

Appendix 6/1 - Classification and Acceptability of Earthworks Materials Requirements for Earthworks Materials

1. Acceptable limits and criteria for the Permitted Classes of fills appropriate to the Contract are detailed on Table 6/1 of the SHW, the modified Table 6/1 included in this Appendix and Appendices 6/14 and 6/15 of the Specification. The Contractor is responsible for appropriate sampling and testing, including testing to determine the concentration of potential contaminants, to classify and determine the acceptability of earthworks materials based on the specified limits and criteria.
2. Samples for classification and acceptability testing shall be taken at the point of excavation for on-site materials and at the point of deposition for imported materials. If the material has altered its classification or become unacceptable for whatever reason, the Contractor shall repeat the classification and acceptability tests. The frequency and scope of acceptability testing requirements shall be according to Appendix 1/5 of the Specification.
3. The Contractor is to submit an Earthworks Quality Control Method Statement for approval by the Project Manager not less than 10 working days prior to the start of Earthworks.
4. Permitted Constituents of fill materials shall be any natural materials or combinations of natural materials other than chalk and material designated as Class 3. There are no existing on-site materials to be designated as Class 3 and no Class 3 materials are to be used in the works.
5. Where fill materials include recycled crushed concrete, the Contractor shall determine the nature of the ground and groundwater beneath and surrounding the areas of proposed fill with respect to sulphur, sulphates, and any other potentially deleterious materials, in accordance with TRL 447 and other relevant guidance, and shall assess in accordance with TRL 447 and other relevant guidance the suitability of using materials containing recycled crushed concrete in the proposed areas.
6. The fill materials shall be inert as defined in Clause 7(4) of the Landfill (England and Wales) Regulations 2002. The fill materials shall be tested to determine the concentration of potential contaminants in accordance with the methodology and limits of detection included in Appendices 6/14 and 6/15 of this Specification. The materials shall be classified as Unacceptable Material Class U2 when the concentrations of potential contaminants exceed the acceptability limits given in Appendices 6/14 and 6/15, and shall be dealt with in accordance with Appendix 6/2. The frequency and scope of acceptability testing requirements shall be to Appendix 1/5 of this Specification.
7. The Contractor is responsible for ensuring all statutory and regulatory requirements for the receipt and use of all materials either excavated from the site or imported onto the site are observed. The Contractor is responsible for ensuring a record of each load delivered and accepted is kept giving: (i) date, (ii) nature and quality, (iii) place of origin, (iv) quantity by weight/volume, (v) carrier, (vi) supplier. The Contractor is responsible for ensuring a visual and olfactory assessment is carried out on every load, on initial receipt and after deposition, to ensure compliance with the Acceptance Criteria; the findings of the assessment shall be recorded with the record sheet for the load.
8. There are no specified requirements for processing to render unacceptable material Class U1A or Class U1B acceptable. There are no specified requirements for the removal off site of excavated acceptable or unacceptable material requiring processing or retention on site of surplus material. The Contractor shall be responsible for removal and / or processing of unacceptable material or surplus acceptable material deemed not acceptable for use in the Permanent Works.
9. Acceptable or unacceptable fill, other than contaminated material may be used in landscape areas. This excludes the environmental, noise bunds, or any other earthworks of structural nature, where the fill parameters are determined through stability or bearing capacity requirements. Class 5 and Class U2 materials shall not be used as landscape fill.

10. There are no specified requirements for groundwater lowering or other treatment. The Contractor shall take all necessary measures (both temporary and permanent) to ensure that the presence or ingress of groundwater, infiltration water and the effects of weather does not compromise the integrity of earthworks. Operations shall not take place during adverse weather conditions.
11. Where material is imported onto site which is not 'as dug' it shall be natural aggregates (except shale, siltstone, or slate) or crushed concrete, bricks or masonry conforming to BS EN 13242.

