
	Aggregates	Penetration at 25°C and 5°C (N)			
		Flakiness index (N)			
		Resistance to polishing (AAV) (N)			
		Resistance to surface abrasion (AAV) (N)			
		Grading (N)			
	System				
920	Bond coats, tack coats and other bituminous sprays				
	Binder	Product identification			
		Vialit cohesion			
		Accuracy of spread			
		Rate of spread			
		Penetration at 25°C and 5°C (N)			
919, 922	Surface Dressing				
	Binder				
		Product Identification			
		Vialit cohesion (N)			
		Accuracy of spread			
		Rate of spread			
		Penetration at 25°C and 5°C (N)			
	Chippings	Resistance to (PSV) polishing (N)			
		Resistance to abrasion (AAV) (N)			
		Grading (N)			
		Binder content (N)			
		Flakiness index (N)			
		Accuracy of spread (N)			
		Rate of spread			Frequency to be reduced to daily after 3 satisfactory results, but not less than 1 test per lane per site
	Rollers	Spray bars working	Before work starts and daily during works		
950	Depressions				Product Acceptance Scheme or equivalent applies
Series 1000					
1001, 1030, 1044	Cement				
	Portland cement CEM1				
	Portland blastfurnace cement				
	Blastfurnace cement CEM III/A				

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
	Portland pfa cement CEM II/B-V				
	Pozzolanic cement CEM IV/A				
	Portland cement with microsilica				Product Acceptance Scheme applies for microsilica
	Pulverised-fuel ash				
	Ground granulated blast furnace slab				
	Admixtures				
	Mixing water	Sulfate content (N)			
	Aggregates	Resistance to freezing and thawing - magnesium sulfate soundness (N)			
		Water absorption (N)			
		Flakiness index (N)			
		Shell content (N)			
		Resistance to fragmentation (N)			
		Resistance to polishing (PSV) (N)			
		Resistance to abrasion (AAV) (N)			
		Grading and fines content (N)			
		Chloride content (N)			
		Total sulfur (TS) and acid-soluble sulfate (AS) content (N)			
	Flint coarse aggregate containing white flints	Water absorption (N)			
	Sand (ie fine aggregate)	Acid-soluble material (N)			
	Blastfurnace slag	Bulk density (N)			
		Dicalcium silicate disintegration (N)			
		Iron distintegration (N)			
		Total sulfur (TS) and acid-soluble sulfate (AS) content (N)			
	Pulverised-fuel ash				
Series 1000 (continued)					
1002, 1003, 1004, 1044	Pavement concrete	Air content test (N)	As required in Table 10/10	Required	Product certification scheme or equivalent applies
		Density (N)	As required in Table 10/10		
		Strength (N)	As required in Table 10/10		
1005	Consistence (Workability)	Degree of Compactability		Required	

Clause	Work, Goods or Material		Test	Frequency of Testing	Test Certificate	Comments
			(Compaction Index) (N)	As required in Table 10/10		
			Vebe (N)			
			Slump (N)			
1011, 1012	Dowel bars				Required (BS4449)	Product certification scheme applies
	Tie bars					
		Dowel bars and supporting cradles	Load test	1 per arrangement*		
		Sheathed dowel bars	Bond stress	4 bars		
		Cranked tie bars (coated)	Bend test	4 bars*		
			Salt fog cabinet	4 bars*		
1015	Joint filler board		Weathering test	3 per source	Required	Normally undertaken by manufacturer
			Compression and recovery	4 per source		
			Extrusion	1 per source		
	Cork filler board	Immersion in water	2 per source			
		Immersion in acid	2 per source			
1016, 1017	Applied sealants					
			Resilience			
	Compression seals					
			Compression set	1 per type of seal*		
			Immersion in oil	1 per type of seal*		
	Self expanding cork seal		Tests specified in Clause 1017	1 per type of seal*		
1026, 1044	Surface macrotexture		BS EN 13036-1 Volumetric Patch Technique (N)	1 per day (set of 10)*	Required	
1027	Aluminised curing compound		Efficiency index	1 per source*	Required	
1030	Wet lean concrete		Density	As required in Table 10/9	Required	
			Cube strength (N)			
1043	Foamed Concrete		Cube strength (N)	2 cubes per 12 m³	Required	
Series 1100						
#1101	Precast concrete kerbs, channels, edgings and quadrants		Bending strength			
1102	In situ asphalt kerbs		Grading	1 test per 500 metres laid*	Required	[See BS 5931 for materials for in situ asphalt kerbs]
			Binder Content			
Series 1100 (continued)						
1104	Precast concrete flags		Bending strength			[Appropriate tests/samples should be scheduled where not included under other Clauses]
	Bedding	Granular material				
		Mortar				
1107	Concrete block paving		Compressive strength			
1108	Clay pavers		Bending strength			
			Skid resistance			
Series 1200						
1202	Permanent traffic signs					
1207	Anchorage in drilled holes to supports of traffic signs		Loading test on site	[As required]		

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
1210	Holding down bolts and anchorages to bases of permanent bollards				
1212	Road Markings				
1214	Permanent traffic cones and traffic cylinders				
	Flat traffic delineators			Required	
		Tests specified in Clause 1214	[As required]		[Where required]
	Other traffic delineators			Required	Certification that the delineators have been tested and comply with Clause 1214 is required
		Tests specified in contract specific Appendix 12/4	[As required]		[Where required]
1217	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
	Traffic signals				Statutory type approval of equipment applies
	Cables				Produce certification scheme or equivalent applies
	Controllers [Other equipment]	Test specified in Appendix 12/5	Each controller before delivery to Site and again after installation		
	Cabling	Tests a, b, c, e, f, g, h, j as defined in sub-Clause 1424.2	Each traffic signals installation	Required	Certification that the installation complies with BS7671 (the IEE Wiring Regulations) is required
Series 1200 (continued)					
1218	Detector loops				
	Cable			Required	Certification that completed cables comply with specification TR 2029 is required
	Epoxy resin			Required [where considered appropriate]	Certification that the epoxy resin complies with specification MCH 1540 is required
	Feeder cable			Required	Certification that completed cables comply with specification TR 2031 is required
	Joints	Pull test (4 kgf)	Each crimp		
	Installation	Series resistance	Each loop	Required	Certification in accordance with specification MCH 1540 is required
		Insulation resistance			

Clause	Work, Goods or Material		Test	Frequency of Testing	Test Certificate	Comments
			Inductance			
Series 1300						
1305	Anchorage for use in drilled holes		Tensile load			
1306	Anchorage in drilled holes to columns and masts with flange plates		Loading test on site	[As required]		
1313	GFRP laminates		Loss on ignition	1 per 50 production columns		[See sub-Clauses 1313. 10-17]
			Colour fastness	1 per batch		
			Electric strength			
			Water absorption			
			Impact strength			
1314	Brackets for laminated GFRP lighting columns			Required		
	Polyurethane foam	Bulk density	1 per batch			
		Surface hardness				
		Apparent bulk density	2 per batch			
		Impact strength				
		Flexural stress				
Series 1400						
1421	Cable					Produce certification scheme or equivalent applies
1424	Lighting Units		Tests specified in Clause 1424	Each unit	Required	Product certification scheme or equivalent applies Certification that the installation complies with BS7671 (the IEE Wiring Regulations) is required
	Networks		Tests specified in Clause 1424	Each network	Required	Certification that the installation complies with BS7671 (the IEE Wiring Regulations) is required
Series 1500						
1506	Copper communications cable				Required	Certification that each completed cable complies with specification TR 2150 or TR2158, as appropriate, is required
	Optical fibre communications cable				Required	Certification that each completed cable complies with specification TR 2151 or TR2159, as appropriate, is required
	Coaxial communications					Certification that each completed cable complies with specification TR 2152 or TR2160, as appropriate, is required
	Energy cable				Required	Certification that each completed cable complies with specification TR 2153 or TR2161, as appropriate, is required
1513	Cable Joint Enclosures		Test specified in Clause 1513.12	Each CJE	Required	Certification that the CJE satisfies the air pressure test is required

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
1518	Coaxial and copper communications and power cable	Tests specified in specification MCG 1022 or MCG 1099, as appropriate	Each cable (Stage 1) As required in contract specific Appendix 15/1 (Stage 2)		Results to be reported in accordance with MCG 1022 or MCG 1099, as appropriate
	Optical fibre communications cable	Tests specified in specification MCG 1055 or MCG 1099, as appropriate	Each cable (Stage 1) As required in contract specific Appendix 15/1 (Stage 2)		Results to be reported in accordance with MCG 1055 or MCG 1099, as appropriate
1522	Motorwarn System				
	Steel posts			Required (BS 6323)	
1526	Electrical Installations	Tests specified in BS 7671	Each installation	Required	Certification that the installation complies with BS 671 (the IEE Wiring Regulations) is required.
1530	Cable ducts				Product Acceptance Scheme or equivalent applies
1533	Cable ducts				
	Mandrel test	Test specified in Clause 1533	Each duct	Required	Certificate that each length of duct between chambers satisfies the mandrel test is required
	Airtest	Test specified in Clause 1533	Each duct	Required	Certificate that each length of duct between chambers satisfies the air test is required.
Series 1600					
1601	Soil samples In situ soil tests			Required	[Appropriate soil tests should be scheduled where required]
1602 to 1606 1610 to 1615	Concrete Grout Reinforcement Prestressing Steelwork Welding Protection against corrosion			Required	[Appropriate tests/samples should be scheduled where not included under other Clauses/Seies]
Series 1600 (continued)					
1606	Coatings for protection against corrosion	Adhesion	As required in Appendix 16/6		
1607	Reduction of friction on piles				[Particular requirements detailed in contract specific Appendix 16/7 should be scheduled]
1608 1616	Integrity testing Dynamic testing				[Particular requirements detailed in contract specific Appendix 16/8 or 16/16 should be scheduled]
1609	Static load testing of piles			Required	[Testing of preliminary piles should not be scheduled in contract specific Appendix 1/5] [Particular requirements detailed in contract specific Appendix 16/9 should be scheduled]
1612	Self hardening slurry mixes				[Particular requirements detailed in contract specific Appendix 16/12 should be scheduled]
1617	Instrumentation				[Particular requirements detailed in contract specific

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
					Appendix 16/17 should be scheduled]
1618	Support fluids	To be proposed by the Contractor			[Particular requirements detailed in contract specific Appendix 16/18 should be scheduled]
Series 1700					
1707	Hardened concrete - Identity Testing	Cube strength (N) - as described in contract specific Appendix 17/4	Prestressed concrete - two cubes from 12 m³ or 2 batches whichever represents the lesser volume	Required	Contractor to cast and test sufficient additional cubes to demonstrate cube strength before transfer [See clause 1724]
			Reinforced concrete - three cubes from 24 m³ or 4 batches whichever represents the lesser volume		[See also Table NG 17/2]
			Mass concrete - two cubes from 50 m³ or 50 batches whichever represents the lesser volume		[See also Table Ng 17/2]
			Additional cubes for special purposes		[Tests/samples should be scheduled as required. See Ng 1707.11]
			Seaside Structures; Reinforced and mass concrete – 4 cubes from 24m³ or per batch, whichever represents the lesser volume. Tests to be at 7, 14 and 28 days with one cube spare.		
		Density	[As required]		[Requirements should be given in contract specific appendix 17/1 as appropriate]
	Fresh concrete - Identity Testing	Consistence (slump) or flow) (N)	Each batch	Required	[See sub-Clause 1707.2]
		Air content	Each batch		
		Density	[As required]		
		Water/cement ratio			
Series 1700 (continued)					
1710	Concrete packing Mortar packing Epoxy resin bonding agent				[Appropriate tests/samples should be scheduled]
	Precast concrete not conforming to any Product Standard or to BS EN 13369	Cube strength (Manufacturer's tests)			Contractor to make available records of tests by the manufacturer. See sub-Clause 1710.8
1711	Grouting and Duct Systems for Post-tensioned tendons				Product acceptance scheme or equivalent applies

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
		Full scale trials, where required in the contract	In accordance with BS EN 447 and BS EN 446		See sub-Clause 1711.1 and Appendix 17/6
		Duct assembly verification tests			See sub-Clause 1711.4 and Appendix 17/6
		Fluidity			See sub-clause 1711.2 and sub-Clause 1711.3
		Bleeding			
		Volume change			
		Cube strength			
		Sieve			
		Density			
		Time Setting			
1712	Reinforcement				Product certification scheme or equivalent applies
	Steel bars			Required (BS4449)	
	Steel wire			Required (BS4482)	
	Steel fabric			Required (BS4483)	
	Stainless steel			Required (BS6744)	
1713	Fabricated reinforcement			Required (BS8666)	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 or equivalent
1716	Reinforcement jointing systems	Permanent elongation characteristic strength (Manufacturer's tests)		Required for each type of connection	Product acceptance scheme or equivalent applies
1717	Reinforcement - Welding	Welding procedure approval (BS EN ISO 17660)	As required in BS EN ISO 17660		<i>[Where tests in addition to those specified in BS EN ISO 17660 are required full details should be scheduled]</i> Tests should be carried out by an independent testing body
		Welder approval (BS EN ISO 17660)			
Series 1700 (continued)					
1718	Prestressing tendons				Product certification scheme or equivalent applies
	Steel wire and strand			Required (BS5896)	
	Steel bar			Required (BS4486)	
	Prestressing steel (all types)	Proof load Breaking load Elongation Ductility Relaxation Modulus of elasticity	<i>[As required]</i>		
	Other than lowest strength wire or strand to BS 5896	0.1% proof load			

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
1724	Post-tensioning anchorages	Tests in accordance with BS EN 13391 (Manufacturer's tests)		Required (BS EN 13391)	Product certification scheme or equivalent applies
1726	Stainless steel bar			Required (BS6744)	Product certification scheme or equivalent applies
1727	Inspection and testing of structures and components				<i>[Tests should be scheduled as appropriate and requirements given in contract specific Appendix 17/4]</i>
Series 1800					
1805	1805.2 Metallic products			Required according to BS EN 1090-2:2008+A1:2011, Table 1	<i>[Give type of metallic product and document required, noting specific requirement for steel grade S355 JR and J0 described in 1805.2]</i>
	1805.3.4 Special properties of constituent products	Testing to identify internal discontinuities or cracks in zones to be welded as specified in Appendix 18/1	As required in Appendix 18/1		<i>[Give specific testing requirements and frequency of testing in Appendix 18/1 with cross reference in Appendix 1/5]</i>
1806	1806.4.4 Check of the capability of cutting processes that are likely to produce local hardness	Testing in accordance with BS EN ISO 6507	As required		
	1806.5.4 d) Check of the hardness and geometry of hollow section components subject to bending by cold forming	Check of the hardness, testing in accordance with BS EN ISO 6507	As required		
Series 1800 (continued)					
1807	1807.4.1.2 Qualification of welding procedures (Processes 111, 114, 12, 13 and 14)	Tests specified in BS EN ISO 15614-1 or BS EN ISO 15613	As required in BS EN ISO 15614-1 or BS EN ISO 15613		Results to be reported in accordance with BS EN ISO 15614-1 or BS EN ISO 15613
	1807.4.1.2 (3 Qualification of welding procedures for joint with restricted access	Tests specified in BS EN ISO 15613	As required in BS EN ISO 15613		Results to be reported in accordance with BS EN ISO 15613
	1807.4.1.3 Qualification of welding procedures for other welding processes	Tests specified in the standards listed in BS EN 1090-2:2008+A1:2011, Table 13	As required in the standards listed in BS EN 1090-2:2008+A1:2011, Table 13		Results to be reported in accordance with the standards listed in BS EN 1090-2:2008+A1:2011, Table 13. Note the requirement in BS EN 1090-2:2008+A1:2011, 7.5.12 relating to stud weld procedure testing
	1807.4.1.4 Validity of welding procedure qualification	Additional tests specified in BS EN 1090-2:2008+A1:2011, 7.4.14 for a welding procedure	As required in BS EN 1090-2:2008+A1:2011, 7.4.1.4		Results to be reported in accordance with BS EN ISO 15614-1

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
		qualified in accordance with BS EN ISO 15614-1, which is undertaken by a welding process that has not been used			
	1807.4.1.4(1) Validity of welding procedure qualification	Welding production test in accordance with the qualification standard for the process concerned	As required		Results to be reported in accordance with the qualification standard for the process concerned
	1807.4.2 Qualification of welders and welding operators	Tests specified in BS EN 287-1 (welders) or BS EN 1418 (welding operators)	As required in BS EN 287-1 or BS EN 1418 as appropriate	Required	Certificate to be in accordance with BS EN 287-1, Annex A or BS EN 1418, Annex C As appropriate
	1807.4.2 Qualification of welders of hollow section branch connection with angles less than 60°	Specific qualification test. Tests specified in BS EN 287-1	As required		
	1807.4.2 (1) Qualification of welders of joints with restricted access	Specific qualification test. Tests specified in BS EN 287-1	As required		
	1807.5.1.1 Verification that joint preparation in steel grades higher than S460 are free from cracks	Testing in accordance with BS EN 571-1 (penetrant) or BS EN 1290 (Magnetic particle)	As required		
	1807.5.1.1 (1) Qualification of welding procedures where prefabrication primers are to be left on the fusion faces	Tests specified in BS EN ISO 15614-1 or BS EN ISO 15613 using such prefabrication primers	As required in BS EN ISO 15614-1 or BS EN ISO 15613		Results to be reported in accordance with BS EN ISO 15614-1 or BS EN ISO 15613
	1807.5.4 (1) Welding of joints in hollow sections, full penetration butt welds with restricted access	Pre-production weld test conforming to BS EN ISO 15613	As required		
Series 1800 (continued)					
1807 (cont)	1807.5.6 (3) Verification of ground surface are free of cracks following removal of temporary welded attachments	Testing in accordance with BS EN 1290 (Magnetic particle)	As required		
	1807.5.9.2 (1) Verification of the absence of surface cracking in continuity welds in permanent steel backing	Testing in accordance with BS EN 571-1 (penetrant) or BS EN 1290 (Magnetic particle)	As required		
	1807.5.18 Welding of bridge decks	Production tests in accordance with BS EN 1090-2:2008+A1:2011, 12.4.4 c)	As required		
1808	1808.5.3 (1) k value check for the Torque method	Test in accordance with BS EN 1090-2:2008+A1:2011, Annex H	Daily		
	1808.5.4 (2) k value check for the combined method	Test in accordance with BS EN 1090-2:2008+A1:2011, Annex H	Daily		
	1808.5.5 (1) Preload check for HRC method	Test in accordance with BS EN 1090-	Each assembly lot		

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
		2:2008+A1:2011, Annex H			
	1808.9 Use of special fasteners and fastening methods	Procedure tests for special fasteners and fastening methods as specified in Appendix 18/1	As required in Appendix 18/1		[Give specific testing requirements and frequency of testing in appendix 18/1 with cross reference in Appendix 1/5]
1810	1810.1 (5) Slip resistant connections	Slip factor test in accordance with BS EN 1090-2:2008+A1:2011, Annex G	As required in Appendix 18/1		[Give specific requirements in Appendix 18/1 with cross reference in Appendix 1/5]
	1810.1 (10) Verification of the preparation carried out before overcoating galvanised components	Test as specified in Appendix 18/1	As required in Appendix 18/1		[Give specific testing requirements and frequency of testing in Appendix 18/1 with cross reference in Appendix 1/5]
1812	1812.2.1 (1) Specific testing of constituent products not covered by standards.	Tests as specified in appendix 18/1	As required in Appendix 18/1		[Give specific testing requirements and frequency of testing in Appendix 18/1 with cross reference in Appendix 1/5]
	1812.2.1 (2) Mechanical fasteners	Sample testing as specified in 1812.2.1 (2)	As required in 1812.2.1 (2)		Results to be reported in accordance with 1812.2.1 (2). Testing not required if mechanical fasteners supplied by a NHSS 3 registered Organisation. See 1800.5.2
	1812.2.1 (3) Mechanical fasteners	Suitability testing as specified in 1812.2.1 (3)	As required in 1812.2.1 (3)		Results to be reported in accordance with 1812.2.1 (3)
	1812.4.1 Inspection before and during welding	Non destructive testing methods selected in accordance with BS EN 12062	As required in BS EN 1090-2:2008+A1:2011, 12.4.1		
Series 1800 (continued)					
1812 (cont)	1812.4.2.2 Inspection after welding - Scope of inspection	Supplementary non destructive testing determined by the manufacturer, according to the nature of the work in normal production	As required in BS EN 1090-2:2008+A1:2011, 12.4.2.2		See 1812.4.2.2 (6)
	1812.4.2.2 (1) Inspection after welding - specific inspection of welds	Supplementary non destructive testing in accordance with 1812.4.2.2	As required by 1812.4.2.2 (1) to (5)		
	1812.4.3 (1) Welded shear studs	Production tests as specified in BS EN ISO 14555, 14.2	As required in 1812.4.3 (1)		Results to be documented in accordance with 1812.4.3 (4)
	1812.4.3 (2) Welded shear studs	Hammer test as specified in 1812.4.3 (2)	Every welded shear stud		
	1812.4.3 (3) Welded shear studs	Simplified production tests as specified in BS EN ISO 14555, 14.3	As required in 1812.4.3 (3)		Results to be documented in accordance with 1812.4.3 (4)
	1812.4.4 (1) Production tests on welding	Production tests on welding as specified in 1812.4.4. (1)	As required in 1812.4.4 (1)		Results to be reported in accordance with the relevant standard
	1812.4.4 (2) Production tests on welding using run-off coupon plates	Production tests on run-off coupon	As required in 1812.4.4 (2)		

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
		plates as specified in 1812.4.4 (2)			
	1812.7.4 Other acceptance tests	Test requirements for components erected to a specific load as specified in Appendix 18/1	As required in Appendix 18/1		[Give specific requirements in Appendix 18/1 with cross reference in Appendix 1/5]
Series 1900					
1903	Abrasives	Grading	As required		[See NG 1903]
	Abrasives	Hardness	As required		[See NG 1903]
1909	Galvanised Coatings	Tests specified in BS EN ISO 1461	As required		
	Thermally sprayed aluminium metal coatings	Tests specified in BS EN ISO 2063	As required		
	Aluminium coating material			Required in accordance with BS EN ISO 14919	
1910	Thermally sprayed aluminium metal coating	Pull off adhesion test in accordance with ASTM D4541- Type III	At the start of the works and [specify subsequent intervals]		
	Thermally sprayed aluminium metal coating (excepted areas)	Grid test specified in BS EN ISO 2063	As required		[Any additional tests should be scheduled in Appendix 19/5]
1911, Table 19/2B	Hot dip galvanised coating to fasteners	Tests specified in BS EN ISO 10684	As required		[Any additional tests should be scheduled in Appendix 19/5]
Series 1900 (continued)					
1912 1912S E	Paints - 'A' and 'B' samples	Provision of samples for 'A' and 'B' sample tests			Samples selected in accordance with Clauses 1912 and 1912SE
	Paints - 'A' and 'B' samples	Specific gravity	As required by rate of 'A' and 'B' sampling		See NG 1912, 3; Appendix 19/4, Note 4; Appendix 19/4SE, Note 4; NG 1912.3NI, 3 and Appendix 19/4NI
	Paints - 'A' and 'B' samples	Colour match	As required by rate of 'A' and 'B' sampling		See NG 1912, 3 and NG 1912NI, 3
1914	Coating system minimum film thicknesses	Minimum dry film thickness measurements. In accordance with BS EN ISO 2808, BS3900-C5	Required - representative testing		
	Coating system adhesion	Pull off adhesion test in accordance with ASTM D4541 - Type III	Required - representative testing		
	Coating system defects	Visual assessment supplemented by appropriate testing	Required		[Any additional tests should be scheduled in Appendix 1/5]
	Coating system defects - pin-holing or porosity	Low or high voltage detectors in accordance with ASTM G62-07	Required - representative testing excluding corners, bolted joints or welds		
Series 2000					

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
2003	Permitted waterproofing systems	[As required - See NG 2003]			Product Acceptance Scheme or equivalent applies
	Additional bituminous protection		1 per 15 tonnes*		
	Stability value		1 per 15 tonnes*		
2004	Tar	Tests specified in BS 76	1 per source*		Sampling to comply with BS 76
	Cut back bitumen				
Series 2100					
2101	Bridge bearings				
	Elastomeric bearings	Hardness	[As required]		[Tests/samples should be scheduled only where tests are required on samples cut from a finished bearing]
		Tensile strength			
		Elongation			
		Ageing			
		Compression set			
		Ozone resistance			
	Complete bearings	Tests specified in contract specific Appendix 21/1	As required in contract specific Appendix 21/1		
Series 2400					
2401	Masonry cement				
2402	Sand				
Series 2400 (continued)					
2403	Water	Tests specified in BS EN 1008	[As required]		
2404	Mortar admixtures				
2405	Lime				
2406/ 2417	Bricks				
	Clay				
	Calcium silicate				
	Concrete				
2407	Blocks				
	Clay				
	Concrete				
2408	Reconstituted stone				
2410, 2411	Stainless steel				
	Wire/fabric				
	Bars				
	Ready mixed mortars				
	Mortars		1 set of tests per mix*		
2501	Materials for corrugated steel buried structures exceeding 900 mm clear span or internal diameter				Type approval applies
	Steel components			Required as appropriate to the standard or specification listed in the type approval Certificate	
	Zinc coating				
	Protective coating				
	Paved invert system				
2502	Materials for reinforcing elements, prefabricated				Product Acceptance Scheme or equivalent applies

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
	facing and capping units, and washers				Silicon content and mechanical properties to be stated on the certificate
	Carbon steel strip			Required (BS 1449: Part 1.1 or BS EN 10025-1 and BS EN 10025-2)	
	Stainless steel strip			Required (BS EN 10029, 10048, 10051, 10258 and 10259)	
	Reinforcing bar for anchor elements			Required (BS4449)	Tests scheduled under Clauses 1717 and 1909 are required for welding and galvanizing of anchor elements
	Materials for fasteners				
	Stainless steel				
	Bolts, screws and nuts				
Series 2500 (continued)					
2503	Materials for pocket type reinforced brickwork retaining wall structures	(Soluble salt content Efflorescence Compressive strength Water absorption Initial rate of suction) (BS 3921/TRL Report 447) (N)	1 set of tests per type of brick*		[Soluble salt content - sulfate shall be determined in accordance with Test No 2 in TRL Report 447] [Random sampling to BS 3921 to be employed]
	Clay bricks				
2504	Environmental barriers				Quality management scheme applies [Appropriate tests/samples should be scheduled where not included under other Clauses]
	Timber				
	Concrete				
	Steel				
	Brickwork				
	Other materials				
	Barriers	Sound absorption	As required in Appendix 25/4		[See NG 2504 14-17]
Sound insulation					
Post foundations	Loading test on site	As required in Appendix 25/4		[See NG 2504.12]	
2505, 2506	Drainage structures/buried rigid pipes for drainage structures Pipes for drains and culverts having diameters or clear span exceeding 900 mm				
	Vitrified clay				
	Concrete PC/SRC	(Manufacturer's test)			See sub-Clause 2506.28
	Iron	[see Note 2]			[Note Certificates are provided for in the relevant BS but should not normally be required except for pipes which are not quality marked by a UKAS or equivalent accredited body]
	Corrugated steel	(Manufacturer's test)			Type Approval Certificate and Product Acceptance Scheme or equivalent apply
Series 2600					
2601	Bedding mortar materials			Required for each batch	Certification in accordance with Clause 2601 is required
	Bedding mortar	Flow cone test	Each batch		Laboratory tests

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
		Flow between glass plates			
		Compressive strength			
		Expansion test			
		Water absorption			
		Elastic stability	1 per source		
		Flow cone test Compressive strength	Each load		Site control tests
2604	Plastic coating to fencing posts, gates and ancillaries			Required (BS1722: Part 16) applicator is required	Certification by powder manufacturer and coating
2607	Granolithic concrete				Testing to be in accordance with Clauses 1702, 1703, 1707 and 1710
Series 3000					
3001	General				Inspection Reports as required in contract specific Appendix 30/1
3005	Grass seeding, Wildflower seeding and turfing	Rate of spread of fertiliser	1 per 1000 square metres*		
		Rate of spread of seeding	1 per 1000 square metres*		
		Chemical analysis of fertiliser	1 per source*		
		Grass seed germination and purity (Official Seed Testing Station tests)	1 per source and mix variety*	Required prior to sowing	
Series 5000					
5003	Abrasives	Grading	[As required]		[see # NG 5003]
		Hardness			
5005	Aluminium and zinc spray coatings	Tests specified in BS EN 22063	[As required]		Areas to be tested in accordance with Clause 5006
	Aluminium coating material			Required (BS EN 1301-1)	
	Zinc coating material			Required (BS EN 1179)	
	Sherardized coatings	Tests specified in BS 4921	[As required]		[Sampling procedure and any special adhesion requirements including test method should be scheduled]
	Zinc electroplated coatings	Tess specified in BS 3382: Part 2	[As required]		
	Plating to high strength grip and tension control bolts				[Special tests to detect hydrogen embrittlement should be scheduled where required]
5006	Metal spray coatings	Tensile test specified in BS EN 22063	[As required]		
		Grid test specified in BS EN 22063	[As required]		
#5007, 5007SE	Paints				[see NG #5007]
	'A' and 'B' Samples	Specific Gravity	[see Clauses #5007 and 5007SE]		
		Colour match			
		Composition			

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
		Application characteristics			Samples will be selected in accordance with Clauses #5007 and 5007SE [see Clauses #5009 and 5009SE]

4. Unless otherwise stated above, all sampling and testing in this Appendix shall be by the Contractor. All testing shall be agreed with the Supervisor prior to commencement.
5. The above testing requirements are in addition to the prerequisite CE testing requirements.
6. Tests comparable to those specified in this Appendix will be necessary for any equivalent work, goods or materials proposed by the Contractor.
7. (N) indicates that a UKAS or equivalent accredited laboratory sampling and test report or certificate is required.
8. 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.
9. Cube strength tests are not required for concrete complying with Clause 2602.
10. 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.
11. * = In the above table indicates that the frequency of testing is given for general guidance. Where materials are known to be marginal or if initial test results show them to be such, the frequency of testing should be increased upon recommendation from the Designer and confirmation from the *Project Manager*. Conversely where material properties are consistently in excess of specified minimum requirements or well below specified maximum limits, then the frequency of testing could be reduced upon recommendation from the Designer and confirmation from the *Project Manager*.

APPENDIX 1/7: SITE EXTENT AND LIMITATIONS ON USE

1. The Contractor shall comply with any constraints on the extent and use of site as specified in the contract.
2. The Contractor shall comply with regulations for traffic and pedestrian management as outlined in Appendices 1/17 and 1/23 and any particular working restrictions imposed the site by the Highways Authority.

Extents of Site

3. The site extents are shown on 415347-MMD-00-ZZ-DR-D-0200 series drawings. In addition, the site shall extend to parts of the highway network that are required for the completion of tie-ins installation, maintenance and removal of traffic management measures. Notwithstanding the site limits as defined above, the Contractor shall be responsible for those locations remote from the site where permanent or temporary signing works may be necessary (as required in the Contract or forming parts of temporary works or diversions of traffic proposed by the Contractor).

Limitation on the Use of Site

4. All existing highways and footways within the site boundary are classified as public rights of way whether or not they have been identified individually. Existing public and private rights of way are to be maintained at all times outside the agreed road closure. Additionally, the Contractor shall ensure the exclusion of the public from all working areas on site throughout the course of the works. Fencing and hoarding is to be secure and interlocking and approved by the Project Manager prior to the commencement of works.
5. The Contractor shall not make any use of the site for purposes other than the construction of the works without specific authorisation of the Project Manager.
6. Reference should be made in particular to Appendices 1/9, 1/13 and 1/23 for details of other limitations on the use of the site.
7. The Contractor shall liaise with the owners/ tenants of the adjacent properties and land with regard to maintaining access at all times throughout the Works and minimising dust nuisance.
8. No materials, plant, machinery or accommodation shall be stored on verges, or within safety zones, or on areas of carriageway that are not to be reconstructed or resurfaced as part of the works. The Contractor shall not obstruct the carriageway outside the site with equipment, plant or materials awaiting transport to or from the works.
9. Any excavations that are to be left overnight must be signed, securely guarded and lit in accordance with Chapter 8 of the Traffic Signs Manual. All recommendations contained within Chapter 8 are to be complied with.
10. The Contractor shall afford access at all times to the site to personnel working for or on behalf of the following organizations: Natural Resources Wales (NRW), The Police, Fire and Ambulance services; Conwy County Borough Council staff and their Designers in connection with the project and any Statutory Undertaker.
11. Unless noted otherwise upon completion, the Contractor shall reinstate any working areas to their original condition. The Contractor is responsible for repairing and reinstating damaged areas to the satisfaction of the Supervisor.

