



Neath Port Talbot County Borough Council

PORT TALBOT HARBOURSIDE

Earthworks Specification





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Earthworks Specification

(R3) CONFIDENTIAL

PROJECT NO. 62253048

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1 INTRODUCTION

- 1.1.1. This document provides the Series 600 Earthwork Specification Appendices for Port Talbot Harbourside and shall be read in conjunction with the 'Manual of Contract Documents for Highways Works (MCHW): Volume 1 - Specification for Highway Works (SHW): Series 600: Earthworks', amendment February 2016.
- 1.1.2. Any perceived conflicts or inconsistencies between this Specification and the SHW, or perceived relevant omissions noted in this Specification, shall be referred to the Engineer for further clarification at least 48 hours prior to that component of the work commencing. In such cases, unless agreed with the Engineer in writing, the SHW shall prevail.
- 1.1.3. This Specification incorporates the relevant earthwork requirements stipulated in the Works & Site Information for the scheme. Notwithstanding this, the Contractor shall refer to the Works & Site Information and the requirements therein.
- 1.1.4. The Contractor will be responsible for identifying chartered and unchartered services to confirm their position and determine whether they are commissioned.
- 1.1.5. There is Archaeological interest in the site and a watching brief will need to be considered. The Contractor is to develop a detailed brief to cover an Archaeological mitigation strategy. Archaeological discoveries and delays will remain an Employer's Risk item.
- 1.1.6. These Specification Appendices shall also be read in conjunction with the following geotechnical reporting for the scheme:
- Phase 1 Desk Study Report, Opus reference V-C8602.01/OIC/00/XX/RP/01, dated July 2017;
 - Interpretive Geo-Environmental Ground Investigation Report, Opus reference V-C8602.01/OIC/00/XX/RP/02, dated September 2017;
 - Port Talbot Harbourside Generic Quantitative Risk Assessment – Supplementary Site Investigation Report, WSP reference 62253048-001, dated September 2019.
 - Port Talbot Harbourside Controlled Waters Detailed Quantitative Risk Assessment Rev 2, WSP reference 62253048-002, dated February 2020;
 - Port Talbot Harbourside Additional Product Investigation – Factual Report, WSP reference 62253048-003, dated February 2020; and
 - Port Talbot Harbourside Remediation Strategy, WSP reference 62253048-004, dated April 2020.
- 1.1.7. Historical ground investigations indicate the ground conditions beneath the site comprise Made Ground overlying a sequence of Cohesive Superficial Deposits or directly on Granular Superficial Deposits. The South Wales Middle Coal Measures Formation was only recorded beneath the Granular Superficial Deposits at one location in the east/north-east area of the site, from 6.5 to 8.0 m bgl.
- 1.1.8. The Made Ground was observed to be slightly variable in its composition although predominantly coarse and granular in nature, comprising a mixture of ash, slag, brick, concrete and stone with various inclusions of deleterious material including metal, glass and wood. The thickness of the Made Ground ranges from around 0.7 to 4.7m.
- 1.1.9. The underlying Superficial Deposits were predominantly recorded as medium dense to very dense sandy gravel, with most of the exploratory holes refusing within this stratum. A 0.2 to 2.8 m thick



layer of Cohesive Superficial Deposits was recorded to overlie the Granular Superficial Deposits across the north-west area of the site only, described as soft and firm sandy gravelly clay.

2 PROPOSED WORKS

- 2.1.1. It is proposed to develop the site for commercial units with associated hardstanding and car parking areas, as shown on the enclosed drawing C2014B/PS004 Harbourside General Arrangement. The details and locations of the proposed structures are not confirmed although it is understood that the existing levels will need to be raised using imported fill between 0.6 and 1.0 m as part of the overall scheme development.
- 2.1.2. The site is irregularly shaped, approximately 2.8 hectares in area and is situated off Old Dock Way and Harbour Way (A4241), Port Talbot. Port Talbot Parkway Railway Station is located beyond the north-east area of the site. The centre of the site is located at National Grid Reference 276566E 189503N.
- 2.1.3. It should be noted the proposed development platform has not been designed to be load bearing, therefore foundations for structures shall penetrate to the base of the platform into the underlying strata in order to distribute loads. The proposed development platform shall be restricted to 25mm settlement and shall provide acceptable long-term performance (i.e. mimic the minimum 60-year design life of the proposed structures).
- 2.1.4. This specification shall predominantly be a method specification with some end product requirements to permit the construction of roads/ external hardstanding areas.
- 2.1.5. At this time no source material has been identified although it is understood that the material will be imported from another site. All imported material to be utilised as part of the earthworks will be subject to the classification, control and verification testing detailed within this report. Classification, control and verification testing shall be the responsibility of the Contractor who shall make allowance to comply with the requirements of this specification.
- 2.1.6. Prior to commencing the full earthworks, a test pad of a minimum size of 20m x 10m is required to be undertaken to prove the method specification in terms of material type, plant to be used, number of passes to be made, testing required and layer thickness to achieve the necessary compaction.
- 2.1.7. This Earthwork Specification should be read in conjunction with the approved Remediation Strategy for the site, which includes the contamination re-use criteria for site-won materials. The criteria in this Earthwork Specification include contamination criteria for imported materials only.
- 2.1.8. Upon completion of the works, the Contractor shall prepare a verification report which confirms that the works have been completed in accordance with the design drawings and specification. This shall include records of all laboratory and insitu testing, as built records, any soft spots identified and any problems identified and resolved during the works.

3 HEALTH AND SAFETY

- 3.1.1. The Contractor shall be responsible for ensuring that all operations and activities, whether on or off the site, are carried out in full compliance with the appropriate health and safety legislation, at current amendments, and with the appropriate guidance documents and approved Codes of Practice published by the HSE. Relevant legislation and guidance include, but is by no means limited to the following:
- Health & Safety at Work Act 1974;
 - Management of Health & Safety at Work Regulations 1992 and subsequent amendments;
 - Construction (Design and Management) Regulations 2015;
 - Control of Substances Hazardous to Health Regulations 2004 and subsequent amendments;
 - Control of Asbestos Regulations 2012, and;
 - Health & Safety Executive Report ref HS(G)66 'Protection of the workers and the general public during the development of contaminated land' 1994.
- 3.1.2. The Contractor shall comply with all regulations of the Local and other Authorities giving notices and paying all fees legally demandable.
- 3.1.3. These works will be subject to the provisions of the Construction (Design and Management) Regulations 2015. This specification relates to the following parties:
- **Client:** Neath Port Talbot County Borough Council
 - **Principal Contractor:** TBC
 - **Contractor:** TBC
 - **Principal Designer:** Neath Port Talbot County Borough Council
 - **Engineer/ Supervisor:** Neath Port Talbot County Borough Council

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

List 'A' below is a list of the relevant Numbered Appendices referred to in the Series 600 Specification for Highway Works with those not adopted marked 'Not Used'.

