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DOCUMENT TITLE: SPECIFICATION FOR GASHOLDER TANK DEWATERING, INFILLING AND REPORTING

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1 INTRODUCTION

This specification sets out the general requirements for the dewatering and infilling of the tanks of decommissioned gasholders and where applicable, ancillary structures such as valve or siphon pits. These works are to be undertaken by the Contractor in accordance with this specification.

1.1 General

1.1.1. Requirements set-out herein may be amended or supplemented as a result of site-specific geotechnical, hydrogeological or structural factors, and other considerations such as intended future end-use and surface sealing.

1.1.2. In certain situations, the presence of contamination surrounding or below the tank structure may require remediation prior to infilling. Details of remediation and associated verification requirements will be provided in the tender information. The tender information will also provide details of any sequencing considerations or restrictions as result of the associated demolition programme.

1.1.3. Site specific requirements are provided in the Scope of Works.

1.2 Guidance and Legislation

The Works shall be carried out in accordance with all legislation, standards, codes and best practice guidance applicable at the time. The Contractor shall be responsible for identifying these requirements and adopting appropriate working methods and practices.

1.3 Project Briefs

On completion of a project specific Contract, SGN will require the Contractor to warrant that it has met a project specific Brief. The five possible Briefs, with a summary of their likely use, are outlined below:

1. **Gasholder Demolition Brief.** The Contractor warrants that the demolition outlined in the Project Works Information has been carried out, no pollution has occurred as a result of the project, and all permits and licences have been complied with during the work.
2. **Gasholder Demolition and Infilling Brief.** In addition to the Demolition Brief, this Brief requires that after infilling, the Site will be suitable for a defined end-use. Compliance with various environmental regulations follows from a compliant infilling design.
3. **Gasholder Infilling Brief.** Where no demolition is required, this Brief means that after infilling, the Site will be suitable for a defined end-use. Compliance with various environmental regulations follows from a compliant infilling design.
4. **Intermediate Brief.** Only used by exception, this Brief will have a specific environmental objective(s) that needs to be met in circumstances when a whole site Remediation Brief is not obtainable
5. **Remediation Brief.** After dealing with contaminated material on-site, the Site will be suitable for a defined end-use. Compliance with various environmental regulations follows from a compliant remediation design.

The detailed Briefs must be reviewed and signed prior to project commencement.

2 GASHOLDER TANK DEWATERING REQUIREMENTS

2.1 General

The Contractor shall undertake dewatering of the gasholder tank prior to infilling in accordance with the specification. The dewatering activity is deemed to include removal and disposal of tank waters and any filming oil and basal sludge present. These requirements are applicable to water-sealed gasholders, of either aboveground or below-ground construction. The dewatering activity may be required to be undertaken in advance of or during gasholder dismantling.

2.2 Dewatering

2.2.1 The Contractor shall provide and maintain all plant and equipment necessary for the dewatering activity.

2.2.2 Filming oil shall be removed from the surface of the tank waters as part of the dewatering process by suitable means such as pumps or skimmers. Where reasonably practicable this shall be undertaken prior to the removal of waters. Disturbance of the oil layer and inadvertent removal of tank waters during the removal process shall be avoided.

2.2.3 Dewatering shall proceed to the level of the basal sludge. The Contractor shall adopt the most appropriate pumping means to maximise removal of tank waters whilst minimising disturbance and inadvertent removal of basal sludges. This will require careful control of abstraction rates and siting of the pump inlet(s).

2.2.4 For above-ground gasholder tanks the Contractor may consider undertaking dewatering primarily via gravity flow. In these circumstances the Contractor is responsible for providing access for dewatering points, and installing any necessary outlet points within the structure.

2.2.5 Following completion of dewatering the Contractor shall remove all basal sludges as far as is reasonably practicable. The most appropriate technique is to be determined by the Contractor and will depend on site specific conditions and constraints and project requirements. Techniques may include vacuum extraction or mechanical removal following separation of sludges via centrifuges or through use of a flocculent, or dewatering bags.