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

Class	General Material Description	Typical Use	Permitted Constituents (All subject to requirements of Clause 601 and Appendix 6/1) See Note 1	Material Properties Required for acceptability (In addition to requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631) See Note 2				Compaction Requirements See Note 3
				Property (see exceptions in previous column)	Defined and Tested in Accordance with:	Acceptable Limits Within:		
						Lower	Upper	
1A	Well graded granular material	General fill	Any material, or combination of materials, other than material designated as Class 3 in the Contract. (Properties (i), (ii) and (iv) in next column, shall not apply to chalk). Recycled aggregate. 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); A (construction and demolition recycling industries); B1 (municipal incinerator bottom ash (MIBA)); D2 (air cooled blast furnace slag) D3 (basic oxygen furnace slag) D4 (electric arc furnace slag (EAF C)) E (non ferrous steel industry – except E2 molybdenum slag) G (mining and quarry industry)	(i) grading	BS 1377: Part 2 or BS EN 13242	Table 6/2	Table 6/2	Table 6/4 Method 2
				(ii) plastic limit (PL)	See Note 5	10	–	
				(iii) mc (see note 4)	BS 1377: Part 2 or BS EN 13242	App 6/1	App 6/1	
				(iv) MCV	Clause 632	App 6/1	App 6/1	
				(v) IDD of chalk	Clause 634	–	App 6/1	

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

Class	General Material Description	Typical Use	Permitted Constituents (All subject to requirements of Clause 601 and Appendix 6/1) See Note 1	Material Properties Required for acceptability (In addition to requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631) See Note 2				Compaction Requirements See Note 3
				Property (see exceptions in previous column)	Defined and Tested in Accordance with:	Acceptable Limits Within:		
						Lower	Upper	
1B	Uniformly graded granular material	General fill	Any material, or combination of materials, other than 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 chalk); A (construction and demolition recycling industries); B1 (municipal incinerator bottom ash (MIBA)); C1 (coal fly ash) C4 (coal bottom ash) D2 (air cooled blast furnace slag) D3 (basic oxygen furnace slag) D4 (electric arc furnace slag (EAF C)) E (non ferrous steel industry – except E2 molybdenum slag) F (foundry industry) G (mining and quarry industry) H1 (dredge spoil sand)	(i) grading	BS 1377: Part 2 or BS EN 13242	Table 6/2	Table 6/2	Table 6/4 Method 3
				(ii) uniformity coefficient	See Note 5	–	10	
				(iii) mc	BS 1377: Part 2 See Note 4	App 6/1	App 6/1	
				(iv) MCV	Clause 632	App 6/1	App 6/1	
2A	Wet cohesive material	General fill	Any material, or combination of materials, other than chalk.	(i) grading	BS 1377: Part 2	Table 6/2	Table 6/2	Table 6/4 Method 1 (Note: Testing of compacted material required in accordance with App 1/5 Series 600)
				(ii) plastic limit (PL)	BS 1377: Part 2	-	-	
				(iii) mc (see note 4)	BS 1377: Part 2	PL -4%	App 6/1	
				(iv) MCV	Clause 632	App 6/1	App 6/1	
				(v) undrained shear strength of remoulded material	Clause 632	App 6/1	App 6/1	

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

Class	General Material Description	Typical Use	Permitted Constituents (All subject to requirements of Clause 601 and Appendix 6/1) See Note 1	Material Properties Required for acceptability (In addition to requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631) See Note 2				Compaction Requirements See Note 3
				Property (see exceptions in previous column)	Defined and Tested in Accordance with:	Acceptable Limits Within:		
						Lower	Upper	
2B	Dry cohesive material	General fill	Any material, or combination of materials, other than chalk.	(i) grading	BS 1377: Part 2	Table 6/2	Table 6/2	Table 6/4 Method 2
				(ii) plastic limit (PL)	BS 1377: Part 2	–	–	
				(iii) mc	BS 1377: Part 2 See Note 4	App 6/1	PL -4%	
				(iv) MCV	Clause 632	App 6/1	App 6/1	
				(v) undrained shear strength of remoulded material	Clause 633	App 6/1	App 6/1	
4	Various	Fill to landscaped areas	See App 6/1	(i) grading	BS 1377: Part 2	App 6/1	App 6/1	See Clause 620 and App 6/1
				(ii) mc	BS 1377: Part 2 See Note 4	–		
				(iii) MCV	Clause 632	App 6/1		
5A	Topsoil existing on site	Topsoiling	Topsoil or turf designated as Class 5A in the Contract	(i) grading	Clause 618	–	Clause 618	–
5B	Imported topsoil	Topsoiling	General purpose grade complying with BS 3882	–	–	–	–	–