APPENDIX NUMBER	APPENDIX TITLE	
	Preliminaries	
1/5	Testing to be carried out by the Contractor	Used
	Earthworks	
6/1	Requirements for Acceptability & Testing etc. of Earthworks Materials	Used
6/2	Requirements for Dealing with Class U1B and Class U2 Unacceptable Materials	Used
6/3	Requirements for Excavation, Deposition, Compaction (Other than Dynamic Compaction)	Used
6/4	Requirements for Class 3 Materials	Not Used
6/5	Geotextiles Used to Separate Earthworks Materials	Not Used
6/6	Fill to Structures and Fill Above Structural Foundations	Used
6/7	Sub-formation and Capping and Preparation and Surface Treatment of Formation	Used
6/8	Topsoiling	Used
6/9	Earthwork Environmental Bunds, Landscape Areas, Strengthening Embankments	Used
6/10	Ground Anchorage's, Crib Walling and Gabions	Not Used
6/11	Swallow Holes and Other Naturally Occurring Cavities and Disused Mine Workings	Used
6/12	Instrumentation & Monitoring	Used
6/13	Ground Improvement	Used
6/14	Limiting Values for Pollution of Controlled Waters	Used
6/15	Limiting Values for Harm to Human Health and the Environment	Used

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

- 5.1.1. Unless otherwise stated in Table 1/5, all sampling and testing in this Appendix shall be undertaken by the Contractor.
- 5.1.2. Tests comparable to those specified in this Appendix will also be necessary for any equivalent work, goods or materials proposed by the Contractor.
- 5.1.3. Testing of imported and cover material should also be carried out in accordance with the below document:
 - Requirements for the Chemical Testing of Imported Materials for Various End Uses and Validation of Cover Systems, Welsh Land Contamination Working Group (V1.1). May 2013.
- 5.1.4. Unless otherwise shown in this Appendix, tests for work, goods or materials as scheduled under any one Clause are required for all such works, goods or materials in the Works.
- 5.1.5. Unless otherwise shown in this Appendix, test certificates for work, goods or materials as scheduled under any one Clause are required for all such work, goods or materials in the Works.
- 5.1.6. All samples used in the earthworks testing shall be taken from materials after delivery to the Site for incorporation into the Works, except for those required for source testing which shall be sampled from the quarry or stockpile to be used.
- 5.1.7. The Contractor's attention is drawn to the requirements of the relevant Specification Appendices for the form of all deliverables, storage of test records, and storage of records of materials imported to / exported from Site.
- 5.1.8. Where the Engineer is of the opinion that any of the material properties defined within Table 1/5 may have changed for a particular material type, he may require the Contractor to repeat any of the testing to confirm acceptability (e.g. if a particular source material is deemed to be variable and the acceptability test data may not be representative of all the material).
- 5.1.9. Definitions of earthworks abbreviations:

MC or mc:	Natural Moisture Content.
Organic Matter:	Organic Matter Content as determined from the 'Walkley Black Method'.
OMC:	Optimum Moisture Content.
MDD:	Maximum Dry Density.
HSV:	Hand Shear Vane.
ACM:	Asbestos and Asbestos Containing Materials.
MCV:	Moisture condition value
PL:	Plastic limit
(N):	UKAS or equivalent accredited laboratory sampling and test report or certificate is required.

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

Clause	Works, Goods or Material		Test	Frequency of Testing	Test Certificate	Comments
Series 600						
601, 631 to 633, 635 to 637, 640, 644	Acceptable material					
	Class	General Description				
	1A	Well Graded Granular Fill	(i) Grading/ uniformity coefficient	1 per 1,000 m ³ (min 3 per source)	Required (N)	Testing frequency shall be reviewed as works advance. Contamination testing relates to imported material only.
			(ii) MC	1 per 500 m ³ (min 3 per source)		
			(iii) MDD/ OMC	Initial data set of 5 per source, then weekly		
			(iv) Contamination (soil and soil leachate)	1 per 500 m ³ (Natural) 1 per 250 m ³ (Made Ground)		
	1B	Uniformly Graded Granular Fill	(i) Grading/ uniformity coefficient	1 per 1,000 m ³ (min 3 per source)	Required (N)	Testing frequency shall be reviewed as works advance. Contamination testing relates to imported material only.
			(ii) MC	1 per 500 m ³ (min 3 per source)		
			(iii) MDD/ OMC	Initial data set of 5 per source, then weekly		
			(iv) Contamination (soil and soil leachate)	1 per 500 m ³ (Natural) 1 per 250 m ³ (Made Ground)		
601, 631 to 633, 635 to 637, 640, 644	1C	Coarse Granular Fill	(i) Grading/ uniformity coefficient	1 per 1,000 m ³ (min 3 per source)	Required (N)	Testing frequency shall be reviewed as works advance. Contamination testing relates to
			(ii) Los Angeles Coefficient	1 per 1,000 m ³ (min 3 per source)		
			(iii) Contamination (soil and soil leachate)	1 per 500 m ³ (Natural) 1 per 250 m ³ (Made Ground)		

Clause	Works, Goods or Material		Test	Frequency of Testing	Test Certificate	Comments
601, 631 to 633, 635 to 637, 640, 644	2A	Wet Cohesive Material	(i) Grading	1 per 1,000 m ³ (min 3 per source)	Required (N)	imported material only.
			(ii) Plastic Limit (PL)	1 per 500 m ³ (min 3 per source)		Testing frequency shall be reviewed as works advance. Contamination testing relates to imported material only.
			(iii) MC	1 per 500 m ³ (min 3 per source)		
			(iv) MCV	1 per 500 m ³ (min 3 per source)		
			(v) Undrained Shear Strength of Remoulded Material	1 per 500 m ³ (min 3 per source)		
			(vi) Contamination (soil and soil leachate)	1 per 500 m ³ (Natural) 1 per 250 m ³ (Made Ground)		
	2B	Dry Cohesive Material	(i) Grading	1 per 1,000 m ³ (min 3 per source)	Required (N)	Testing frequency shall be reviewed as works advance. Contamination testing relates to imported material only.
			(ii) Plastic Limit (PL)	1 per 500 m ³ (min 3 per source)		
			(iii) MC	1 per 500 m ³ (min 3 per source)		
			(iv) MCV	1 per 500 m ³ (min 3 per source)		
			(v) Undrained Shear Strength of Remoulded Material	1 per 500 m ³ (min 3 per source)		
			(vi) Contamination (soil and soil leachate)	1 per 500 m ³ (Natural) 1 per 250 m ³ (Made Ground)		
	2C	Stony Cohesive Material	(i) Grading	1 per 1,000 m ³ (min 3 per source)	Required (N)	Testing frequency shall be reviewed as works advance.
			(ii) Plastic Limit (PL)	1 per 500 m ³ (min 3 per source)		
			(iii) MC	1 per 500 m ³ (min 3 per source)		

Clause	Works, Goods or Material		Test	Frequency of Testing	Test Certificate	Comments
			(iv) MCV	1 per 500 m ³ (min 3 per source)		Contamination testing relates to imported material only.
			(v) Undrained Shear Strength of Remoulded Material	1 per 500 m ³ (min 3 per source)		
			(vi) Contamination (soil and soil leachate)	1 per 500 m ³ (Natural) 1 per 250 m ³ (Made Ground)		
	5B	Imported Topsoil	BS 3882-2015 compliant.	2 per source	Required	
			Contamination testing (soil and leachate testing). For suite refer to App. 6/14 and App 6/15.	3 per source		
	6F1	Selected Granular Fill (fine grading)	(i) Grading	1 per 1000 m ³ (min 3 per source)	Required (N)	Testing frequency shall be reviewed as works advance. Contamination testing relates to imported material only.
			(ii) MC	1 per 500 m ³ (min 3 per source)		
			(iii) MDD/ OMC	Initial data set of 5 per source, then weekly		
			(iv) Los Angeles coefficient	1 per 1,000 m ³ (min 3 per source)		
			(v) Class Ra (asphalt) content	1 per 1,000 m ³ (min 3 per source)		
			(vi) Bitumen Content	1 per 1,000 m ³ (min 3 per source)		
			(vii) Contamination (soil and soil leachate)	1 per 500 m ³ (Natural) 1 per 250 m ³ (Made Ground)		
	6F2	Selected Granular Fill (coarse grading)	(i) Grading	1 per 500 m ³ (min 3 per source)	Required (N)	
			(ii) MC	1 per 500 m ³ (min 3 per source)		