2.2.6 Depending on phasing, the Contractor may be required to undertake a further phase of sludge removal following dismantling of the gasholder superstructure to deal with any residual sludge. This will be of particular relevance where the lifts remain in-situ on commencement of dewatering as sludge will require removal from the lift cups.

2.2.7 Following removal of basal sludges the tank base, dumpling and sides are to be cleaned.

2.2.8 Where necessary the Contractor shall undertake further removal of tank waters prior to infilling. This is particularly relevant where there is a lag between the two activities, and ingress of groundwater, rainwater or surface water has occurred.

2.2.9 For below-ground gasholders the surrounding groundwater level and ground conditions will be identified within the tender documents. The Contractor will need to consider this information when designing the dewatering procedures and take account of any risk associated with the potential for water ingress as a result of dumpling or basal failure, or leakage through the tank walls. Consideration should be given to the need for structural inspection by a competent structural engineer and the potential need to relieve stress on the dumpling.

2.3 Treatment and Disposal

2.3.1 Disposal of tank waters to foul sewer under a trade effluent consent is the preferred method of disposal. Where no discharge point is locally available discharge to surface water, or off-site disposal via tanker may be necessary.

2.3.2 Where discharge to foul sewer or surface water is to be undertaken the Contractor shall design and install a suitable treatment plant sufficient to treat the waters to the relevant compliance standards. As a minimum this shall include an oil / water interceptor and a flow-meter to record volumes and rate of discharge. Further components such as sand filters, activated carbon vessels, air-stripping (see 2.3.3) and off-gas treatment may be necessary depending on the quality of the influent. The treatment plant shall be fitted with a sampling point. The design of the treatment plant shall consider any potential stratification of the tank waters and associated variation in quality, and also be suitable to deal with any residual waters generated by the desludging activity.

2.3.3 As part of the treatment process the Contractor shall ensure that levels of dissolved methane are removed prior to discharge from the site. Methane may be removed via a number of methods including crown sparging, in line methane stripping towers, air sparging etc. The Contractor is responsible for implementing a suitable designed solution in relation to methane reduction/removal. The method adopted should minimise the disturbance of basal sludges. Consideration of the chosen method should consider the potential nuisance effect of gas and other odours and suitable robust mitigation i.e. odour suppressant implemented. Monitoring of the foul sewer should also be undertaken to check for the potential build-up of methane, if required.

2.3.3 The parts of the foul drainage system to be used are to be surveyed by the Contractor to check the condition and confirmation that the selected discharge point is connected to the public foul system and can accept the planned flow rate. In addition, the route to the foul sewer will need to be proven to avoid any discharge to surface water drainage or water courses. The Contractor is to undertake a CCTV survey of the existing drainage/interceptors prior to gasholder dewatering and discharge and upon completion of the demolition works, as required. The Contractor shall include any jetting requirements as part of the works.

2.3.4 The Contractor shall be responsible for the disposal of filming oil and basal sludges, including any additional testing required for characterisation and disposal purposes.

2.3.5 Additives may be required to facilitate handling of sludges such as use of polymers as a flocculent, and pre-treatment of sludges may be required for waste acceptance purposes. The Contractor shall undertake any additional testing necessary following use of additives or treatment of sludges.

2.4 Consents

2.4.1 The Contractor shall obtain the necessary consent(s) from the local foul sewer provider or the Environment Agency / SEPA as required.

2.5 Compliance Testing

2.5.1 The Contractor shall provide and maintain all plant and equipment necessary to monitor discharge quantity and quality in accordance with the minimum standards outlined herein and any additional requirements as required by the relevant consent authority.

2.5.2 Sampling of the effluent quality prior to discharge will be required during the dewatering activity. The testing shall be undertaken at the discharge point in accordance with the parameters stated within the relevant consent. As a minimum, notwithstanding any consent

conditions, the treated effluent is to be tested on a weekly basis during discharge, for an appropriate suite of determinands.

2.5.3 The Contractor is to provide a safe means of access to the discharge point should the consent authority wish to carry-out compliance testing.