Site Maintenance

12. The proposed works are located within a sensitive marine area. Suitable measures shall be provided and maintained by the Contractor to safeguard the environment. The Contractors attention is drawn to the Special Requirements laid out in relation to the NRW and Welsh Assembly Government Marine Consents Unit.
13. The contractor shall produce and operate a Construction Environmental Management Plan (CEMP) incorporating a Site Waste Management Plan. The CEMP will include the appointment of an onsite

Environmental Manager and specific procedures for managing and monitoring the contractor's environmental activities and performance.

Construction Environmental Management Plan

Purpose

14. General construction environmental impacts will be managed through the implementation of a Construction Environmental Management Plan (CEMP). The purpose of a CEMP is to set out the precautionary and reasonable steps that the contractor will take to prevent adverse environmental impacts occurring.

The Contractor must establish a substantiality management system and must undertake regular checks to ensure that the sustainability management mechanisms have been implemented.

The Contractor must apply the Waste Hierarchy as per Waste Regulations 2011. The Contractor shall in accordance with the specification / scope take all reasonable measures to reduce project waste in first instance, then reuse site won materials, then use recycled / sustainable materials where appropriate.

15. The Contractor shall provide a CEMP for the acceptance of the Supervising Authority prior to the commencement of works.
- Details of the Contractor's organisational framework, in particular the designation of a senior manager to take overall responsibility and an engineer, nominated as the Environmental Monitor to manage environmental control facilities on a day-to-day basis and liaise with the Supervising Authority.
 - Details of the principal pollution control facilities proposed, including procedures for the mitigation, collection and disposal of wastes, and of contingency plans in the event of failure of these facilities, including emergency procedures where appropriate;
 - Details of the Contractor's proposed environmental monitoring procedures, to ensure the construction sites are operating satisfactorily and that problems are being dealt with promptly;
 - Format of a monthly report to the Supervising Authority, comprising a checklist of environmental issues at each work site, and covering the specific problems of the Works;
 - Forms that will be used by the Contractor to demonstrate compliance with the environmental requirements of the Contract and to identify any problems;
 - Details of any other records to be kept to allow the Contractor to demonstrate compliance with the CEMP;
 - Details of the Contractor's environmental awareness training programme proposed for the workforce;
 - A requirement that all method statements include a section on environmental impacts and mitigation;
 - A formalised mechanism to audit the effectiveness of the CEMP.

Scope

16. The CEMP shall, as a minimum, address the following issues:

- Noise and vibration;
- Water pollution;
- Waste management;
- Impacts on flora/fauna;
- Visual impact
- Air pollution, including odour, dust and fumes;
- Storage and handling of hazardous materials;
- Good housekeeping/vermin control;

- Contaminated land;
- Archaeology and heritage issues;
- Impacts on the local community;
- Impacts of any temporary works including location of Contractors facilities, workers camps, gravel pits, haul roads etc.
- A formalised mechanism to audit the effectiveness of the CEMP.

Compliance with CEMP

17. The Supervising Authority shall have the right to audit the Contractor's management of the CEMP. Such audits will include a review of the Contractor's internal audit records including identified non-conformities and the effectiveness of the corrective action. The Contractor shall be provided with ten working days' notice prior to an audit being carried out. On a day-to-day basis; the Contractor shall afford reasonable availability of staff and documentation for the Supervising Authority to assess implementation of CEMP.
18. Site Waste Management Plan – As a method of effectively managing materials and waste, the Authority requires a Site Waste Management Plan (SWMP) to be in place for the project. An outline SWMP has been prepared during the design phase (see Work Information Volume 3). Upon appointment the Contractor shall take on the responsibility for adopting the SWMP and updating it as the project progresses.

Integrity of Existing Sea Defences

19. The Contractor shall, during the Contract, be responsible for maintaining and ensuring the integrity of the sea defences at all times within the Area of Works

Construction Method Statement

20. Prior to commencement of the works, the Contractor shall prepare a Construction Method Statement for approval by the Project Manager in consultation with the local planning and highway authorities. The statement shall provide for:
- The parking of vehicles of site operatives and visitors
 - The loading and unloading of plant and materials.
 - Storage of plant and materials used in constructing the development.
 - The erection and maintenance of security hoarding.
 - Re-fuelling arrangements including for marine operations.
 - Measures to control the emission of dust and dirt during construction.
 - A scheme for recycling/ disposing of waste resulting from demolition and construction works.

APPENDIX 1/9: CONTROL OF NOISE AND VIBRATION

General

1. The Local Authority having responsibility for the area is:

Conwy County Borough Council
Housing and Environmental Enforcement
Regulatory & Housing Services
PO Box 1
Conwy
LL30 9GN

2. The measures detailed in this Appendix are given as a guide; however, it is for the Contractor to decide whether 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.

Permitted Hours Of Working

3. 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 decide whether to seek the Local Authority Environmental Health Officer's formal consent to his proposed methods of work and to the steps he proposes in order to minimise noise.
4. The normal working hours within the Site shall be Monday to Friday between 0700 and 2000 hours Mondays to Fridays and Saturday between 08:00 and 16:00 hours.
5. The normal working hours within the Site for piling shall be Monday to Friday between 08:00 and 18:00 hours and Saturday between 10:00 and 16:00 hours, with no working on Sundays or public holidays. No further restrictions on working hours will be imposed for other elements of the Works.
6. The Contractor shall not carry out the works on Sunday and Public Holidays, nor shall he be allowed to receive deliveries of materials or plant on Saturdays after 12:00 hours.
7. Subject to the above, Tidal working (except piling) may be carried between 05:00 and 22:00 hours

Working in Darkness

8. The following requirements shall apply for working during the hours of darkness:
 - a. The Contractor shall require the written consent of the Project Manager prior to commencing operations in darkness.
 - b. No machine shall move on site during darkness without white front, red rear and top orange flashing lights.
 - c. All personnel working on site shall carry a torch.
 - d. The hours of darkness are defined as "lighting up time" as specified in the Road Traffic Regulations.

NOISE – MITIGATION AND CONTROL MEASURES

9. Without prejudice to the generality of the Contractor's obligations under Clause 109 paragraph 1, the levels of noise and vibration emanating from the site are to be minimised by compliance with the following:
 - a. The guidance and criteria as defined in BS 5228 Part 1 (1997)-Noise and Vibration Control on Construction and Open Sites: Code of Practice for Basic Information and Procedures for Noise and Vibration Control.
 - b. The guidance and criteria as defined in BS 5228 Part 4 (1997)-Noise and Vibration Control on Construction and Open Sites: Code of Practice for Noise and Vibration Control applicable to Piling Operations.
 - c. The guidance and vibration criteria as defined in BS 6472 (1992)- Guide to Evaluation of Exposure to Vibration in Buildings.

- d. The guidance and vibration criteria as defined in BS 7385 Part 2 (1993) - Evaluation and Measurement for Vibration in Buildings.
 - e. "Best Practicable Means" as defined in Section 72 of The Control of Pollution Act 1974.
 - f. All plant and machinery used on the site shall be properly maintained, lubricated and silenced in accordance with the manufacturer's requirements. No plant or machinery which emits black smoke will be permitted to operate on the site.
 - g. All plant shall be shut down when not in use. All static plant shall be acoustically screened wherever practicable. All compressors and their associated tools shall be sound reduced models, the covers shall be kept closed whenever they are in use. Pneumatic tools shall be fitted with dampers to reduce the effects of vibration on the user.
 - h. All diesel engined plant shall be fitted with air intake silencers.
 - i. The site induction for all workers is to include specific reference to, and explanation of, the conditions contained within this Appendix.
10. All residents living within 750 metres of the site boundary are to be sent written notification of the commencement of works at least 7 days before work is due to start. The notification shall include an explanation of the nature and anticipated duration of the works and in particular any specific operations likely to generate greater levels of noise or vibration. The notification shall contain the contact telephone number of the Contractor's site office, this office shall be manned at all times whilst the works are in progress, with an automated phone messaging system in use whenever the office is not manned.
 11. The Contractor is to invite the Environmental Health Officer to regular Site Progress Meetings and provide (at least 7 days in advance), detailed updates of future operations together with plans showing the locations of specific operations.
 12. Delivery of materials and plant via road shall be via the A55 Expressway at Junction 22. This route does not pass close to any residential properties or other sensitive receptors and avoids the movement of construction traffic through the streets of Colwyn Bay and Old Colwyn.

NOISE CONTROL LIMITS

13. The following maximum limits will be used in order to control noise levels arising from the Works:

SCHEDULE 1/9/1

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)
Monday to Fridays	07:00-20:00	75	13	80
Monday to Friday	20:00 – 22:00	65	2	75
Any Day If Permitted	22:00 – 07:00	50	9	55

Saturday	0700 – 12:00	75	5	80
Saturday If Permitted	12:00 – 22:00	60	11	70
Sunday If Permitted	0900 – 1700	60	8	70
All unattended Plant outside normal working hours		50 or existing ambient + 5 (whichever is the greater)		

Notes:

- (i) Noise levels relate to free field conditions. Where noise control stations are located 1 m from facades of buildings, the permitted noise levels can be increased by 3 dB(A).
- (ii) The ambient noise level, Leq, at a noise control station is the total Leq from all the 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 the noise sources in the vicinity over the specified period prior to the commencement of the Works.
- (iv) Maximum sound level is the highest value indicated on a sound level meter which meets the requirements of BS EN 60651 Type 1 or 2 set to SLOW response and frequency weighting A or on an integrating – averaging sound level meter to BS EN 60804. Construction activities shall not be outside of the above hours.
- (v) Should the Contractor wish to carry out construction work outside these hours he should approach the Council Environmental Health Officer to obtain prior consent in accordance with the Pollution Act.

VIBRATION

- 14. Vibration shall not be allowed to cause detrimental effect to adjacent structures.

NOISE & VIBRATION MONITORING

- 15. Although the precise monitoring locations have yet to be agreed, it is expected that noise and vibration monitoring will be undertaken at or nearby two or more of the buildings closest to the proposed Works. Locations to be agreed with the Local Authority Environmental Health Officer and the Employer's Representative.
- 16. The noise monitoring equipment shall comply with BS6698:1986(Type 1). The vibration equipment shall be capable of simultaneous triaxial monitoring.
- 17. The Contractor shall in relation to vibration caused by other plant or equipment installed on the site if requested monitor vibration using a suitable seismograph or vibration analyser with continuous recording capability. The Contractor shall furnish such information evaluating the effects of vibration WITHIN 2 WORKING DAYS of taking the readings and submit them to the Employers Representative and the Local Authority Environmental Health Officer.

COMPLAINTS PROCEDURE

- 18. The Contractor will ensure that his Company's name and address is clearly displayed on the site hoarding in at least 2 locations.
- 19. At least one telephone number for complaints shall also be displayed clearly in the two locations agreed. The telephone must be attended during all operational hours by persons with the appropriate Authority to act to resolve any problem that may occur.
- 20. Both the Contractor and the Project Manager will keep accurate records of complaints received which will

be made available to the Local Authorities Environmental Health Officer for inspection.

LIAISON/ CONSULTATION PROCEDURE

21. Liaison meetings between the Environmental Health Officer, the Employer, the Project Manager and the Contractor will occur on a regular basis. These meetings will be used to discuss and exchange information regarding:
 - Monitoring results
 - Monitoring locations
 - Dispensations that may be sought by the Contractor
 - The Works programme and method statements
 - Complaints received regarding the Works
22. Liaison meetings between the Environmental Health Officer, the Employer, the Project Manager and the Contractor will occur on a regular basis. These meetings will be used to discuss and exchange information regarding:
23. The Contractor and the Project Manager will also be under an obligation to inform the Local Authorities Environmental Health Officer as soon as reasonably practicable should any emergency Works, confirmed as essential for reasons of safety and which could cause environmental disturbance, arise at short notice.
24. The Employer will inform local residents of the progress of the works and the arrangements being taken to minimise disturbance. To this end a mail shot will be undertaken prior to the start of construction explaining what work will occur and giving the contact telephone numbers and addresses for queries or complaints.

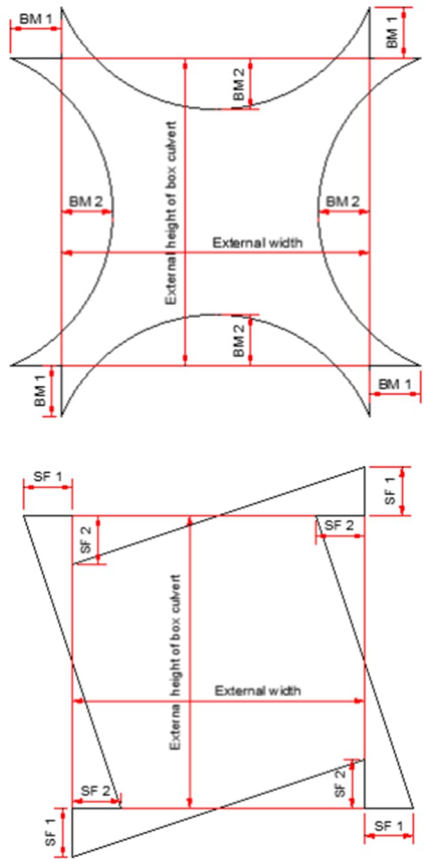
DISPENSATION PROCEDURE

25. In certain circumstances the Contractor may apply to the Project Manager for consent to carry out Works which he considers will exceed the noise and vibration limits specified in this Appendix, or which he considers must occur at times when work is not otherwise permitted. Once the Project Manager is satisfied that the Works need to be carried out as described and that sufficient information has been supplied, the Project Manager will pass the application to the Local Authority Environmental Health Department. This information must be provided at least 14 days prior to the intended date of carrying out the Works whenever this is feasible and in any case all efforts will be made to provide the information as far in advance of the works as possible. The details of any dispensation application maybe discussed at the liaison meetings discussed above.
26. The information supplied will include:
 - Full details of the operations in question
 - Rationale for requiring extension to working hours
 - Proposed working hours
 - Predicted noise levels at relevant locations during the proposed operation
 - Measures including site supervision arrangements, being adopted to reduce noise to a minimum in accordance with best practicable means, as defined in Section 72 of the Control of Pollution Act, 1974.
27. On receipt of this information the Local Authority Environmental Health Officer will consider the request and may grant a dispensation, which may specify the hours of work and noise levels which must not be exceeded. These additional safeguards will be in accordance with local conditions and will apply exclusively to the operation for which it is granted and may be of limited duration. A decision regarding dispensation will not unreasonably be withheld or delayed by the Local Authority Environmental Health Officer.

APPENDIX 1/10: PERMANENT WORKS TO BE DESIGNED BY THE CONTRACTOR

1. The Contractor shall carry out design in accordance with relevant EuroCodes, British and European Standards and the reference designs provided within the drawings and this specification.
2. During the design the Contractor shall consider their construction methodology for the works to ensure that design detailing considers lifting, storage, and any temporary phases during construction.
3. The following structural elements are to be designed by the Contractor and submitted to the Project Manager for review as per clause 106.

Structure	Location	Design Specification
Precast concrete elements.	Various – Refer to 415437-MMD-00-XX-DR-C-3500 series drawings	All precast elements indicated on the contract drawings are to be detailed and manufactured by the Contractor in accordance with relevant Eurocodes and British Standards. Detailing shall be in accordance with the contract drawings, this specification, and give consideration to the Contractor construction methodology. Reinforcement detailing and scheduling undertaken by the Contractor are to be compliant with reinforcement intent drawings where provided as part of the contract drawings. The Contractor shall design the precast concrete elements to robustly interlock to resist applied loading and movement.
Precast concrete box culverts and headwall used for outfall No 2 extension.	Outfall extensions through proposed rock revetment – Refer to 415437-MMD-00-XX-DR-C-3526 & 3527 drawings	<p>The Contractor shall design these structures to BS EN 1992-1-1:2004, and as part of this design the Contractor shall determine the following:</p> <ul style="list-style-type: none"> · External dimensions of the box culverts shown on drawings 3526 and 3527, and subsequently determination of headwall width · Thickness of box culvert side walls and top and bottom slabs · Reinforcement design <p>These shall be determined considering the following moments and shear forces (Refer to sketch below for shear force and bending moment locations across each box culvert wall):</p> <ul style="list-style-type: none"> · Characteristic Serviceability Limit State (SLS) and Quasi Permanent Bending Moment 1 & 2: Under Permanent Loads only = 35kNm/m · Ultimate Limit State (ULS) Bending Moment 1 & 2 = 50kNm/m · Ultimate Limit State (ULS) Shear Force = 145kN/m · Minimum thickness of box culvert side walls, top slab and bottom slab to be

		<p>275mm · Nominal cover to reinforcement to be 75mm · Concrete mix design shall be the mix design specified for 'In-Situ Reinforced Concrete' in Appendix 17/1 (Seaside Structures)</p>  <p>Note: The Bending moments and shear forces stated above shall be applied to external sides of each of the 4 walls of the box culverts (2xside walls, top slab and bottom slab). Shear force units are in kN/(m length of box culvert), bending moment units are in kNm/m length of box culvert). Bending moments and shear forces specified above do not include self-weight dead loads. The bending moments and shear forces resulting from self weight dead load shall be considered in the design and added to those specified above where applicable.</p>
Proprietary precast concrete manhole units and cover slabs designed by manufacturer on behalf of contractor.	Various as shown on drawings	See drawings 415437-MMD-00-XX-DR-S-2031 & 2133, section 5 of this specification document and SHW 500 series.

4. The following features are to be designed by the Contractor and submitted to the Project Manager for review as per clause 106.

Feature	Location	Design Specification
Handrailing	Various – Refer to 415437-MMD-00-XX-DR-C-3500 series & 415437-MMD-00-XX-DR-S-2030 series drawings.	The performance specification is provided in Specification Appendix 3/1
Guard railing	Various - Refer to 415437-MMD-00-XX-DR-S-2030 series drawings.	The performance specification is provided in Specification Appendix 4/1
Sign Plates	Sign plates – Refer to 415437-MMD-00-XX-DR-S-2031 for locations	Contractor to design sign plates and associated fixings in accordance with Appendix 12/1.
Electrical cabling and connections	Lighting beacons – Refer to 415437-MMD-00-XX-DR-S-2030 for information and 415437-MMD-00-XX-DR-S-2031 for locations	Contractor to design the electrical cabling and connections for the lighting beacons in accordance with Appendix 12/1.

5. Additional artwork design requirements are to be confirmed by CCBC in consultation with stakeholders and landscape architect. See Appendix 26/10 for requirements.

APPENDIX 1/12: SETTING OUT AND EXISTING GROUND LEVELS

1. The setting out information will be/ is provided on the construction issue drawings. The promenade structures and pavement shall be constructed from 415437-MMD-00-XX-DR-S-2030 series PDF drawings. The coastal structures and rock revetment shall be constructed from the 415437-MMD-00-XX-DR-C-3500 series PDF drawings.
2. The existing geometry, existing levels, existing coordinates and proposed setting out information for the scheme are to be checked by the Contractor and agreed with the Project Manager prior to commencement of any work. Any discrepancies shall be reported to the Project Manager. Subject to Project Manager review and acceptance, Contractor to undertake revised grading & alignment works at tie-ins where necessary if discrepancies are identified.
3. The lines and levels of formation and the walls and paved areas shall be carefully set out and frequently checked, care being taken to ensure that correct gradients and cross sections are obtained. The finished surface shall be formed so as to provide adequate fall and satisfactory run off.
4. In order to facilitate the setting out of the works the design lines must be accurately established by the Contractor and approved by the Project Manager. It then must be accurately referenced in a manner satisfactory to the Project Manager, every 10 metres and a schedule of reference dimensions shall be prepared and supplied by the Contractor to the Project Manager. These reference markers shall be maintained until the works reach formation level.
5. No reference peg or marker shall be removed or withdrawn without the approval of the Project Manager and no earthworks are to be commenced until the design channel or centre line has been referenced.

APPENDIX 1/13: PROGRAMME OF WORKS

1. The Contractor shall provide a programme of the works in accordance with Clause 31 of the NEC4 Engineering and Construction Contract.
2. The Contractor shall provide the programme in the following form to comply with the constraints below:
A network diagram or bar chart produced as a result of a 'critical path analysis'. 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 title, earliest start and finish dates, duration, identification of predecessor and successor activities together with links, any lead or lag times, milestone dates, critical dates at which activities must start or finish and staff resources.
3. The Contractor is required to produce the Contractor's programme on appropriate computer software. To enable the Project Manager and Supervisor to monitor the Contractor's progress against the Programme, the software used shall be proprietary programming software to be agreed with the Project Manager.
4. The Contractor shall update and submit the Programme (colour version) to the Project Manager. Additional detail to be shown on the Programme shall be agreed with the Project Manager. The Contractor shall submit a daily return showing in detail all labour and plant, including that of sub-contractors, employed on the Site.

Schedule of Constraints

5. The following is a list of applicable programming constraints, it is not exhaustive, and all work elements should be considered for their programming requirements and constraints.
 - Work to privately and publicly owned services and supplies including but not limited to Scottish Power, Welsh Water and BT (See Appendix 1/16).
 - Possession including but not limited to the railway embankment and local properties.
 - Traffic safety and management including notice requirements (See Appendix 1/17).
 - Restrictions arising from particular health and safety requirements (See Appendix 1/23).
 - Environmental constraints including seasonal restrictions and provision of environmental protection prior to main construction operations.
 - Timeframes for acceptance. Approval or authorisation requirements including authorisation of non-prescribed working days and signs. The Project Manager reserves the right, in the event of adverse weather condition to suspend the Works without prior notice and/or remove the Contractor from site in the event of an emergency.
 - Restrictions with respect to avoidance of pollution due to noise and vibration (See Appendix 1/9).
 - Key Dates as listed in Contract Data Part1

APPENDIX 1/14: PAYMENT APPLICATIONS

1. The payment applications submitted to the Project Manager in accordance with the Conditions of Contract.
2. The Contractor shall agree with the Project Manager the dates for submission of monthly statements.
3. The format for submission shall be agreed with the Project Manager.
4. The statement shall be accompanied by a summary in a form approved by the Project Manager prior to the submission of the first Application for Payment.

APPENDIX 1/16: PRIVATELY & PUBLICLY OWNED SERVICES

1. This Appendix contains details of services and supplies affected by the Works.
2. The Contractor shall make arrangements with the Statutory Undertakers, utility companies and others concerned, for the co-ordination of their work with all work which needs to be done by them 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. 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 disconnections and diversion of private services affected by the Works.
4. The names, addresses and contact details of the Statutory Undertakers, utility companies and authorities serving in the locality are listed below in Table 1.6.

Relevant Contact Information for Statutory Undertakers

Statutory Undertaker	Address	Contact Information
Wales & West Utilities	-	dig@wwutilities.co.uk 029 2027 8912
BT Open Reach	-	cbyd@openreach.co.uk 0800 023 2023
Scottish Power	SP Power Systems Limited Registered Office: 1 Atlantic Quay, Glasgow G2 8SP.	Cheshire, Merseyside, N. Wales & N.Shropshire Power cuts & emergencies: 0800 001 5400 Connections: 0845 270 0783 General enquiries: 0330 10 10 444
Network Rail	Asset Protection Network Rail Wales Route 5 th Floor 5 Callaghan Square Cardiff CF10 5BT	Carl Sells 07739785425 Carl.Sells2@networkrail.co.uk
Welsh Water	Welsh Water, Linea, Fortran Road, St Mellons, Cardiff, CF3 0LT.	0800 917 2652 P.O. Box 3146
CCBC Street Lighting	-	Street.lighting@conwy.gov.uk Monday – Thursday / Friday 08:45 – 17:15 / 16:45 01492 575 337 Out of Office 01248 680 033

Services and Supplies Affected by the Works

Location	Description	Group*	Drawing No.	Description
Refer to Statutory Undertaker returns and/or Invek Sewer Survey Drawings	Surface Water Main (Dwr Cymru Welsh Water)	E	See Statutory Undertaker plans and/or Invek Sewer Survey Drawings. 415437-MMD-00- XX-DR-S-2031, 2131, 2132 & 2133.	Existing inspection chambers and manholes to be raised/tied into proposed works and outfall No 2 extended as per details.

Location	Description	Group*	Drawing No.	Description
			415437-MMD-00-XX-DR-C-3500, 3526, 3527.	
Refer to Statutory Undertaker returns and/or Invek Sewer Survey Drawings	Combined Sewer (Dwr Cymru Welsh Water)	E	See Statutory Undertaker plans and/or Invek Sewer Survey Drawings.	Existing inspection chambers and manholes to be raised/tied into proposed works as per statutory undertakers' standards.
			415437-MMD-00-XX-DR-S-2031, 2131, 2132 & 2133.	
Refer to Statutory Undertaker returns and/or Invek Sewer Survey Drawings	Low Voltage Electricity ducts (Scottish Power)	B	-	Existing low voltage cable within works. New electrical cable and connection from existing lighting system needed for lighting beacons.
Refer to Statutory Undertaker returns and/or Invek Sewer Survey Drawings.	Existing outfall pipe.	B	415437-MMD-00-XX-DR-C-3001 & 3002	Existing outfalls No1 on coastal plans to be protected and existing outfall No2 to be extended though proposed revetment.

Group definitions

A Work expected to be completed before the commencement of the Works.

B Work required after commencement of the Works which does not require prior work by the Contractor but does require the Contractor to undertake liaison and coordination.

C Work required after commencement of the Works which does require prior work by the Contractor.

D Work expected to be in progress at the commencement of the Works.

E Work to be wholly undertaken by the Contractor.

APPENDIX 1/17: TRAFFIC SAFETY & MANAGEMENT

Submission of Traffic Safety and Management Proposals

1. In all areas of the site the Contractor shall be responsible for providing and maintaining adequate and suitable carriageways/routes (including footways) for the passage of vehicular traffic, cyclists and pedestrians and in compliance at all times with the requirements of the Project Manager. The Contractor shall:
 - Maintain two-way traffic flows at all times during the contract, except as authorised by the Project Manager, or except as specifically referred to elsewhere in the Contract (for example within clause 19 below).
 - Provide and maintain when required, or as may be directed by the Project Manager, suitable traffic direction, diversion, warning or other related signs and lighting to the satisfaction of the Project Manager.
 - Provide, maintain and remove, when required, or as may be directed by the Project Manager, temporary road markings to the satisfaction of the Project Manager.
 - Remove some or all his constructional plant and equipment, as and when directed by the Project Manager, to relieve traffic congestion on carriageways.
 - Always maintain and keep open to the satisfaction of the Project Manager all rights of way and means of access to property to the extent of providing temporary roads or crossovers where necessary.
2. The Contractor shall ensure adequate pedestrian routes are available at all times except where otherwise stated within the contract document. This may involve the provision of temporary surfaces in order to facilitate suitable pedestrian and cyclist movements. Wherever possible such accesses shall comply with the guidance on the compliance with the Equality Act published by the Department for Transport. Where such compliance is not suitable, the prior approval of the Project Manager shall be obtained before implementing measures that are otherwise safe but not fully compliant with such guidance.
3. The Contractor shall submit his proposed traffic management programme to the Project Manager for approval **two weeks** prior to the commencement of site works and shall include the following:
 - Phasing of Works
 - Drawing showing traffic management layout including as appropriate:
 - Position of traffic signs
 - Width of lanes
 - Working area
 - Safety zone
 - Crossovers
 - Pedestrian and cycle routes and safety measures
 - Timing of operation
 - Road lighting requirements
 - A minimum of 500mm safety zone, delineated by traffic cones, must be maintained between any live traffic lane and all site staff/workmen.

Traffic Safety and Management Requirements and Constraints

4. The Contractor shall phase their work so as to cause the minimum level of disruption to traffic and shall maintain operation of vehicles in two-directions on highways affected by the Works where practicable.

The actual timing for each change to the traffic management layout shall be subject to the agreement of the Police, Supervisor and Highway Authority.

5. All Temporary Footways and Cycleways shall be constructed as follows:

- Where part of the Permanent Works - Permanent construction where possible.
 - Other areas - 100mm thickness Type 1 or 2 granular sub-base, 25mm dense macadam binder course. Temporary footways shall not be less than 2 metres in width except as specifically authorised by the Project Manager. They shall be clearly signed, adequately fenced, delineated and illuminated, kept free from obstructions and maintained in a clean, safe condition at all times.
6. The Contractor shall submit to the Project Manager for approval details of any proposals which involve the reduction of carriageway widths. The Contractor shall not commence works requiring reductions in carriageway widths or implement such reductions before the Engineer's permission has been given.
- Minimum lane widths of 3.25m shall be provided in each direction, giving a minimum carriageway width of 6.5 in two-way roads and 3.25m in one-way roads, unless prior consent has been granted by the Highway Authority. These widths shall be increased where turning movements are required or on bends. A lane width reduction to 3.00m may be allowed for limited periods subject to the approval of the Project Manager.
7. Where a road is closed temporarily, new road markings shall be in place before the road is re-opened to traffic. All road markings removed or obscured as part of the Works are to be reinstated within 24 hours where a road remains open to traffic, unless alternative temporary traffic management measures are in place.
8. Where Give Way and Stop markings have been erased, warning signs and temporary road markings in accordance with the Traffic Signs Manual shall be provided in the appropriate position. All signs and markings are to be maintained in position until their removal is authorised by the Project Manager.
9. The Contractor shall ensure that at no time does the standard of street lighting (including footways and cycle tracks) fall below the standard that existed before work commenced.
10. Temporary lighting to illuminate Working Areas wherever work is in progress shall be provided and maintained by the Contractor during the hours of darkness and at times of poor visibility. The Contractor shall take all reasonable steps to prevent dazzle from this lighting or works vehicles and plant affecting all traffic. All temporary lighting shall meet the requirements for 'Noise Control'.
11. The Contractor shall co-ordinate traffic management and diversion proposals with the bus operators and the Passenger Transport Authority where applicable. No bus stops shall be closed until temporary arrangements have been agreed with the Project Manager and the organisations concerned.
12. The Contractor shall ensure that pedestrian and cycle routes, crossing facilities and lighting levels in the vicinity of permanent and temporary bus stops are maintained to a high standard at all times.
13. All vehicles shall move into and out of the Working Area travelling in the direction of traffic flows using the designated access and exit points. Vehicles entering the Working Area shall be equipped with rotating amber beacons and shall have "Highway Maintenance/Contractor" signs affixed to the rear of the vehicles. Beacons shall be switched on when entering and leaving the works and should be positioned such that they are clearly visible to other traffic. Vehicles not equipped with the appropriate beacon or sign shall not be permitted to access the Working Area.
14. All traffic management and diversion proposals shall be co-ordinated with the emergency services. If the access to / egress from any emergency service station, hospital etc. is affected by any part of the works, the relevant bodies shall be consulted in advance and no works shall be carried out until any temporary arrangements have been agreed with the Project Manager and the organisations concerned.

Traffic Safety and Control Officer

15. A traffic safety and control officer are not required for this scheme.

Temporary Traffic Regulation Orders and other Statutory Orders

16. The Contractor shall submit details of all proposed temporary diversions within 8 weeks of the diversion being required to allow any Statutory Orders or Notices to be published. No work shall commence on the site until the Contractor's proposals have been approved by the Project Manager.
17. The Contractor is to include for all costs in connection with the provision of all temporary diversions of traffic including the cost of all signage which is deemed necessary to implement, temporarily cover and remove as necessary diversion.
18. Approval of the Highway Authority and Project Manager is required prior to the implementation of diversions.
19. The Contractor will submit the required temporary traffic order notice for:
- the complete closure of the promenade between Rotary Way Porth and Splash Point Old Colwyn.
 - The complete closure of Promenade road between the junction between Rotary Way and Promenade road, and the junction between Beach Road and Cliff Gardens to the south of Splash Point Old Colwyn.
20. The Contractor shall be responsible arranging and maintaining the signage and traffic management required for the diversion routes for the duration of the works.
21. Subject to any restrictions in the Contract, the Employer will endeavour to arrange any temporary Traffic Regulatory Orders or Statutory Orders necessary to accommodate the Contractor's proposed traffic management scheme if requested to do so by the Contractor. Attention is drawn to the paragraphs in this appendix relating to programme implications and notice periods. The following conditions shall apply to all permanent and temporary orders:
- No permanent or temporary stopping up of existing highways shall be undertaken without the approval of the Project Manager, confirmation of the statutory order, and the alternative routes (either permanent or temporary) being constructed and available for use.
 - All existing roads shall remain open until the actual date when reconstruction work is to commence, or traffic management schemes are to be implemented.
 - The Contractor shall be responsible for giving all necessary notice to and complying with any requirements of the Project Manager in connection with the permanent or temporary closing or restricting of highways.
22. In all cases of road closures, continued access for pedestrians and cyclists must be maintained via existing routes or temporary/permanent alternative routes, unless otherwise directed by the Project Manager.
23. Applications for Traffic Orders shall be comprehensive, for the duration of the scheme and shall reflect the complete traffic management system provided. Provisional periods of notice required by Applications for Traffic Orders shall be comprehensive, for the duration of the scheme and shall reflect the complete traffic management system provided. Provisional periods of notice required by the Highway Authority for them to arrange orders are as follows:
- For any works requiring a temporary traffic order a **minimum of 8 weeks**' notice period shall be given to Conwy County Borough Council's Streetworks Department.
 - For any works in the highway or works requiring traffic management within the highway not requiring a temporary traffic order, the Contractor will be required to submit the necessary works order notices to Conwy County Borough Council's Streetworks Department with a **minimum 14**

days' notice period.