Clause	Works, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
		(iii) MDD/ OMC	Initial data set of 5 per source, then weekly		Testing frequency shall be reviewed as works advance. Contamination testing relates to imported material only.
		(iv) Los Angeles coefficient	1 per 1,000 m ³ (min 3 per source)		
		(v) Class Ra (asphalt) content	1 per 1,000 m ³ (min 3 per source)		
		(vi) Bitumen Content	1 per 1,000 m ³ (min 3 per source)		
		(vii) Contamination (soil and soil leachate)	1 per 500 m ³ (Natural) 1 per 250 m ³ (Made Ground)		
	6F5	Size designation and overall grading category	1 per 1000 m3 (min 3 per source)	Required	Testing frequency shall be reviewed as works advance.
		Maximum fines and oversize categories	1 per 1000 m3 (min 3 per source)		
		Volume stability of blast furnace slag	Source approval and 6 monthly		
		Volume stability of steel (BOF and EAF) slag	Source approval and 6 monthly		
		Other aggregate requirements	Annex C of BS EN 13242		
		Laboratory dry density and optimum water content	Initial data set of 5 per source, then weekly		
		Water content	Weekly		
		Bitumen content	1 per 1,000 m3 (min 3 per source)		
		Class A (asphalt) content	Source approval and Weekly		

Clause	Works, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
601, 644	Earthworks material within 500 mm of metallic structural elements, concrete, cement bound materials, other cementitious mixtures, or stabilised capping forming part of the permanent works	Water soluble sulphate (WS), Total sulphur (TS), and sulphide content Oxidisable sulphides (OS) content and pH	To satisfy clauses 601.16, 601.17, and 644 (min 5 per source)	Required (N)	Testing frequency shall be reviewed as works advance.
Compaction of Fills					
612	Method Compaction	Field Dry Density/ MC	1 per 1,000 m ³ (min 3 per material type and at least one test every other layer)	Required (N)	Sand replacement or correlated nuclear density meter. Testing frequency shall be reviewed as works advance.
		Optimum MC (2.5kg rammer/ vibrating hammer method)	Weekly (min 3 per source)		
		Undrained shear strength and CBR - using plate load testing (600mm)	Earthworks formation level – 1 per 1000m ² and identified soft spots Earthwork fill materials – 1 per 500 m ² (on every 2 nd layer and on the final layer)		
	Compaction Trials	20m x 10m zone required to prove compaction method is adequate	1 per source material. To be undertaken one week prior to commencement of Earthwork operations. To be witnessed by the Engineer.	Required (N)	Summary report on conclusions required.

Footnotes to Table 1/5:

1. Table 1/5 to be reviewed following completion of the compaction trial.
2. Contamination testing frequency requirements of imported material should be confirmed with the Contaminated Land Officer in advance of the works.

6 APPENDIX 6/1: REQUIREMENT FOR ACCEPTABILITY AND TESTING OF EARTHWORKS MATERIALS

- 6.1.1. The following materials are not acceptable constituents of all classes of materials under the Contract:
- Topsoil, turf or other materials of an organic nature except for use within classes 5A, 5B and 5C;
 - Chalk as defined in clause 601.5;
 - Slag resulting as a by-product of steel production unless the Contractor can demonstrate to the satisfaction of the Engineer that it is stable, inert and free from expansive properties.
- 6.1.2. A schedule of acceptability limits for the fill materials required for this Contract is given in Table 6/1 of these Appendices. The grading requirements and the compaction requirements for each class of fill are given in Table 6/2 and Table 6/4 of the Specification for Highway Works Series 600, respectively.
- 6.1.3. Only the earthworks materials recorded in Table 6/1 of this Specification may be used in the works.
- 6.1.4. It has been assumed that the re-use of site won naturally occurring material will be completed under the Definition of Waste: Code of Practice (DoW:CoP). Liaison and approval with the LPA and NRW is required to confirm this is acceptable. The works should be completed in conjunction with the approved Remediation Strategy which states the re-use criteria for site-won soils.
- 6.1.5. The preliminary classification of earthworks materials into their various Classes shall be carried out by the Contractor. This should be done prior to, and at the point of, excavation for materials to be won from within the Site, and at the point of source for imported materials. The preliminary classification shall be subject to verification by testing as noted below.
- 6.1.6. Prior to the Engineer granting approval for imported fill, classification and acceptability tests shall be carried out by the Contractor. For each material source, three sets of relevant tests shall be performed on each class of materials to be used in the earthworks.
- 6.1.7. The Contractor shall provide two copies of all the classification test results, within five working days from the completion of the test, to the Engineer, duly signed by the Contractor's Responsible Engineer or Technician.
- 6.1.8. Where the Engineer is of the opinion that the classification of imported material has changed, he may require the Contractor to repeat the classification tests to check its acceptability.
- 6.1.9. The rapid assessment procedure for assessing material acceptability is not permitted in this Contract.
- 6.1.10. The frequency of testing of earthworks materials is indicated in Appendix 1/5.
- 6.1.11. The Contractor is permitted to remove acceptable material, or unacceptable material required to be processed, from the site to suit his operational procedure only where it is surplus to the works.
- 6.1.12. There is no identified requirement for groundwater lowering or other groundwater treatment in the works other than as determined by the Contractor to satisfy the requirements of Clause 602.15 and 602.16.

- 6.1.13. No material within 475mm of the designed final road surface shall be frost susceptible as defined in TRRL Supplementary Report SR 829, whether pavement, capping, fill material in embankments or in-situ material in cuttings.

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

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	
GENERAL GRANULAR FILL	1	A	Well graded granular material	General fill	Any material, or combination of materials, other than chalk. Recycled aggregate. (other requirements detailed in Table 6/1 of SHW)	(i) grading	BS 1377: Part 2	Tab 6/2	Tab 6/2	Tab 6/4 Method 2
						(ii) uniformity coefficient	See Note 5	10	-	
						(iii) mc	BS 1377: Part 2 See Note 4	OMC - 2%	OMC +2%	
						(iv) MDD/ OMC	BS 1377 Part 4	-	-	
						(v) Limiting values for human health, environment and controlled waters	-	-	App 6/14 and 6/15	
	1	B	Uniformly graded granular material	General fill	Any material, or combination of materials, other than chalk. Recycled aggregate. (other requirements detailed in Table 6/1 of SHW)	(i) grading	BS 1377: Part 2	Tab 6/2	Tab 6/2	Tab 6/4 Method 3
						(ii) uniformity coefficient	See Note 5	-	10	
						(iii) mc	BS 1377: Part 2	OMC - 2%	OMC +2%	

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	
							(iv) MDD/ OMC	BS 1377 Part 4	-	-	
							(v) Limiting values for human health, environment and controlled waters	-	-	App 6/14 and 6/15	
1	C		Course granular material	General fill	Any material, or combination of materials, other than chalk. Recycled aggregate. (other requirements detailed in Table 6/1 of SHW)	(i) grading	BS 1377: Part 2	Tab 6/2	Tab 6/2	Tab 6/4 Method 5	
						(ii) uniformity coefficient	See Note 5	5	-		
						(iii) Los Angeles coefficient	Clause 635	-	50		
						(iv) Limiting values for human health, environment and controlled waters	-	-	App 6/14 and 6/15		
GENERAL COARSE FILL	2	A	Wet cohesive material	General fill	Any material, or combination of materials, other than chalk.	(i) grading	BS 1377: Part 2	Tab 6/2	Tab 6/2	Tab 6/4 Method 1 except for materials with liquid limit >50, determined by BS 1377: Part 2, only deadweight tamping or	
						(ii) plastic limit (PL)	BS 1377: Part 2	-	-		
						(iii) mc	BS 1377: Part 2	PL-4%	STT		