2.6 Monitoring and Supervision

2.6.1 The Contractor shall maintain a full-time site presence during removal of the filming oil. During the removal of tank waters, the Contractor shall undertake inspection visits on a minimum weekly basis, except during the latter stage of removal where a full-time presence will be required, to ensure that basal sludges are not removed or disturbed. A telemetry system shall be installed and maintained to provide sufficient data so the process can be monitored remotely with confidence.

2.7 Environmental and Emergency procedures

2.7.1 The Contractor should be aware that the Dewatering process can impact on the environment in several ways including odours from holder water and increased noise due to generators and pumps. The Contractor shall consider these issues in their Environmental Management plan.

2.7.2 The Contractor must have an emergency procedure/incident response plan in place to take account of any potential failure of dewatering plant or pipework to prevent an environmental incident.

2.7.3 The Contractor shall provide clean/dirty segregation/units during de-sludging activities. This will include, but is not limited to the provision of a boot-wash, changing area etc. in the immediate area surrounding the gasholder for use during de-sludging operations.

3 PREPARATION OF GASHOLDER TANK PRIOR TO INFILLING

3.1 General

3.1.1 Following dewatering and completion of the demolition activities the Contractor shall prepare the gasholder tank for infilling in accordance with the specification.

3.2 Characterisation of Materials

3.2.1 All materials generated by the preparation works (including any soil or hard materials) shall be tested and characterised by the Contractor. Suitable materials, subject to meeting the requirements of the specification, may be stockpiled and re-used as infill material. Where material is to be re-used on site, this must be undertaken in accordance with the CL:AIRE Code of Practice 'The Definition of Waste: Development Industry Code of Practice' under a Materials Management Plan, which is to be developed and implemented by the Contractor.

3.3 Sealing Requirements

3.3.1 The ends of any unsealed pipes or conduits shall be sealed by the Contractor by grout or using appropriate propriety pipe bungs, taking due care not to cause any blockage to adjacent live services.

3.3.2 The Contractor is to determine whether any additional sealing or drainage works are required and where necessary, include these in his design. These may include:

- Repairs to bases, walls and dumping;
- Break-out of the base;

- Installation of a clay seal around the tank walls, base and / or providing a clay cover; and
- Installation of a drainage system at the base or surface.

3.4 Groundwater Equalisation and Drainage

3.4.1 The Contractor is to determine whether groundwater equalisation (between the inside and outside of the gasholder tank) is required and where necessary, include this in his design.

3.4.2 Where a high-water table is present, the Contractor shall pay particular attention to the approach to dewatering (and any subsequent demolition), since dewatering of the holder without simultaneous lowering of the surrounding water table may lead to failure of the holder base by uplift and/or hydraulic heave. The Contractor should also take into account the potential settlement effects of dewatering on nearby structures. Where necessary the Contractor shall prepare a detailed dewatering plan, setting-out procedures to address this risk and identifying how the stability of the holder is to be monitored and maintained. A programme of detailed structural inspections/assessments will be required by a competent structural engineer and consideration given to relieving the stress on the dumping. In addition, the Contractor's dewatering plan shall give consideration to the use of standby pump(s) in case of breakdown to prevent re-charge of groundwater into the holder.

4 INFILLING REQUIREMENTS

4.1 General

4.1.1 The Contractor shall undertake infilling of below-ground gasholder tanks in accordance with the specification. The specification is also applicable to infilling of adjoining valve or siphon pits where present, and general land raising or other bulk fill operations.

4.1.2 The Contractor's infill design shall take into account the specified end-use of the site (as stated in the Scope of Works).

4.1.3 The requirements of this Specification should not detract from the Contractor's overall responsibility to provide acceptable material as defined in the Contract.

4.2 Permitted Materials

4.2.1 Only acceptable materials shall be used. All fills shall be of classes stated in Appendix A Table 2.

4.2.2 Unacceptable materials include:

- material that does not comply with the permitted constituents of Appendix A Table 2;
- peat, materials from swamps, marshes and bogs; logs, stumps and perishable materials; materials in a frozen condition; clay having a liquid limit (determined in accordance with BS1377:Part 2) exceeding 90 or a plasticity index (determined in accordance with BS1377:Part 2) exceeding 65; and material susceptible to spontaneous combustion; and
- Material containing contaminant concentrations in excess of the site-specific criteria.