- 24. The Contractor shall be responsible for confirming with the Highway Authority whether any additional temporary or permanent Traffic Orders or authorisations are required for his traffic management systems. The Contractor shall apply to the Highways Authority for any necessary traffic orders and copy all his correspondence with the Highway Authority to the Project Manager.
- 25. All costs associated with obtaining traffic orders are to be included in the Contract sum. The costs of public notices shall be borne by the Employer except where the Contractor requires amendments to a made Traffic Order or further orders for the same scheme are subsequently requested.

Driver Information Signs

- 26. The Contractor shall cover (in a manner approved by the Project Manager) and uncover existing signs and temporary signing that become inaccurate as a result of the introduction of any traffic management measure.
- 27. Driver Information signs to Clause 117 are required. See Appendix 1/21 for details.

Temporary Speed Limit Cameras

- 28. The scheme will not utilise temporary speed limit cameras.

APPENDIX 1/19: ROUTING OF VEHICLES

Permitted Access and Egress Routes to the Site

1. Access and egress to the working areas for construction traffic is strictly off the A55 at Junction 22. The contractor is expected to visit the site during the tender period and satisfy himself that the route is suitable for delivery of plant and materials. The Contractor shall use only Primary and Principal Roads to access the site wherever possible. The Contractor will be required to comply with all existing weight and vehicle size restrictions. Any alternative proposals for access shall be submitted to the Project Manager for approval.
2. The Contractor shall make reasonable arrangements for the collective transportation of his personnel and those of his Sub-Contractors onto and away from the site. This is to avoid unnecessary movements and excessive parking of vehicles on site in the interests of safety.

The Use of Permanent Works by Construction Traffic

3. The approval of the Project Manager to proposals to use the structures or finished pavement forming part of the permanent Works for construction traffic shall not relieve the Contractor of his responsibilities under the Contract. The Contractor shall provide the Overseeing Organisation with details of proposed construction traffic movements as part of his Traffic Management arrangements (See Appendix 1/17).
4. The site speed limit will be 10mph.

Movement of Machinery and Plant Across Public Roads

5. Labour, plant and materials shall be kept within the confines of the Working Area and the Contractor shall not use areas of carriageway that are open to the public except in the following circumstances:
 - Labour and plant required for traffic management purposes;
 - Labour, plant and materials being moved to and from the Working Area by suitable vehicles.

In the event the above circumstances are met, the Contractor shall ensure that the carriageways be kept free from dirt by installing wheel-cleaning equipment and/or by regular sweeping. Sweeping will not be deemed satisfactory if the wheels and chassis of vehicles are exposed to hazardous materials and the installation of vehicle-cleaning equipment will be necessary.

6. Tracked vehicles and plant shall not be permitted to work or run on the sections of carriageway which are to be reconstructed or overlaid unless the surface over which movement is to take place is protected to the satisfaction of the Project Manager and Highway Authority.
7. The Contractor shall provide approved protection to all drains or ducts wherever it is required to move plant or vehicles across such drains, ducts and services and shall reinstate at his own expense any such drain or duct which becomes damaged or disturbed.
8. Damage to the public highway or private roads/tracks which the Project Managers considers is due to their use by the Contractor's plant or machinery shall be repaired at the Contractor's expense.

Movement of Machinery and Plant Across Beach/Tidal Areas

9. Plant, equipment, and materials shall be kept within 20m of the toe of the proposed rock revetment. In localised areas where plant may be needed for loading/unloading and delivery operations, plant may travel outside this 20m zone.

APPENDIX 1/21: INFORMATION BOARDS

1. Contract Information Boards are to be provided on all approaches (2No) at locations to be agreed with the Project Manager.
2. The Contract Information Boards shall contain bi-lingual information in Welsh and English.
3. The Contractor is responsible for the structural design of the total information board assembly including posts and foundations. The design is to be based on wind loading to BD37.
4. Details of the scheme signboard size and legends shall be obtained from the Project Manager. They will be approximately 2.0m x 2.0m. They will be constructed from a weather resistant material with the logo of the Employer, Project Manager and funding/other agencies in colour.

APPENDIX 1/22: PROGRESS PHOTOGRAPHS

Requirements for Progress Photographs

Location	Type and Format	No. of Photographs and Distance Between Photographs or Specific Aspects Required	Aerial / Ground	Frequency Required / Interval	Remarks
Throughout the works	Digital high resolution Minimum 12MP.	To be agreed initially with PM. (As a minimum general photographs at 100m intervals in each direction.)	Ground	1. Prior to commencement of work 2. At weekly intervals 3. Upon completion of work	Additional photographs to be provided if directed to do so by the Project Manager

1. All photographs to bear the date and time.
2. Photographs to be supplied to the Project Manager in electronic format. Photographs to be supplied to the Project Manager no later than one month from the date on which they were taken. Delivery of photographs to include the project title, reference number, location and a brief description of the work shown for each picture.
3. The photographs and copyright privileges shall be the property of the Overseeing Organisation.

APPENDIX 1/23: RISKS TO HEALTH AND SAFETY

1. Reference to the Pre Construction Information prepared by the Principle Designer should be made for identification of site specific risks.
2. The Contractor shall ensure that all areas used by the general public are fully protected during any work involving substances hazardous to health.
3. The Contractor shall take all reasonable precautions to ensure that emissions of dust and air pollution from the site are minimised. All lorries delivering to and from the site shall be fully and properly sheeted at all times. A suitable dust-suppression system must be adopted where the generation of dust would otherwise occur.
4. Precautions shall be taken to prevent the emission of all substances applied by spraying including among others saline, bituminous sprays, concrete curing compounds and paint systems.

The measures to be taken shall include but not be limited to:-

- The erection of adequate screens or the closure of traffic lanes if the screening cannot be made fully effective.
- Spraying must cease when the prevailing wind is such that it may blow the sprayed substance in the direction of members of the public.
- Adequate signs should be put up to warn that particular spraying is in progress.
- Compliance with the manufacturer's recommendations in relation to storage, handling and use.

Fuel, Lubricants and Hydraulic Fluids

5. The Contractor shall store and handle, including refuelling, only on hard-standing or other approved areas, away from watercourses and drains. They are also to ensure:
 - All plant and containers are on drip trays or within bunds
 - That soil, planting and grassed areas are not contaminated.
 - That vehicles and plant are secure from leakage and spillage. If spillage occurs, take appropriate emergency action and inform the Project Manager immediately.

The Contractor shall be responsible for all consequences arising from any pollution attributed to the works.

Use of Pesticides

6. Use only where specified or approved, and then only suitable products as listed in the UK Pesticide Guide. Where work is near water, drainage ditches or land drains, comply with the MAFF guidelines for the use of herbicides on weeds in or near water courses and lakes. Observe all precautions recommended by the manufacturer and remove containers from site immediately once they have been emptied or are no longer required. Operatives must hold a BASIS Certificate of Competence, or work under the supervision of a Certificate holder.

Nuisance

7. Take all necessary precautions to prevent nuisance from smoke, dust, rubbish, vermin and other causes. Ensure that the works do not increase the risk of bird strike by attracting birds. Keep all materials attractive to birds contained, unless otherwise agreed with the Project Manager.
8. Burning of materials arising from the work will not be permitted.

APPENDIX 1/24: QUALITY MANAGEMENT SYSTEM

1. The Contractor shall institute and operate a Quality Management Plan which is in accordance with ISO 9001 and their current certification.
2. The Quality Plan shall be submitted to the Project Manager for its acceptance not later than 21 days after award of the Contract.
3. The Quality Plan shall include details on the following as a minimum.
 - Contractor's Organisation and Management.
Including the organisation of the contract, line command and communication links between parties involved in the Contract on and off site.
Names, roles, responsibilities and authority of principals and key personnel.
 - Identification of the parts of the Contractor's Quality Management System relevant to the Works.
 - Details how the Contractor shall competently inspect, test, check and approves their own work and the work of their sub-contractors.
 - Supply Chain Management.
Including details of control and communications processes, assessment of the supplier's and subcontractor's quality management systems and quality control capabilities, monitoring arrangements, review and acceptance of work items being undertaken by the subcontractor or supplier.
Details and scheduling of Quality Plans required by relevant National Highways Sector Schemes or other quality management schemes.
Details of registration to relevant National Highway Sector Schemes or other quality management schemes.
 - Document Control.
Controls relevant to the Works, including the control and processing of testing results, materials and workmanship certification and quality records.
The management of quality records
The control and scheduling of all documentation to be submitted to the Overseeing Organisation as required by the Specification throughout the Works.
 - Resource Management.
Including details of relevant skills and experience of personnel involved in the Works.
The relevant training and/or competency assessment certificates and/or registration/skills cards or scheduling of when they will be provided.
 - Method Statements
Method Statements for initial items of work and scheduling for all other method statements required. This scheduling shall include times for submission of method statements such that they are submitted a minimum of 14 days prior to the commencement of relevant work.
 - Hold Points for inspecting, testing and checking.
4. The Construction Phase Plan developed from the Pre-Construction Information must be submitted to the Project Manager not less than 2 weeks before the proposed date for start of construction work. The Contractor shall not start construction work until the Employer has confirmed in writing that in his view the Construction Phase Plan is sufficiently developed to allow construction to commence.

Security

5. The Contractor shall adequately safeguard the site, the Works, products, materials, plant, and any existing buildings affected by the Works from damage and theft. Take all reasonable precautions to prevent unauthorised access to the site, the Works and adjoining property.

Employers' Representatives Site Visits

6. The Contractor shall inform the Project Manager in advance of all safety provisions and procedures (including those relating to materials which may be deleterious) which will require the compliance of the Employer or his representatives when visiting the site.

2 Site Clearance

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

1. During the Contract period, the Contractor shall ensure the stability of all existing structures. The Contractor shall provide and maintain all necessary temporary supports. The Contractor shall agree all safety measures with the Project Manager.
2. The Contractor shall take precautions to prevent fire and explosion caused by gas or vapour.
3. Holes left by the removal of underground structures, chambers and foundations shall be filled with Class 1 material and be compacted in compliance with Appendix 6/1 and Table 6/1.
4. The buildings and structures described in the Table below require demolition:

Table 2.1: Buildings and Structures Requiring Demolition

Description	Drawing No.	Requirements
Copings along existing seawalls to be raised.	415437-MMD-00-XX-DR-D-0231	Where seawall is being raised, coping to be carefully removed and disposed off site.
Existing stairs from highway to promenade (next to retaining wall near Rotary Way junction)	415437-MMD-00-XX-DR-D-0231	Existing steps and associated furnishings / railings to be removed and disposed off site.
Existing steel stairs from promenade to beach.	415437-MMD-00-XX-DR-D-0231	Existing steps and associated furnishings / railings to be removed and disposed off site.
Existing concrete cross over steps.	415437-MMD-00-XX-DR-D-0231	Existing concrete cross over steps and to be removed and disposed off site.
Existing shelter at west end of promenade to Rotary Way junction ramp.	415437-MMD-00-XX-DR-D-0231	Subject to CCBC approval existing shelter to be removed if Contractor needs access and space to construct the works.
Columns at ends of RC wall near high to prom stair entrance.	415437-MMD-00-XX-DR-D-0231	End RC columns next to entrance removed to ensure facade is continuous between new & existing sections. RC disposed of off site.
Ends of existing revetments to be extended.	415437-MMD-00-XX-DR-D-0231	Where revetment shall be extended / filled in, primary, underlayer and core along sloped sides of phase 2 rock revetment shall be removed to allow geotextile to be lapped and revetment extended lineally. Removed armourstone shall be incorporated into the works as per specification.
Top of existing revetment between proposed steps 1 and outfall No 1.	415437-MMD-00-XX-DR-D-0231	Top 1.2m depth of phase 2 rock revetment crest along this section to be removed, graded and reincorporated into the works as per specification.
Existing toe armourstone along base of existing seawall west of outfall No 2.	415437-MMD-00-XX-DR-D-0231	Where new revetment is to be constructed, existing toe armourstone to be removed, tested and

Description	Drawing No.	Requirements
Existing guard railing along seawall copings to be removed.	415437-MMD-00-XX-DR-D-0231	<p>incorporated into the works if compliment with the specification</p> <p>Unless noted otherwise existing guardrail to be typically removed and disposed of off site. However recently installed / undamaged key clamp along seawall coping shall be carefully removed from the seawall for client re-use. Taken to CCBC storage yard as directed by client. Contractor to ensure safe edge protection during works.</p>

The following lists the superficial obstructions, which shall be demolished together with any further requirements.

Redundant Cables

- Existing underground cables shall be safely disconnected, cut out and removed from Site and disposed of as part of the Contractor's obligations under Health and Safety requirements.

APPENDIX 2/2: FILLING OF TRENCHES AND PIPES

1. Redundant pipes, services, etc. within 1m of formation or elsewhere within 1.2m of finished ground levels are to be removed and backfilled with granular material in accordance with Clause 201 of the Specification of Highway Works. Where this cannot be readily achieved, pipes shall be filled with cement/PFA grout as described in Clause 506 of the Specification of Highway Works.
2. Redundant pipe work left in place to be sealed in accordance with Clause 506 of the Specification.
3. Pipes, services, etc. over 1m below formation shall be left in place. The end of existing drains and sewers no longer required as part of the drainage layout shall be sealed in accordance with Clause 506 of the Specification.
4. All trenches shall be backfilled with Type 1 granular sub-base (above pipe bedding and surround) unless under existing carriageway where concrete class ST4 shall be used.

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

1. All construction material e.g. concrete, steel, timber etc. arising from excavation is to be removed from site and shall become the property of the Contractor and shall be consigned in accordance with statutory requirements.
2. Unless noted otherwise redundant items arising from site clearance shall become the property of the Contractor and disposed of under the Contract, unless otherwise instructed by the Project Manager.
3. Where required, voids left by items that have been removed shall be backfilled immediately with Class 1 material in accordance with Appendix 6/1.
4. The table below relates to retention of materials arising from Site Clearance. See drawing 415437-MMD-00-XX-DR-D-0231 for locations.
5. Contractor is required to re-use the site won bituminous material from existing carriageway and promenade within the works, whilst fully compliant with the Specification for Highway Works and EA Guidance RPS 75.

Description	Location	Delivered to	Requirements
Sign and post	At end of Rotary way to promenade junction ramp.	Kept undamaged and kept in same location.	
Lifebuoy	Near phase 2 prom transition ramp (to be raised). See recent site drone photographs.	Kept undamaged and kept in same location on railing.	
Ends of existing revetments to be extended.	415437-MMD-00-XX-DR-D-0231	Re-incorporated into the works as per specification.	Where revetment shall be extended / filled in, primary, underlayer and core along sloped sides of phase 2 rock revetment shall be removed to allow geotextile to be lapped and revetment extended lineally. Removed armourstone shall be incorporated into the works as per specification.
Top of existing revetment between proposed steps 1 and outfall No 1.	415437-MMD-00-XX-DR-D-0231	Re-incorporated into the works as per specification.	Top 1.2m depth of phase 2 rock revetment crest along this section to be removed, graded and reincorporated into the works as per specification.
Existing toe armourstone along base of existing seawall west of outfall No 2.	415437-MMD-00-XX-DR-D-0231	Tested and incorporated into the works if compliant with the specification.	Where new revetment is to be constructed, existing toe armourstone to be removed, tested and incorporated into the works if compliant with the specification
Existing guard railing along seawall copings to be removed.	415437-MMD-00-XX-DR-D-0231	Taken to CCBC storage yard as directed by client.	Unless noted otherwise existing guardrail to be typically removed and disposed of off site. However recently installed / undamaged key clamp along seawall coping shall be carefully removed from the seawall for client re-use. Taken to CCBC storage yard as directed by client. Contractor to ensure safe edge protection during works.

APPENDIX 2/4: EXPLOSIVES AND BLASTING

1. Explosives shall not be used on this contract.

APPENDIX 2/5: HAZARDOUS MATERIALS

1. The existing bituminous surfacing to the promenade and highway was tested for polycyclic aromatic hydrocarbons (PAHs) and other organics prior to the start of the works as part of the Ground Investigation (GI). The GI reports are included with the Site Information (report references CCG-C-20-11993). The reports suggest that the existing carriageway/promenade bituminous surfacing material is likely to contain PAH compounds, and may be classifiable as hazardous waste for off-site disposal.
2. The Contractor is required to re-use the site won bituminous material from the existing carriageway and promenade within the works where possible, whilst fully compliant with the Specification for Highways Works and EA Guidance RPS 75.

The material is to be reused as a hydraulic bound material as a substitute to the first 250mm of 6N beneath the new promenade slab and as sub base beneath footways.

If, during the works, hazardous waste materials are discovered or suspected; the Contractor, after notifying the Project Manager, must immediately inform:

- The Hazardous Waste Officer of NRW (Telephone TBC, Emergency Pollution Hotline 0800 80 70 60)
 - The Waste Strategy Officer for Conwy County Borough Council
3. The site of the hazardous material must be appropriately fenced off to prevent unauthorised access. The Contractor must comply with the recommendations of NRW for dealing with the hazardous material.
 4. The requirements for dealing with Class U2 Unacceptable Material and Hazardous Waste material are given in Appendix 6/2.
 5. All unacceptable and surplus materials (other than those classified as Class U2 materials as defined in Clause 601.3 of the Specification) to be removed from site shall be classified as controlled waste and the Contractor will be required to dispose of such materials in accordance with the Environmental Protection Act 1990. The Duty of Care imposed by the Act shall apply to the Contractor as producer of the waste. This shall also apply to any sub-contractor employed by the Contractor.
 6. All waste material haulage must be undertaken by a carrier permitted to transport controlled waste and each load must be accompanied by a transfer note and transported in sheeted wagons.
 7. All waste must be deposited at an approved and permitted site capable of taking the waste in question. The Contractor should contact Conwy County Borough Council to check the availability and location of appropriate waste disposal facilities or to seek approval to any alternative proposals for the disposal of waste materials.

3 Fencing

APPENDIX 3/1: FENCING, GATES AND STILES

The following specification applies to the edge restraint and handrails detailed on 415437-MMD-00-XX-DR-S-2030 to 2399 drawings for promenade structures, and on 415437-MMD-00-XX-DR-C-3500 to 3599 drawings for coastal structures.

1. Handrailing generally (all types) - All handrailing to be detail designed by a manufacturer on behalf of the Contractor. Proposals to be submitted to CCBC for approval prior to manufacture.

Coastal structures

The following specification applies to the edge restraint and handrails detailed on coastal drawings 415437-MMD-00-XX-DR-C-3500 to 3599. Typical cross section details of edge restraint and handrails are shown on drawing 415437-MMD-00-XX-DR-C-3530.

2. **Handrail Type A; to beach access stairs and cross over steps:**

Combined guardrail and handrail system. Class 3 to BS 7818, 'Harbour' style handrailing by Marshals or similar accepted, to provide top rail height of 1150mm above floor level. Handrail to be provided at 900mm to 1000mm above floor level / stairs pitch line. Posts fixed at maximum of 2m uniform centres to accommodate two rails. Rails and posts to be constructed of 'polymer cast' material around a mild steel core and finished with two coats of polyurethane based coating in colour RAL 1013 'Oyster White'. Combined guardrail and handrail system to provide a min. 50 year design life in the marine environment. Some posts to be fixed to top of walls with baseplates and holding down bolts where level rail fixings are required. Some posts to be root fixed (aka planted) to top of walls where diagonal rail fixings are required.

- i. Base plate and holding down bolt arrangement to withstand loading requirements for class 3 post and rail pedestrian restraint systems as detailed in table 2 of BS 7818-1995. Holding down bolts to be grade A4 stainless steel.
- ii. Posts to be root fixed (aka planted) to withstand loading requirements for class 3 post and rail pedestrian restraint system as detailed in table 2 of BS 7818-1995. Rooted section grouted into cored holes along top of wall with 35N/mm² compressive strength non-shrink grout.

Promenade structures

The following specification applies to the edge restraint and handrails detailed on promenade drawings 415437-MMD-00-XX-DR-S-2030 to 2399. Typical cross section details of edge restraint and handrails are shown on drawing 415437-MMD-00-XX-DR-S-2134.

3. **Handrailing; promenade edge generally:**

1150mm high class 3 'Harbour' style handrailing to BS 7818 by Marshals or similar approved. Posts fixed at 2m centres to accommodate three rails. Rails and posts to be constructed of 'polymer cast' material around a mild steel core and finished with two coats of polyurethane based coating in colour RAL 1013 'Oyster White'. 50mm diameter horizontal rails fixed to posts as standard. Handrailing to provide a min. 50 year design life in the marine environment. Posts to be fixed to top of walls with baseplates and holding down bolts. Base plate and holding down bolt arrangement to withstand loading requirements for class 3 post and rail pedestrian restraint system detailed in table 2 of BS 7818-1995. Holding down bolts and domed nuts to be grade A4 stainless steel.

4. **Kee Klamp 1 - Along transition ramp:**

Proprietary galvanized steel Kee Klamp (2-rail) selected & installed by Contractor to resist class 2 loading to BS 7818 (equivalent to a 0.7kN/m horizontal load along top rails). Top of handrail to be

900mm to 1000mm above FFL ramp pitch line. Top of lower handrail to be 600mm above FFL ramp pitch line. Post root fixed to min 450mm depth and in 350mm \varnothing concrete (C35/45 grade) below surface & binder course layers, to resist a 1.4kN/m characteristic horizontal load applied to system top.

5. Kee Klamp 2 - Along back of promenade transition ramp (due to fall from height):

Proprietary galvanized steel Kee Klamp (2-rail) selected & installed by Contractor to resist class 3 loading to BS 7818 (equivalent to a 1.4kN/m horizontal load along top rails). Top of handrail to be 1100mm above FFL. Top of lower handrail to be 600mm above FFL ramp pitch line. Post root fixed to min 450mm depth and in 350mm \varnothing concrete (C35/45 grade) below surface & binder course layers, to resist a 1.4kN/m characteristic horizontal load applied to system top.

5 Drainage

APPENDIX 5/1: DRAINAGE REQUIREMENTS

1. The drainage within the promenade shall be constructed in accordance with the promenade drawings and specification of highway works 500 series.

Cleaning and Testing

2. A CCTV survey of the entire new drainage system is to be undertaken upon completion, a copy of the report and electronic videos of the surveys are to be included in the Health and Safety file for the Scheme.

APPENDIX 5/2: SERVICE DUCT REQUIREMENTS

1. Duct construction shall conform to clause 501.7 of the Specification for Highway Works with construction details as Highway Construction detail I2 with the exception that all ducts shall have concrete surround.
2. The location and number of ducts are shown on the contract drawings.
3. Marker blocks and location posts (where required) are shown on the contract drawings and shall comply with Highway Construction detail I1.
4. Ducts shall be colour coded in accordance with NJUG Guidelines on the positioning and colour coding of underground utilities apparatus and works shall comply with Health and Safety Executive Booklet HS(G)47

Service Duct requirements (Street Lighting)

- a) The ducting required for street lighting and illuminated signs is described on drawings 415437-MMD-00-XX-DR-S-2030 to 2399.
- b) Cable ducts shall be 50mm diameter of twin wall construction, ribbed on the outer profile and smooth internal profile manufactured from polythene or medium density polyethylene, wall thickness 5mm minimum, orange in colour, inscribed "STREET LIGHTING" at 1 metre intervals permanently embossed.
- c) Plastic marker tape shall be laid above all cable runs and shall be 150mm wide yellow self-coloured polyethylene not less than 0.1mm thick. Where the trench is only being used for a private street lighting network the tape shall include the wording 'CAUTION' and 'STREET LIGHTING CABLE BELOW' along its full length.
- d) Ducts in verge and footways shall be installed by open trench with a depth of cover of not less than 450mm, in accordance with Clause 1421. All cables will be installed in ducting.
- e) All duct requirements for Statutory Undertakers and Agent Authorities shall be determined by the Contractor in liaison with the relevant bodies, ducts and draw cords provided where necessary.
- f) Ducts shall be colour coded as follows:
 1. Electricity Company (DNO) – black colour – supply cable into feeder pillar.
 2. 50mm diameter duct – orange colour – for highway lighting cables.

Draw Pits for Street Lighting and Traffic Signals

- g) The draw pits required for street lighting and traffic signs is described on drawings 415437-MMD-00-XX-DR-S-2030 to 2399:
 - The chamber formwork shall be manufactured from high Density Polyethylene with pre-formed knockout areas to accept the specified ducts.
 - They shall be modular units, which can be stacked to the required level and have reinforced profile to retain its shape during the placing of concrete surround.
 - Chamber covers and frames shall be capable of class C250 (refer to drawings 415437-MMD-00-XX-DR-S-2030 to 2399 for information) and the covers shall be in accordance with the type of surrounding surface.

APPENDIX 5/7: THERMOPLASTICS STRUCTURAL WALL PIPES AND FITTINGS

1. Thermoplastic structural wall pipes and fittings shall be manufactured from high strength HDPE to a structured wall design certified by Highways Authorities' Product Approval Scheme (HAPAS) by the British Board of Agrément (BBA) in conjunction with the Highways Authority. The general requirements for structured wall pipes and fittings are contained in the MCHW Volume 1, Clause 518.

6 Earthworks

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

Definition of Fill Classes and Acceptable Limits for Fill Classes

1. Acceptable materials shall be those imported on to the Site, which meet the requirements of this Specification for acceptability for use in the Permanent Works.
2. The earthworks shall be constructed in accordance with the Series 600 Earthworks Drawings. Acceptability limits and permitted Classes are given in Table 6/1 of this Appendix.
3. The Contractor is responsible for determination of acceptability and classification of materials at source and is responsible for preventing any deterioration of condition in transport, deposition and stockpiling. Appendix 1/5 lists the required tests and frequency of testing.
4. A method statement for the earthworks is required giving details and plans of the source of the materials (including lateral and depth zoning), placement and compaction methods and the proposed sampling strategy.
5. The classification and confirmation of acceptability of the earthwork materials shall be carried out by the Contractor. The classification shall include all materials excavated on site or imported.
6. Where imported material is used to form embankments the Contractor shall, prior to the delivery of the material to site, supply information regarding the nature and source of the material together with the results of source material testing. A plan, updated weekly, is to be supplied identifying the locations and depths of the samples taken for source approval testing. When material is stockpiled for an extended period, re-testing prior to commencement of placement may be required.
7. All test results for the construction are to be reviewed and verified by the Contractor and shall be presented to the Supervisor for information purposes within a maximum of 1 week of sampling. Data should be supplied daily in Excel, AGS and on a legible pdf. The in situ density results should include a comparison against target density and also the derivation of the target density. A plan should be provided weekly showing the location and depths of the samples taken for testing. The Supervisor shall then be given a maximum of three days to review test data and verify classification and acceptability limits and amend, if necessary, the limits provided in Table 6/1 and Table 6/2. The Contractor shall provide the name, qualifications and relevant experience of the individual or individuals responsible for the review and verification of the test results and this shall be a minimum of ten years' experience in the management and geotechnical assessment of earthworks, and/or an appropriate qualification in geotechnical or civil engineering.

Processing of Unacceptable Class U1 Material

8. The requirements for processing unacceptable (Class U1) to acceptable shall be determined by the Contractor. It is not anticipated that site-won materials will be used in the works and therefore no further requirements for processing Class U1 material are presented.

Material Disposal

9. The Contractor shall be responsible for the disposal of any material arising from the Site. Such arisings may only be disposed of in a suitably permitted facility which has a current Environmental Permit as required by the Environment Protection Act 1990.
10. Waste Transfer Notes shall be made available to the Supervisor for inspection. The Contractor shall ensure that full written details of all transfers of waste are kept and made available to the Supervisor.

11. Where the Contractor sub-contracts the disposal of material, the above conditions shall still apply to the sub-contractor. The Contractor shall be responsible for checking Waste Transfer Notes / Environmental Permits and making these available for the Supervisor to inspect.
12. The use of all tipping facilities must be approved by the Supervisor.

Table 6.1: Acceptable Earthwork Materials Classification and Compaction Requirements (see footnotes)

Class			General Material Description	Typical Use	Permitted Constituents (all subject to Requirements of Clause 601 and Appendix 6/1)	Material Properties Required 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 within		
								Lower	Upper	
6	A		Selected well graded granular material	Below water	Natural gravel, natural sand, crushed gravel, crushed rock other than argillaceous rock, crushed concrete, chalk, well burnt colliery spoil or any combination thereof. (Properties (i) and (ii) in next column, shall not apply to chalk.) Recycled aggregate Where material is imported onto site which is not 'as dug' it shall be aggregate conforming to BS EN 13242 from one or more of the following source codes, see Notes 8, 9, and 10: P (natural aggregates – except shale, siltstone or slate, see Note 7); A (construction and demolition recycling industries); G1 (red coal shale) G3 (pre-selected all-in from quarrying/mining)	(i) grading	BS 1377: Part 2 (On-site)	Table 6/2	Table 6/2	No compaction
							BS EN 933-2 (Imported onto site)	Table 6/5	Table 6/5	
						(ii) uniformity	See Note 1	10	-	
						(iii) SMC of chalk index	Clause 634	-	20%	
						(iv) plasticity index	BS 1377: Part 2	Non-plastic		
6	F	5	Selected granular material (coarse grading) – imported on to the Site	Capping	Unbound mixture complying with BS EN 13285 containing aggregate conforming to BS EN 13242 from one or more of the following source codes, see Notes 8, 9 and 10 of Series 600 Specification: P (natural aggregates – except chalk, shale, siltstone or slate, see Note 7) A2 (crushed concrete) A3 (crushed bricks, masonry) A4 (mixed recycled aggregate)	(i) Size designation and overall grading category	BS EN 13285 – 0/80 and G _E	Tab 6/5	Tab 6/5	For raising of level: Tab 6/4 Method 6
						(ii) Maximum fines and oversize categories	BS EN 13285 – UF ₁₂ and OC ₇₅	Tab 6/5	Tab 6/5	For fill to voids: End product 95% of maximum dry density of BS 1377: Part 4 (vibrating hammer method)
						(iii) Los Angeles coefficient	BS EN 13242 – LA ₅₀	-	50	
						(iv) Volume stability of blast furnace slag	BS EN 13242 – free from dicalcium silicate	-	-	

Class			General Material Description	Typical Use	Permitted Constituents (all subject to Requirements of Clause 601 and Appendix 6/1)	Material Properties Required 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 within		
								Lower	Upper	
					B1 (municipal incinerator bottom ash (MIBA)) D2 (air cooled blast furnace slag) D3 (basic oxygen furnace slag) D4 (electric arc furnace slag (EAF C)) G (mining and quarry industry – except G2 (black coal shale)) Aggregates from source code A4 shall contain not more than 50% of constituents in Class Ra (bituminous materials). Property (x) in the next column shall not apply if the Class Ra (asphalt) content of any recycled aggregate is 20% or less		and iron disintegration			
						(v) Volume stability of steel (BOF) and EAF) slag	BS EN 13242 – V5	-	-	
						(vi) Other aggregate requirements	BS EN 13242 – Category NR (no requirement)	-	-	
						(vii) Laboratory dry density and optimum water content	BS EN 13285, Clause 5.3 – declared values	-	-	
						(viii) Water content	BS EN 1097-5	Optimum wc – -2%	Optimum wc	
						(ix) Class Ra (asphalt) content	Clause 710	-	50%	
						(x) bitumen content	BS EN 12697-1 or BS EN 12697-39	-	2.0%	
6	N		Selected well graded granular material	Fill to structures	Natural gravel, natural sand, crushed gravel, crushed rock, crushed concrete or any combination thereof. None of these constituents shall include any argillaceous rock. Recycled aggregate except recycled asphalt. Where material is imported onto site which is not 'as dug' it shall be	(i) grading	BS EN 933-2 (Imported onto site)	Tab 6/5	Tab 6/5	End product 95% of maximum dry density of BS 1377: Part 4 (vibrating hammer method)
						(ii) uniformity coefficient	Note 1	10	-	
						(iii) Los Angeles coefficient	Clause 635	-	40	
						(iv) effective angle of internal friction (ϕ') and effective cohesion (c')	Clause 636	c'= 0 kN/m ² ϕ' = 35° for seawall backfill	-	
						(v) permeability	Clause 640	5 x 10 ⁻⁵ m/s	-	

Class			General Material Description	Typical Use	Permitted Constituents (all subject to Requirements of Clause 601 and Appendix 6/1)	Material Properties Required 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 within		
								Lower	Upper	
					aggregate conforming to BS EN 13242 from one or more of the following source codes, see Notes 3 & 4 below: P (natural aggregates – except shale, siltstone or slate); A2 (crushed concrete) A3 (crushed bricks, masonry)	(vi) Water content	BS 1377: Part 2. Note 2	Note 2	Note 2	
						(x) Density	BS EN ISO 17892 : Part 2	-	21kN/m³	

Notes:

- App = Appendix Tab = Table 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.