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

Class	General Material Description	Typical Use	Permitted Constituents (All subject to requirements of Clause 601 and Appendix 6/1) See Note 1	Material Properties Required for acceptability (In addition to requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631) See Note 2				Compaction Requirements See Note 3
				Property (see exceptions in previous column)	Defined and Tested in Accordance with:	Acceptable Limits Within:		
						Lower	Upper	
6F1	Selected granular material (fine 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 tarbitumen binders, unburnt colliery spoil, argillaceous rock and chalk. Property (vi) in the next column shall not apply if the Class Ra (asphalt) content of any recycled aggregate is 20% or less. Where material in this Class is imported onto site it shall be classified as Class 6F4 and comply with the requirements for that material.	(i) grading	BS 1377: Part 2 (On site materials only)	Table 6/2	Table 6/2	Table 6/4 Method 6
				(ii) optimum mc	BS 1377: Part 4 (vibrating hammer method)	–	–	
				(iii) mc	BS 1377: Part 2	Optimum mc - 2%	Optimum mc	
				(iv) Los Angeles coefficient	Clause 635	–	60	
				(v) Class Ra (asphalt) content	Clause 710	–	50%	
				(vi) bitumen content	BS EN 12697-1 or BS EN 12697-39	–	2.0%	

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

Class	General Material Description	Typical Use	Permitted Constituents (All subject to requirements of Clause 601 and Appendix 6/1) See Note 1	Material Properties Required for acceptability (In addition to requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631) See Note 2				Compaction Requirements See Note 3
				Property (see exceptions in previous column)	Defined and Tested in Accordance with:	Acceptable Limits Within:		
						Lower	Upper	
6F2	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 tarbitumen binders, unburnt colliery spoil and argillaceous rock. Property (i) in the next column shall not apply to chalk. Property (vi) in the next column shall not apply if the Class Ra (asphalt) content of any recycled aggregate is 20% or less. Where material in this Class is imported onto site it shall be classified as Class 6F5 and comply with the requirements for that material.	(i) grading	BS 1377: Part 2 (On site materials only)	Table 6/2	Table 6/2	Table 6/4 Method 6
				(ii) optimum mc	BS 1377: Part 4 (vibrating hammer method)	—	—	
				(iii) mc	BS 1377: Part 2	Optimum mc - 2%	Optimum mc	
				(iv) Los Angeles coefficient	Clause 635	—	50	
				(v) Class Ra (asphalt) content	Clause 710	—	50%	
				(vi) bitumen content	BS EN 12697-1 or BS EN 12697-39	—	2.0%	

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

Class	General Material Description	Typical Use	Permitted Constituents (All subject to requirements of Clause 601 and Appendix 6/1) See Note 1	Material Properties Required for acceptability (In addition to requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631) See Note 2				Compaction Requirements See Note 3
				Property (see exceptions in previous column)	Defined and Tested in Accordance with:	Acceptable Limits Within:		
						Lower	Upper	
6F4	Selected granular material (fine 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: 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). Property (x) in the next column shall not apply if the Class Ra (asphalt) content of any recycled aggregate is 20% or less.	(i) Size designation and overall grading category	BS EN 13285 - 0/31.5 and G_E	Table 6/5	Table 6/5	Table 6/4 Method 6
				(ii) Maximum fines and oversize categories	BS EN 13285 - UF_{15} and OC_{75}	Tab 6/5 Table	Table 6/5	
				(iii) Los Angeles coefficient	BS EN 13242 - LA_{60}	–	60	
				(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	–	–	
				(viii) Water content	BS EN 1097-5	Optimum wc - -2%	Optimum wc	
				(ix) Clas Ra (asphalt) content	Clause 710	–	50%	
				(x) bitumen content	BS EN 12697-1 or BS EN 12697-39	–	2.0%	