GENERAL COHESIVE FILL	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					
								See Note 4				vibratory tamping rollers or grid rollers shall be used.			
							(iv) MCV	Clause 632	-	-					
							(v) Undrained shear strength of remoulded material	Clause 633	50 kN/m ²	-					
							(vi) Limiting values for human health, environment and controlled waters	-	-	App 6/14 and 6/15					
	2 B						Dry cohesive material	General fill	Any material, or combination of materials, other than chalk.	(i) grading		BS 1377: Part 2	Tab 6/2	Tab 6/2	Tab 6/4 Method 2
										(ii) plastic limit (PL)		BS 1377: Part 2	-	-	
										(iii) mc		BS 1377: Part 3 See Note 4	STT	PL- 4%	
			(iv) MCV	Clause 632	-	-									
			(v) Undrained shear strength of	Clause 633	80 kN/m ²	-									

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	
						remoulded material				
						(vi) Limiting values for human health, environment and controlled waters	-	-	App6/14 and 6/15	
GENERAL COHESIVE FILL	2	C	Stony cohesive material	General fill	Any material, or combination of materials, other than chalk.	(i) grading	BS 1377: Part 2	Tab 6/2	Tab 6/2	Tab 6/4 Method 2
						(ii) plastic limit (PL)	BS 1377: Part 2	-	-	
						(iii) mc	BS 1377: Part 2 See Note 4	OMC-2%	OMC+2%	
						(iv) MCV	Clause 632	-	-	
						(v) undrained shear strength of remoulded material	Clause 633	50 kN/m ²	-	
						(vi) Limiting values for human health, environment and controlled waters	-	-	App 6/14 and 6/15	

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	
Topsoil	5	B	-	Imported topsoil	Topsoiling	General purpose grade complying with BS 3882 (2015)	-	-	-	-	-
SELECTED GRANULAR FILL	6	F	1	Selected granular material (fine grading)	Capping	Natural gravel, natural sand, crushed gravel, crushed rock, crushed concrete, slag, well burnt colliery spoil or any combination thereof. None of these constituents shall include any argillaceous rock. Recycled aggregate except recycled asphalt. (other requirements detailed in Table 6/1 of SHW)	(i) grading	BS 1377: Part 2	Tab 6/2	Tab 6/2	Tab 6/4 Method 6
						(ii) mc	BS 1377: Part 2 See Note 4	OMC - 2%	OMC		
						(iii) MDD/ OMC	BS 1377: Part 4	-	-		
						(iv) Los Angeles coefficient	Clause 635	-	60		
						(v) Class Ra (asphalt) content	Clause 710	-	50%		
						(vi) bitumen content	BS EN 12697-1 or BS EN12697-39	-	2.0%		
						(vii) Limiting values for human health, environment and controlled waters	-	-	App 6/14 and 6/15		

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	
SELECTED GRANULAR FILL	6	F	2	Selected granular material (coarse grading)	Capping	Any material, or combination of materials – including recycled aggregates with not more than 50% by mass of recycled bituminous planings and granulated asphalt, but excluding materials contaminated with tar and tar-bitumen binders, unburnt colliery spoil and argillaceous rock.	(i) Grading	BS 1377: Part 2	Tab 6/2	Tab 6/2	Tab 6/4 Method 6
	(ii) MDD/ OMC	BS 1377: Part 4	-				-				
	(iii) mc	BS 1377: Part 2 See Note 4	OMC - 2%				OMC				
	(iv) Los Angeles coefficient	Clause 635	-				50				
	(v) Class Ra (asphalt) content	Clause 710	-				50%				
	(vi) Bitumen content	BS EN 12697-1 or BS EN12697-39	-				2.0%				
	(vii) Limiting values for human health, environment and controlled waters	-	-				App 6/14 and 6/15				
6	F	5	Selected granular material (coarse grading)	Capping	Unbound mixture complying with BS EN 13285 containing aggregate conforming to BS EN 13242 from one or more of the	(i) size designation and overall grading category	BS EN 13285 - 0/80 and G _E	Tab 6/2	Tab 6/2	Tab 6/4 Method 6	

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	
SELECTED GRANULAR FILL	- Imported on to the Site		following source codes, see Notes 8, 9 and 10: • P (natural aggregates – except chalk, shale, siltstone or slate, see Note 7) • A2 (crushed concrete) • A3 (crushed bricks, masonry) • A4 (mixed recycled aggregate) • 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).	(ii) Maximum fines and oversize categories	BE EN 13285 - UF ₁₅ and OC ₇₅	Tab 6/5	Tab 6/5	
				(iii) Los Angeles Coefficient	BS EN 13242-LA ₅₀	-	50	
				(iv)Volume stability of blast furnace slag	BS EN 13242 - free from dicalcium silicate and iron disintegration	-	-	
				(v) Volume stability of steel (BOF) and (EAF) slag	BS EN 13242 - V ₅	-	-	
				(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	-	-	

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					
							Property (x) in the next column shall not apply if the Class Ra (asphalt) content of any recycled aggregate is 20% or less.		(viii) Water content	BS EN 1097 - 5	OMC-2%	OMC+2%
									(ix) Class A (asphalt) content	Clause 710	-	50%
				(x) bitumen content	BC EN 12697 - 1 or BS EN 12697 - 39	-	2.0%					
Compaction of fills												
612	Compaction Requirements			Field Dry Density/ MC	BS 1377: Part 4	-	-	90% of MDD of BS 1377 part 4, and a dry density corresponding to a maximum of 10% air voids at field MC				
				Plate Tests (600mm)	BS 1377: Part 9	CBR greater than 5%	-					

Footnotes to Table 6/1:

1. App = contract specific Appendix.
2. Tab = Table
3. Where in the Acceptable Limits column reference is made to App 6/1, only those properties having limits ascribed to them in contract specific Appendix 6/1 shall apply. Where contract specific Appendix 6/1 gives limits for other properties not listed in this Table such limits shall also apply.
4. Where BS 1377: Part 2 is specified for mc, this shall mean BS 1377: Part 2 where the material is a soil or BS EN 1097-5 where the material is required to conform to a harmonised European Standard.
5. Uniformity coefficient is defined as the ratio of the particle diameters D_{60} to D_{10} on the particle size distribution curve, where:
 - D_{60} = particle diameter at which 60% of the soil by weight is finer,
 - D_{10} = particle diameter at which 10% of the soil by weight is finer.
6. The limiting values for Class U1B material are given in contract specific Appendix 6/14 and contract specific Appendix 6/15.
7. For works in Wales see sub-Clause 601.21W
8. Materials shall comply with the current Environmental Regulations at the time of use.
9. STT refers to testing where it is necessary to select the parameters following testing of the source of imported materials.
10. Table 6/1 to be reviewed following completion of the compaction trial.