1. 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

D10 = particle diameter at which 10% of the soil by weight is finer

2. The limiting moisture content values are those between which not less than 95% maximum dry density and not more than 10% air voids are achieved as determined by the appropriate compaction test to BS1377: Part 4. Where BS 1377: Part 2 is specified for mc, this shall mean BS 1377: Part 2 or BS EN 1097 - 5 as appropriate. For Class 6 Selected Granular Material the maximum permitted Air Voids is 5%.

3. Where materials are required to be aggregates conforming to BS EN 13242 materials certificated as being compliant with BS EN 13285 are acceptable for use provided that they meet all the specification requirements and the Declaration of Performance for constituent parts to BS EN 13242 are provided to the Supervisor.

4. Materials shall comply with the current Environmental Regulations at the time of use. Reference shall be made to Annex ZA (informative) of BS EN 13242

Armourstone and Rip Rap

Armourstone refers to the materials utilised to form the rock revetment, including the “Primary Layer” rock, “Underlayer” rock and “Core” rock.

Classification

3. Armourstone shall be graded and tested in accordance with BS EN 13383 1 and BS EN 13383 2.
4. Armourstone shall be natural, hard, sound homogenous, non-argillaceous Armourstone of good durability. It shall be free from laminations and weak cleavage planes and shall be of such character that it shall not disintegrate or erode when exposed to frost attack or the actions of air, water, wetting and drying, freezing and thawing, and impact due to wave action. The armour stone shall have a monolithic structure and shall not contain cellular, honeycombed or other voids and shall be free from cracks, seams or similar defects. The armour stone shall not contain harmful materials such as iron pyrites, coal, mica, laminated material or any materials in sufficient quantity to adversely affect the strength and durability of the material. It shall be capable of being handled and placed without undue fracture or damage. It shall be free from coating of clays or other deleterious material.
5. The armourstone shall be granite, basalt, carboniferous limestone, feldsparitic, greywacke, dolerite or other material accepted by the Supervisor. The outer most layer of revetment rock shall be granite. The revetment armourstone supplied for any single grade shall be from a single quarry. The rock supplied for any single grade shall be from a single quarry, unless mixed Micro Deval testing to BS EN 1097-1 : 2011 utilising samples from two interfacing combinations complies with the specification, source combinations and interfaces are minimal, plan extent of each source is maximised and the Contractor supplies proposals to the *Project Manager* for acceptance well in advance.
6. The properties of the armourstone are given in the following tables in accordance with BS EN 13383.
7. Above a geotextile, core quarry armourstones shall have a smooth surface free from sharp stone corners formed.

Material Grading for Armourstone

Rock Grade	Description	Grading	Average Mass (W ₅₀)	Extreme Lower Limit <5%	Nominal Lower Limit <10%	Nominal Upper Limit >70%	Extreme Upper Limit >97%
Primary Layer	Heavy grading	3000kg–6000kg	4200kg-4800kg	2000kg	3000kg	6000kg	9000kg
Underlayer	Light grading	300kg-1000kg	540kg-690kg	200kg	300kg	1000kg	1500kg
Core	Light grading	15kg-300kg	45kg-135kg	5kg	15kg	300kg	450kg

Armourstone Properties

Property	Primary Layer and Underlayer	Core	Ref to BS EN 13383:Part 1	Sampled, tested and reported in accordance with:
Grading	As per above table	As per above table		
Shape	LT _A	LT _A	Table 6	BS EN13383 Part 2 – Clause 7
Crushed or broken surfaces	RO _{NR}	RO _{NR}	Table 7	BS EN13383 Part 1 – Clause 4.4
Minimum particle density (t/m ³)	2.65	2.5	Table 8	BS EN13383 Part 2 – Clause 4 and Clause 8
Resistance to breakage	CS ₆₀	CS _{NR}	Table 9	Test with EN 1926:1999 annex A
Resistance to wear	M _{DE20}	M _{DENR}	Table 10	EN 1097 Part 1:1996 - Clause 7
Water absorption	WA _{0.5}	N/A	Table 12	BS EN 13383 Part 2 – clause 8
Resistance to salt crystallisation	MS ₂₅	MS _{NR}	Table 14	EN 1367 Part 2 :1998 – clause 8

Tolerances

Rock, excavated or filled surface	Level or location	Tolerance Any point to design profile	
Excavated formation	All	±0.2 m	
Filled rock formation (top of core or fill)	Trimmed in dry	±0.2 m	
	Trimmed below water	±0.3 m	
Top of rock (bulk placed light gradings)	Placed in dry	±0.2 m	
	Placed below water	±0.3 m	
		Individual stone to actual mean profile	Actual mean profile to design profile
Top of rock (individually placed stones)	Crest (above water)	±0.25 D ₅₀	±0.2 D ₅₀
	Revetment slope:		
	above water	±0.25 D ₅₀	±0.3 D ₅₀
	below water	±0.40 D ₅₀	±0.4 D ₅₀
	Toe:		
	above water	±0.30 D ₅₀	±0.25 D ₅₀
	below water	±0.35 D ₅₀	±0.35 D ₅₀

Notes:

- 1) Reference to Table 2, BS EN 13242:2002.

Testing

8. Testing shall be carried out by an accredited laboratory to the acceptance of the Supervisor.
9. The test requirements detailed in the tables above shall be carried out on representative samples of primary rock armour, underlayer rock armour and core. The tests shall be carried out at the frequency as detailed in Appendix 1/5.

Placement

10. Light gradings

- i. Light gradings (to BS EN 13383-1) may be placed in bulk by a machine, with care, so as to minimise disturbance to any already-placed rocks and to avoid damage to the rocks, surface below or the geotextile.
- ii. Rock underlayer shall be placed to achieve a dense layer but shall not be compacted.

11. Heavy gradings

- iii. Heavy gradings (to BS EN 13383-1) shall be constructed by placing the rocks, individually by a machine with care ensuring a random orientation and weight distribution, and so that the structure has a large void ratio of 35% to 40%.
- iv. The rocks shall be placed to achieve a minimum 'three-point support' and shall not be placed so that they can move or obtain their stability on a plane solely by frictional resistance prior to placing further rock. The rock shall be placed so that the adjacent faces of abutting rocks are not parallel and that each rock is stable against wave and current action.

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

Procedure for assessment and disposal of Class U1B and U2 materials

1. Should Class U1B or U2 unacceptable material (fibrous, odorous, brightly coloured, tarry or oily material or material significantly different from that encountered during the ground investigation works) be encountered, the Contractor shall immediately inform the Supervisor. A specialist environmental chemist (employed by the Contractor) shall satisfy themselves and the Supervisor by chemical analysis, that the material is not Class U1B or U2 material or otherwise hazardous.
2. Samples collected as part of the investigation shall be subjected to chemical analysis at UKAS accredited laboratories with suitable UKAS / ISO accreditation for the tests being performed. All testing shall be done by the Contractor or sub-contractor and shall comply with appropriate testing techniques. Test reports and certificates shall be required after testing is carried out. Sampling of materials shall be undertaken in clean laboratory supplied sampling containers in accordance with BS 10175 and suitable for the range of tests listed below. Samples shall be stored in insulated containers with ice packs and transported to the laboratory on the day of sample collection with appropriate chain of custody forms.
3. The Contractor shall keep records of the location, volumes, extent, nature (including a visual and olfactory assessment) and test results of all Class U1B and U2 materials encountered.
4. If Class U1B or Class U2 materials are identified, the Contractor shall make all necessary arrangements for their safe handling and disposal after consultation with the appropriate Local Authority and, if necessary, Natural Resources Wales and the Health and Safety Executive. All Class U2 materials arising from site shall be deposited only at appropriately licensed waste disposal facilities. Details of the proposed disposal sites, together with copies of the appropriate waste disposal licences, shall be supplied to the Supervisor prior to the start of relevant excavation works.
5. Generally, all “controlled wastes” shall be handled and disposed of in accordance with the Environmental Protection (Duty of Care) Regulations 2003 and the accompanying Code of Practice. The Contractor shall keep records of the handling and disposal of waste for a minimum of two years.
6. Waste materials shall only be transported off-site by a carrier registered under the Controlled Waste Registration of Carriers and Seizure of Vehicles Regulations (1991). A copy of the appropriate registration certificate shall be supplied to the Supervisor for agreement prior to the start of the works. All open vehicles used for transporting wastes off-site shall be sheeted securely prior to leaving site.
7. Should the Contractor not possess the relevant licences for handling Class U2 material, including asbestos, the Contractor shall appoint a licensed subcontractor to handle the material.
8. The Contractor shall ensure that waste soils, including contaminated Made Ground, are not taken off site on vehicle wheels. The Contractor shall agree suitable arrangements with Natural Resources Wales and Local Authority prior to commencement of works on site.

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

General

1. Before the commencement of any earthworks the Contractor shall provide the Project Manager with a detailed Method Statement describing his proposals for carrying out excavation, storage, transportation, and filling works. The Method Statement shall describe the sequence of operations to be carried out, the personnel and equipment to be employed, the safety provisions and procedures to be incorporated, and the means for achieving the specified environmental control criteria. Earthworks shall not be commenced until the Project Manager has given his approval in writing to the Contractor's Method Statement, and the Contractor shall carry out all earthworks in accordance with the requirements of the Approved Method Statement.
2. If, at any time during the course of the Works, situations arise which are not covered by the original Method Statement, then the Contractor shall issue the Project Manager with an updated Method Statement which shall include the necessary modifications or amendments to his proposed method of working, and such proposed amendments shall not be commenced until written approval of the updated Method Statement has been granted by the Project Manager.
3. During the Works, the Contractor shall ensure that the construction of the Works are secure against the effects of the rise and fall of the tide and wave action.
4. All fill material where possible shall be placed and compacted in the dry. Where this is not possible, the Contractor shall develop a specific method statement for hydraulically placed fill material to the approval of the Project Manager.

Drawings references for all drawings with earthwork requirements

5. All earthworks shall be constructed in accordance with the Series 600 Earthworks Drawings.
6. The location of all cuttings and embankments and other structural elements involving earthwork operations are shown on the Series 600 Earthworks Drawings.
7. Construction details for cuttings and embankments and other earthwork operations are shown on the Standard Earthwork Details Drawings.

Excavation by blasting

8. Not required

Requirements for cutting faces

9. Not required

Watercourses, including ditches etc.

10. All watercourses shall be protected from contamination from site materials. in accordance with the scheme environmental constraints.
11. Requirements for dealing with watercourses and ditches are described in SHW Clause 606.

Cut/fill transition zone

12. Not used

Embankment construction (highway raising)

13. Formation, construction and compaction of fills and embankments shall be in accordance with Clause 608 and 612 unless specified differently in this section.

14. No over-steepening of embankment slopes will be permitted, except, with the prior permission of the Supervisor. Embankment slopes shall be constructed in such a way as to ensure unrestricted drainage of water from the earthworks.
15. Where an embankment is constructed on an existing slope, the existing surface shall be benched. Benching into existing slopes is required at the locations shown on the Scheme drawings. Benching dimensions are as shown on the Standard Earthworks Details Drawings.
16. Where filling is required on or against ground sloping at greater than 1V:5H then the existing ground shall be benched following topsoil removal. The maximum height of the benches shall be 500mm and benches shall have a minimum slope gradient of 5 percent.
17. Topsoil, pockets of soft soil, debris or detritus and loose rock shall be removed from beneath embankments.
18. Prior to embankment construction, the formation shall be inspected for suitability by a qualified and competent Geotechnical Engineer / Engineering Geologist and all voids / soft spots identified and soft ground removed in accordance with Appendix 6/11 and requirements shown on the scheme drawings. Hand shear vane apparatus may be used to determine the undrained shear strength. Excavation of soft spots and replacement with acceptable fill is to be as shown on the Standard Earthworks Details Drawings.
19. For treatment of voids and soft spots including excavation, backfilling and compaction, refer to Appendix 6/11.
20. The Contractor shall take measures to ensure that the settlement of embankments shall be substantially complete before the road pavement shall be constructed

Compaction

21. Compaction requirements shall be as detailed in Table 6/1 and SHW Clause 612.
22. Compaction is required over the full width of embankment or between outer extremities of verges unless otherwise specified.
23. If, for any reason, the surface of the fill material becomes smooth or dry such that, in the opinion of the Supervisor, it cannot be properly bonded with the succeeding layer, then the Contractor shall water the surface and, if necessary scarify, before recommencing filling operations.
24. When smooth rollers are employed, the surface of the fill shall be scarified before a further layer is placed on top.
25. The surface of any fill layer which has been rolled smooth by the action of traffic or the compaction process shall be scarified to loosen the surface to a depth of 50mm immediately prior to placing the next layer; if the surface has dried out it shall be wetted and blended to the correct uniform moisture content throughout the fill.
26. Where method compaction is specified for structural earthwork related fill, it shall be to the appropriate method as defined in the SHW for the corresponding class of material as shown in Table 6/1.
27. Allowance shall be made for the consolidation of fill following compaction, to ensure that at the end of the maintenance period the embankment will be within the tolerances required.
28. Field dry density testing shall be carried out on material laid, at a rate as detailed in Appendix 1/5. A nuclear density gauge (NDG) is permitted for measuring field dry density where the NDG has been calibrated against core cutter or sand replacement testing in similar materials. Calibration of the gauges will be checked weekly or as required by the Supervisor.
29. Moisture content and compacted bulk density may be measured in the field by nuclear density meter (direct transmission method) with checks against laboratory determination using a drying oven and in situ density determination by core cutter and or sand replacement testing. Every 50 field tests should be calibrated against 1 laboratory test. If a calibration relationship can be established, these rates may be reduced subject to agreement with the Supervisor. If a calibration relationship cannot be established, then the sand replacement technique shall be used throughout.

End product compaction

30. Field compaction trials in accordance with the requirements of SHW Clause 612 Sub-Clauses 11-15 or as otherwise directed by the Supervisor shall be followed where end product compaction is required.
31. To verify end product compaction, sand replacement tests (in accordance with BS1377 Part 9) at a minimum frequency as specified in Table 1/5 of Appendix 1/5.

Excavation and replacement

32. Areas of anticipated soft ground requiring treatment are shown on the Series 600 Earthworks Drawings. All soft material surrounding voids shall be excavated to the extent specified by the Supervising Geotechnical Engineer / Engineering Geologist. Hand shear vane apparatus may be used to determine the undrained shear strength. Once the Supervising Geotechnical Engineer / Engineering Geologist is satisfied that the full extent of the void has been exposed and that all surrounding soft material has been removed the void shall be replacement with a suitable granular fill as defined in Table 6/1.
33. Formation, construction and compaction of fills shall be by vibrating hammer method in accordance with Table 6/1 and Clause 608 and 612 unless specified differently.
34. Where general acceptable fill is used, the excavation is to be kept drained throughout the fill process. No filling below water is anticipated, should water in excavations be encountered the Supervising Geotechnical Engineer should be informed to develop a treatment strategy.
35. Where a combination of acceptable and unacceptable materials is revealed in excavations, the materials shall be excavated and deposited in accordance with sub-Clause 602.6.
36. Excavations for foundations and trenches shall not be battered unless otherwise directed by the Supervisor. Where batters are permitted, they shall be benched prior to backfilling and compaction as detailed on the Scheme drawings or as directed by the Supervisor.
37. Other than for the Contractor's working method it is not anticipated that excavation supports will be left in position.
38. Water from excavations must be correctly managed in accordance with Natural Resources Wales guidance so that nearby watercourses are not adversely affected.

Beach Re-profiling Requirements

39. Displaced sand from promenade widening and headland construction should be redistributed back onto the beach and the pre-works crest berm width profile reinstated seaward of the new defence line with the beach crest berm being going through rather than around the local headland.
40. The pre-works crest berm width shall be based upon the line of the +4.5m AOD contour level line from the pre-construction beach survey described below, with the re-profiled beach level along the new seawall line being placed at +5m AOD.
41. The crest berm width shall be reinstated, such that the original crest berm width is maintained i.e. the reinstated +4.5m AOD contour shall be offset from new seawall at same offset from existing seawall as measured in pre-commencement survey and agreed with Supervisor on site.
42. Any surplus material to be graded out over the beach as agreed with the Supervisor.

Beach Surveying Requirements

43. The Contractor shall undertake the following topographical surveys of the beach area along the length of the scheme between Porth Eirias and Splash Point: :
 - Pre commencement survey.
 - Monthly surveys during the works.
 - Post completion survey.

44. The survey requirements for the pre-commencement, monthly and post-completion surveys shall be as follows.
45. The surveys shall cover the whole frontage from the base of the existing sea wall to the MLWS contour (-1.99m AOD) and shall include levels on all existing foreshore features that are to remain e.g. outfalls and groynes but shall not include any features e.g. groynes that are to be removed.
46. Spot levels shall be recorded as a series of cross-shore lines at a longshore frequency of not greater than 10 metres.
47. Levels will be recorded along each cross-shore line (profiles or plan surveys) at the following frequencies:
 - Within 50 metres of the toe of the existing coastal defences at a maximum cross-shore spacing of 5m (plus breaks of slope).
 - Within 50-100 metres of the toe of the existing coastal defences at a maximum cross-shore spacing of 10m (plus breaks of slope).
 - At distances >100 metres from the toe of the existing coastal defences at a maximum cross-shore spacing of 20m (plus breaks of slope).
48. Sufficient additional spot heights shall be recorded between adjacent cross-shore lines, to record the lines of specific features (e.g. beach crests or troughs), plan details of which would not be recorded by the cross shore profiles.
49. Along the toe of the defences spot levels shall be recorded at not greater than 5m intervals.
50. Additional spot levels shall be recorded along the perimeter of any cross-shore features e.g. groynes, outfalls, rock outcrops etc.
51. The survey accuracy shall be $\pm 15\text{mm}$ in plan position and $\pm 20\text{mm}$ in elevation.
52. The surveys should record sufficient point data to produce a full contour survey of the inter-tidal zone within the boundaries identified, at generally 0.5 metre intervals but also identifying the position of the MHW, MLW and MTL contours. Where appropriate the survey will record the physical boundaries of differing intertidal zone habitats e.g. shingle beach, sand beach etc.
53. The survey data is to be provided in xyz and AutoCAD digital formats, relative to OS grid and Ordnance Datum for overlaying on base OS mapping or other data e.g. aerial photographs.
54. The Contractor shall allow access to an independent survey company appointed separately by the Employer during the works to undertake independent level surveys as a means of providing the Employer with an independent verification of the beach level for the Employer. Details and timing of any independent level survey shall be agreed between the Contractor and Project Manager.

APPENDIX 6/5: GEOTEXTILES TO SEPARATE EARTHWORKS MATERIALS

Raising level and resurfacing of promenade and highway

1. Geotextiles are not anticipated to be required for geotechnical purposes for the raising or resurfacing of the promenade and highways.

Rock revetment

2. Geotextile shall be used to separate existing beach deposits and overlying core armourstone. The required locations are shown on the contract drawings and are called up as "Geotextile".
3. The geotextile which complies with the properties specified in the table below is HPS 17 Non-woven geotextile produced by Geofabrics limited (UK). HPS 17 Geofabric geotextile or similar geotextile shall be used in the Works. The required characteristics shall be as follows:

Geotextile Required Characteristics

Characteristics	Test Standard	Value and Unit
Tensile Strength	BS EN ISO 10319	≥90 kN/m
Elongation at maximum load	BS EN ISO 10319	>80%
Static Puncture Resistance (CBR Test)	BS EN ISO 12236	≥17 kN
Dynamic Perforation Resistance (cone drop test)	BS EN 918	0mm
Characteristic Opening Size	BS EN ISO 12956	<69 microns
Water Permeability Normal to the Plane	BS EN ISO 11058	≥15 l/s/m ²
Durability	BS EN 13251 (Table 1, Annex B and Annex C)	Minimum 120 years

4. Geotextiles shall be placed manually and ballasted with due care.
5. Rocks shall not be dropped directly onto the geotextile from a height greater than 1m.
6. Damaged geotextile shall be replaced.
7. Geotextile shall be placed directly on the prepared area. Longitudinal and transverse joints shall be placed with an overlap of at least 1000mm or an overlap of 500mm and stitched together. The fabric shall be placed in such a manner as to have the least number of longitudinal joints. Wherever such joints occur, the upper portion of the fabric shall overlap the lower portion. Geotextile shall be laid down the slope without any transverse joints.
8. Testing of geotextile membranes shall be in accordance with Appendix 1/5.
9. Filter fabric shall be protected at all times against mechanical or chemical damage. During all periods of shipment, land transportation and storage, the filter fabric shall be protected from direct sunlight, ultra violet rays and temperatures greater than 60°C. As far as possible, the fabric shall be maintained wrapped in its protective covering.

APPENDIX 6/6: FILL TO STRUCTURES AND FILL ABOVE STRUCTURAL FOUNDATIONS

General

1. Locations in which fill to structures and fill above and below structural foundations is required are shown on the scheme drawings.
2. Fill to structures and fill above structural foundations shall be carried out strictly in accordance with the construction sequencing on the relevant scheme drawings.
3. The Contractor shall satisfy themselves that the proposed material is stable at the trimmed batters shown on the scheme drawings, as required in SHW Clause 610.6. If the Contractor proposes materials that cannot be trimmed to the batters indicated, shallower stable slopes shall be used.

Formation to structural foundations / RC slabs

4. The founding strata shall be inspected and recorded by a suitably qualified and competent Geotechnical Engineer / Engineering Geologist to confirm that the ground conditions are as assumed in the design and as shown on the scheme drawings.
5. The formation shall be investigated by the Contractor, using the approved methods described below for the presence and extent of any voids and 'soft spots' (refer to definition in Specification Appendix 6/3).
6. The full extent of such 'soft spots' and/or voids should be exposed under the supervision of the Supervising Geotechnical Engineer / Engineering Geologist and shall be removed and backfilled in accordance with Appendix 6/11 and Clause 604 and as directed by the Supervisor. The founding level of all foundations and the depth or extent of excavation of inadequate founding strata ("soft spots") shall be subject to the inspection and acceptance of the Supervisor.
7. Backfill shall be Class 6N fill or as otherwise shown on the drawings and as agreed with the Supervisor.
8. Fill of the rear of the RC foundation/sea wall shall be Class 6N compacted using a vibrating hammer to 95% of maximum dry density (BS 1377: Part 4) as per Table 6/1.
9. Hand shear vane apparatus may be used to determine the undrained shear strength. Excavation of soft spots and replacement with acceptable fill is to be as shown on the Standard Earthworks Details Drawings.
10. For treatment of voids and soft spots including excavation, backfilling and compaction, refer to Appendix 6/11.
11. If the ground conditions and other conditions at formation are not compatible with the design assumptions stated on the scheme drawings, then excavation shall continue until such conditions are met or a suitable alternative formation as agreed with the Supervisor is met. The excavation shall be backfilled to the specified formation depth with Class 6N or as shown on the Scheme drawings and/or as agreed with the Supervisor.
12. Where blinding concrete is required, the formation shall be blinded as soon as possible after excavation is complete (allowing for the inspections and investigations described above and testing described below).
13. In the presence of groundwater, the Contractor shall undertake the excavation works with adequate temporary dewatering measures. This shall ensure that the working area remains 'dry', i.e. without resulting in saturation of the material that is to be excavated leading to loss of strength to the foundation layer or affecting the stability of slopes and excavation.
14. New promenade slab to be raised with Specification For Highway Works Class 6N compacted granular fill to underside of concrete blinding.
15. Final filled surfaces shall be to within $\pm 20\text{mm}$ of the top of existing seawall and to be minimum 250mm below blinding level for new promenade slab or paving units. Demolition to be undertaken as appropriate to achieve this criterion.

Sheet Pile Wall

16. Imported fill material in filling directly behind the sheet pile wall shall be selected well graded granular material class 6A, complying with Table 6/1 of Department of Transport Specification for Highway Works: Series 600, Earthworks and having the engineering properties indicated on the Drawings.
17. Testing of the fill material is required as stated in Table 6/1 of the Department of Transport, "Specification for Highway Works" to ensure acceptability of the material properties (in addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631). The frequency of testing shall be in accordance with Appendix 1/5.

Testing at formation level

18. The following tests (or as otherwise shown on the Scheme drawings) shall be carried out at formation level by the Contractor to confirm that the design assumptions have been satisfied. Personnel trained in the use of the equipment shall undertake tests using suitably calibrated equipment. The tests referred to below shall be taken at representative locations across the formation (on a grid pattern if necessary at maximum of 35m centres throughout the foundation). Additional tests shall be undertaken at any apparent 'soft spots' identified visually. The locations, results and correlation for equipment used shall be recorded by the Contractor with the results.
 - a. Cohesive Soils – by use of a hand shear vane test to prove that the c_u (undrained shear strength) value at a depth of 0.2m below the excavated formation level is greater than the minimum stated on the Scheme drawings
 - b. Granular Soils - by use of a 450mm diameter plate bearing test to prove that the bearing pressure value is a minimum of that stated on the Scheme drawings. The pressure on the plate should be loaded safely to 3 times the minimum allowable bearing resistance.
 - c. Bedrock – where bedrock is anticipated at founding level, prior to placing blinding concrete the Contractor shall confirm to the Supervisor that the bedrock is of the required strength and weathering grade as shown on the Scheme drawings. If bedrock is not confirmed, then trial pitting shall be carried out to identify the depth to rockhead and the Supervisor notified. Depending on the findings of the additional exploration, further dig out and replacement may be required or alternatively redesign of the foundations may be required, as agreed with the Supervisor.
19. Records of the inspections and testing and any subsequent remedial measures shall be submitted to the Supervisor for review, including the test locations, test values and calibrations of equipment.

Backfill to structural foundations

20. Backfill requirements to the rear of the RC concrete foundation/sea wall are shown on the relevant scheme drawings and Table 6/1.
21. The loads applied to the embankment surface by vehicles or plant operating over the completed embankment shall not exceed the maximum laden weight or the maximum axle load permitted for use on the public highway, or equivalent.
22. Backfilling around permanent works or existing structures shall be carried out in such a manner as to avoid uneven loading or damage.
23. The Contractor is to ensure that, before any backfilling is carried out, the space that is to be filled has been cleared of water and is dry. If the Contractor cannot comply with the above, he is to request instruction from the Project Manager before commencing backfilling.

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

General

1. Details of the preparation works required to existing road and pavements on site prior to the works are shown on the relevant scheme drawings.
2. The sub-formation below highway construction throughout the scheme shall be in accordance with the 700 series of the Specification for Highway Works.
3. In-situ CBR testing shall be by TRL CBR probe (otherwise known as Farnell Dynamic Cone Penetrometer) in all soil types. The testing shall be undertaken by Contractor's technicians or engineers trained in the use of the equipment, and the Contractor shall maintain a list of operatives approved for undertaking this testing. Testing shall commence at or above sub-formation level, and shall be continued down to 300mm minimum below sub-formation level.

Design CBR values

4. It is assumed that all new road pavement and paving areas will be constructed on fill materials e.g. Class 6F5 achieving a minimum CBR value of 3%.

Construction and verification

5. The Contractor shall inspect all formation levels and undertake in-situ CBR testing at the time of trimming sub-formation. This information shall be assessed by the Contractor to check the minimum CBR values stated on the drawings are satisfied by the conditions encountered in-situ.
6. The Contractor shall determine CBR values following completion of filling prior to placement of sub-base. Tests shall be undertaken at the frequency shown in Appendix 1/5. All results shall be recorded although the test result shall be the lowest of the tests undertaken.
7. Where design CBR values are not satisfied the area of low sub-grade strength shall be treated as a soft spot and the sub-grade shall be excavated and replaced with acceptable fill.
8. The sub-grade inspection shall be a visual inspection by a suitably experienced member of the Contractor's site team, preferably a qualified and competent Geotechnical Engineer / Engineering Geologist.
9. The results of subgrade inspections and in situ CBR testing shall be recorded by the Contractor as a formal part of the earthworks records.
10. CBR testing shall commence at or above sub formation level and shall be continued down to 300mm minimum below sub formation level.

Capping

11. Not applicable.

Pavement

12. Where there is a requirement to incorporate existing pavement into the works the Contractor shall undertake trial pits as necessary to confirm the thickness of the layers in the existing pavement. If the thickness of the existing pavement foundation exceeds the thickness of the proposed pavement thickness, the Contractor shall increase the thickness of the proposed such that the base of the proposed pavement foundation is level with the base of the existing foundation. The solution shall ensure that the proposed foundation thickness is adequate to satisfy the long term subgrade CBR value, the lateral change in pavement stiffness across the pavement is acceptable, and sub-base drainage is satisfied.

Existing highway

13. Where it is proposed that the levels be raised, puncturing of existing hardstanding including the highway, parking spaces, pavement and promenade should be carried out on a 1m grid. Puncturing should be carried out in accordance with the relevant 415437-MMD-00-XX-DR-S-200 series drawings.
14. Where resurfacing of the existing highway is proposed without raising of levels, the existing highway shall be planed.
15. Where voiding is present in areas where resurfacing is proposed, all hardstanding should be broken out to expose the full extent of the void under the supervision of the Supervising Geotechnical Engineer / Engineering Geologist. The void shall be treated and filled in accordance with Appendix 6/11 and the highway or other hardstanding, reconstructed in accordance with the relevant S415437-MMD-00-XX-DR-S-200 series drawings.

Voiding

16. Prior to embankment construction, the formation shall be inspected for suitability by a qualified and competent Geotechnical Engineer / Engineering Geologist on behalf of the Contractor and the full extent of all voids / soft spots identified and soft ground removed in agreement with the Supervising Geotechnical Engineer / Engineering Geologist. The depth or extent of excavation of inadequate founding strata (voids or “soft spots”) shall be subject to the inspection and acceptance of the Supervisor.
17. Hand shear vane apparatus may be used to determine the undrained shear strength. Excavation of soft spots and replacement with acceptable fill is to be as shown on the contract drawings and in accordance with Table 6/1 .
18. For treatment of voids including excavation, backfilling and compaction, refer to Appendix 6/11.

APPENDIX 6/8: TOPSOILING

General

1. The following clauses are general clauses in relation to topsoil and any specific topsoil requirements in the SHW Series 3000 Landscape Specification shall take precedent over clauses in this section.

Stripping

2. Not used – it assumed that topsoil will be imported to site.

Stockpiling and Handling

3. Topsoil stockpiles shall not exceed 2m height.
4. Topsoil shall not be stockpiled for more than 2 years.
5. Where temporary stockpiling of topsoil is unavoidable then care should be taken by the Contractor to sort the material in accordance with the recommendations of BS 3882 Part N and store it separately from other materials
6. Topsoil stockpiles should be located to avoid water logged areas and be shaped to shed water.
7. Care should be taken by the Contractor to prevent compaction of stockpiled topsoil.
8. As stated in Clause 618.3, topsoil shall not be excavated from stockpiles that have been exposed to a cumulative rainfall of 100mm or more during the preceding 28 days measured at the main site offices.

Placement

9. The depth of topsoil to be provided in the different landscape areas is set out in the SHW Series 3000 Landscape Specification.
10. Any surplus Class 5B material shall be returned to its source where possible.
11. If tracked vehicles are used for spreading topsoil they must be a low ground pressure type (maximum of 50kPa is permitted).

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

General

1. There is no requirement for earthwork environmental bunds.
2. Requirements for landscape areas are shown on the Scheme drawings and included within the SHW Series 3000 Landscape Specification.
3. There is no requirement for strengthened embankments.

APPENDIX 6/10: GROUND ANCHORAGES, CRIB WALLING AND GABIONS

Ground Anchorages

Not used.

Crib Walling

Not used.

Gabions

Not used

APPENDIX 6/11: SWALLOW HOLES AND OTHER NATURALLY OCCURRING CAVITIES AND DISUSED MINE WORKINGS

Voiding

1. Prior to embankment construction, the formation shall be inspected for suitability by a qualified and competent Geotechnical Engineer / Engineering Geologist. Where it is identified that voiding is present in the in subbase of the existing highway, the surface of the highway shall be broken out to expose the full extent of the void under the supervision of the Supervising Geotechnical Engineer / Engineering Geologist. All soft material surrounding the void shall be excavated to the extent specified by the Supervising Geotechnical Engineer / Engineering Geologist. Hand shear vane apparatus may be used to determine the undrained shear strength. Once the Supervising Geotechnical Engineer / Engineering Geologist is satisfied that the full extent of the void has been exposed and that all surrounding soft material has been removed the void shall be replacement with a suitable granular fill as defined in Table 6/1.
2. Formation, construction and compaction of fills shall be by vibrating hammer method in accordance with Table 6/1 and Clause 608 and 612 unless specified differently.
3. Where extensive voiding or soft ground is encountered which cannot be effectively excavated and replaced, additional investigation under the supervision of the Supervising Geotechnical Engineer / Engineering Geologist may be required to define the extent and condition of the void / soft ground. The extent of testing will be determined by the Supervisor.