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

Class	General Material Description	Typical Use	Permitted Constituents (All subject to requirements of Clause 601 and Appendix 6/1) See Note 1	Material Properties Required for acceptability (In addition to requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631) See Note 2				Compaction Requirements See Note 3
				Property (see exceptions in previous column)	Defined and Tested in Accordance with:	Acceptable Limits Within:		
						Lower	Upper	
6F5	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: 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). Property (x) in the next column shall not apply if the Class Ra (asphalt) content of any recycled aggregate is 20% or less.	(i) Size designation and overall grading category	BS EN 13285 - 0/80 and G_E	Tab 6/5	Tab 6/5	Table 6/4 Method 6
				(ii) Maximum fines and oversize categories	BS EN 13285 - UF_{12} 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	–	–	
				(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%	

Footnotes to Table 6/1

1. Permitted constituents shall all be subject to requirements of Clause 601 and Appendix 6/1 Clause (4) & (6).
2. Material properties required for acceptability shall be in addition to requirements on use of fill materials in Clause 601.
3. Compaction requirements shall be as defined in Clause 612.
4. Optimum moisture content (omc) determined in accordance with BS 1377 : Part 4, 2.5 kg rammer method.
5. Uniformity coefficient is defined as the ratio of the particle diameters D₆₀ to D₁₀ on the particle-size distribution curve, where:
D₆₀ = particle diameter at which 60% of the soil by weight is finer
D₁₀ = particle diameter at which 10% of the soil by weight is finer
6. Optimum moisture content (omc) determined in accordance with BS 1377 : Part 4, vibrating hammer method.
7. 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 they meet all the specification requirements and the Declaration of Performance for constituent parts to BS EN 13242 are provided to the Overseeing Organisation.
8. 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.

Appendix 6/2 - Requirements For Dealing With Class U1B And Class U2 Unacceptable Materials

1. The Contractor shall report immediately to the Project Manager any Class U1B and U2 Unacceptable Material found within the works. Unacceptable material Class U1B and U2 shall not be permitted to remain on site. The Contractor shall agree with the Project Manager methods for the safe removal of the material.
2. The Contractor is responsible for dealing with Class U1B and Class U2 unacceptable material including where required:
 - a) Classification of Class U1B and Class U2 material by appropriate chemical testing including WAC testing.
 - b) Preparation of method statements for dealing with any Class U1B and Class U2 materials
 - c) Keeping records of the location, volumes, extent, nature and test results for all Class U1B and Class U2 materials encountered.
 - d) Agreement of special requirements for dealing with unacceptable materials with the Environmental Health Officer, Environment Agency and other statutory bodies.
 - e) Agreement of special requirements for dealing with leachate and contaminated water with the Environmental Health Officer, Environment Agency and other statutory bodies.
 - f) Dealing with unacceptable materials whether by excavation and disposal, treatment, sealing or other means.
 - g) Dealing with leachate and contaminated water whether by pumping and disposal, treatment or other means, including the provision of special drainage where required.
 - h) Compliance with all Duty of Care and waste regulation obligations.
3. Where Class U1B and Class U2 material is excavated, the material shall not be left exposed overnight and the Contractor is responsible for providing temporary cover. Cover may be provided by Class U1B materials or other material determined by the Contractor as agreed with the Project Manager. This shall be placed to give a cover of not less than 150 mm. All temporary cover shall be removed in advance of the permanent works and disposal off site accordingly.
4. The Contractor is to ensure that all Class U1B and U2 materials are disposed of at an appropriately licensed landfill or processing facility approved by the Environment Agency in a safe and competent manner and in accordance with relevant Statutory Regulations. The Contractor shall keep records/transfer notes of all waste materials removed from this site and shall include the volume of waste material, the description of the waste material, date of removal, the destination of the waste material and the carrier. The Contractor is required to submit copies of this information to the Project Manager as soon as it becomes available.