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

- 7.1.1. The following materials are deemed to be unacceptable Class U1A material:
- Any material which does not meet the acceptability criteria and properties of Table 6/1 and Appendix 6/1;
 - Material which does not comply with the requirements of Clause 601 Item 2(i) of the SHW;
 - Any material with wood or peat;
 - Any material with biodegradables;
 - Any material with scrap metal;
 - Frozen or waterlogged substances; and,
 - Material that cannot be compacted because of its particle size or shape.
- 7.1.2. All costs associated with dealing with Class U1A material in making it suitable shall be carried by the Contractor.
- 7.1.3. The Contractor shall carry out visual assessment for the presence of metal, slag, wood, biodegradables etc., and such material shall be excluded from the earthworks fill.
- 7.1.4. Ground investigation works completed at the site have identified contamination at the site has the potential to impact identified receptors. There is evidence of ground contamination throughout the site consisting of:
- Hydrocarbon contamination in soil and groundwater (including free phase);
 - Presence of asbestos fibres in Made Ground across the site area;
 - Locally elevated concentrations of metals in Made Ground;
- 7.1.5. As such, the works included within this report should be completed in conjunction with the approved Remediation Strategy. The Remediation Strategy involves the removal of free-phase product at the site, use of capping layers where applicable and includes limiting values for site-won materials in accordance with the approved risk assessment.
- 7.1.6. It should be noted that extensive Ground Investigation works have been undertaken to enable the Contractor to consider the risks associated with the remediation associated with this Brown Field industrial site.
- 7.1.7. If potentially contaminated material is encountered during the earthworks following the Remedial works being undertaken in accordance with the approved strategy, the Contractor shall immediately advise the Engineer who will instruct on a course of action. This may include removal of the potentially contaminated material to a separate stockpile constructed on an impermeable geotextile separator layer, subsequent sampling and laboratory testing at an interval to be agreed by the Engineer dependent on volume, and advice provided on the suitability of the material for use in the permanent works.
- 7.1.8. The Contractor should ensure that appropriate measures are in place to ensure the protection of both staff and members of the general public during the course of the works. This should include mitigation measures to prevent potential risks associated with the known presence of asbestos at the site.
-

- 7.1.9. The following materials are deemed to be unacceptable Class U1B material:
- Material which does not comply with the requirements of Clause 601 Item 2(ii) of the SHW.
Materials considered to be Unacceptable Class U2 are detailed in the SHW Clause 601 Item 3.
- 7.1.10. Fill material which is not suitable for placing immediately should be stockpiled for use until such time as treatment can be applied to the material to render it suitable.
- 7.1.11. Surplus material shall be stockpiled on site prior to disposal off site by the Contractor on completion of the project. If additional Class U1B or U2 shall be found on site, then the Contractor shall carry out a risk assessment and a suitable course of action shall be agreed.
- 7.1.12. Methods of excavation, precautions and requirements for handling Class U1A material shall be handled in accordance with best practice and the requirements of current health and safety guidance and shall be fully detailed in the construction phase plan. Movements of material shall be carefully controlled and recorded to avoid the risk of mobilising any potential ground contaminants or mixing up of stockpiles.
- 7.1.13. Potentially contaminated and contaminated stockpile areas should be provided with a suitable water run-off collection system to ensure contaminated waters do not impact the site.
- 7.1.14. The Contractor shall carry out laboratory contamination testing of stockpiled materials for disposal off site to confirm its status with respect to waste disposal. The testing shall be in accordance with Appendix 1/5.
- 7.1.15. Generally, all controlled wastes shall be handled and disposed of in accordance with The Waste (England and Wales) Regulations 2011 and the accompanying Code of Practice. Hazardous wastes and asbestos wastes shall also be subject to other relevant controls including those referred to in this Specification.
- 7.1.16. Waste materials shall only be transported off-site by a carrier registered under The Waste (England and Wales) Regulations 2011. A copy of the appropriate registration certificate shall be supplied to the Engineer for approval prior to the start of the works. All open vehicles used for transporting wastes off-site shall be sheeted securely prior to leaving the site areas. Consideration should be given to the need for wheel wash facilities and road sweepers.
- 7.1.17. Should leachate or potentially contaminated waters be encountered they should be collected and stored in tanks or lined ponds. Samples will be taken and scheduled for laboratory testing to determine the nature and concentration of any contamination and the water disposed of appropriately.
- 7.1.18. All soil and groundwater laboratory contamination testing shall be undertaken at a UKAS/ MCERTS accredited laboratory.

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

- 8.1.1. Requirements for earthworks are shown on Drawing No. C2014B/EW/0601.
- 8.1.2. The earthworks shall be constructed to the lines and levels shown on the drawings and on the setting out data. Embankments shall be overfilled and trimmed back to provide the specified compaction of all parts of the embankment, including the slope faces.
- 8.1.3. The Contractor shall be responsible for the design of any temporary works necessary for the Contract. Details of temporary works shall be submitted for the review and approval of the Engineer.

8.2 EXCAVATION

- 8.2.1. The stability of stockpiles and temporary slopes during construction are the responsibility of the Contractor and shall be assessed as part of the Contractor's temporary works proposal.
- 8.2.2. Whilst excavations are not anticipated as part of the bulk earthworks, outline information is provided should any localised excavations be necessary.
- 8.2.3. All excavations to formation level shall be surveyed in using a Total Station or similar to provide X, Y and Z coordinates for As Built records.
- 8.2.4. The Contractor is not permitted to undercut any cutting slopes, toes of cuttings, or undertake excavation in front of any retaining walls without prior acceptance of the methodology from the Engineer.
- 8.2.5. Where localised soft spots (undrained shear strength $<50\text{kN/m}^2$) occur, they shall be removed and replaced with compacted material consistent with the surrounding ground.
- 8.2.6. Blasting is not permitted as an alternative to normal excavation methods.
- 8.2.7. Assessment of waste acceptance criteria shall be carried out prior to export of any site arisings to landfill.
- 8.2.8. Where contaminated deposits are present, specific consideration regarding disposal is likely to be required. This assessment is subject to discussions with the specific landfill to which the waste will be taken and results of further testing during construction.
- 8.2.9. The depth of any earthworks excavation shall not exceed the distance of that earthworks operation from the nearest live traffic lane. This may require the moving of traffic lanes as appropriate.
- 8.2.10. The Contractor shall take all measures required by any Statutory Undertakers, the Management of other publicly owned services, or owners of privately owned services or supplies for the support, protection, backfilling and compaction of material below, adjacent to and above Statutory Undertakers apparatus whether exposed or buried.
- 8.2.11. Unless otherwise directed by the Engineer or the Statutory Undertaker concerned, any voids found during the course of the works shall be backfilled with suitable approved fill material which shall be

similar to the surrounding material and (if necessary) suit its proximity to any other Statutory Undertaker apparatus.

8.3 PREPARATION OF SITE

- 8.3.1. Existing foundations present on the site shall be grubbed out and backfilled in accordance with this Specification.
- 8.3.2. The removal of all buried foundations and structures (some possibly containing reinforced concrete) has to be undertaken and processed so that the material can be redistributed as suitable fill in reshaping the site. The Contractor is to consider the risk of localised obstructions beyond 1.0m bgl and price accordingly.
- 8.3.3. Any site clearance should be carried out in accordance with Highways Agency Manual of Contract for Highway Works Series 200.
- 8.3.4. All topsoil shall be stripped and, where required for further use, stockpiled in an area provided by the Contractor and agreed by the Engineer/ Client.
- 8.3.5. The formation which is receiving the fill material shall be prepared and proof-rolled.
- 8.3.6. The Contractor shall undertake plate load testing on the earthworks formation level at the rate noted in App 1/5 to demonstrate the undrained shear strength of the soils. The Contractor shall demonstrate a minimum undrained shear strength of 50kN/m².
- 8.3.7. Soft material, defined as an undrained shear strength less than 50kN/m², shall be excavated and replaced with material in accordance with this specification.