APPENDIX 6/12: INSTRUMENTATION AND MONITORING

Not used.

APPENDIX 6/13: INSTRUMENTATION AND MONITORING

Not used.

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

General

1. Requirements for dealing with watercourses and ditches are described in SHW Clause 606.
2. The works will involve the on-site excavation and use of imported materials. Chemical acceptance criteria will determine whether a material from any on or off-site source is environmentally acceptable for use within the scheme or if to be classed as U1B (unacceptable).
3. The following sections should be reviewed on completion of investigation works and analysis of environmental testing and may need to be revised accordingly.

Aquifers and Source Protection Zones

4. The superficial deposits and bedrock underlying the site are Secondary A Aquifers. These are described as permeable layers capable of supporting water at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. The site is not within a Source Protection Zone.

Potential sources of contamination within earthwork material

5. No groundwater will be discharged from excavations into surface water systems. The Contractor must take all necessary precautions to prevent oil or diesel from his plant from entering watercourses or drains. The Contractor's attention is drawn to the provisions of the HSE publication HS(G)66 'Protection of Workers and the General Public during the Development of Contaminated Land'.

Imported Material

6. Imported material shall be tested for the contaminants listed in Table 6/14/1. Exceedances will require site specific assessment to determine whether risks to controlled waters exist. Any site-specific risk assessment must be agreed by the Client prior to use of material.

Table 6/14/1: Contamination Limiting Values for Leachate and Groundwater

Determinant	Limiting Value (µg/l unless stated)
Metals and Metalloids	
Arsenic	25
Boron	7000
Cadmium	0.2
Chromium (VI)	0.6
Copper	3.76
Iron	1000
Lead	1.3
Mercury	0.07
Nickel	8.6
Vanadium	100
Zinc	7.9
Polyaromatic Hydrocarbons	
Anthracene	0.1
Benzo[a]pyrene	0.001 ⁽¹⁾
Benzo[b+k]fluoranthene	0.03
Benzo[ghi]perylene + Indeno[123-cd]pyrene	0.002
Fluoranthene	0.006
Naphthalene	2
Petroleum Hydrocarbons	
Total Petroleum hydrocarbons	10 ⁽²⁾
Inorganic Contaminants	

Determinant	Limiting Value (µg/l unless stated)
pH	min = 6, max = 9
Ammoniacal Nitrogen (as N)	290

- (1) Laboratory limit of detection
- (2) Petroleum hydrocarbons – arbitrary value adopted in absence of regulation

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

General

1. Disposal of Class U1B and U2 samples should be in accordance with Appendix 6/2.
2. At the time of writing site specific ground investigation works have yet to be undertaken. The following sections should be reviewed on completion of investigation works and analysis of environmental testing and may need to be revised accordingly.

Safety On Site

3. Precautions must be taken to protect personnel working on the site against possible effects of excavated contaminated material or of water associated with that material.
4. The Contractor's attention is also drawn to possible long-term effects of contact or inhalation with contaminated material and the possible effects of accumulation of harmful substances within the body.

Safety Of Surrounding Area

5. Deposits of excavated material must not be allowed to spread on to the public highway or surrounding area. A wagon chassis/wheel cleaner will be provided at the wagon exit point and used at all times.
6. Precautions will be taken against the generation (or inhalation) of dust during dry periods. The Contractor will provide portable bowzers with sprinkler systems sufficient to control dust for the duration of the Contract.

Imported Material

7. Imported material shall be tested for the contaminants listed in Table 6/15/1. Test results exceeding the limiting values specified in Table 6/15/1 shall be classed as unacceptable U1B or U2 material and shall not be imported onto site unless a site-specific risk assessment can be shown to demonstrate suitability for use and is accepted by the Client prior to the material being reused.

Table 6/15/1: Contamination Limiting Values for Soils

Determinant	Limiting Value (soil) (mg/kg, Dry Weight)
Arsenic	170
Beryllium	63
Boron	46000
Cadmium	560
Chromium (III)	33000
Chromium (VI)	220
Copper	44000
Lead	1300
Mercury (Inorganic)	240
Molybdenum	2900
Nickel	800
Selenium	1800
Vanadium	5000
Zinc	170000
Asbestos	No fibres detected
Petroleum Hydrocarbons (Aliphatic/Aromatic EC 05-44)	8000
Acenaphthene	29000
Acenaphthylene	29000
Anthracene	150000
Benz[a]anthracene	49
Benzo[a]pyrene	11

Determinant	Limiting Value (soil) (mg/kg, Dry Weight)
Benzo[b]fluoranthene	13
Benzo[ghi]perylene	1400
Benzo[k]fluoranthene	370
Chrysene	93
Dibenz[ah]anthracene	1.1
Fluoranthene	6300
Fluorene	20000
Indeno[123-cd]pyrene	150
Naphthalene	1200
Phenanthrene	6200
Pyrene	15000
Benzene	90
Toluene	87000
Ethylbenzene	17000
Xylenes	1700

7 Road Pavements – General

APPENDIX 7/1: PERMITTED PAVEMENT OPTIONS

1. Permitted pavement types are shown on the following drawing:
- 415437-MMD-00-XX-DR-S-2031.
2. General Requirements:

General Requirements for Permitted Pavement Options

General		
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:	B
Interval for measurement of longitudinal regularity (702.7):		Along full length of new surfacing
Interval for measurement of transverse regularity (702.8):		20m
Whether surface texture is required (921.2):		Required

Permitted Construction Materials – Buff quartzite "Tarmac Ulticolour" (as shown on 415437-MMD-00-XX-DR-S-2031)

Buff quartzite "Tarmac Ulticolour"					
Pavement Layer	Material Ref.	Thickness (mm)	Clause	Material	Special Requirements
Surface Course	Buff quartzite "Tarmac Ulticolour" (or equivalent accepted)	40	937	SMA 6 surf to match Old Colwyn Phase 2	To table D.1 of PD6691: 2022 AAV 10 PSV 55
Binder Course	BC-B	60	906	AC20 dense bin 40/60 rec. with coarse limestone aggregate	To table B.11 of PD 6691:2022
Base Course	B-B	100	906	AC32 dense base 100/150 rec. with coarse limestone aggregate	To table B.11 of PD 6691:2022
Sub-Base*	SB-B	250 (Min)	803	Granular Type 1 or class 6N near seawalls	Design based on min. 3% CBR value, which is to be confirmed on site by the Contractor. The Designer is to be notified of any variations

Buff quartzite "Tarmac Ulticolour"					
					to enable confirmation of the design.
Total Thickness		450mm			

Permitted Construction Materials – Mid grey "Tarmac Ulticolour" (as shown on 415437-MMD-00-XX-DR-S-2031)

Mid grey "Tarmac Ulticolour"					
Pavement Layer	Material Ref.	Thickness (mm)	Clause	Material	Special Requirements
Surface Course	Mid grey "Tarmac Ulticolour" (or equivalent accepted)	40	937	SMA 6 surf to match Old Colwyn Phase 2	To table D.1 of PD6691: 2022 AAV 10 PSV 55
Binder Course	BC-B	60	906	AC20 dense bin 40/60 rec. with coarse limestone aggregate	To table B.11 of PD 6691:2022
Base Course	B-B	100	906	AC32 dense base 100/150 rec. with coarse limestone aggregate	To table B.11 of PD 6691:2022
Sub-Base*	SB-B	250 (Min)	803	Granular Type 1 or class 6N near seawalls	Design based on min. 3% CBR value, which is to be confirmed on site by the Contractor. The Designer is to be notified of any variations to enable confirmation of the design.
Total Thickness		450mm			

Permitted Construction Materials – Temporary asphalt promenade ramp as shown on 415437-MMD-00-XX-DR-S-2031)

Temporary asphalt promenade ramp					
Pavement Layer	Material Ref.	Thickness (mm)	Clause	Material	Special Requirements
Surface Course	SC-B	25	910	AC 10 close surf 100/150	To table B.14 of PD6691: 2022 Coated Chippings 14/20 AAV 10 PSV 55
Binder Course	BC-B	90	906	AC32 dense bin 40/60 rec.	To table B.11 of PD 6691:2015

Temporary asphalt promenade ramp					
Sub-Base*	SB-B	165 (Min)	803	Granular Type 1 or class 6N near seawalls	Design based on min. 3% CBR value, which is to be confirmed on site by the Contractor. The Designer is to be notified of any variations to enable confirmation of the design.
Total Thickness		280mm			

*Depth of sub-base above existing promenade varies. Refer to cross-sections.

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

1. Excavation and reinstatement of existing surfaces shall be carried out in accordance with Clause 706 of the Specification for Highway Works and the New Roads and Street Works Act.
2. Locations of excavations shall be approved on site by the Project Manager and any relevant Statutory Providers.
3. **Contractor is required to re-use the site won bituminous material** from existing carriageway and promenade within the works, whilst fully compliant with the Specification for Highway Works and EA Guidance RPS 75. The material is to be used to form a hydraulic bound material as a substitute to the first 250mm of 6N fill material beneath the new prom slab and within the footways as the sub-base material.
4. Locations of joints between new and existing surfaces are shown on the following drawings:
- 415437-MMD-00-XX-DR-S-2031.
5. Any trenches, pits etc. which are to be excavated shall be reinstated as shown on HCD K4.
6. At all joints between new and existing construction stepped construction will be applied at all tie in points. Minimum steps of 1000mm longitudinally and 300mm transversely will be provided between each bituminous layer at all joints.
7. All Joints to be saw cut and vertical joints to be painted with an approved sealant.
8. Regulating material to be laid as necessary in order to achieve final road levels. Materials to be as per Appendix 7/1
9. The Contractor shall carry out all permanent reinstatements of excavations opened by Statutory Undertakers in the course of carrying out their diversion works in areas of carriageway or paved areas which are to be subsequently overlaid.
10. All cutting shall be carried out with wet cutting equipment, cutting equipment with dust extraction or hydraulic splitters. Dry cutting will not be permitted.
11. Where necessary, covers, gratings and frames in existing footway and/or carriageway shall be adjusted to correspond with new footway and/or carriageway levels.

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

1. A bond coat shall be applied prior to the laying of a new asphalt layer on any bound substrate.
2. All bond coats, tacks coats and bituminous sprays shall comply with Clause 920.
3. Bituminous emulsion tack coat shall be applied to all milled surfaces, existing pavement surface which is to be overlaid and between all bituminous layers.
4. Locations of joints between new and existing surfaces are shown on the following drawings:
 - 415437-MMD-00-XX-DR-S-2031.
5. The Contractor shall complete the table overleaf detailing the product or products he proposes to use together with their data sheets, product identification data, and cohesivity data as specified.

Binder Data Sheet – Appendix 7/4 (08/08)		Bond Coats, Tack Coats and Other Bituminous Sprays	
Manufacturer of Binder:		Product name:	
Binder type:		Batch no:	
Binder Grade (highlight as required)			
Conventional	Intermediate	Premium	Super-premium Non-tack Other
Binder	Source	→	
	Test	Recovered Binder	Recovered Binder after Ageing Test
	↓	Recovered in accordance with Clause 955	Aged in accordance with Clause 955
	Penetration at 25°C 0,1 mm (100g and 5 secs)		
	Penetration at 5°C 0,1 mm (200g and 60 secs)		
	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 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.	The Contractor shall attach a Report and graphical output to this schedule as specified in Clause 956.	The Contractor shall attach a 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; etc. Temperature max: Temperature min: Other:		

6. 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.
7. The spraying equipment proposed, and a test certificate.
8. The source or sources of blinding material proposed.
9. Contingency plans in the event of any breakdown.
10. The results of any other tests or other data the Contractor considers would assist the Project Manager in assessing the technical merit of the treatment such as:
 - a. Tackiness test and/or trafficability time and methods of test.
 - b. Breaking time test results for different weather conditions and substrates.

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

1. Areas within the highway where existing pavement is to be broken up and removed from site or perforated are shown on drawings 415437-MMD-00-XX-DR-S-2030 series and 415437-MMD-00-XX-DR-D-0231.
2. Perforations shall be made at 1m centres.
3. Perforations shall be a minimum of 75mm diameter core holes to penetrate the full depth of the material to be perforated.

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

1. Areas of existing pavement at tie in shall be cold milled to suit new pavement construction shown on drawings 415437-MMD-00-XX-DR-S-2031.
2. General requirements as per Clause 709, tolerance $\pm 6\text{mm}$.
3. The Contractor shall plane the surface of the existing road ensuring that the new and existing surfaces are benched in accordance with the standard detail provided on drawing 415437-MMD-00-ZZ-DR-D-1100.
4. The areas of existing pavement shall be swept to locate buried metalwork in accordance with sub clause 709.11.

For Tie in Construction:

Tie-in Construction Detail Requirements

Pavement Removal Method			
Pavement Layer	Material	Thickness (mm)	Method
Existing Surface / binder Course	Asphalt	40mm	Cold milling
Total Thickness		40mm	

11 Kerbs, Footways and Paved Surfaces

APPENDIX 11/1: KERBS, FOOTWAYS AND PAVED AREAS

1. Kerbs, Footways and Paved areas are shown on the following drawings:
- 415437-MMD-00-XX-DR-S-2031
2. Footways and Paved areas shall comply with BS 7533 and shall be constructed as specified for the relevant type in the following tables:

Type L – Deterrent Paving – Flexible Construction

Layer	Material	Thickness (mm)	Clause / Specification	Special Requirements
Paving	To match existing	50	BS 7533	Paving to match existing
Joints	Sand	2-5	cl. 5.4.6 BS 7533-4	2-5mm flexible sand joints
Bedding	Sand	25	cl. 5.4.6 BS 7533-4	Compacted thickness
Sub-base	Granular Type 1	220	803 SHW	Compacted thickness based on 5% CBR sub grade

Paving manufacturer/supplier: Marshall or equal and approved.

Kerbs and Edging

Kerb, Channel and Edging				
				50 x 150mm PCC flat top pin kerb to BS EN 1340.
				Flush.
Edging Kerb		Opposite highway to promenade steps entrance.		Manufacturer/Supplier: Marshalls, or equal and approved.

3. All sand joints to receive 'Instarmac Ultrascap Joint Fix', or equal and approved, once joints are filled and refilled after settlement to ensure fully filled joints, and applied in accordance with supplier's recommendations. Sealant to be applied in accordance with supplier's recommendations.
4. Unless premixed by manufacturer, paving to be selected from 5 or more packs in rotation, to avoid colour banding.
5. Test samples for all types of paving to be provided for CCBC approval.
6. Paving shall not be laid using frozen material nor bedding laid on frozen or frost covered sub-bases.
7. Mortar bedded paving to be kept free from pedestrian traffic for minimum 7 days and vehicular traffic minimum of 14 days. All construction traffic to be restricted from paved areas.

12 Traffic Signs

APPENDIX 12/1: TRAFFIC SIGNS – GENERAL

1. For the location of all Traffic Signs refer to drawings:
 - 415437-MMD-00-XX-DR-S-2031
2. Refer to the Table below for details for the following:
 - a. The overall sizes of sign plates;
 - b. The number, type and sizes of posts, including foundation details.
3. All signs shall have their exact location determined by the Engineer with the Contractor before commencement of any associated ground works.
4. All sign posts shall be as specified in Clause 1204.1. The manufacturer's trade mark shall not be permitted on the face of the sign.
5. All signs shall be reflectorised,
6. All signs are to have dew resistance coating and are to be CE marked.

Table 12.1: Traffic Sign Properties

Sign Ref.	TSR & GD 2016 Diagram No.	x-Height (mm)	Width (mm)	Height or Diameter (mm)	Illumin ation	Reflection Class (to BS EN 12899-1: 2007)	No. of Propo sed Posts	Post Type (ref. 6Cs Design Guide)	Foundati on Size (l x w x d) (mm)	Minimum Mounting Height (mm)	Mounting	Remarks
C-01 & C-02 (Located just east of new prom transition ramp)	956	N/A	N/A	300	No	RA2	1	76mmØ plain grey post.	600 x 350 x 600	2400	Propose d sign faces mounted back to back on propose d sign posts.	Every pair of proposed sign faces is positioned back to back e.g. C-01 & C-02
C-03 & C-04 (Two spaced equally apart from existing)	N/A	20	TBC by Contra ctor	TBC by Contractor	No	RA2	NA	NA	NA	Top of sign to be level with top of top rail of guardrail.	To be fixed to guardrail	Sign to comprise: Warning Safety Sign W001 to BS EN 7010:2020 followed by text "WARNING Steps may be slippery. Do not climb of rock revetment." The text shall be included in both the Welsh and English languages with the Welsh text above the English Text. The Welsh text shall be agreed with the Employer.

APPENDIX 12/3: ROAD MARKINGS AND STUDS

1. For the location and details of all proposed Road Markings and road studs refer to drawings: 415437-MMD-00-XX-DR-S-2031. All permanent road markings shall be thermoplastic screed complying with BS EN 1436 and BS EN 1871.
2. All permanent road markings shall have a skid resistance of Class S3 to BS EN 1436
3. Where existing road markings are to be permanently removed, this shall be by mechanical means or forced air abrasive (shot blasting). Hot compressed air (HCA) shall not be used, and obliteration of road markings using bituminous, resinous or prefabricated materials will not be permitted.

13 Road Lighting Columns and Brackets, CCTV Masts and Cantilever Masts

APPENDIX 13/1: INFORMATION TO BE PROVIDED WHEN SPECIFYING LIGHTING COLUMNS AND BRACKETS

Lighting Columns and bollards

The extent of proposed lighting column and bollard positions and requirements are shown on drawings
415437-MMD-00-XX-DR-S-2030 & 2031

The requirements for each type of lighting column/bollard are as follows:

Column Type	3
<i>Location</i>	415437-MMD-00-XX-DR-S-2030 & 2031
Number of Columns	4
Column Type	Bollard
Nominal Height (m)	4m
Bracket Projection (mm)	N/A
Overall Projection (m) ¹	N/A
Luminaire weight (kg), Windage Area (SCx)	Max 35.3kg, 0.683m ² (SCx)
Luminaire fixing; Length, Width, Height & Angle	600 x 170x171mm
Signs and/or other attachments	N/A
Height of installation above ground level	4m
Type of column base	Planted Root
Door opening	n/a
Height of Door ²	400mm
Position of door	Perpendicular to the footway
Column doors with hinges or chains	N/A
Column Material	Top cap: die-cast aluminium Base: Extruded aluminium

Corrosion Protection	RAL 7016
Number of Door keys	1
Earthing Requirements	In accordance with BS 7671 and Clause 1420
Lantern type to be mounted	DW Windsor Silka 4 Light stack (205m x 4k LED tape)
Cable entry Dimension 'X'	

1. Manufacturer: DW Windsor Lighting (Pindar Road, Hoddesdon, Hertfordshire, EN11 ODX Tel: 01992 474600 E-mail: marketing@dwwindsor.co.uk.)
2. The Contractor shall submit the completed data sheets within 2 weeks of Construction Issue.
3. Information requirements given in BS EN 40 PD 6547:2004 +A1:2009;
4. Extract from Table A.1

Administrative area	10 min mean wind velocity m/sec	Maximum Altitude m	Rationalized wind loading region	Rationalized wind loading factor, R_{wf} N/m ²
Conwy	24.5	250	Extra Heavy	576

5. Extract from Table A.2

Item to be specified	Requirement
Topography factor	1
Terrain category	I
Exposure Coefficient C_e (Z)	<ul style="list-style-type: none"> 2.25
Rationalized wind loading region	Extra Heavy
Partial safety factors on loads f	Class B (as recommended in BS EN 40 PD 6547:2004 +A1:2009)
Deflection class	Class 3
Soil type	Assumed Poor
Road signs	Type B - In accordance with Table 3 of BS EN 40 PD 6547:2004 +A1:2009
Fatigue requirements	In accordance with Highways Agency BD 94/07

APPENDIX 13/2: (SPECIFICATION FOR HIGHWAY WORKS) TYPICAL LIGHTING COLUMN AND BRACKET DATA – SHEET 1

Name of Manufacturer			Column Reference No <input style="width: 150px;" type="text"/> Revision No <input style="width: 150px;" type="text"/> Date <input style="width: 150px;" type="text"/>		
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1. NAME OF CONTRACT

2. Part A General

Column nominal height (m)

Column material

Material design strength (N/mm²)

No of door openings

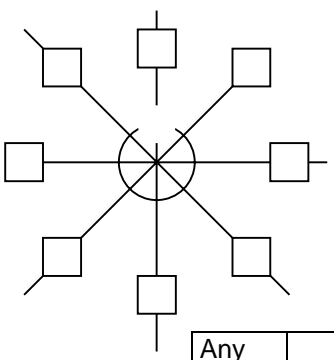
Door opening size - Height (mm)

- Width (mm)

Cross-section of base compartment	Height (mm)	Width (mm)	Depth (mm)

Acceptable positions of bracket arms relative to door position

Door Opening



Any

Manufacturer's drawing ref. no

Corrosion protection (steel columns only) – basic system type (sub-Clauses 1911.9 and 1911.10)

Reference Wind Velocity Vref,0 as defined in BS EN 40-3-1:2000

Details of signs & attachments allowed for in the design Area (mm²), Eccentricity (mm), Height

- additional sacrificial steel thickness, above that needed in the design, from the bottom of the column to at least 250 mm above the anticipated ground level

Part B Foundation Data

Planted Base

m/s

 (mm)

Diameter of concrete surround (if any)

Flange Plate

Planting depth (m)

Standard Soil Type Factor G		

Bolt hole centres	Bolt Hole diameter	Design load/bolt
(mm)	(mm)	(N)

Relevant forces and moments at ground level

Line of action of max. moment relating to door opening

NOTE: For flange plates with slotted holes a diagram shall be included with this Data Sheet

Typical Lighting Column and Bracket Data – Sheet 2

Part C Acceptable Luminaires

Luminaire: Maximum Characteristics

Post Top
column

Luminaire Connection		Terrain Categories as defined in BS EN 40-3-1:2000				
		I	II	III	IV	
Luminaire Max Wt (kg)		Maximum Windage Area (m ²) for Terrain Categories as defined in BS EN 40-3-1:2000				
Diameter						
Length						

Single Arm
Bracket
Column:

Luminaire Lever Arm (mm)	
Due to wt. of luminaire	Due to windage on luminaire

Bracket Projection (m)	Ref No.	Drawing No.	Material		Luminaire Fixing Angle	Luminaire Connection		Luminaire Maximum Wt (kg)	Maximum Windage Area (m ²) for Terrain Categories as defined in BS EN 40-3-1:2000				
			Grade	Design Strength (N/mm ²)		Diameter (mm)	Length (mm)						

Double Arm
Bracket
Column

Luminaire Lever Arm (mm)	
Due to wt. of luminaire	Due to windage on luminaire

Bracket Projection (m)	Ref No.	Drawing No.	Material		Luminaire Fixing Angle	Luminaire Connection		Luminaire Maximum Wt (kg)	Maximum Windage Area (m ²) for Terrain Categories as defined in BS EN 40-3-1:2000				
			Grade	Design Strength (N/mm ²)		Diameter (mm)	Length (mm)						

Part D Certification

It is certified that the information given in this Data Sheet has been obtained in accordance with
Departmental Standard BD 26(DMRB 2.2.1) and the Specifications.

Signed on behalf of the Contractor Date

APPENDIX 13/3: INSTRUCTIONS FOR COMPLETION OF LIGHTING COLUMN AND BRACKET DATA SHEETS

General

1. When information is not required a dash shall be inserted in the appropriate boxes
2. Where a Data Sheet is amended it shall be given a new revision number with a date.
3. The revision numbers shall be consecutive letters of the alphabet, commencing with "A".
4. The date of the revision shall agree with the date of the Contractor's signature
5. The column, or bracket material shall be steel, aluminium, reinforced or pre-stressed concrete, glass fibre reinforced plastic or any other suitable material.
6. The material design strength shall be the minimum specified in the design. Where more than one material is used values for all materials shall be given.
7. All relevant entries shall be made on the Data sheet before the document is certified by the Contractor.

Column Data

8. The column nominal height shall be selected from in BS EN:40 as appropriate.
9. The number of door openings shall agree with the manufacturer's drawing.
10. The cross-section of the base compartment shall be indicated by a dimensioned diagram/sketch.
11. The acceptable positions of bracket arms relative to the door position shall be indicated on the diagram. Where all positions are acceptable, the box noted "ANY" shall be ticked.
12. Where concrete is necessary around the planted base in accordance with sub-Clauses 1305.3 and 1305.4 the minimum diameter shall be entered.
13. For flange bases all forces and moments used in the design of the foundations, anchorages and attachment systems shall be given.
14. The corrosion protection system used on the column when new shall be recorded. Where additional steel is provided for sacrificial purposes the amount shall be recorded.
15. The signs and attachments surface area, eccentricity from the centre line of the column to the centre of area of the sign and height above ground level to the centre of area of the sign and height above ground level to the centre of area of the sign shall be stated.

Bracket Data

16. The luminaire lever arms, weight and maximum windage area quoted shall be based on the most adverse loading on the bracket when it is attached to any of the columns quoted in the compatible column sections.

(Note: The luminaire lever arms are the horizontal distances from the centre of gravity of the luminaire and, if applicable, the centroid of the windage surface area to the end of the bracket joint).

14 Electrical Work for Road Lighting and Traffic Signs

APPENDIX 14/1: SITE RECORDS

1. The Contractor shall keep duplicate daily records, on drawings, of all work carried out as it proceeds, in accordance with clause 1402.3.
2. As-built drawings shall be produced by the Contractor. The as-built drawings shall be in accordance with the requirements of Clause 1402 and shall be produced in CAD format.
3. Records shall include schedules of equipment as necessary.
4. Records shall show the position and type of each item of equipment installed and the positions, depth and type of underground cables and ducts, with measurements to the nearest 0.1 metre from the nearest edge of carriageway or fence line. Offsets for longitudinal cables and ducts shall be at 20 metre intervals unless otherwise directed by the Project Manager. Offsets shall be defined longitudinally by distance from a permanent highway feature or other point agreed with the Project Manager.
5. Electrical schematics shall show the method of cabling to all items of electrical equipment as installed on a private network. The Contractor shall provide full manufacturer's data sheets for all equipment installed.
6. The Contractor shall provide, as part of the package of as-built information the following for all street lighting columns included in the works in tabulated form:
 - i. Column number
 - ii. Location and setback from carriageway
 - iii. Chainage
 - iv. Type of column
 - v. Column height
 - vi. Base type
 - vii. Planting depth
 - viii. Bracket Arm (length, single / double)
 - ix. Exposure Coefficient
 - x. Door opening size (Columns and feeder pillars)
 - xi. Quantity of lanterns on column
 - xii. Glare classification
 - xiii. Tilt above horizontal
 - xiv. Lamp wattage / type
 - xv. Control gear location
 - xvi. Switching control
 - xvii. Serial number of all sub-modules in lanterns
 - xviii. Design modification status of the lantern
 - xix. Photometric details for lanterns
 - xx. Lantern type.
7. The Contractor shall supply test certificates cross-referenced to the apparatus identified on the as-built drawings.
8. The Contractor shall supply Operations and Maintenance manuals to support site records.
9. The Contractor shall provide and leave one as-built schematic drawing in a water proof laminated covering within the feeder pillar suitably marked up to represent the latest installation. As-built schematic drawings may only be stamped 'As Built' after approval of the drawings by the Project Manager.

APPENDIX 14/2: LOCATION OF LIGHTING UNITS AND FEEDER PILLARS

1. The positions of the proposed lighting units and proposed cable routes are shown on drawings 415437-MMD-00-XX-DR-S-2030 & 2031.
2. Lighting beacons to be instated by Contractor with private supply and feed from the nearest CCBC street lighting column with time clock at west end of Rotary Way ramp.
3. The Contractor shall be responsible for the design of connections.
4. The Contractor shall be responsible for the design of lighting beacon cabling configuration and arranging and paying for connections.
5. The Contractor shall give the Supervisor 48 hours' notice of his intention to make connections and disconnections.
6. Lighting columns to be erected a minimum of 24hours prior to the fitting of luminaires
7. The contractor shall obtain a quotation/s from the DNO & CCBC for all electrical connection/disconnection identified on the drawings 415437-MMD-00-XX-DR-S-2030 & 2031. Following receipt of quotations; the contractor shall gain approval for the works from the overseeing organisation prior to placing an order with the DNO.

APPENDIX 14/3: TEMPORARY LIGHTING

Standard of Illumination for Night Work

1. During the hours of darkness should night working be carried out, the Contractor shall provide, maintain and operate suitable mobile high mast flood lighting minimum height 6 metres and shall be responsible for the watching and lighting of plant, equipment, material and work. Note that in addition to lighting all stockpiles, plant and equipment shall be surrounded by lamps and cones.
2. The minimum maintained average horizontal illuminance for the working area shall be (Eav) 50 lux and 0.4 overall uniformity in accordance with BS EN 12464.2-2014. Positions of towers to be agreed with the Overseeing Organisation such that safety is not impaired.
3. If new or existing lighting cannot be maintained in working order during the contract in areas of public access, then temporary lighting shall be provided to the same standard as that of the original. Lighting shall be provided in accordance with Clause 1405 of the MCHW, BS 5489:2020 and BS EN 13201.
4. The Contractor shall provide temporary lighting to the indicated standards in the following situations:
 - Where it is proposed to use, as a temporary diversion, any permanent alignment which is to be provided with permanent lighting under the Contract.
 - Where controlled single way traffic working is required.
 - Where temporary junction layouts are in use.
5. Where possible the permanent lighting shall be installed to provide adequate lighting. In the event that temporary lighting positions are required on no account shall columns that are to be used in the Works be used for temporary purposes.
6. No permanent lighting columns are to have any form of catenary wire attachment.
7. Temporary lighting using diesel trailer type lighting units may only be provided as a short-term measure and minimised where possible.
8. f All temporary lighting units are to be positioned so that they do not cause disability glare or excessive obtrusive light onto adjacent properties and businesses.
9. The Contractor is to submit, for approval by the Conwy County Borough Council (CCBC) Street Lighting Department, details of lighting equipment proposed for use as temporary lighting prior to installation on site.

APPENDIX 14/4: ELECTRICAL EQUIPMENT FOR ROAD LIGHTING

1. Cabling, electrical equipment and the installation thereof shall be in accordance with BS 7671:2018 and revised amendments, "Requirements for Electrical Installations" with particular reference to Section 559, "Luminaires and Lighting Installations".
2. Inspection and testing shall be in accordance with Part 6, "Inspection and Testing" and results and certificates shall be provided on completion of the installation as required by the relevant chapters contained therein.
3. The luminaires shall be compatible with the columns and brackets offered in Appendix 13/2 and the information shall include the following lamp type, wattage, and luminaire circuit wattage.
4. Luminaires shall be suitable to meet the requirements of BS 5489-1:2020 and BS EN 13201-2:2015 for the illumination of roads footways.
5. The manufacturer of luminaires shall be as detailed below or similar and approved.

Table 14.1 - Highway Lighting – "Lighting Beacon" Luminaires

Quantity	4
Manufacturer	DW Windsor
Model	Silka 4
Optic Setting	N/A
Lamp	1.77klm (29w) Neutral White 2.5m LED tape
Driver Current	126mA
Control Gear	Electronic DALI Compatible
Fixing Detail	Post top 0° tilt
Glare Control Class	None
IP Rating	IP66
PECU Socket	None

6. Where acceptable, lamps shall not be fitted until columns, brackets and luminaires have been installed to the satisfaction of the Overseeing Organisation.
7. The Contractor shall demonstrate to the Adopting Authority on completion of the works that the lighting installation on the roads as detailed above satisfies the performance requirements of BS 5489-1:2020 and BS EN 13201-2:2015.
8. Where luminance values are specified in the British Standards, the Contractor may measure horizontal illuminance in accordance with ILE Technical Report TR28, to verify compliance.
9. The Contractor shall give not less than fourteen days' notice to the Adopting Authority of his intention to carry out the tests and afford every opportunity for them to witness the tests.
10. The Contractor shall supply details of the proposed tests and calibration certificates for all measurement instrumentation fourteen days prior to the tests being carried out.
11. The Contractor shall record the results on a schedule and drawings, the format of which shall be agreed with the Adopting Authority.
12. If the Contractor wishes to propose alternative luminaires, they shall satisfy the minimum requirements as defined in the BS 5489-1:2020. The luminaires shall utilise the proposed column types and positions shown on the scheme drawings and detailed in Appendix 13/1.
13. The Contractor shall insert in the following table, details of the equipment proposed for use in the Works.