Appendix 6/3 - Requirements for Excavation, Deposition, Compaction (Other than Dynamic Compaction)

1. The extent of excavation, cutting or filling is to be determined by reference to longitudinal section drawings and cross-section drawings.
2. The existing topsoil, subsoil and near-surface soils shall be excavated as required within the area of the proposed works as shown on the Drawings. The topsoil/subsoil shall be handled and stored in accordance with the requirements of BS 3882 (2007). Unnecessary and premature removal of topsoil and subsoil shall be avoided.
3. The exposed natural soils shall be profiled such that there are no areas in which surface water may accumulate. The Contractor shall take all necessary measures (both temporary and permanent) to ensure that the integrity of formation is not compromised by adverse affects of construction traffic, weather et cetera as required. Operations shall not take place during adverse weather conditions.
4. Where the slope to the excavated area is greater than 1 vertical in 10 horizontal, the excavation shall be cut in horizontal benches in order to "key" the existing and the new fill materials together. The benches shall be 0.5 m high and at least 0.5 m wide.
5. The Contractor shall note and record any groundwater inflows, existing land drainage or cases of instability and provide records to the Designer's Representative and Project Manager within 24 hours.
6. The exposed formation to all works is to be inspected by a qualified geotechnical engineer prior to constructing the works to identify the presence of any natural solution features and mining cavities. Particular care is to be given to identifying any features that may be indicative of the presence of any solution features and mining cavities, such as (a) voids in the ground; (b) collapsed ground that may appear as depressions or hollows at the ground surface; (c) different ground conditions to those expected, e.g. areas of infill or disturbed ground; (d) rapid changes of soil colour or soil type over short horizontal distances; and (e) vertical interfaces between different soils types. Any potential solution features or mining cavities shall be investigated by appropriate intrusive ground investigation techniques. If the presence of solution features or mining cavities is confirmed appropriate techniques shall be adopted to infill any voids and stabilise any soft or loose infill materials. The investigation and stabilisation works shall be carried out in accordance with the requirements of Appendix 6/11 of the Specification.
7. The prepared formation shall be subject to approval by the Project Manager prior to placing any fill material.

Watercourses

8. The Contractor shall be responsible for any temporary or permanent protection of watercourses, including ditches.

Embankment Construction

9. The following requirements relate to the embankments to be constructed using conventional earth fill.
10. The fill material to be used to form the embankment will be determined in agreement with the appointed contractor for the works.
11. Method compaction of fill materials is to be carried out in accordance with the requirements of Table 6/1 of the Specification. Filling shall be in uniform layers. Compaction shall be completed as soon as possible after the material has been spread and in accordance with specific requirements for the placed material. Fill material in areas of benching shall be carefully placed and compacted to ensure that no voids occur at the upright steps of the benching.

12. The surface of any layer of material shall on completion of compaction and immediately before overlaying, be free from movement under compaction plant and be free from ridges, cracks, loose materials, pot holes, ruts and other defects. All loose segregated or otherwise defective areas shall be removed to the full thickness of the layer and new material should be laid and compacted.
13. Should at any time the material change from that identified, the Contractor shall change the method of compaction to ensure compliance with the requirements of the Specification.
14. The Contractor shall keep contemporaneous records of the method of compaction including layer thickness, type of plant, number of passes and material type.

Appendix 6/5 - Geotextiles Used to Separate Earthworks Materials

1. Terram 1000 or Multitrack 1000 or similar approved to be used between subgrade and improvement layer. Refer to Appendix 6/7.