8.4 DEPOSITION / FILLING

- 8.4.1. Where several different types of fill material are to be placed, they shall be deposited in such a way that as far as possible, the material is deposited evenly across the site in approximately the same sequence, thus ensuring a uniform distribution of fill types over the whole fill thickness.
- 8.4.2. Cobbles, boulders, rock or waste fragments whose largest dimension is greater than two-thirds of the loose layer thickness shall not be incorporated into the fill. If discovered, they shall be stockpiled for processing. Materials such as plastic and metal shall be segregated, stored and sent for off-site recycling.
- 8.4.3. The maximum layer thickness, to method specification, shall be 300mm.
- 8.4.4. No material within 475mm of the designed final road surface shall be frost susceptible as defined in TRRL Supplementary Report SR 829, whether pavement, capping, fill material in embankments or in-situ material in cuttings.

8.5 COMPACTION

- 8.5.1. Fill shall be placed and compacted in near horizontal layers of the thicknesses required to achieve the specified requirements and shall, as far as practicable, be brought up at a uniform rate so that all parts of the site reach finished (formation) level at the same time.

- 8.5.2. The compaction plant selected, the number of passes made, and the fill layer thickness and moisture content used shall have regard to the method specification and requirement to achieve the necessary compaction.
- 8.5.3. The Contractor shall take all necessary steps to ensure that the fill is placed at the moisture content necessary to achieve the specified level of compaction and shall, where necessary, add water to or dry the fill, in order to obtain this value. Where it is necessary to add water, this shall be done as a fine spray and in such a way that there is time for the water to be absorbed into the fill before being rolled by the plant.
- 8.5.4. No fill shall be placed and left uncompacted at the end of a working day. Compacted fill shall be graded to falls to ensure free run-off of rainwater without ponding.
- 8.5.5. Trafficking of the fill by any plant other than compaction plant shall not constitute or be a substitute for compaction plant both for the trials or the works proper
- 8.5.6. Before allowing construction traffic on compacted surfaces, the contractor shall raise the level of compacted cohesive soil by filling at least 150 mm above formation level using properly compacted temporary filling. The temporary protective filling shall be removed from site before permanent construction.
- 8.5.7. Compaction plant and compaction method shall be selected having regard to the proximity of existing trenches, excavations, retaining walls or other structures and all work shall be performed in such a way as to ensure that their existing stability is not impaired.
- 8.5.8. If weather conditions are such that the specified moisture content and density values cannot be achieved, the Contractor shall cease work until such time that the fill can be placed and compacted to meet specification requirements.
- 8.5.9. If the results of control tests indicate that the fill is being placed and compacted in such a way that the desired level of compaction is not being achieved, the Contractor shall further compact or, if necessary, shall excavate the affected work and replace with new fill, compacted to meet the specification requirements.
- 8.5.10. If the results of control tests indicate that antecedent weather conditions (such as frost or heavy rain) have caused deterioration of finished work such that the work no longer meets specification, the Contractor shall take such steps as are necessary to bring the fill to specification requirements at the Contractor's own cost.
- 8.5.11. Additional compaction for the top 600mm below formation is required in accordance with SHW sub-Clause 612.10(ii). In Table 6/4, column headed N#, the number of passes shown shall be doubled for material Classes 1A, 1B, 2A, 2B, 2C and 2D when such materials occur within 600 mm of sub-formation (if capping is required) or formation.

8.6 COMPACTION TRIALS

- 8.6.1. Prior to commencing the full earthworks, a test pad of a minimum size of 20m x 10m is required to be undertaken to prove the method specification in terms of material type, plant to be used, number of passes to be made, testing required and layer thickness to achieve the necessary compaction.
- 8.6.2. The Contractor shall provide the Engineer with the details and specification of the proposed compaction plant. Prior to the compaction trial, the Contractor shall undertake laboratory

classification testing of the proposed fill material in accordance with Appendix 1/5. When the test results are known, the compaction trial shall be allowed to occur. The Engineer shall receive a minimum of 1 weeks' notice of the date of the compaction trial.

- 8.6.3. Compaction of the material in the trial should produce a minimum state of compaction, such that a CBR equal to 5% is achieved at finished level.
- 8.6.4. During the trial, in-situ Nuclear Density Meter tests, sand replacement tests or core cutter testing shall be performed on the surface of layers at locations to be agreed on site by the Engineer following the placement and compaction of the material. Results of these tests shall be compared against those achieved in the soils laboratory following which the layer thickness of material and passes of compaction plant can be confirmed.
- 8.6.5. Copies of the in-situ test results for the compaction trial shall be sent to the Engineer.

8.7 MAIN WORKS

- 8.7.1. The Specification shall be a combination of a Method and end-product specification, compaction shall be carried out in accordance with the requirements of Table 6/1 of this Specification and Table 6/4 of series 600 of the SHW. Compliance testing to assess the degree of compaction shall be carried out.

8.8 COMPLIANCE TESTING

- 8.8.1. Nominal field dry density tests are required for the compacted fill. Field density testing may be carried out using a Nuclear Density Meter (NDM), by sand replacement tests or core cutter. In the event that the NDM is used, the Contractor shall provide to the Supervisor on a weekly basis the data used for the calibration of the NDM in accordance with BS1377 part 9. The compaction shall be controlled by in situ and laboratory testing as follows:
 - In situ dry density using the sand replacement method and nuclear method (BS 1377: Part 9:1990, section 2) and moisture content determinations (BS1377: Part 2:1990, section 3); and
 - Where required these tests shall be augmented by moisture content-dry density relationships (BS1377: Part 4:1990, section 3) and particle density (BS1377: Part 2:1990, section 8).
- 8.8.2. Compliance testing to assess the degree of compaction shall be carried out. The degree of compaction shall be deemed to have been obtained if at least 9 out of 10 consecutive samples taken from the compacted material attain the specified dry density and air void.
- 8.8.3. Should any results lie outside the selected compaction criteria, the Contractor shall provide the Engineer with proposals for rectifying the existing situation and for improving future performance.
- 8.8.4. The Contractor shall carry out plate bearing tests both during and after completion of the works across the site to ensure compliance with the performance criteria at a frequency of 1 test per 500m² on the finished level, and on every second layer as the platform is built up. The tests shall be carried out in accordance with BS 1377: Part 9. Each test shall be carried out in accordance with BS1377: Part 9 Method 4.1. The results shall be converted to CBRs with no results less than 5% acceptable.

9 APPENDIX 6/4: REQUIREMENTS FOR CLASS 3 MATERIALS

Not used. Class 3 Material is not accepted in the Main Works.

10 APPENDIX 6/5: GEOTEXTILES USED TO SEPARATE EARTHWORKS MATERIALS

Not used.

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

- 11.1.1. Locations of fill to structures is given on drawings C2014B-CU-1701, and C2014B-CU-1702.
- 11.1.2. Fill to retaining walls, structures and fill above structural foundations shall be Class 6N or Class 6S material in accordance with Table 6/1 and as indicated on the Structure Drawings.
- 11.1.3. Where required, all 6S material will need a 'terram' type geotextile laid over the top to prevent migration of fines from overlaying materials.
- 11.1.4. The relevant structural drawings indicate the minimum lateral extents for backfill materials.
- 11.1.5. Full scale determination of stable slope angles in the fill material (Clause 610.6) is not required for Classes 6N unless needed by the Contractor to satisfy himself that his proposed material is stable at the batters shown on the Structures Drawings.
- 11.1.6. For those cases where the approach embankments have been constructed before the placement of fill to structure, the Contractor shall trim and bench the embankment fill already placed before placing and compacting any fill to structure.
- 11.1.7. For any imported Blast Furnace Slag (BFS) and/or any blended BFS with Basic Oxygen Steel Slag (BOS) refer to Appendix 6/1 for testing requirements.