14. Information provided by the Contractor shall include a number of computer calculation reports detailing lighting levels achieved for each location / section of road where the width of illuminated carriageway alters. (Maintenance factors to be based on a six-year cleaning cycle).
15. The Contractor shall submit all information with his Tender.
16. Table of Contractors Proposals - Luminaires

Reference No.			
Luminaire No.			
Manufacturer			
Catalogue No.			
Matrix / Optic Position			
Lamp Type and Rating			
Glare Control Class Threshold Increment			
IP Rating			
PECU Socket (Control)			

Ancillary Equipment

17. Luminaire control gear shall be integral.
18. Cut outs are to be positioned at the bottom edge of the column baseboard. All other equipment required to be installed in the base compartment is to be positioned above the cut out.
19. Ancillary equipment should be designed in accordance with drawings 415437-MMD-D-DR-00-00-1302 to 1305.

Cabling and Cable Joints

20. The Contractor shall carry out the electrical supply design and wiring to Lighting Beacons and bring them into service.
21. All new cabling to be installed in accordance with BS 7671:2018 and revised amendments.
22. All cabling shall be installed in duct and all ducts containing one or more cables shall have spare capacity of at least 33% to allow for future use.
23. Positions of cable ducts and draw pit chambers are as described on drawings 415437-MMD-00-XX-DR-S-2030 & 2031..
24. Cable joints are not permitted under this contract unless authorisation has been sought by the Contractor from the Overseeing Organisation's Electrical Design Engineer.

Earthing

25. Circuit protective and equipotential conductors shall be installed in columns in accordance with BS 7671:2018 and Conwy Borough Council Specification 'Roads for Adoption in Conwy, Procedure & Design Guide, Construction Specification Revision A (June 2006)'.
26. Earth electrodes and inspection chambers shall be installed at the last column in each circuit as described on drawing 415437-MMD-00-XX-DR-S-2030 & 2031.

Radio Interference

27. Electrical equipment shall be installed such that levels of radio interference given in BS 55014 are not exceeded.

Inspection and Testing

- 28. Inspection and testing to be carried out in accordance with BS 7671:2018.
- 29. A schedule shall be produced recording all test result readings at each point with an accompanying cable schematic drawing.
- 30. Test results shall be submitted immediately after completion of all the tests in accordance with Appendix 14/1.
- 31. NICEIC Highway Electrical Installation Certificate to be used where possible or similar and approved.
- 32. Separate certificates shall be provided for the following: -
 - i. Electrical Test Certificate for cabling from each feeder pillar including new and existing cabling.
 - ii. Electrical Test Certificates for internal wiring in all columns and signs.
- 33. Inspection and testing to include all new electrical works and any amendments to existing cabling installations. This includes identifying and the labelling of existing circuits.

APPENDIX 14/5: ELECTRICAL EQUIPMENT FOR TRAFFIC SIGNS

- 1. The Contractor shall carry out wiring to illuminated signs and bring them into service.
- 2. All traffic sign lanterns as scheduled in Appendix 12/1, shall be supplied by the Contractor.
- 3. All electrical work associated with illuminated signs shall be carried out in accordance with the requirements of Appendix 14/4.

16 Piling and Embedded Retaining Walls

APPENDIX 16/1: GENERAL REQUIREMENTS FOR PILING AND EMBEDDED RETAINING WALLS

1. Piles shall be to the following specification and the contract drawings: 415437-MMD-00-XX-DR-C-3500 series.
2. The corners, junctions and special piles indicated on the Drawings shall be fabricated at the pile manufacturer's premises under workshop conditions or at a similar approved facility under an approved quality assurance system. All work shall comply with the standard dimensions and tolerances quoted by the manufacturer, or for non-standard fabrications to the approval of the Project Manager.
3. Where necessary, the tops of the piles, which are longer than design length, shall be flame cut to the design levels and on completion of the cut shall have a neat appearance. The top 300mm of sheet piles which are to be cast into bulkhead or capping beams are to be free from oil, grease and loose scale, rust or other such contaminants which would have a detrimental effect on the adhesion between the concrete and the sheet pile.

Damage Criteria and Monitoring Equipment Required for Pile Works

4. Noise and vibration monitoring to be conducted during piling works shall be in accordance with Appendix 1/9 and 26/11.
5. Existing structures in close proximity to piling works shall be monitored to check there is no damage or movement as a result of the piling works.

APPENDIX 16/15: STEEL SHEET PILES

Materials

1. Steel sheet piles shall be AZ Sections as produced by Arcelor or similar approved and shall be of the section sizes, numbers and dimensions specified on the Drawings. Steel shall be grade S355 GP to BS EN 10248. No protective coating is required to the steel sheet piles as shown on the Drawings.

Pile Handling and Driving

2. All piles shall be stacked on approved supports.
3. The Contractor shall repair any piles damaged during any storage, handling, transporting and pitching operations to the satisfaction of the Project Manager and at the Contractor's expense.
4. Holes or opening shall not be burnt or drilled in piles for the purpose of handling without the approval of the Project Manager. Any hole or opening made after receiving permission shall be plugged to the satisfaction of the Project Manager at the Contractor's expense.
5. Piles shall be handled, pitched and driven using equipment and methods suitable for the site conditions and the pile size. The Contractor shall submit, with his tender, outline proposals of the plant and method he proposes to adopt for driving sheet piles in accordance with the details shown on the Drawings and the requirements of the Specification.
6. Prior to start of piling operations, the Contractor shall submit to the Project Manager for approval a full and detailed method statement for the fabrication and installation of sheet piling. The method statement shall confirm and expand upon the information previously submitted with the tender and shall include the following:

- Details of piling and ancillary plant and equipment including type and make of hammer, weight of ram, the maximum drop or energy output and rating;
 - Details of plant, appliances and temporary works required for handling, pitching and driving and, if required extraction and method by which required penetration will be achieved;
 - Details of proposals for reinforcing heads and/or toes of piles;
 - Details for overcoming obstructions if encountered during driving of sheet piles;
 - Details and numbers of personnel to be used for pile installation;
 - Method of extending a pile;
 - Detailed construction programme showing sequence of and periods of sheet pile construction;
 - Any other details required by the Project Manager.
7. Notwithstanding approval of the Contractor's proposals by the Project Manager, the Contractor is solely responsible for the successful driving of the piles to achieve the embedment as shown on the Drawings.
8. The Contractor shall appoint an experienced pile driving foreman together with gangs of trained labour capable of dealing with all pile driving.
9. All holes in the piling, including drain outlets and holes for tie rods, bolts and the attachment of fittings shall be formed on site after the piling is driven, unless otherwise agreed with the Project Manager. All holes shall be clean and free of burrs before assembly of steelwork.
10. The piling hammer shall be properly fitted with a suitable helmet or other device before driving is commenced to prevent damage to the tops of the piles.
11. The Contractor shall make their own assessment of requirements for pile head stiffening and or driving shoes. The cost of any stiffening or shoes shall be the responsibility of the Contractor. Any piles that are damaged during driving shall, if required by the Project Manager, be made good, replaced or otherwise repaired, as directed at the Contractor's expense.
12. Taper piles shall not be introduced in order to correct piles that have developed a lean, without the written approval of the Project Manager.
13. Interlocking steel sheet piles shall be driven vertically and accurately in the positions and to the penetrations and levels required by the design. The Contractor should ensure the methods employed for driving the piles shall not directly or indirectly lead to damage to nearby structures.
14. Any piles that spread or do not properly interlock or do not remain interlocked during driving shall be withdrawn and re-driven at the Contractor's expense.
15. Piles that reach refusal before achieving the designed penetration shall not be cut off without the approval of the Project Manager.

Piling Records

16. The Contractor shall keep piling records as per sub-clause 1615.8 with the following additions:

Sheet Pile Record Data:

- Contract
 - Time of driving
 - Working level
 - Depth from working level to sheet pile toe
 - Toe level
 - Type, weight, drop and mechanical condition of hammer and equivalent information for other equipment
 - Driving record for sheet piles
17. The Contractor shall submit 1 signed electronic copies of these records to the Project Manager not later than noon the next working day after the piles were installed. The signed records will form a record of work.

18. The format and presentation of the above information shall be subject to agreement with the Project Manager.
19. Any unexpected driving obstructions, delays or interruptions to the sequence of work shall be noted in the records.

Positional and alignment tolerance

20. Positional and alignment tolerance shall be as per sub-clause 1615.9.
21. This out of alignment shall not build up in less than 6.0m and any correction shall return to the correct line within 6.0m.
22. The cut off level of the pile heads shall be within $\pm 20\text{mm}$ of the required level as shown on the Drawings. The tolerance is increased to $\pm 50\text{mm}$ where the sheet pile cut off level is on a slope greater than 1:50.
23. Except as shown on the Drawings, the toe of any pair of piles shall not be driven more than 2m lower or 0.5m higher than the toe of the adjacent pile or pair of piles.
24. Where piles fall outside the above tolerances, the Project Manager shall have the power to reject the pile and to order that it shall be withdrawn and re-driven, all at the Contractor's expense.

Welding

25. Each pair of piles when over 10m long, shall be welded together before pitching with a minimum of 300mm of 6mm fillet weld to hold each pair straight and to resist drag down of any previously driven pile.

17 A: Structural Concrete – Seaside Structures

APPENDIX 17A/1: SCHEDULE FOR THE SPECIFICATION OF DESIGNED CONCRETE

The Contractor shall note that Appendix 17: 'Structural Concrete' is provided in separate chapters (17 A and 17 B) of this document to reflect the varied properties of concrete required for seaside structures and promenade structures respectively.

The following specification applies to the seaside structures detailed on 415437-MMD-00-XX-DR-C-3500 series drawings. This is mainly for the new beach access steps, cross over steps, outfall extensions and outfall protection.

Concrete Strength and Mix Design Requirements

Requirement	Schedule			
	In-Situ Reinforced Concrete	Pre-cast Concrete	Mass Concrete	Blinking Concrete
Intended working life (years)	120	120	120	120
Applicable Exposure Class (Excluding DC Class)	XC3/4 XS3 XF4	XC3/4 XS3 XF4	XS3	XS3
Compressive Strength Class of Concrete	C35/45	C35/45	C35/45	C25/30
Minimum Cement Content (kg/m ³)	380	380	370	300
Maximum Cement Content (kg/m ³) ¹	-	-	-	-
Maximum Free Water/Cement Ratio	0.4	0.4	0.45	0.55
Required Group or Type and Class of Cement or Combination ^{4,5}	IIIA	IIIA	IIIA	IIIA
Maximum Aggregate Size (mm)	20	20	20	20
Chloride Content Class	CI 0,2	CI 0,2	CI 1.0	CI 1.0
For Lightweight Concrete, the Density Class or Target Density or For Heavyweight Concrete, the Target Density	N/A	N/A	N/A	N/A
Nominal Cover (mm)	75	75	N/A	N/A
Consistence Class ²	S3	S3	S3	-
Additional Measures	Controlled ³ permeability formwork Bio-enhancing Admixture required—refer to “Admixtures” section in Appendix 17/4	Controlled ³ permeability formwork		N/A
Air Entrainment Requirement	No	No	No	No
Sampling and Testing	Refer to Appendix 1/5	Refer to Appendix 1/5	Refer to Appendix 1/5	Refer to Appendix 1/5
Aggregate Requirements	Refer to Appendix 17/4	Refer to Appendix 17/4	Refer to Appendix 17/4	Refer to Appendix 17/4
Maximum and Minimum Temperature of Fresh Concrete	See below	See below	See below	See below

Notes:

- Contractor may use more cement provided the maximum permitted concrete temperature is not exceeded and the Contractor has demonstrated this through accepted calculations or trials.
- Contractor shall determine this where not specified.

- 4) Controlled permeability formwork for in-situ and precast concrete works is only required for formed surfaces.
- 5) IIB-V defined as 21%-35% PFA in BS 8500-1:2015.
- 6) IIIA defined as 36%-65% GGBS in BS 8500-1:2015.

Fresh Concrete Temperature

2. Concreting in adverse temperatures shall be in accordance with Series 1700 of the Highways Specification.
3. During hot weather, with shade air temperatures (above 20°C), precautions shall be taken by the Concrete Supplier and Contractor to ensure the maximum temperature of the concrete mix at time of placing is less than 20°C, unless it has been demonstrated in the Contractor's trials that a higher temperature will not adversely affect the concrete and its resistance to early cracking.
4. Concreting at shade air temperatures below 5°C shall be carried out only if the following conditions are met:
 - v. Aggregates and water used in the mix are free from snow, ice and frost.
 - vi. Formwork, reinforcement and any surface with which the fresh concrete will be in contact with is free from snow, ice and frost and be at a temperature above 0°C.
 - vii. Initial temperature of the concrete is at least 5°C.
 - viii. Temperature at the surface of the concrete shall be maintained at not less than 5°C until concrete reaches a strength of 5N/mm².
 - ix. Temperatures at the surface of the concrete shall be measured where the lowest temperature is to be expected.
 - x. Temperature of the concrete shall be prevented from falling below 0°C
 - xi. Shade air temperatures (minimum): 2°C (subject to above).
5. During wet weather the concrete shall be adequately protected as soon as it is in position. No concreting shall be carried out during periods of continuous heavy rain.

APPENDIX 17A/3: CONCRETE SURFACE FINISHES

6. Unless specified on the Drawings, or agreed otherwise, formed surfaces shall have a F3 finish on exposed faces in the permanent case and F2 finish elsewhere.
7. At locations on the contract drawings where an "ECO Seawall" textured concrete surface is specified the concrete surface shall be formed using a formliner. The formliner used shall be "ECO Seawall" formliner, with an "Azouri" pattern", supplied by EConcrete or similar accepted. The thickness of the concrete wall, over the surface area where the formliner is fixed, shall be locally increased by the depth of the formliner, to ensure minimum cover to external wall face reinforcement is maintained. Where this formliner is used a biodegradable mold release agent such as CHRYSO® Dem DBV Bio 1 Delayed Mould-Release, or similar accepted shall be used. The agent shall not deposit a residue that can affect biological growth on the concrete surface.
8. Effort shall be made to match the colour of the concrete and the release agent used shall be such that the permanent concrete surface is not stained or discoloured. Internal ties and embedded metal parts shall not be used.

Unformed surface finishes

9. All unformed exposed surface finishes shall be a Class U3 surface finish unless specified elsewhere.
10. The ramp slab, steps and step landings shall be finished with a slightly ridged non-skid surface, the direction of ridges being perpendicular to the slope of the ramp/landings. The non-skid surface shall be formed by sweeping newly laid concrete lightly with a stiff broom after the initial set has occurred.

Repair of surface defects in concrete

11. All concrete work shall be inspected by the Supervisor as soon as formwork has been stripped and no patching or other treatment shall be carried out before this inspection has been completed. Any concrete badly out of alignment or with a defective surface which, in the opinion of the Supervisor, cannot be properly repaired or patched shall be cut out and made good. The method of making good shall be subject to the Supervisor's approval before remedial work commences.
12. Immediately on removal of the forms, all surfaces shall be carefully examined, and any irregularities found in the concrete surface shall be immediately rubbed down in a manner satisfactory to the Supervisor to produce a smooth, uniform and continuous surface. Blow holes shall be filled with a cementitious mortar. Concrete containing voids, holes, honeycombing or similar depression defects shall be completely removed and replaced to the satisfaction of the Supervisor.
13. Cement mortar for filling blowholes shall consist of cement and fine aggregate together with the minimum amount of water necessary to achieve a consistency suitable for completely filling the blowholes.
14. Cement mortar for filling holes left by formwork ties and components shall consist of 1 part of cement to 3 parts of fine aggregate together with the minimum amount of water necessary to achieve a consistency suitable for compacting the mortar into the holes; the mix shall contain a non-shrink admixture.

Trial panels

15. As per clause 1708.1 of the Specification for Highway Works.
16. Prior to commencing concrete works, the Contractor shall prepare test panels of a minimum size of 1m x 1m in accordance with BS EN 206 for the textured seawall formliner and the F3 finish. These trial panels shall be provided for the Project Manager to approve the concrete mix, concrete colour, aggregate composition and surface finish.

APPENDIX 17A/4: CONCRETE GENERAL

1. All concrete shall be designed and produced in accordance with the requirements of BS 6349-1-4, EN 206-1 and those laid out in sub-clauses 1701.1 and 1701.2.
2. As per clause 1702.1, cementitious materials must conform to BS EN 197-1. The suitability of materials in accordance with BS EN 206-1: Section 5.2.2. The materials shall be selected by the Contractor and submitted to the Project Manager for acceptance. All main types of cementitious materials and additions may be considered.
3. The total acid soluble sulphate content of the concrete arising from all the mix constituents expressed as SO₃, when calculated from certified sulphate ion concentrations, shall not exceed 4.0% SO₃ by weight of cementitious material.
4. Constituent materials shall comply with EN 206-1 Section 5.
5. The Contractor shall obtain certificates of compliance with the relevant standards and all other requirements of this specification from the producers of the constituent materials or ready-mixed concrete for the approval of the Project Manager prior to use.
6. Any change in materials or supplier shall require new certificates of compliance which shall also be submitted to the Project Manager for approval.
7. The strength of concrete for trial mixes and production mixes shall be assessed in accordance with EN 206-1 Section 8. The target strength shall exceed the characteristic strength by a sufficient margin to consistently meet the compliance criteria.
8. The Contractor shall demonstrate the compliance of any proposed mix with the tests specified in this document, at a test age of 28 days, no later than 28 days prior to commencement of concrete works.
9. The Contractor shall submit for the approval of the Project Manager, prior to the supply of any concrete, the following information:
 - the nature and source of each constituent material;
 - nominal grading details in tabular and graphical form of the fine and coarse aggregates;
 - nominal grading details in tabular and graphical form of the combined aggregate together with details of the proportions in which the fine and coarse aggregates are combined;
 - the designed consistence (i.e. workability), having due regard to the final location and dimensions of the concrete;
 - the methods of manufacturing, placing and curing, and the batching plant to be used;
 - full details of tests on trial mixes carried out in accordance with clauses 11 to 17 of Appendix 17/4;
 - the quantities of each material per cubic metre of fully compacted concrete; and
 - any proposed admixtures
10. Any changes in the source of material or in mix proportions (except changes in the cementitious content of not more than 20 kg/m³) shall be subject to the prior approval of the Project Manager. Where required by the Designer the revised proportions are to be considered as a new mix design and initial tests will be required. The sampling rate shall be increased to that required for initial production for the next 35 test results.

Initial Testing of trial mixes

11. Prior to incorporation of concrete in the works, Initial Testing trials shall be undertaken to determine the optimum quantities of constituents required. Testing shall be carried out in accordance with EN 206-1 Annex A to establish the concrete satisfies all requirements for fresh and hardened concrete. The tests shall be carried out using procedures, equipment and conditions similar to those to be used on site during construction.

12. In addition to, or concurrently with initial testing, the Contractor shall undertake trials, to the satisfaction of the Project Manager, to demonstrate constructability, the suitability of the mix, and compatibility with the intended construction methods. Trial sections shall be constructed using samples of the approved materials, plant and equipment typical of those proposed for use in the works and shall contain reinforcement typical of the configuration to be used in the permanent works.
13. The Contractor shall submit details of the initial testing and trial sections for the approval of the Project Manager and shall give sufficient notice to enable their representatives to be present at the making of trial mixes, the preliminary testing of cubes and the construction of trial sections.
14. The concreting plant shall be similar to the corresponding plant to be used in the Works. A clean dry mixer shall be used. Three concrete batches shall be assessed. From each batch, at least five 150mm cube samples shall be prepared. At least three cube samples from each of the three batches shall be tested for compressive strength at an age of 7 days. In addition, 2 cube samples from each batch shall be tested at 28 days. The tests shall be carried out at a laboratory approved by the Project Manager. The strength of a batch or load shall be taken as the average of the test results at each age. The result of the initial test shall be the average strength of the batches or loads at 7 days.
15. The Contractor shall demonstrate the compliance of any proposed mix with the initial tests required by BS EN 206, no later than 28 days prior to the programmed use of the concrete mix.
16. Compressive strength testing shall be carried out in accordance with EN 12390-1 and made in accordance with EN 12390-2 from samples taken in accordance with EN 12350-1.
17. During production the Contractor shall carry out such trial mixes and tests as are required by the Project Manager, before changes are made in the materials or in the proportions of materials to be used.

Cementitious Materials and Additions

18. The Project Manager may order additional tests on cement and the Contractor draw the necessary samples from the stocks on site.
19. Different cements and GGBS shall be stored in separate silos. Silos for storing GGBS shall be equipped with aerators to ensure free flow within the silo. Alternatively, these materials may be stored in dry, weatherproof sheds with raised floors.
20. Each consignment of bagged cement shall be stored separately and labelled so as to be identifiable and shall be used in order of delivery.
21. Cement which has been deleteriously affected by moisture shall not be used in the works and shall be immediately removed from the site.

Aggregates

22. Aggregates to comply with sub-clause 1702.2. Selection of aggregates, including recovered aggregate, must also take into account factors present in BS EN 206-1, Section 5.2.3.
23. The aggregate shall be freeze-thaw resistant to BS 8500-2, Section 4.3 and BS EN 1367-2.
24. 'All-in' aggregates shall not be used. Single-sized coarse aggregates and fine aggregates shall be used. Aggregates shall be stored in separate hoppers, or different stacks, which shall be well separated from each other.
25. Only approved aggregates whose source contains a sufficient quantity of aggregate to complete the work as per sub-clause 1705.2 shall be used.
26. All aggregates shall be kept free from contact with deleterious matter with adequate provision for drainage and shall be stored and handled so as to avoid mixing.
27. The overall grading of the aggregate shall be such as to produce concrete of the specified quality that will work readily into position without segregation or exhibiting a depth of bleed water in excess of 0.2% of the height of the pour.

28. Resistance to alkali aggregate reaction shall be achieved through following the procedures as stated in BS8500-2 Section 5.2 and sub-clause 1704.5

Water

29. Water shall be potable and comply with the requirements of BS EN 1008:2002.
30. Water from the sea shall not be used.
31. Where water for use in the works is not available from a public utility the Contractor shall demonstrate there is no significant detrimental effect on the initial setting times of cement and the average compressive strength. The water shall be clean and free from industrial wastes and other deleterious material. Water which is highly coloured, or which has a pronounced odour or in which algae is growing shall not be used. The pH value shall be numerically greater than 6.
32. Water recycled from concrete production may only be used if it complies with the requirements of BS EN 1008:2002.

Admixtures

32. Admixtures which contain a chloride ion content in excess of 2% by weight of admixture or 0.03% by weight of cementitious content shall not be used.
33. The quantity and method of adding admixtures shall be in accordance with the manufacturer's recommendations. Admixtures shall be stored in accordance with the manufacturer's recommendations and in containers marked to clearly show the contents.
34. The Contractor shall demonstrate the action of any proposed admixture by means of trial mixes.
35. Where Bio-enhancing Admix is required in any of the mix designs specified in Appendix 17/1 it shall be incorporated into the concrete mix design at a weight equivalent to 10% of the weight of the cementitious material in the mix. The Bio-enhancing Admix is to be added to the mix either at batching plant or on site directly to the truck. The Bio-enhancing admixture shall meet the following requirements:
- a. Scientifically proven biological performance. The accepted products shall demonstrate enhanced ecological performance compared to standard Portland cement products including significant reduction in dominance of invasive species.
 - b. Comply with EN 934-1 2008 and EN 934-2: 2009 + A1: 2012.
 - c. Accepted products shall also have a track record in demonstrating biological and structural performance over time through demonstrated and recorded monitoring and analysis in peer-reviewed publications and reports

Sampling and Testing

36. Conformity shall be based on running production and the number of test results outside of the specified limiting values according to the criteria stated in EN 206-1, Section 8.2.3.2:
- The number of test results outside of the specific limiting value, class limits or tolerances of target values are not greater than the acceptance number in Tables 19a or 19b as given in Tables 17 and 18;
 - All individual test results are within the maximum allowed deviation given in Table 17 and 18.
37. The concrete shall be 'normal weight concrete' (2000-2600kg/m³ oven dry density) in accordance with BS EN 206-1, Section 5.5.2, unless an alternative design is submitted to, and approved by, the project Manager.

38. The relative proportions of the coarse and fine aggregates to be used shall be determined on the basis of trial mixes.
39. The overall grading of admixtures shall be controlled throughout the works to ensure conformity. Each delivery shall be inspected and, if required by the Project Manager, tested in accordance with BS 812.
40. The Contractor shall measure the free moisture content of the aggregate prior to batching, at regular intervals and at least twice per day. The free moisture shall be allowed for in the quantity of water to be added to the concrete.
41. Routine tests shall be carried out by the Contractor on the aggregate at intervals shown in BS EN 12620:2002, Tables H.1 to H.3. These tests shall include:

- Grading
- Shape
- Particle density and water absorption
- Petrography
- Humus content
- Shell content
- Fines content
- Water soluble chloride content
- Acid soluble sulphate content

- a. Copies of the results of routine control tests carried out by the by the aggregate producer shall be retained by the Contractor and be available for inspection by the Project Manager.

a.

42. The quantities of cement, aggregate and water shall be measured by weight with separate weighing machines used for cementitious materials. Alternatively, cementitious materials may be measured by using a whole number of bags in each mix.
43. Adjustment to the batch weight of aggregate and quantity of water and the quantity of water to allow for the free moisture content are to be made.
44. All measuring equipment shall be maintained in a clean and serviceable condition. The accuracy of measuring equipment shall be checked over the range to be used, when set up at each site, and maintained thereafter.
45. Weekly checks on the accuracy of the weigh batching equipment are to be made. The mixer shall be operated in accordance with the manufacturer's recommendation. Care shall be taken to ensure that all components are thoroughly mixed and, in particular, any admixtures are uniformly distributed throughout the batch. The accuracy of equipment shall fall within the limits described in as follows:

Measurement Accuracy

Material	Required Accuracy
Measurement of Cementitious Material	+ or – 3% of the quantity of cementitious material in each batch
Measurement of Water	+ or – 3% of the quantity of water in each batch
Measurement of Aggregate	+ or – 3% of the total quantity of aggregate in each batch
Measurement of Admixture	+ or – 5% of the quantity of admixture in each batch

46. The mixer shall be operated in accordance with the manufacturer's instructions. Care shall be taken to ensure that all components are thoroughly mixed and in particular any admixtures are uniformly distributed throughout the batch.

47. The mixing blades of pan mixers shall be maintained within the tolerances specified by the manufacturer of the mixer and the blades shall be replaced when it is no longer possible to maintain the tolerances by adjustment.
48. The quantities of all of the constituents, the temperatures of the cement and water when added to the mix, the time of mixing and the temperature of the mixed concrete immediately before discharge shall be recorded for each batch.
49. The temperature of the cement when added to the mix shall not exceed 30°C. The temperature of the concrete after mixing, and at delivery to the site, shall not exceed 30°C.
50. Adequate standby equipment shall be available so that in the event of a breakdown of mixing plant, critical concreting operations will not be interrupted.
51. No remixing of partially hardened concrete with or without additional cement, aggregate or water shall be allowed.
52. The mixing time shall be established during the trials but shall be not less than that recommended by the manufacturer of the mixer, subject to the approval of the Project Manager.
53. Mixers that have been out of use for more than 30 minutes shall be thoroughly cleaned before any fresh concrete is mixed. The first batch of concrete through the mixer shall then contain only two-thirds of the normal quantity of coarse aggregate. The mixer shall be cleaned prior to mixing of a concrete containing a different cement/binder type.

Information supplied by the Concrete Supplier

54. On request, the Concrete Supplier shall provide information relating to the concrete, to the Contractor and Project Manager, for each delivery, as follows:
 - type and strength class of cement and type of aggregates;
 - type of admixtures, type and approximate content of additions, if any;
 - target water/cement ratio;
 - results of relevant previous tests for the concrete e.g. from production control or initial tests;
 - strength development;
 - sources of the constituent materials.
55. Delivery information for site-mixed concrete shall be provided by the Concrete Supplier to the Contractor and Project Manager in accordance with EN 206-1 Section 7.4 and with points 43-46 of this Appendix where the site is large or several types of concrete are involved or where the party producing the concrete is different from the party who is responsible for placing the concrete.

Ready-mixed Concrete

56. Ready-mixed concrete shall comply with this specification, including the following special requirements. The concrete shall be carried in purpose-made agitators, operating continuously, or truck mixers. The concrete shall be compacted in its final position within 2 hours of the introduction of cement to the aggregate, unless a longer or shorter time is agreed by the Project Manager. The time of such introduction shall be recorded on the Delivery Note together with the weights of the constituents of each mix.
57. When truck-mixed concrete is used, water shall be added under supervision either at the Site or at the central batching plant as agreed, but under no circumstances shall water be added in transit.
58. Unless otherwise agreed, truck mixer units and their mixing and discharge performance shall comply with the appropriate European or National Standard.
59. A record book shall be kept on site by the Contractor and be available for inspection by the Project Manager at all times. This shall contain the following information relating to each delivery of concrete to the site, in accordance with EN 206-1 Section 7.3:

- Registration number of trucks, name of supplier and location of the batching plant;
 - Time of loading and first introduction of cement and water to the mix;
 - Date and time of arrival of the truck at the specified concreting location;
 - Time when concrete arrived at site, at beginning of unloading, at end of unloading, and time when placed in position and left undisturbed;
 - Mix reference, strength class, exposure class chloride content class, consistence class, and other limiting factors at the request of the Project Manager;
 - Mix proportions, including water/cement ratio, type of cement, nominal maximum aggregate size, and admixtures if any and grade of concrete;
 - Declaration of conformity with reference to the specification and to EN206-1;
 - Position where the concrete was placed, with reference to chainage and part of structure, where appropriate;
 - Whether test cubes were taken from the delivery, and details of cube markings;
 - Slump test results;
 - Temperature of mixed concrete immediately prior to discharge;
 - Quantity of concrete brought to site and quantity placed in works;
 - Serial number of the delivery certificate.
60. If the use of ready-mix concrete is approved by the Project Manager, tests carried out by a supplier shall be in addition to the tests specified in this Specification. The results of the works tests shall take priority over the supplier's tests.
61. The supplier shall permit the Project Manager to visit the concrete plant at any time to discuss matters arising and take samples if required of constituent materials and take copies of certificates for routine quality control tests carried out.

Concrete Compliance

General

62. Conformity shall be measured in accordance with EN 206-1 Section 8.2, against Initial Production criteria until at least 35 test results are available and against Continuous Production criteria when at least 35 test results are obtained.
63. Conformity testing is required for compressive strength, density, consistence and when applicable air entrainment.
64. In addition to table 13 of BS EN 206-1 testing shall be carried out on each pour for in-situ concrete carried out for different elements or in different areas of the site. If fresh concrete does not comply with the consistence (i.e. workability) requirements of this specification it shall not be included in the Works.
65. The Contractor shall have at least one person on site trained and competent to sample concrete, undertake the relevant test measurements for consistence (workability) and prepare test specimens in accordance with the required standards.

Strength Control

66. Sampling and testing for strength shall be carried out as directed by EN 206-1 Section 8.2.1.2. Samples shall be taken in accordance with EN 12350-1 and at a rate as specified below. Compliance with the specified characteristic strength shall be based on tests made on cubes at an age of 28 days, unless there is satisfactory evidence that a particular testing regime is capable of predicting the strength at 28 days, of concrete tested at an earlier age.
67. Loading shall not be applied to elements of the Works composed of the concrete with early strength requirements until such time the minimum strength requirement has been achieved, as demonstrated by cube test results from samples manufactured from the concrete proposed for loading and cured in a manner identical to the concrete in the works.
68. Conformity of compressive strength shall be in accordance with EN 206-15.5.1.2 and Table 14, for:
- groups on “n” non-overlapping or overlapping consecutive test results f_{cm} (criterion 1),

- each individual test result f_{ci} (criterion 2).
- 69. Conformity of compressive strength shall be in accordance with EN 206-1 Section 5.5.1.2 and Appendix 1/5 under “Seaside Structures”.
- 70. The action required in the case of non-compliance shall be as per EN 206-1 Section 8.4 and then as determined by the Project Manager, but may include the testing of additional samples of the concrete or removal of the non-compliant concrete. All additional testing or remedial work shall be at the Contractor’s expense.

Consistence

- 71. The consistence (i.e. workability) of the fresh concrete shall be such that the concrete is suitable for the conditions of handling and placing so that after compaction it surrounds all reinforcement and completely fills the form. This shall be proven by construction trials, to the satisfaction of the Project Manager, prior to use in the Permanent Works.
- 72. The Contractor shall propose both the required consistence and the method by which to measure it. Consistence shall be measured for each batch in accordance with EN 12350 Part 2 2000, and shall be within the limits appropriate for the consistency class as defined in EN 206-1 Section 4.2.
- 73. The timing of consistence measurement for concrete at the work place shall be in accordance with EN 206-1 Section 5.4.1
- 74. Concrete which does not comply with the required consistence shall not be used in the Permanent Works.

Rejection

- 75. The Contractor or Project Manager may, before placement, reject any batch of concrete which in their opinion does not conform with the approved mix design or is unsatisfactory in any respect or, in the case of concrete mixed off-site, for which a delivery docket containing the full information as specified herein is not immediately available.
- 76. The Project Manager may reject any concrete after placement due to unsatisfactory test results or unsatisfactory finish or incorrect positioning or other failure to conform to the requirements of this Specification.
- 77. Concrete which has been rejected shall be demolished and removed from the site and replaced with concrete conforming to the requirements of this Specification, in a manner approved by The Project Manager. All such work shall be entirely at the expense of the Contractor.

Formwork

General

- 78. Formwork shall not be tied to or supported by reinforcement.
- 79. Formwork shall be timber, metal, plastic or other material that shall produce the specified finish.
- 80. Plywood for formwork shall have a close, uniform grain and the edges shall be sealed with barrier paint, polyurethane varnish or other impermeable material.
- 81. Controlled permeability formwork shall be used on all exposed faces.
- 82. Formwork which has been previously used shall be repaired and the edges resealed before it is erected.
- 83. Formwork which in the opinion of the Supervisor has deteriorated to an extent such that it will not produce the specified finish shall not be used.
- 84. Unless otherwise shown on the Drawings, 25mm x 25mm chamfers or fillets shall be formed at all angles or arises of concrete.
- 85. Faces of formwork in contact with concrete shall be free from adhering foreign matter, projecting nails and the like, splits and other defects. All formwork shall be clean and free from standing

water, dirt, shavings, chippings and other foreign matter. Joints shall be sufficiently watertight to prevent the escape of mortar or the formation of fins or other blemishes on the face of the concrete.

86. Formwork shall be provided for the top surfaces of sloping work where the slope exceeds one in two and a half (22 degrees) and shall be anchored to enable the concrete to be properly compacted and to prevent flotation, care being taken to prevent air being trapped.
87. Where top inclined surfaces are to be created underwater, or where they will be covered within the next tide, they shall be protected by a top form.
88. Where ties are built into the concrete for the purpose of supporting formwork, the whole or part of any such supports shall be capable of removal so that no part remaining embedded in the concrete shall be nearer than 50mm from the surface in the case of reinforced concrete and 150mm in the case of unreinforced concrete. Holes left after removal of such supports shall be neatly filled with a high-flow, non-shrink, cementitious grout conforming to the requirements of BS EN 1504-3 Class R4.
89. Where holes are needed in forms to accommodate projecting reinforcement or fixing devices, care shall be taken to prevent loss of grout when concreting or damage when removing the formwork.
90. Before each concreting operation is commenced, formwork shall be carefully examined and cleaned out.

Construction Joints

91. Requirements for construction joints as laid out sub-clause 1710.1.

Formwork fixing devices

92. No plugs, bolts, wire ties, holdfasts or any appliances whatsoever, for the purpose of supporting the formwork or reinforcement, shall be fixed permanently into the structure so that they have less cover than the reinforcement or in any way impair the strength or appearance of the work, nor shall they be placed in such a manner that damage to the work would result due to the removal of the formwork.

Release agents

93. Barrier paint, polyurethane varnish, wax or other materials shall not be used instead of a release agent.
94. Release agents used on steel formwork shall contain a rust-inhibiting agent.
95. The release agent shall be applied by the method and at the rate of application recommended by the manufacturer.
96. The same type and make of release agent shall be used throughout the entire area of any one finish in one location. The release agent shall be environmentally friendly. The release agent shall be applied evenly to formwork surfaces, from the top downwards, and to horizontal surfaces last. The minimum necessary amount of release agent shall be used to obtain a clean release. Excessive local collection shall be prevented. The release agent shall be prevented from touching the previously placed hardened concrete, other materials not part of the formwork face and permanent forms to be built into the concrete.
97. The formwork release agents shall be compatible with any waterproofing and coating systems that may be required to be applied to the finished concrete surfaces. Site trials shall be carried out to demonstrate the adhesion of primers to the concrete surface is not reduced and that the performance of the coating systems will not be impaired.
98. Refer to Appendix 17/3 for mold release agents that can be used where formliners are utilised.

Striking of formwork

99. Formwork shall be removed in a manner not to damage the concrete, and at times to suit the requirements for its curing and to prevent restraint that may arise from elastic shortening or shrinkage.
100. For structural concrete made with ordinary Portland cement only, in the absence of control cubes the period before striking shall be in accordance with the requirements of BS EN 1992-1-1:2004. No formwork shall be removed less than 24 hours after completion of a pour.
101. The periods of time elapsing between the placing of the concrete and the striking of the formwork shall be such as to ensure that the concrete has gained sufficient strength to withstand the loads likely to be imposed on the concrete.
102. All exposed concrete surfaces after removal of the forms shall be protected at least 14 days against thermal shock and damage due to frost, chilling winds and the like.

Void Formers

103. Collapsible void formers shall be used above existing outfalls where concrete is to be poured above, as shown on THE 415437-MMD-00-XX-DR-C-3750s series drawings.
104. Collapsible void formers shall have the following properties:
 - To withstand a minimum working load of 3tonnes/m²
 - Shall break down and disintegrate when moisture is absorbed, leaving a void in its place
 - Minimum of 2mm thick polythene sheeting shall be placed on the topside of void former prior to pouring of concrete, to prevent moisture from wet concrete prematurely breaking down the void former. Sheeting shall be lapped 150mm at joins, and shall be taped
 - If the void former becomes wet or damp prior to the pouring of concrete, it shall be replaced

Placement, Transport and Compaction

105. Concrete shall be placed within fixed shutters or slip forming shutters.
106. The Contractor shall agree with the Concrete Supplier the time, date and rate of delivery of concrete to site as well as any special requirement for transportation, delivery and placing in accordance with BS EN 206-1: Section 7. Transportation and compaction shall be in accordance with BS EN 13670-1 or other relevant local standards; the method for these shall be proposed by the Contractor and approved by the Project Manager.
107. Production concrete shall be capable of being pumped, without segregation or blockage and at a rate appropriate for the construction process, from the delivery location to the placement location.
108. The Contractor shall be permitted to place concrete by pumping subject to the approval of the Project Manager. The Contractor shall submit in good time, for the approval of the Project Manager, details of the proposed mix specification, type of plant to be used and the method of batching, mixing and transporting the concrete. Attention is drawn to the need for the provision of adequate standby facilities to cover any breakdown of the plant supplying and pumping the concrete.
109. Concrete pumps shall be operated and maintained in accordance with the manufacturer's recommendations. The pumps and pipelines shall be maintained in a clean condition. Internal surfaces of pipelines shall not be aluminium. Joints in pipelines shall be tightly fixed and shall not permit grout loss.
110. Concrete pumps shall be positioned such that pipelines are as short and straight as is practicable and require as little repositioning as is practicable. Bends in pipelines shall be arranged in such a manner that concrete, formwork, and reinforcement or built in components are not disturbed.
111. Pipelines shall be lubricated by passing cement grout or concrete through the pipeline. The initial discharge of pumped concrete shall not be placed in the Permanent Works.

112. Conveyor systems shall be operated and maintained in accordance with the manufacturer's recommendations. Conveyors shall be kept in a clean condition. They shall be designed and operated in a manner such as to prevent segregation and loss of material. The maximum time interval between concrete being placed onto the conveyor and being discharged into the Works shall be 30 minutes.
113. Concrete shall not be dropped into place from a height exceeding 2m except with the use of trunking and/or chutes. When trunking or chutes are used, they shall be kept clean and used in such a way as to avoid segregation.
114. The placement and compaction of concrete shall be carried out in such a way as not to cause disturbance/damage to reinforcement or formwork. The reinforcement projecting above the lift shall be adequately supported so as to prevent movement of the bars during the casting and setting of the concrete.
115. Concrete shall be compacted in its final position within 30 minutes of discharge from the mixer unless carried in purpose-made agitators, operating continuously, when the time shall be within 2 hours of the introduction of cement to the aggregates and within 30 minutes of discharge from the agitator, provided that the concrete is sufficiently workable.
116. Fresh concrete shall not be placed against in-situ concrete which has been in position for more than 30 minutes unless the in-situ concrete has been kept damp with a layer of wet hessian and protected from the weather.
117. Surfaces upon which concrete is to be placed shall be clean and free from standing water. Loose, shattered or unsound concrete fragments shall be removed.
118. A sufficient number of vibrators in serviceable condition shall be on site to ensure that spare equipment is always available in the event of breakdowns.
119. Vibration shall not be applied by way of the reinforcement. Where vibrators of the immersion type are used, contact with reinforcement and all inserts shall be avoided as far as is practicable. Internal vibrators shall operate at not less than 10,000 cycles per minute and external vibrators at not less than 3,000 cycles per minute. Vibration shall not be used as a means of distributing heaped concrete into position.
120. The Contractor shall plan the Works to ensure that the extent of concreting Works affected by tidal conditions is minimised.
121. Where concreting Works are carried out within the tidal range, the Contractor shall submit a detailed method statement to the Project Manager for approval stating the procedures to be adopted. In particular the Contractor's proposed procedures shall ensure that:
 - All formwork and reinforcement is washed down with clean water prior to placement of concrete;
 - All debris or other deleterious materials are removed from within the shutters prior to the placement of concrete;
 - Concreting works shall stop in sufficient time to allow the concrete to harden to avoid potential damage to the surface or otherwise resulting from tidal inundation.
122. Concrete shall be transported and placed so that contamination, segregation or loss of constituent materials when placing underwater does not occur.
123. During and after concreting any operation likely to disturb or adversely affect the placed concrete shall be suspended until the concrete has reached its final set.
124. A sufficient number of tremie pipes and hoppers of a size suited to the Works shall be provided by the Contractor before concreting commences. Tremie pipes shall be of sufficient diameter and stiffness to be satisfactorily used at the required depth without sustaining blockages or breakages. Tremie pipes shall be securely supported in position and the concrete placed as follows:
 - A water-tight seal shall be made at the bottom of the tremie pipe by a means approved by the Project Manager. This seal shall be capable of being easily removed by the operator at surface cementitious
 - level;

- The tremie pipe shall be lowered to the bottom level of the area to be concreted and during the lowering process concrete shall be filled quickly into the pipe and hopper;
 - The seal at the bottom of the tremie pipe shall be removed and the concrete allowed to flow. Concrete shall be maintained up to hopper level throughout the operation;
 - Once the concrete is flowing the tremie pipe shall be raised slowly and a constant supply of concrete maintained in the pipe;
 - On no account shall water, or other material be allowed to enter the pipe, the lower end of which must be kept immersed in the deposited concrete.
125. Concreting by tremie shall proceed as rapidly and continuously as possible to prevent the formation of layers.
126. Unless the Contractor can show that his proposed method of placing will produce fully compacted concrete throughout the complete pour, the tremie concrete shall be placed beyond the required top level by a sufficient amount to allow for the removal of all incompletely compacted concrete, which shall be removed, after it has hardened, so that the upper surface consists of dense uniform concrete. The method of removing concrete shall be approved by the Project Manager.
127. Concreting operations shall not be permitted to displace or damage steel sheet-piling or formwork.
128. Whenever placing of concrete has been stopped or delayed before completion of a portion of the work under construction and placed concrete has taken its initial set, all laitance and deleterious matter shall be removed prior to recommencing.

Curing

129. Concrete cast below MHWS shall have curing Class 4 to BS EN 13670. (Curing class 3 in accordance with SHW applies in other locations.)
130. The method of curing shall prevent loss of moisture from the concrete. Methods deemed acceptable include the use of curing membranes approved by the Project Manager, and use of wet hessian protected from drying by secured, overlying plastic sheeting.
131. Liquid curing membranes shall not be used on concrete surfaces against which concrete has subsequently to be placed.
132. The curing time and methods shall be determined by the Contractor, and submitted to the Project Manager for approval. The time shall be determined in accordance with EN206-1 Section 7.2, with due consideration to the need to minimise shrinkage in the slab, the method of curing and time to trafficking, and shall not be less than 5 days.
133. Concreting in adverse weather conditions to take place as per sub clauses 1710.6 and 1710.7 and Appendix 17/1.

Contraction Joints

134. Unless otherwise shown on the contract drawings all contraction joints shall be constructed as below:
135. Contraction joints shall be prepared by applying two (2) coats of bituminous paint to a dry film thickness of 250µm. Hardened surfaces shall not be 'hacked'.
136. Formwork retarding agents shall not be used.
137. Once the adjacent concrete element has been constructed and cured adequately a joint sealant shall be provided on all exposed edges of the joint.

Reinforcement

138. The type of reinforcement for all steel shall be Class B and Grade 500 in accordance with EN 1992-1-1.
139. Cover to reinforcement shall be as shown on the Drawings.

Materials

- 140. At the time of delivery of each consignment of steel reinforcement, test certificates shall be obtained for each batch from the supplier/manufacturer for supply to the Project Manager confirming compliance with the appropriate European or National Standard.
- 141. Chairs, supports and spacers other than cover spacers for reinforcement shall be steel.
- 142. Tying wire shall be 1.6mm diameter soft annealed steel wire.
- 143. Cover spacers for reinforcement shall be concrete blocks or a proprietary concrete type. Cover spacers shall be of a type accepted by the Project Manager.

Handling and storage of reinforcement

- 144. Reinforcement shall not be subjected to rough handling, shock loading or dropping from a height.
- 145. Reinforcement shall be stored off the ground on level supports and in a manner which will not result in damage or deformation to the reinforcement or in contamination of the reinforcement.
- 146. Reinforcement shall not be stored on or adjacent to concrete surfaces which form part of the permanent work.

Cutting and bending reinforcement

- 147. Reinforcement shall not be re-bent or straightened after bending.

Surface condition of reinforcement

- 148. Reinforcement shall be clean at the time of fixing and shall be free from loose mill scale, loose rust or any substance which in the opinion of the Project Manager is likely to reduce the bond or affect the reinforcement or concrete chemically; the reinforcement shall be maintained in this condition until concrete is placed around it. The reinforcement shall be inspected immediately prior to pouring to ensure it has not deteriorated, for example, through the effects of salt spray.
- 149. If the surface condition of the reinforcement deteriorates such that it does not comply with the requirements stated above, the reinforcement shall be cleaned or dealt with by other methods agreed by the Project Manager.

Fixing Reinforcement

- 150. Reinforcement shall not be held in position by welding.
- 151. Tying wire shall be tied at locations in accordance with BS 7973-2:2001.
- 152. Laps and joints in reinforcement shall be made only at the specified positions and by the specified method.
- 153. Reinforcement which is to be left exposed shall be protected by a method agreed by the Project Manager.

APPENDIX 17A/7: PRECAST CONCRETE ELEMENTS

1. All precast concrete shall comply with this section and the relevant previous sections of this Specification.
2. All precast concrete units, hereinafter referred to in this Clause as 'units', shall be indelibly marked with a unique reference mark that includes the date of casting and identification of the manufacturer.
3. Units shall be stored in a manner such that additional bending stresses in the units are prevented. The accumulation of trapped water and deleterious matter in the units shall be prevented. Care shall be taken to avoid rust staining, efflorescence and the effects of salt spray.
4. Units shall be lifted or supported only at designated lifting and support points. Units shall be handled and placed without impact. At all stages of construction units shall be properly protected to prevent damage to concrete surfaces especially arises and other features.

Manufacture

5. The method of manufacture shall be approved by the Project Manager before work is started. When the method has been approved no changes shall be made without the further approval of the Project Manager. The Project Manager reserves the right to inspect precast units at any stage in the manufacturing process.
6. Each mould for concrete work which is specified or approved by the Project Manager to be precast shall have a different embossed or recessed identification mark in a position to the approval of the Project Manager. Each precast unit shall be indelibly marked with the date of casting and, if they are of symmetrical section, the face which will be uppermost when the member is in its correct position in the Works. The markings shall be so located that they shall not show or be exposed in the finished work.
7. Precast panels shall not be disturbed until 28 days after removal of the mould, unless calculations and the recommendations of CIRIA Report 136 *Formwork striking times* show that a strength gained at an earlier age will allow handling without causing damage. Match-cured specimens shall be tested for strength to confirm that any such earlier age strength has been attained before any handling is permitted. Proposals, supported by calculations, for early handling shall be submitted for the Project Manager's approval.
8. A copy of all 28 day results relating to the work shall be sent to the Project Manager as soon as they become available.
9. The Contractor shall submit two copies of all fabrication drawings for precast panels for the Project Manager's approval prior to commencement of fabrication.

Storage

10. When precast units are stored, they shall be supported at such positions as will ensure that the stresses induced in them are always less than the permissible design stresses.

Handling

11. Precast units shall be lifted or supported only at points approved by the Project Manager, and shall be handled and placed without impact. The Contractor shall submit his proposed lifting arrangements to the Project Manager for approval.

Moulds

12. All moulds shall be of adequate strength and stiffness to carry without deformation the loads and pressures of wet concrete during the casting and compaction operations. Moulds shall be sufficiently

tight to prevent leakage of the concrete and shall be adequately supported, braced and maintained so as to produce units within the tolerances specified.

13. The assembled moulds shall be checked for accuracy immediately prior to the first casting of each type of unit, and thereafter prior to every third casting.
14. Each mould shall be allocated a code number and all units cast in that mould shall have the mould code number and date of casting marked on.

Rejection of Units

15. All finished units, whether erected in position or not, which do not comply with the Drawings and Specifications shall be removed and replaced.
16. Reasons for rejection of units may include the following:-
 - The presence of cracks or repairs,
 - The presence of broken edges whether reinforcement is exposed or not,
 - Concrete cover to any reinforcement being less than that required by this Specification,
 - A surface finish inferior to that indicated on the Drawings
 - Out of tolerance dimensions

Elevated temperature curing

17. The method of curing shall be approved by the Project Manager.
18. Four hours must elapse from completion of the placing of concrete before its temperature is raised. The rise in temperature within any period of 30 minutes shall not exceed 10°C and the maximum temperature attained shall not exceed 70°C. The rate of subsequent cooling shall not exceed the rate of heating.
19. The method of curing used shall minimise the loss of moisture from the concrete.

Dimensional tolerances in precast concrete work

20. Unless shown otherwise on the Drawings, deviations from the specified dimensions for precast members shall not exceed the limits shown in tolerance tables below. If deviations exceed the target limit, the Contractor shall take the necessary steps to bring subsequent work within the target. If, however, deviations exceed the maximum allowable value as shown in the table, the member may be rejected by the Project Manager.

Dimensional Tolerances in Precast Concrete Work

Length	Target (mm)	Maximum Allowable (mm)
- Up to 3 m	± 5	± 6
- 3 to 4.5 m	± 7	± 9
- 4.5 to 6 m	± 9	± 12
- Additional for every subsequent 6m	± 5	± 6
<u>Cross Section (each direction)</u>		
- up to 500mm	± 5	± 6
- 500 to 750 mm	± 7	± 9
- Additional for every subsequent 250mm	± 2	± 3
<u>Straightness or bow</u>		
- up to 3 m	± 5	± 6
- 3 to 6 m	± 7	± 9

Length	Target (mm)	Maximum Allowable (mm)
- 6 to 12 m	± 9	± 12
- Additional for every subsequent 6m	± 5	± 6

Squareness of a corner: If the longer side of a member is taken as a base then the shorter adjacent side should not vary from the perpendicular by more than the following:

Dimensional Tolerances in Precast Concrete Work

Length of Shorter Sides	Target (mm)	Maximum Allowable (mm)
- up to and including 1.2 m	± 5	± 6
- over 1.2 m but less than 1.8 m	± 7	± 9
- 1.8 m and over	± 9	± 12

Twist: Any corner should not be more than the deviation stated below from the plane containing the other three corners.

Dimensional Tolerances in Precast Concrete Work

	Target (mm)	Maximum Allowable (mm)
- up 600 mm wide and up to 6 m in length	± 5	± 9
- over 600mm wide and for any length	± 9	± 12

Flatness

Dimensional Tolerances in precast Concrete Work

	Target (mm)	Maximum Allowable (mm)
-maximum deviation from a 1.5m straight edge	± 5	± 6

Reinforcing steel

21. Reinforcing steel for precast concrete units shall be high yield and shall comply with all the relevant clauses applicable to reinforcing steel.

Filling behind precast concrete units

22. The Contractor is to ensure the temporary stability of precast concrete units during placement of any in-situ concrete infill or granular backfills. The Contractor shall submit to the Project Manager method statements for placement of backfill, which demonstrate through calculation or otherwise, the temporary stability of the precast units.

17 B: Structural Concrete – Promenade Structures

APPENDIX 17B/1: SCHEDULE FOR THE SPECIFICATION OF DESIGNED CONCRETE

The following specification applies to the Promenade Structures detailed on 415437-MMD-00-XX-DR-S-2030 to 2399 series drawings, which includes the promenade raised RC seawalls.

Schedule for the Specification of Designed Concrete

Requirement		Schedule
Designed Concrete Ref		Prom - C35/45 RC
Location in the Works		Raised seawalls.
Intended Working Life of Structure		120 years
Nominal Cover to Reinforcement		75mm
Applicable Exposure Classes		XC3/4 XF4 XS3
DC-class (where appropriate)		DC-2
Compressive Strength Class of Concrete		C35/45 ($f_{cu} = 45\text{N/mm}^2$)
Minimum Cement Content (kg/m^3)		400
Maximum Free Water/Cement Ratio		0.40
Required Group or Type and Class of Cement or Combination	IIIA+SR (46% to 65% GGBS) or IIIB+SR (66% to 80% GGBS).	
Maximum Aggregate Size, mm		20
Chloride Content Class		Max. Cl 0,30
For Lightweight Concrete, the Density Class or Target Density or For Heavyweight Concrete, the Target Density	Not applicable as normal density concrete required.	
Consistence Class		S3
Required Source/Special Type of Aggregate	Aggregate to have a Los Angeles abrasion resistance <30 (LA30) to BS EN 1097-2 / BS EN 12620:2002+A1. Each constituent material to be obtained from a single consistent source.	
Maximum Cement Content (kg/m^3)		450
Required Admixture	Contractor to submit for approval. Must not contain calcium chloride and must be compliant with BS EN 934.	
Air Entrainment Required		NO
Minimum or Maximum Temperature of Fresh Concrete °C		5°C Min & 35°C Max
Sampling and Testing		See appendix 17/4.
Requirements to Control Early Thermal Cracking	Curing requirements in appendix 17/4. Install reinforcement and movements joints as per details.	

Requirement	Schedule
Designed Concrete Ref	Prom – ST2
Location in the Works	Concrete blinding for promenade structures.
Intended Working Life of Structure	Not applicable.
Nominal Cover to Reinforcement	Not applicable.
Applicable Exposure Classes	Not applicable.
DC-class (where appropriate)	Not applicable.
Compressive Strength Class of Concrete	C8/10 ($f_{cu} = 10\text{N/mm}^2$)
Minimum Cement Content (kg/m^3)	180
Maximum Free Water/Cement Ratio	-
Required Group or Type and Class of Cement or Combination	CEM I, IIA, IIB-S, IIB-V, IIIA, IVB-V
Maximum Aggregate Size, mm	20
Chloride Content Class	Max. Cl 0,30
For Lightweight Concrete, the Density Class or Target Density or For Heavyweight Concrete, the Target Density	Not applicable as normal density concrete blinding required.
Consistence Class	S3
Required Source/Special Type of Aggregate	Aggregate to have a Los Angeles abrasion resistance <30 (LA30) to BS EN 1097-2 / BS EN 12620:2002+A1. Each constituent material to be obtained from a single consistent source.
Maximum Cement Content (kg/m^3)	450
Required Admixture	Contractor to submit other proposed admixtures for approval. Admixtures must not contain calcium chloride and must be compliant with BS EN 934. Each constituent material to be obtained from a single consistent source.
Air Entrainment Required	NO
Minimum or Maximum Temperature of Fresh Concrete °C	5°C Min & 35°C Max
Sampling and Testing	See appendix 17/4.
Requirements to Control Early Thermal Cracking	Not applicable.

Requirement	Schedule
Designed Concrete Ref	Prom – ST4
Location in the Works	Mass concrete for promenade structures or concrete surround.
Intended Working Life of Structure	Not applicable.
Nominal Cover to Reinforcement	Not applicable.
Applicable Exposure Classes	Not applicable.
DC-class (where appropriate)	Not applicable.
Compressive Strength Class of Concrete	C16/20 ($f_{cu} = 20\text{N/mm}^2$)
Minimum Cement Content (kg/m ³)	220
Maximum Free Water/Cement Ratio	-
Required Group or Type and Class of Cement or Combination	CEM I, IIA, IIB-S, IIB-V, IIIA, IVB-V
Maximum Aggregate Size, mm	20
Chloride Content Class	Max. Cl 0,30
For Lightweight Concrete, the Density Class or Target Density or For Heavyweight Concrete, the Target Density	Not applicable as normal density concrete blinding required.
Consistence Class	S3
Required Source/Special Type of Aggregate	Aggregate to have a Los Angeles abrasion resistance <30 (LA30) to BS EN 1097-2 / BS EN 12620:2002+A1. Each constituent material to be obtained from a single consistent source.
Maximum Cement Content (kg/m ³)	450
Required Admixture	Contractor to submit other proposed admixtures for approval. Admixtures must not contain calcium chloride and must be compliant with BS EN 934. Each constituent material to be obtained from a single consistent source.
Air Entrainment Required	NO
Minimum or Maximum Temperature of Fresh Concrete °C	5°C Min & 35°C Max
Sampling and Testing	See appendix 17/4.
Requirements to Control Early Thermal Cracking	Not applicable.

APPENDIX 17B/3: CONCRETE – SURFACE FINISHES

1708.1 Trial panels – additional requirements

1. As per clause 1708.1 of the Specification for Highway Works.
2. Prior to commencing concrete works the Contractor shall prepare test panels of suitable size in accordance with BS EN 206 for all concrete elements including the retaining walls and different coloured promenade slabs. These trial panels shall be provided for CCBC to approve the concrete mix, concrete colour, aggregate composition and surface finish.

1708.4 Surface finishes for concrete – additional requirements

3. As per clause 1708.4 of the Specification for Highway Works.
4. Insitu RC raised seawalls shall have a Class F3 finish (including seaward side of seawalls).

APPENDIX 17B/4: CONCRETE – GENERAL

5. Fresh concrete temperature requirements as per Appendix 17A “Fresh Concrete Temperature”

1702.1 Permitted Cements or Combinations to BS 8500.

1. As per clause 1702.1 of the Specification for Highway Works.
2. **Prom - C35/45 RC**
3. **Prom – ST2 & Prom – ST4** = CEM I, IIA, IIB-S, IIB-V, IIIA, IVB-V

1702.2 Aggregates - additional requirements

4. As per clause 1702.2 of the Specification for Highway Works.
5. Aggregate with a Los Angeles abrasion resistance <30 (LA30) to BS EN 1097-2 / BS EN 12620:2002+A1..

1702.3 Admixture - additional requirements

6. As per clause 1702.3 of the Specification for Highway Works.
7. Contractor to submit proposed admixtures for approval. Admixtures must not contain calcium chloride and must be compliant with BS EN 934.

1702.3 Pigmented concrete - additional requirements

8. As per clause 1702.3 of the Specification for Highway Works.

1707.2 Concrete sampling and testing – additional requirements

9. As per clause 1707.2 of the Specification for Highway Works.
10. Concrete compressive strength tests undertaken by UKAS/ NAMAS accredited laboratory. Sample at point of placing. Each type of concrete sampled every 60m³ or per day (whichever occurs first). 4 cubes per sample and tested at 7days, 14days, 28days and spare. Cubes for early age strength testing to be stored under same conditions as concrete in members.

1707.2 Concrete identity check – additional requirements

11. As per clause 1707.2 of the Specification for Highway Works.
12. Check all delivery tickets meet works specification, visually check all concrete and undertake slump tests to each delivery.

1710.1 Construction joints – additional requirements

13. As per clause 1710.1 of the Specification for Highway Works.

14. Concrete pours to match movement joints where possible. Construction joints located as per drawings or as required between areas of different contrasting concrete. Contractor to submit proposals for alternative construction joint locations in accordance with the works information for approval.

1710.1 Retarding agents – additional requirements

15. As per clause 1710.1 of the Specification for Highway Works.
16. Retarding agent product details shall be submitted by Contractor for approval from CCBC. The retarding agent must be environmentally friendly. Application must be in accordance with manufacturer's instructions by uniform fine low pressure spraying. Retarding agent must be completely removed after use. Retarding agent must not weaken the concrete surface and cause surface aggregate to become dislodged.

1710.5 Curing of Concrete – additional requirements

17. As per clause 1710.5 of the Specification for Highway Works and proposed curing agents must be environmentally friendly.
18. BS EN 13670 Clause F.8.5 titled "Curing and protection" and table F.2 titled "Minimum curing period for curing class 3" applies.

1712 Reinforcement Materials – additional requirements

19. As per clause 1712 of the Specification for Highway Works.
20. Reinforcement shall be derived from a minimum of 70% recycled steel and sourced from a CARES certified supplier.

1712.5 Stainless Steel Dowels – additional requirements

21. As per clause 1712.5 of the Specification for Highway Works.
22. Stainless steel dowels shall be grade 1.4436 with a 0.2% proof strength of 500N/mm² to BS EN 10088 and BS 6744.

1727.1 Inspection and testing of structures and components – additional requirements

23. As per clause 1727.1 of the Specification for Highway Works.
24. Contractor to write and submit an inspection and test plan to CCBC for approval. Contractor to inspect and check all their work in accordance with BS EN 13670 and the works information. Inspection and checking shall be documented in accordance with an approved quality management system to ISO 9001. Contractor must also to invite CCBC's site supervisor in sufficient time to inspect all work including reinforcement, formwork, cleaning before casting, concrete, concreting and curing, injection etc.

APPENDIX 17B/5: BURIED CONCRETE

No specific additional requirements. See previous sections.

APPENDIX 17B/7: PRECAST CONCRETE ELEMENTS

Not used for promenade structures. See Appendix 17A/7 of Structural Concrete: Seaside Structures for precast step elements and Appendix 26/4 for landscape features.

24 Brick, Blockwork and Stonework

APPENDIX 24/4 SEAWALL REPAIRS

1. The existing seawalls which adjoin the new rock revetment shall be repaired prior to the revetment construction. See promenade drawings 415437-MMD-00-XX-DR-S-2030 for specific requirements and the below.

2. Masonry wall repairs.

a) Do not use frozen or lay masonry units on frozen surfaces. Do not bed masonry units or repoint when ambient air temperature is at or below: 3°C for cement mortars / 5 °C for hydraulic lime mortars. Maintain masonry repairs above freezing until mortar has fully set. Prevent masonry from drying out rapidly during hot or windy conditions. Rake out and replace new mortar damaged by frost.

b) The Contractor shall provide suitable and safe means of gaining access to all repair areas to enable the Works to be carried out and the Employers Supervisor to carry out the necessary inspections. Abseiling techniques shall not be used. The means of access shall be to the approval of the Employers Supervisor and to the current safety regulations and appropriate British and European Standards.

c) Scaffolds, platforms and cradles shall be designed, erected, operated, maintained and dismantled so as to ensure that safe working conditions are provided for all site personnel. In addition, complete protection shall be provided to the structure, its occupants and the general public.

d) Before cleaning work begins the Contractor shall remove all surface attachments (signs, notices, electrical fittings etc.) from the area to be repaired or from positions that obstruct access or which may be damaged. The method of removal shall be such as to avoid unnecessary damage and shall be subject to the approval of the Employers Supervisor. Once repair work is complete, all surface attachments shall be reinstated by the Contractor.

e) Loose units shall be removed with as little disturbance as possible and set aside for reuse. The stability of the masonry shall be maintained at all times. Temporary prop or wedge voids as necessary to maintain structural stability. Report defects (including signs of movement) that are exposed or become apparent during the removal of masonry units.

f) Lost or damaged masonry shall be replaced with masonry matching the existing wall. Samples of the proposed masonry shall be supplied by the Contractor for the approval of the Employers Supervisor a minimum of seven days prior to ordering replacement masonry.

g) Surrounding areas of masonry shall be carefully and thoroughly cleaned by means of high pressure water jetting to remove all traces of dirt or other contaminants, paint, algae, moss, lichens, plant growth etc.

h) Prior to laying bedding mortar, surrounding areas of masonry shall be cleared of dust and debris, and thoroughly dampened with clean water to control suction as necessary. Any surplus water shall be removed before repair work begins. Repair stones shall be dampened with clean water prior to placement.

i) Masonry shall be bedded to match existing and flush pointed with a propriety class R4 (to BS EN 1504-3:2005; i.e. minimum 45N/mm² compressive strength) repair mortar suitable for the Marine environment e.g. "Marine Mortar S" by Flexcrete or equivalent accepted similar approved product with BBA or BS EN 1504 certification. The product shall be applied in accordance with the manufacturer's instructions.

j) The units must be accurately aligned, to ensure satisfactory junctions with existing and maintain existing joint widths. All joints must be fully filled with mortar. The exposed faces must be kept clear of mortar.

k) The extent of the repair works shall be agreed on site with the Employers Supervisor prior to commencement of the works, shall be marked up on the seawalls and photographs taken as a record.