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

12.1 PREPARATION AND SURFACE TREATMENT OF FORMATION

- 12.1.1. The formation shall, after completion of any subgrade drainage, and immediately before laying sub base on areas of completed formation, have a surface level tolerance within +20mm and -30mm (in accordance with Clause 616), or other level of tolerance agreed with the Engineer, relative to its designed level after completion of the following operations as necessary:
- Any protection layer shall be removed, and any soft or damaged areas shall be rectified by excavating them and replacing with acceptable material having the same characteristics and strength as the surrounding material. The surface of the formation shall be trimmed and immediately cleaned free from mud and slurry which shall be dealt with as unacceptable material.
 - The formation shall immediately be compacted, in addition to the compaction required for the fill. This additional compaction shall for this purpose be assumed to be a repeat of the compaction required for a layer of fill. Immediately after the additional compaction the formation shall be trimmed to achieve the surface level tolerances as above.
- 12.1.2. Where the tolerances are exceeded, the Contractor shall determine the full extent of the area which is out of tolerance and shall make good the formation as follows:
- If the surface is too high, it shall be re-trimmed and re-compacted.
 - If the surface is too low, it shall be corrected by the addition of acceptable material having characteristics and strength matching the overlain material, deposited and compacted in compliance with this specification. In cohesive materials, where this low surface is less than 150 mm below formation, material shall be removed to a depth of at least 150 mm below formation before the additional material is deposited and compacted.
- 12.1.3. After trimming, or re-trimming if necessary, the formation shall be rolled with one pass of a smooth-wheeled roller having a mass per metre width of roll not less than 2100 kg.
- 12.1.4. The Contractor shall limit any areas of completed formation to suit the output of plant in use and the rate of deposition of sub-base. No formation of cohesive material shall remain continuously exposed to rain causing degradation or be left uncovered overnight.
- 12.1.5. Modifications to land drainage on site will be required and should be determined prior to the commencement of full scale works on site.

12.2 USE OF SUB-FORMATION OR FORMATION BY CONSTRUCTION PLANT

- 12.2.1. Construction plant and other vehicular traffic (except that required for the construction of capping) shall not be operated on the sub-formation unless adequate protection is provided, in addition to any weather protection.
- 12.2.2. Construction plant and other vehicular traffic (except for that required for preparation of the formation) shall not be operated on the formation unless adequate protection is provided, in addition to any weather protection.

- 12.2.3. In addition, the Contractor shall make available to the Engineer his proposals for the protection of the sub-formation or formation in areas where they are within 300 mm of the existing ground level, after topsoil has been stripped, before using construction plant or other vehicular traffic at or above sub-formation or formation.

13 APPENDIX 6/8: TOPSOILING

- 13.1.1. The thickness of topsoil/ subsoil to be deposited shall be as described and to the areas shown on the Drawings. Topsoil depths are after settlement (618.4i).
- 13.1.2. Subsoil and topsoil shall not be stripped from existing rooting zones of vegetation to be retained or protected landscape areas (602.9).
- 13.1.3. Subsoil and topsoil shall be stockpiled in separate storage piles. Plant movement shall be limited on the soil mounds to avoid subjecting the mound to surface compaction. Subsoil and topsoil shall be stockpiled in stacks not exceeding 1.3m in height.
- 13.1.4. Soil mounds shall be constructed with side slopes at a safe angle, determined by a temporary works designer, and the top of the mound shall either be domed or provided with a cross fall to facilitate drainage. All outer surfaces of the mounds shall be lightly graded to prevent the ingress of rainwater.
- 13.1.5. The Contractor shall repair any slumping or damage to the mounds which may cause damage or loss of the soils.
- 13.1.6. The period of storage shall be in accordance with clause 602.10
- 13.1.7. Imported topsoil should it be required shall exclude the items as follows:
- Toxic material
 - Material from marshes or bogs
 - Peat, logs, stumps, slurry, mud and perishable material
 - Material susceptible to spontaneous combustion
 - Material in a frozen condition
 - Clay of liquid exceeding 80 and/or plasticity index exceeding 55
 - Material with excessive moisture content
 - Material containing scrap, rubbish, hardcore, builder's rubble and materials or other foreign matter
 - Potentially invasive naturalised plant materials such as Japanese Knotweed, Giant Hogweed, Himalayan Balsam, Rhododendron ponticum.
- 13.1.8. The requirements of Clause 618.3 shall apply with the exception of sub-clause 618.3(vi).
- 13.1.9. The requirements of 618.4(ii) shall not apply to this contract. The Contractor's attention is drawn to the requirements of sub-clause 618.3 with regards to spreading topsoil and the method of working.
- 13.1.10. Topsoil and subsoil shall not be worked during wet weather conditions that will result in the destruction of the soil structure.

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

- 14.1.1. The Reinforced Turf shown on drawing C2014B/CU/1702 shall be Salix Vmax Shear Stress turf or similar approved.
- 14.1.2. To withstand flow velocities up to 7.6m/sec. Short duration (half hour flow event) 672 pascal or N/m². Long duration flows (50 hours) 576 pascal or N/m²
- 14.1.3. The reinforcement element of the turf shall be soil filled, seeded and grown outdoors as a turf for a minimum of 12 weeks at a nursery prior to being installed on site.
- 14.1.4. The reinforced turf is to be installed in accordance with the manufacturer's specification.

15 APPENDIX 6/10: GROUND ANCHORAGES, CRIB WALL AND GABIONS

Not used.

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

- 16.1.1. The Desk Study of the site area did not indicate any swallow holes, other naturally occurring cavities or disused mine workings. If any such items are encountered, the Contractor shall inform the Engineer immediately. The Engineer shall issue instructions for further treatment of the such items if necessary.

17 APPENDIX 6/12: INSTRUMENTATION AND MONITORING

- 17.1.1. The contractor should be aware that certain existing groundwater monitoring infrastructure across the site (boreholes), will either need protecting during the works or decommissioning in accordance with an appropriate borehole abandonment specification. Further details to be supplied in due course.

18 APPENDIX 6/13: GROUND IMPROVEMENT

- 18.1.1. Ground improvement in the form of vibro-stone columns or dynamic compaction is not required.
- 18.1.2. The Contractor shall be aware that the site development is subject to a Remediation Strategy to which the Contractor shall refer.