3. Repointing works

a) To be read in conjunction with appendix 24/4 clause 2 as appropriate.

b) Where masonry is to be repointed, all joints shall be thoroughly raked out to remove all loose or defective material without damaging sound mortar and to a minimum depth of 100mm. All dust and debris should be removed from the joint. Care should be taken not to displace or undermine surrounding stones.

c) The joints shall be fully filled with no voids and keyed in with mortar to appendix 24/4 clause (i) of this Specification, and struck flush with the surrounding masonry. All surplus mortar shall be removed from around the joint to leave a tidy finish free from wide feathered edges.

d) Joints or holes deeper than 150mm shall be pressure or injection pointed, with nozzle sizes appropriate to the width of the joint or hole. Joints are to be fully filled with no voids.

26 Miscellaneous

APPENDIX 26/4 STREET FURNITURE

Refer to drawing: 415437-MMD-00-XX-DR-S-2030, 2031 and 2134

Seating Units

1. Concrete seating bench
2. Manufacturer & Model: Broxap Fallowfield or equivalent accepted
3. Dimensions: 2000mm long, 600mm wide and 450mm high
4. Fixed to RC pad foundation: See drawing 415437-MMD-00-XX-DR-S-2134 for requirements.

Litter Bins

5. Nexus 200 general waste / mixed recycles recycling bin by Glasdon or equivalent accepted.
6. Bin to be centre on foundation.
7. Bin approx. 1177mm high, 1169mm wide and 591mm deep
8. Fixed to RC pad foundation: See drawing 415437-MMD-00-XX-DR-S-2134 for requirements.

APPENDIX 26/6 COASTAL STRUCTURE ECOLOGICAL ENHANCEMENTS

This Appendix is dedicated to structural modifications made to coastal elements of the scheme to enhance the ecological habitat, including the rock revetment and the pedestrian access steps. Coastal elements of the scheme are shown within coastal discipline drawings - 415437-MMD-00-XX-DR-C-3500s series.

Textured outer walls

1. See drawings and appendix 17A for requirements.

Ecological Armouring Units

2. Ecological armouring units, "Oyster Shell" model type supplied by EConcrete® (ECO Armouring Unit) or similar accepted such as BIOBLOCK (1.5m x 1.5m x 1.1m) shall be installed at the locations shown on drawing 415437-MMD-00-XX-DR-C-3500.
3. Ecological armouring units shall be placed such that they are amongst the existing rocks, on the slope of the existing groynes, at levels comprised between -2.00m AOD and -3.00m AOD (bottom level).
4. The location of the units shall be decided on site, in advance of works, by a marine ecologist to avoid patches of reef.
5. The specific concrete matrix used for the casting is defined in Appendix 17/1 in line with the project's distinct constructive and biological requirements and the supplier recommendations.
6. The design of the unit should be tailored to the local species and be adapted accordingly. These adaptations will need to be agreed with the supplier and accepted by the Project Manager prior to commencement of works.

APPENDIX 26/10 ARTWORK

Refer to drawing 19.537

ALL ARTWORK DESIGN TO BE SUPPLIED FOLLOWING CONSULTATION WITH CCBC AND STAKEHOLDERS. SELECTED ARTWORK DESIGN MAY BE SUBJECT TO CCBC APPOINTMENT. ALL DETAILS SHOULD BE VIEWED AS INDICATIVE AND SUBJECT TO CHANGE.

Ground inset artwork

1. Location: Promenade Active Travel Route
2. Drawing: location shown on 415437-MMD-00-XX-DR-S-2030
3. Supplier: Hardscape Products Ltd. (Tel 01204 59062) or equal and approved
4. Artwork reference: A1 – Granite Health Markers
5. Stone type 1: central block - natural granite 'Crystal black' sawn finish: mist' granite insets
6. 1500mm long x 500mm wide x 100mm deep,
7. Stone type 2: 2No. end blocks, granite 'Kobra sawn finish;
8. 750mm long x 500mm wide x 100mm deep,
9. Special marker edge granite 'Kobra'; Special marker insets: Granite 'mist'
10. Special Funder's marker; granite 'Mist'; insets: 'Edgerton' red sandstone
11. Fixing: dowel fixed. See structures discipline drawings and specification.
12. Jointing: 10mm mortar joint
13. Artwork insets: Designs duplicated and expanded from Colwyn Bay Waterfront Phase 2 Health Markers.

APPENDIX 26/11 ENVIRONMENTAL MITIGATION UNDERTAKEN BY CONTRACTOR

1. The following **Air Quality** mitigation measures shall be incorporated into the CEMP and it is the responsibility of the Contractor to ensure dust and emission control methods presented below are agreed with the local authority and implemented effectively:
 - a. General
 - i. Display the name and contact details of person(s) accountable for air quality and dust issues on site boundary;
 - ii. Display contractor's head or regional office contact information; and
 - iii. Develop and implement a Dust Management Plan (DMP) as part of the CEMP, including regular site inspections.
 - b. Site Management
 - i. Record all dust and air quality complaints, identify causes and take appropriate action and record measures to reduce emissions. Make a complaints log available to the local authority when requested; and
 - ii. Record any exceptional incidents that cause dust and air quality pollutant emission either on or off the site and the action taken to resolve it.
 - c. Monitoring
 - i. Undertake daily on-site and off-site inspection where receptors are nearby to monitor dust;
 - ii. Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked; and

- iii. Increase the frequency of site inspections by the person accountable for air quality and dust issue on site when activities with a potential to produce dust are being carried out during dry or windy conditions.
- d. Preparing and Maintaining the Site
 - i. Plan site layout so that machinery and dust causing activities are away from receptors, as far as is possible;
 - ii. Erect solid screens or barriers around dusty activities or the application site boundary that are at least as high as any stockpiles on site. Keep screens clean using wet methods;
 - iii. Fully enclose area of concern on-site or specific operations where there is a high potential for dust production and the site is active for an extensive period;
 - iv. Avoid site run-off of water or mud. A record of any site run off shall be kept and actions to prevent reoccurrence;
 - v. Keep site fencing, barrier and scaffolding clean using wet methods;
 - vi. Remove materials that have a potential to produce dust from site as soon as possible unless being re-used on site;
 - vii. Cover, seed or fence stockpiles to prevent wind whipping;
 - viii. Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques;
 - ix. Ensure an adequate water supply on the site for effective dust/ particulate matter suppression/ mitigation using non-potable water where possible and appropriate;
 - x. Use enclosed chutes and conveyors and covered skips;
 - xi. Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling;
 - xii. Ensure equipment is readily available on site to clean any dry spillages; and
 - xiii. No burning of waste.
 - xiv. Use of low pollution vehicles and machinery where possible.
 - xv. Utilize sustainable travel.
 - xvi. Ensure all vehicles switch off engines when stationary - no idling vehicles;
 - xvii. Avoid the use of diesel or petrol-powered generators and use mains electricity or battery powered equipment where practicable; and
 - xviii. Impose and signpost a maximum speed limit (15mph on surfaced road, 10mph on un-surfaced road).
- e. Construction
 - i. Avoid dusty surface treatments to concrete or stone (scabbling) if possible; and
 - ii. Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out. Unless this is required for a particular process, in which case ensure that appropriate additional controls are in place.
- f. Trackout
 - i. Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use;
 - ii. Avoid dry sweeping of large areas;
 - iii. Ensure vehicles entering and leaving the site are covered to prevent escape of materials during transport;

- iv. Record all inspections of haul routes and any subsequent action in a site logbook; and
- v. Implement a wheel washing system.

2. The Contractor shall adhere to the following **primary biodiversity** mitigation and enhancement measures.

- a. The core wintering bird season (October to March inclusive) shall be avoided for the delivery of revetment rock via barge (should this delivery method be selected). This would avoid disturbance to SPA bird species and also would minimise the risk of standing time due to storms and safety/delay risks for moving boulders between barges by transshipment in bad weather;
- b. Vessels present in the intertidal area of the Site at high tide (for the unloading of rock via barge) shall not drop anchor, and instead barges would be guided and positioned by tugs or small support vessels. This would avoid any potential impact on mussel bed or Sabellaria alveolata habitat as a result of meeting anchors;
- c. Piling works shall be undertaken at low tides. This would avoid piling within the marine water body, therefore avoiding the propagation of underwater noise through the water column and avoiding any resultant impacts on marine mammals and finfish.
- d. Throughout the construction and operational phases, best practice guidance in reference to pollution prevention shall be followed; CIRIA (2015)103.

3. The Contractor shall undertake the following **secondary biodiversity** mitigation measures during construction largely relating to safeguarding habitats and species from works. The CEMP would include, but not be limited to the following:

- a. Marine Pollution Contingency Plan (to include information on the prevention of the release of hydrocarbons, solid waste and plastics into the marine environment and how to deal with these should a pollution event of this nature occur);
- b. Marine Bio-security Plan (this shall consider how to prevent and monitor the potential introduction and spread of INNS (Invasive and Non-Native Species) and disease within the marine environment on site e.g. biosecurity protocols to follow for vessels associated with the works. It shall also outline contingency actions to take should INNS or disease be discovered on site);
- c. Erosion prevention measures (to include restricting plant movement on vegetated and unvegetated ground (including intertidal sands), avoidance of repeated tracking and the provision of erosion matting);
- d. Use of tree-protection fencing (in line with BS5837-2012117) and other demarcation fencing to protect retained habitats from construction encroachment;
- e. Best practice measures to reduce noise and vibration during construction;
- f. Damping down of dust sources and other measures to minimise air quality effects to habitats;
- g. Best practice construction and hygiene measures (avoiding littering, fires, storage of foods, etc);
- h. Best practice pollution prevention measures;
- i. Construction safeguards to include, where relevant, timing of works to avoid sensitive seasons and/or check surveys and supervised clearance of habitats to safeguard nesting birds, reptiles and mammals (including badger and common burrowing mammals), as follows:
 - a. Nesting Birds: Any woody vegetation clearance or building demolition to be undertaken outside of the nesting bird season (widely considered to be from March to August inclusive but can vary depending on the species/or seasonal constraints). Where this is not possible, pre-clearance checks must be undertaken by an experienced ecologist (at the Contractors cost) to identify if any birds are nesting within or close to the vegetation

due to be removed. If a bird's nest is found, it must be left in-situ and protected from the works. No works can be undertaken in that area until the young birds have fledged from the nest site, which may take up to 6 weeks depending on the species;

- b. Reptiles: Vegetation clearance (NWC Railway Line embankments) to be undertaken between April and the end of October, if possible, whilst reptiles are active. Vegetation clearance would be undertaken in a phased manner under ecological supervision and preceded by a hand search for reptiles. Any reptiles encountered would be moved to outside of the working area; and
- c. Badgers (and other mammals): An update check would be undertaken 12 weeks prior to the commencement of works on the NWC Railway Line embankments to ascertain whether there is any evidence of badger or other mammals. Works shall avoid any recorded or potential tunnels or burrows, where possible. In the unlikely event badgers are recorded, setts would be avoided during works. General best practice should be followed within the construction zone (including avoiding storage of large piles of earth near the woodland and no open excavations to be left overnight without a mammal ladder or ramp).
- j. Measures to minimise light spill onto sensitive habitats (including use of directional lighting as well as minimising night working); and
- k. Adherence to a Surface Water Management Plan.
- l. *Sabellaria alveolata* and *Mytilus edulis* (Blue Mussel bed): Pre-construction photographic condition surveys have been undertaken of the marine habitats on site. It is important to take ongoing images of the site immediately after construction is completed as this would enable records to be taken of the amount of existing habitat that was lost to incorporate the site enhancements (e.g. sections of groynes and associated *Sabellaria alveolata* that were removed to enable the installation of ecological armouring units). This would provide a suitable baseline against which to assess any improvement in colonisation of the enhanced areas of the site over the future years.

4. The Contractor shall undertake the following **coastal process** mitigation measures:

- a. Following the appointment of a Contractor, and the selection of a delivery method for the revetment rock (barge or road), the CEMP shall be updated to outline the routes where the construction vehicles can travel to minimise the area of beach affected. These routes would be finalised in agreement with CCBC and NRW, but as a minimum would exclude the Blue Mussel bed, and areas of Honeycomb Worm reef patch (see Drawing 415437-MMD-00-XX-DR-N-1711), along with the avoidance of disturbing the existing rock groyne areas where Honeycomb Worm has been identified (other than for ecological enhancement works – placement of ecological armouring units). A site walkover by an experienced ecologist 6-8 weeks prior to works commencing shall be completed to make any necessary changes to plant movement routes and proposed stockpiling areas. Where material to be retained is disturbed, localised reinstatement of the beach shall be undertaken.
- b. Stockpile locations would be agreed in advance with CCBC and NRW once a Contractor has been appointed (to be recorded in the CEMP) and the revetment rock delivery method has been selected. During construction, to reduce short term negative impact on hydrodynamics and the sediment transport regime, materials, such as rock armour used for revetment construction, shall be stored as high up the beach as practicable. Where this is not possible, the size of the stockpile shall be assessed to ensure that changes to the current flows are not creating areas of scour. The Contractor shall monitor the beaches around the stockpiles, and the beach levels reinstated (with due respect to the construction works scope) should beach lowering be recorded. A Contractor-led beach inspection scheme shall be required, to be agreed in advance with CCBC and NRW and detailed in the CEMP.
- c. Excavation of waste materials would be kept to the minimum required in order to allow a solid founding for new structures without the removal and disturbance of excess materials. This would

minimise displacement of removed sediments onto the foreshore that might be dispersed leading to an increase in suspended sediments.

- d. If transshipment of revetment rock is considered necessary, the Contractor shall produce a Transshipment Management Plan for approval of CCBC, NRW and other local stakeholders prior to construction. It is proposed that this plan would include the identification of the transshipment locations offshore and a bathymetric survey of the area prior to works commencing. The plan shall also include shipping corridors to the frontage, along with bathymetric surveys of these areas. The methodology for transferring rocks between barges shall also be included to minimise the loss of rocks overboard. A plan for recovering any lost rocks off the seabed shall also be included should this be required by NRW.
- e. The contractor shall develop and implement a robust Construction Flood Risk Management Plan prior to commencement of the construction phase. To reduce the potential increase in flood risk and increased erosion during the temporary removal of defences, works shall be scheduled as far as is practicable for lower tides and reduced storm periods (i.e. outside the winter period). The Contractor shall also closely monitor and make provision the tides and any storm events.
- f. A detailed CEMP shall be produced by the Contractor detailing the practical and necessary measures required during construction to prevent the pollution of the surrounding environment.
- g. Contamination should not be released during the works. Should existing contamination be identified, an appropriate risk assessment would be completed to ascertain any additional mitigation measures considered necessary.

5. The Contractor shall undertake the following **Landscape** mitigation measures:

- a. Lighting during construction shall be designed to minimise light pollution during the hours of darkness. Lighting shall be directional to prevent light spill and designed to reduce skyglow;
- b. Site fencing around the construction sites shall be well maintained throughout the construction period;
- c. Cycleways shall be diverted to allow access where possible;
- d. Footpaths shall be diverted to allow access where possible;
- e. During construction and offloading of materials, the affected beach area shall be off limits to recreational users of the beach and water. Users would be encouraged to use other stretches of the coastline.
- f. All areas of land within the Scheme red line boundary that have been temporarily occupied during the construction phase (areas not to be re-developed) shall be re-instated to pre-construction condition.
- g. The Contractor would adopt sensitive policies towards reducing visual impact as far as possible. Wherever possible viewing areas shall be provided so that members of the public can safely view the ongoing work;
- h. Subject to approval from CCBC areas where works are complete shall be reopened to the public as soon as safely possible;
- i. Complaints from residents would be collated by the Contractor and wherever possible mitigation undertaken to reduce that impact; and
- j. Where planned activities are anticipated to cause a visual disturbance, the Council shall be informed in advance to allow notification of the proposed works to be disseminated.

6. The Contractor shall undertake the following **materials** mitigation measures:

- a. A Materials Management Plan (MMP) shall be compiled by the Contractor, if required, as part of the Construction Environmental Management Plan (CEMP). It shall identify ways to re-use

site-won or excavated materials within the construction of the Scheme, provided they meet the requirements of the CL:AIRE Code of Practice (CoP)190;

- b. A site waste management plan (SWMP) shall also be developed by the Contractor as part of the CEMP. It shall contain specific information on how material with the potential to become waste is reused or managed on- or off-site during the construction of the proposed Scheme. The SWMP is a key part of the CEMP and would be a live document based on construction operations as they occur; and
- c. The MMP and SWMP shall show how efficient use of material resources and reduction of waste arisings would be achieved, and how the potential impacts identified in this chapter would be reduced or mitigated.
- d. Materials shall as far as practicable be delivered on an 'as required' basis to avoid damage or contamination and limit the generation of waste;
- e. Where site-won material is not available or suitable for re-use; secondary or recycled materials shall be procured where available and practicable;
- f. In accordance with the specification all suitable excavated material would be re-used in the construction of the Scheme and in landscaping features to reduce the requirement to import materials for construction and reducing the need to remove surplus materials from site;
- g. Excavating activities shall be confined to the minimum areas required for the works to minimise the quantity of contaminated material removed;
- h. Temporary stockpiling of fill materials prior to incorporation in the Scheme shall be avoided where possible, to ensure double handling and damage is minimised and therefore avoidance of waste. However, where required, materials shall be stockpiled in accordance with best practice and managed appropriately to limit the likelihood of damage or contamination;
- i. Locally sourced materials and suppliers shall be identified and used, where practicable, to reduce fuel requirements and cost of delivery, for example sand along the coast where permitted. This also reduces greenhouse gas emissions resulting from transportation;
- j. Pre-fabricated elements shall be used for Contractor Design elements, where practicable and in accordance with the Specification, to ensure efficient use of materials and avoid the generation of waste arisings from off-cuts;
- k. Collaborating with nearby projects to provide and use surplus material, where suitable;
- l. The waste hierarchy shall be implemented throughout the construction to minimise disposal and maximise re-use and recycling of site-won material. Opportunities for re-use and recycling include (but are not limited to):
 - i. Re-using excavated soils on-site in the landscaping features of the Scheme;
 - ii. Chipping green waste on-site for use in the landscaping for the Scheme;
 - iii. Composting of green waste;
 - iv. Recycling of inert material by crushing, blending and subsequent re-use, as an aggregate;
 - v. Re-using waste on other nearby schemes, subject to permitting requirements and suitability of the material; and
 - vi. Re-using waste for uses with clear benefits to the environment, for example in the remodelling of agricultural land or in the restoration of nearby quarries or other excavation sites.
- m. Facilities e.g. site compounds and skips would be provided on-site to separate out waste, for example for recycling.

7. The Contractor shall undertake the following **noise and vibration** mitigation measures:

- a. Construction noise and vibration shall be managed through implementation of the good practice documented within the Construction Environmental Management Plan (CEMP). See Appendix 1/9 for permitted hours of working, and noise & vibration requirements.
- b. Furthermore, the mitigation measures below from BS5228-1:2009+A1:2014 shall be undertaken by the Contractor where practicable:
 - i. Unnecessary revving of engines would be avoided, and equipment would be switched off when not in use;
 - ii. Internal haul routes would be kept well maintained;
 - iii. Rubber linings in, for example, chutes and dumpers would be used to reduce impact noise;
 - iv. Drop heights of materials would be minimised;
 - v. Plant and vehicles would be sequentially started up rather than all together;
 - vi. Use of effective exhaust silencer systems or acoustic engine covers as appropriate;
 - vii. As far as reasonably practicable, sources of significant noise would be enclosed;
 - viii. Plant would always be used in accordance with manufacturers' instructions. Care would be taken to site equipment away from noise-sensitive areas. Where possible, loading and unloading would also be carried out away from such areas;
 - ix. Regular and effective maintenance by trained personnel would be undertaken to keep plant and equipment working to manufacturers specifications;
 - x. Screening e.g. noise barriers and blinds would be used as appropriate;
- c. Consideration shall be given to traffic routing, timing and access points to the Site so as to minimise noise impacts at existing receptors following contractor appointment, and as construction working methods are developed. However, increases in road traffic noise levels during works would be temporary, relatively short term, and although the effect would be dependent on the actual number of HGV deliveries, it is considered that significant effects can be managed and avoided;
- d. Contractors would issue a project route map and delivery schedule to control construction traffic. Traffic management would be employed to guide and control both public and construction traffic during deliveries;
- e. All work outside these hours would be subject to prior agreement of, and/or reasonable notice to CCBC. Night-time working would be restricted to exceptional circumstances, and any minor indoor work if absolutely necessary.
- f. Construction Traffic - To mitigate potential disturbance traffic calming measures and/or enforcement would potentially be effective if traffic is perceived as noisier due to increases in combination with speeding vehicles. To prevent complaints, good community consultation and communication would be vital along with effective complaint management. It would be important to gather information on any received complaints and respond quickly.
- g. Construction Vibration - A risk assessment identifying the probability of vibration from any piling activities shall also be carried out prior to commencement of construction activities, to determine the need for periodic or continuous vibration monitoring. It is recommended that the contractor uses techniques such as rotary piling methods that are least likely to cause vibration. Should the need arise, additional means of mitigating potential effects would be considered as the construction arrangements are developed further. It is likely that the magnitude of the potential vibration effects can be reduced, if not avoided altogether, as a result of these further considerations.
- h. For the general control of vibration, BS5228-2:2009+A1:2014 recommends:
 - xi. Selection of appropriate piling technique and energy input;

- xii. Provision of cut off trenches (which are similar to noise screens in that they interrupt the direct path between source and receiver);
- xiii. Pre-boring which can reduce resistance to penetration;
- xiv. Site management and planning;
- xv. Working methods such as hours of work;
- xvi. Control of vibration at source by replacing plant/methods of works at or near vibration sensitive premises, where reasonably practicable, with less intrusive plant and/or methods of working;
- xvii. Where reasonably practicable, vibrating equipment would be located as far from sensitive premises as possible, and, if on a structure, not on one which is continuous with that of the sensitive premises; and
- xviii. Identify any opportunities to reduce vibrations from piling activities through identifying any alternative methods available and removal of obstructions to reduce the exacerbation of transmission of vibration.

8. The Contractor shall undertake the following **Public Health** mitigation measures:

- a. During the tendering process the contractor shall demonstrate the measures it shall utilise to employ a local workforce so that long- and short-term benefits can be attributed to the local area (CCBC area).
- b. The Contractor shall develop a CEMP to minimise disruption to businesses for customers, deliveries and staff and to minimise disruption to pedestrians, cyclists and users of the beach;
- c. Temporary diversions and other management procedures shall be advertised throughout the WIA; and
- d. The Contractor shall develop a Traffic Management Plan to minimise disruption to motorised users
- e. The Contractor shall identify commitments to benefit local workforce and these are implemented and monitored.

30 Landscape and Ecology

Unless otherwise stated, works as described in the Specification for Highway Works, Series 3000.

APPENDIX 30/1: GENERAL

1. The Contractor shall give at least 48 hours' notice to the Supervisor of the intention to commence any of the operations listed in sub-Clause 3001.2.
2. The bird nesting season shall be confirmed by the Employer.
3. Please refer to the following drawing which show the locations of the proposed soft landscape works:
- 415437-MMD-00-XX-DR-S-2030
(These shall be read in conjunction with all relevant drawings and specification.)

APPENDIX 30/2: WEED CONTROL

Requirements noted in Appendix 30/4.

APPENDIX 30/4: GROUND PREPARATION

Grass Seeding/Wildflower Seeding/Turfing Areas - Preparation

Seeded Areas

1. Contractor is required to make good to edges between new hard works and existing grass with topsoil sown with a seed-mix to match the existing grassland. Mix RE8 Coastal reclamation MG12 grassland or equal approved. Please refer to drawing 19.537/104.
2. Growth and development to be healthy, vigorous grass sward, free from visible effects of pests, weeds, disease.
3. Appearance: A closely knit, continuous ground cover of even density, height and colour.

Climatic Conditions

4. Works to be conducted while soil and weather conditions are suitable (generally April to September, avoiding hot dry periods in July-August)

Preparation / Materials

5. General: Free from toxins, pathogens or other extraneous substances harmful to plant, animal or human life.
6. A certificate is to be submitted giving supply source, content analysis, confirmation of suitability for purpose and confirmation of absence of harmful substances. All materials are to come from the same source for the entirety of the contract. If the supply source is exhausted and a new supplier is needed the certificate process is to be repeated for the new source, which is to match the original source in every respect to create a seamless joint between adjacent areas from different sources where this is unavoidable.
7. The contractor is required to give notice before ordering and/or using materials for ground preparation.

Herbicide for Emergent Weeds in Grass Areas

8. Type: Glyphosate leaf -applied contact translocated herbicide. Apply to areas on instruction of Project Manager only with glove applicator –spray application shall not be used due to windy conditions and lack of control of spray drift.

Cultivation

9. Compacted topsoil: Contractor is to make every effort to avoid unnecessary compaction of soil in areas to be planted, but where this is unavoidable, break up to full depth.
10. Tilth: Reduce top 100 mm of topsoil to a tilth suitable for blade grading, particle size 10 mm (maximum).
11. Material brought to the surface: Remove stones and clay balls larger than 25 mm in any dimension, roots, tufts of grass, rubbish and debris.

Grading

12. Topsoil condition: Reasonably dry and workable.
13. Contours: Smooth and flowing, with falls for adequate drainage. Remove minor hollows and ridges.
14. Finished levels after settlement shall be 25 mm above adjoining paving, kerbs, manholes etc.
15. Blade grading may be used to adjust topsoil levels provided depth of topsoil is nowhere less than 100mm.

16. Contractor is required to give notice if required levels cannot be achieved by movement of existing soil.

Final Cultivation

17. Cultivation shall take place after grading and fertilizing.
18. Seed bed: Reduce to fine, firm tilth with good crumb structure.
19. Depth: 25 mm.
20. Surface preparation: Rake to a true, even surface, friable and lightly firmed but not over compacted.
21. Remove surface stones/ earth clods exceeding 10mm:
 Adjacent levels: Extend cultivation into existing adjacent areas sufficient to ensure full 'marrying-in' of levels.

Pre-Seed Fertilizer (Amenity Grass Areas Only- N.B. NOT in areas for Wildflower seeding))

22. Type: British Seed Houses Ref. BSH Agrosil LR 0-20-0 or equal and approved.
23. Fertiliser to be applied application before final cultivation and three to five days before seeding/ turfing.
24. Fertiliser shall be spread evenly at 50gms/m2.
25. The Contractor shall not use pre-seed fertiliser in areas scheduled for wildflower seeding.

Pre-Seeding Watering

26. Quantity: Wet full depth of topsoil.
27. Application: Even and without displacing seed, seedlings or soil.
28. Frequency: As necessary to ensure the establishment and continued thriving of all seeding/ turfing.

Planting Areas - Preparation

Weed Control for all Planted Areas

29. Prevent weeds from seeding and perennial weeds from becoming established, by manual methods.

Soil Specifications

30. Imported topsoil to be multi-purpose topsoil to BS3882:2015 (as 4.1 a), within the parameters of Table One (p.5-6) designated as "sandy loam" with reference to the Soil Texture Triangle Fig. 1, Sample of topsoil to be provided, stating name of supplier and place of origin.
31. Composition: Previously prepared mixture of topsoil excavated from pit plus additional imported topsoil as required, plus peat free soil improver/compost incorporated at application rate of 20% of total backfill
32. Soil improver / compost material – submit details to Project Manager for consideration /approval prior to placing orders.
33. Topsoils may be retained for reuse, location to be agreed with Project Manager.

Cultivation

34. Compacted topsoil: Break up to full depth prior to spreading compost.

- 35. Within a few days before planting, but in suitably dry weather and ground conditions, cultivate top 300mm of all planting beds, using suitable plant to loosen, aerate and break up soil into particles of 2 - 8 mm.
- 36. Surface: Finished levels after settlement to be 25 mm above adjoining paving, kerbs, manholes etc.
- 37. Remove weeds, perennial weed roots, and undesirable material brought to the surface including stones and clods larger than 25 mm in any dimension, tufts of grass and foreign matter.
- 38. Soil within root spread of trees and shrubs to be retained: Do not dig or cultivate.

Climatic Conditions

- 39. General: Carry out the work while soil and weather conditions are suitable. Do not plant during periods of frost or strong winds. Plant only during the following periods:
- 40. Deciduous shrubs: Late October to late March
- 41. Herbaceous plants [field grown]: September/October or March/April
- 42. Container grown plants: At any time if ground and weather conditions are favourable. Ensure that adequate watering (as Q31 / 765) and weed control is provided.

Watering prior to Planting

- 43. Quantity: Wet full depth of container prior to planting.
- 44. Application: apply evenly and without damaging soil structure.

Water Restrictions

- 45. General: If water supply is or is likely to be restricted by emergency legislation, do not carry out planting until instructed. If planting has been carried out, obtain instructions on watering.

Reuse of Existing Turf

- 46. Any existing grassed areas covered up by the works is to be carefully harvested and reused. The contractor shall keep records of quantities.

APPENDIX 30/5: GRASS SEEDING, WILDFLOWER SEEDING AND TURFING

Quality of Seed for all Areas

1. Freshness: Produced for the current growing season.
2. Certification: Blue label certified varieties to EC purity and germination regulations and the Department for Environment, Food and Rural Affairs Higher Voluntary Standard. When requested, submit an Official Seed Testing Station certificate of germination, purity and composition.
3. Samples of mixtures: Submit when requested.

Sowing

4. General: Establish good seed contact with the root zone to promote healthy, consistent growth.
5. Method: To suit soil type, amenity usage of area, location and weather conditions during and after sowing.
6. Oversowing: where sown on steeper slopes the Contractor must include an allowance for oversowing to ensure full coverage of the area to be seeded.
7. Germinal Seeds Ltd. (formerly British Seed Houses) (Tel. 01522-868714) OEA Mix WFG 20 ECO Species-rich lawn or equal comprising species all as detailed on drawing 19.537/201/C01
8. Rate of application: 5gm/m², sown 10mm deep.

APPENDIX 30/7: GRASS, BULB AND WILDFLOWER MAINTENANCE

Maintenance

1. Duration: Carry out the following operations from completion of seeding for a period of 12 months following Completion, or until grass is established.
2. All maintenance operations are to be instructed in writing by the Project Manager during the course of this period to make due allowance for the prevailing weather conditions.
3. Submit proposed maintenance schedule with tender (for preliminary reference purposes only)

Cleanliness

4. Soil and arisings: Remove from hard surfaces.
5. General: Leave the works in a clean, tidy condition at completion and after any maintenance operations.

First Cut of General Grassed Areas

6. Timing: When grass reaches 50mm high and is reasonably dry.
7. Preparation: Before cutting, remove debris, litter, and stones and earth clods larger than 25 mm in any dimension.
8. Height of first cut: 25mm
9. Arisings: remove from site

Maintaining General Grass Areas

10. Maximum height of growth at any time: 38mm
11. Preparation: Before each cut remove all litter and debris.
12. Cutting: As and when necessary to a height of 25mm
13. Arisings: to be removed
14. Bulb planting areas: Do not cut until bulb foliage has died down [Jan – May].
15. Trimming: At the time of each cut, trim all grass edges, including round the base of trees, manholes, etc. and remove arisings.
16. Stones brought to the surface: Remove regularly.
17. Areas of settlement: Make good.
18. Watering: as NG3008.

Weed Control

19. Weed control: Keep the sward substantially free of broad leaved weeds by applying a suitable selective herbicide.

Fertilizer for Amenity Grass Areas

20. Supplier: Contractor to specify
21. March application: 15:10:10 Spring turf fertilizer at 35 g/m².
22. September application: 5:10:10 Autumn turf fertilizer at 50 g/m².
23. Stones brought to the surface: Remove regularly.
24. Size: Exceeding 25 mm in any dimension.
25. Areas of settlement: Make good.
26. The Contractor shall not use fertiliser in areas of wildflower seeding.

Failures of Seeding / Turfing

- 27. General: Seeded areas that have failed to thrive (unless due to theft or malicious damage), during the 12 month period stated from Completion, will be regarded as defects due to materials or workmanship not in accordance with the Contract. Make good by re-cultivation and reseeding/ re-turfing.
- 28. Timing of making good: Submit proposals.

APPENDIX 30/8: WATERING

Duration

1. Carry out the following watering operations from completion of planting to end of 12 months rectification period.

Watering - Shrubs, Herbaceous

2. Frequency: regular watering during the first two year period is critical to the establishment of the plants. A minimum of one visit per fortnight during the period mid-March – mid September (28 weeks / 14 visits minimum per annum plus contingency of 7no. further occasions) or at other intervals to suit the prevailing weather conditions.
3. Rate of watering (minimum) –
 - Shrub / herbaceous planting – 10 litres / m² per visit