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

- 19.1.1. This appendix sets out the Limiting Values that should be referenced in the assessment of whether imported soil has the potential to cause harm to controlled waters and the environment. The Limiting Values for Harm to Human Health and the Environment are set out in Appendix 6/15.
- 19.1.2. It is intended that the approved Remediation Strategy is completed in advance of the works contained herein, and that any site won soils requiring re-use on site will be tested in accordance with the approved Remediation Strategy and the Qualified Person (QP) approved Materials Management Plan (MMP) (CL:AIRE Definition of Waste: Code of Practice, 2011 V2).
- 19.1.3. In carrying out the Works, the Contractor shall take such measures as are necessary to minimise the generation of contaminated water (physical and chemical) and prevent its discharge and leaching to groundwater.
- 19.1.4. There are no surface watercourses within 60m of the site boundary, and direct discharge into surface water features is considered unlikely. However, potential discharge to surface water via drainage cannot be ruled out and the contractor shall confirm that any drainage at the site does not lead directly to surface water features prior to use.
- 19.1.5. All gullies and surface water drains shall be protected from contamination from solid and liquid wastes and any accumulated sediment shall be removed by the Contractor.
- 19.1.6. Any discharge into surface watercourses shall meet the criteria set out in the specific discharge consent issued by the Natural Resources Wales.
- 19.1.7. Any imported material which exhibits visual evidence of contamination (e.g. visible evidence of hydrocarbons such as free product) is unacceptable.
- 19.1.8. The soil leachate Limiting Values generic assessment criteria (GAC) are based on current UK Drinking Water Standards (DWS) and Environmental Quality Standards (EQS). Consideration should be given to any future legislative changes by the Contractors' environmental advisor.
- 19.1.9. Testing requirements are as stated in Appendix 1/5 of this specification which require prior approval by the CLO in NPTCBC.
- 19.1.10. Contaminants that may be present within the excavated or imported material that could impact controlled waters (groundwater) via leaching, are presented in Table 6/14, with corresponding Limiting Values for soil leachate tests. The Limiting Values stated are published UK Drinking Water Quality Standards (2000) (UKDWS) (amended 2004), WHO Drinking Water Guidelines (2017), and WHO Petroleum Products in Drinking Waters (2008) and Environmental Quality Standards (EQS) 2015. The lowest available Limiting Value is applied as a conservative approach. Laboratory limits of detection for the analytes should be selected to be less than the Limiting Values. Where this is not reasonably achievable, the Contractor should seek advice from the Project Manager's Geo-environmental Representative to agree an alternative approach.

Substance	Concentration or Value Maximum (µg/l)	Criteria Source
Metals and Inorganics		
Arsenic	10	DWS
Cadmium	5.0	DWS
Chromium (total)	50	DWS
Hexavalent chromium	3.4	EQS
Iron	200	DWS
Lead	10	DWS
Mercury	1.0	DWS
Selenium	10	DWS
Copper	2,000	DWS
Nickel	20	DWS
Zinc	10.9	EQS
Cyanide	50	DWS
pH	6.5-10	DWS
Polycyclic Aromatic Hydrocarbons (PAH)		
Benzo(a)pyrene	0.01	DWS
Sum 4 benzo b, ghi, k, & ideno pyrene	0.1	DWS
Total Petroleum Hydrocarbons (Criteria Working Group Approach)		
Aliphatic EC >5-6	15,000	WHO 2008
Aliphatic EC >6-8	15,000	WHO 2008
Aliphatic EC >8-10	300	WHO 2008
Aliphatic EC >10-12	300	WHO 2008
Aliphatic EC >12-16	300	WHO 2008
Aromatic EC >6-8	700	WHO 2008
Aromatic EC >8-10	300	WHO 2008
Aromatic EC >10-12	90	WHO 2008
Aromatic EC >12-16	90	WHO 2008
Aromatic EC >16-21	90	WHO 2008
Aromatic EC >21-35	90	WHO 2008
BTEX		
Benzene	1.0	DWS
Ethylbenzene	300	WHO 2017
Toluene	700	WHO 2017
Xylene (total)	500	WHO 2017

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

- 20.1.1. The Limiting Values presented within this Appendix can be used to determine if imported materials are suitable for use within the scheme, from the viewpoint of protecting human health from contaminated earthworks materials.
- 20.1.2. WSP has derived a set of Generic Assessment Criteria (GAC) for the generic land use scenarios following the CLEA methodology and using the CLEA V1.071 modelling tool. Further details on the generic assumptions and methodologies adopted by WSP are available on request.
- 20.1.3. The Limiting Values are presented in Table 6/15 and are based on most conservative of GACs for commercial land use with a soil organic matter content (SOM) of 1%.
- 20.1.4. The re-use of site won material shall be undertaken in accordance with a CL:AIRE DoWCoP, 2011 V2) QP approved Materials Management Plan (MMP) and approved Remediation Strategy.
- 20.1.5. Testing frequency requirements are as stated in Appendix 1/5 of this specification which require prior approval by the CLO in NPTCBC.
- 20.1.6. Any material which exhibits visual evidence of contamination (e.g. visible evidence of hydrocarbons such as free product or asbestos containing materials) is unacceptable.
- 20.1.7. Testing requirements shall be specified by the Project Manager's Geo-environmental Representative.
- 20.1.8. The results of the testing shall be presented to the Project Manager's Geo-environmental Representative for approval prior to reuse.
- 20.1.9. Concentrations of contaminants recorded in soils and sediments shall be assessed and compared to the Limit Values in Table 6/15. Concentrations of contaminants in soil shall be assessed and compared to the in 'absolute terms' (by direct comparison) except where a statistical approach is considered appropriate.
- 20.1.10. All contamination testing shall be carried out in a UKAS and MCerts accredited laboratory, in accordance with the standards and procedures defined by MCerts.
- 20.1.11. Additional sampling and analysis shall be carried out by the Contractor where other contamination is suspected, for any reason as instructed by the Project Manager's Geo-environmental Representative.
- 20.1.12. All testing shall be presented to the Project Manager's Geo-environmental Representative for approval and additional assessment, and testing scheduled as appropriate. Soil samples shall be dispatched to the laboratory by the contractor within 24 hours of sampling. Samples shall be stored in cool boxes or similar and at temperatures in line with the requirements of the accredited laboratory.

Parameter	Units	Limit Values (mg/kg)
Metals and Inorganics		
Asbestos	% w/w	No asbestos detected
Arsenic	mg/kg	635
Cadmium	mg/kg	223
Chromium (III)	mg/kg	9,550
Chromium (VI) (Hexavalent)	mg/kg	24
Copper	mg/kg	69,800
Cyanide (free)	mg/kg	78
Lead	mg/kg	1,390
Mercury (inorganic)	mg/kg	1,110
Nickel	mg/kg	1,710
Selenium	mg/kg	12,300
Zinc	mg/kg	1,050,000
Phenol	Mg/kg	760
Polycyclic Aromatic Hydrocarbons (PAH)		
Benzo[a]pyrene	mg/kg	38
Naphthalene	mg/kg	193
Total Petroleum Hydrocarbons (Criteria Working Group Approach)		
Aliphatic EC >5-6	mg/kg	3,190
Aliphatic EC >6-8	mg/kg	7,780
Aliphatic EC >8-10	mg/kg	2,000
Aliphatic EC >10-12	mg/kg	9,690
Aliphatic EC >12-16	mg/kg	58,800
Aliphatic EC >16-21	mg/kg	1,910,000
Aliphatic EC >21-35	mg/kg	1,910,000
Aliphatic EC >35-44	mg/kg	1,910,000
Aromatic EC >5-7	mg/kg	26,200
Aromatic EC >7-8	mg/kg	56,100
Aromatic EC >8-10	mg/kg	3,460
Aromatic EC >10-12	mg/kg	16,200
Aromatic EC >12-16	mg/kg	36,200
Aromatic EC >16-21	mg/kg	28,600
Aromatic EC >21-35	mg/kg	28,600
Aromatic EC >35-44	mg/kg	28,600
BTEX*		
Benzene	mg/kg	27
Toluene	mg/kg	56,300
Ethylbenzene	mg/kg	5,710
m-Xylene	mg/kg	5,920
o-Xylene	mg/kg	5,920
p-Xylene	mg/kg	5,920



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