4.2.3 Prior to the commencement of filling the Contractor is to determine the geotechnical and geochemical acceptability criteria for imported fill materials and any site-won material for re-use. These criteria shall be appropriate for the specified end-use of the site. The classes of material used should be appropriate for the location in the works.

4.2.4 Recycled materials may be permitted as acceptable materials providing that the content of other materials (including wood, plastic and metal) does not exceed 1% by mass. Recycled aggregates must also comply with the requirements for asphalt content in Table 2.

4.2.5 The Contractor is encouraged to propose alternative fill material not permitted by the specification. The Contractor shall provide a materials statement providing sufficient detail of the material's geochemical and geotechnical characteristics, proposed acceptability criteria (if different from those in Table 2) and proposed compaction method to enable the Employer to consider the proposal. Use of any alternative material will be subject to the Employer's consent.

4.2.6 Where materials are to be deposited in open water (i.e. where full dewatering is not achievable) only Class 6A materials shall be used.

4.2.7 Fill within 1.5 metres of the final formation level shall be Class 6F materials (Capping) compacted to an end product specification. Compliance testing shall be carried out by the Contractor in accordance with Table 1b.

4.2.8 Where siphon or valve pits are to be filled and these cannot be practicably compacted due to constraints, then only 6F materials shall be used.

4.2.9 Chalk shall only be used as infill to structures (including below ground gas-holders) by exception and with the permission of the Employer. If the Contractor wishes to use chalk as a potential fill material, this must be approved by the Employer at the initial tender stage. The testing and infilling regime must be carefully designed to ensure the material is acceptable as fill and agreed in writing prior to any chalk material being imported onto site.

4.2.10 An appropriate starter layer shall be used at the base of the infill and below any Class 2 fill materials.

4.3 Classification of Fill Materials

4.3.1 Classification of all fill materials used in the works shall be undertaken by the Contractor, who shall undertake all necessary testing in accordance with Table 1. For each stockpile or source of imported or site-won material for re-use the Contractor shall provide for the Employer's review, a material statement detailing the chemical testing results, geotechnical testing results, destination of material and proposed method of compaction. This statement shall be supplied to the Employer for comment a minimum of 10 working days prior to placement.

4.3.2 For geochemical testing the Contractor shall use a UKAS and MCERTS accredited laboratory, and shall ensure that the laboratory method detection limits are sufficient to meet the re-use/import criteria.

4.3.3 The Contractor shall undertake chemical testing to provide data to allow the suitability of any required fill materials. As a guide only, the Contractor shall provide chemical analysis of all fill materials at a minimum rate of 1 sample per 250 m³ for site derived materials. For on-site material there may be wide variation in potential contaminants, particularly if there are "hot spots" and 1:250m³ would be required. For open areas of the rest of the site there may be a case for relaxing the requirements. For imported material 1 sample per 1,000 m³ is suggested and at least 3 samples per source. The Contractor shall minimise the number of fill sources utilised. All imported fill material shall comply with the chemical criteria appropriate for the end-use specified in the Project Works Information. Any fill materials exceeding their respective criteria shall be assessed on an individual basis by the Project Manager. Such

materials may subsequently be approved for use as fill by the Project Manager dependent upon the nature and scale of any identified exceedances.

4.3.4 The Contractor shall undertake geotechnical testing in accordance with the Specification to confirm the classification and engineering properties of any required fill materials as complying with the requirements of Appendix A. The laboratory shall be UKAS accredited for the tests used. The Contractor shall provide geotechnical analysis of all fill materials at a minimum rate of 1 sample per 500T and at least three samples per source. The Contractor shall minimise the number of fill sources utilised.

4.3.5 The Contractor shall submit analytical results for both chemical and geotechnical sampling of any proposed fill material to the Supervisor for acceptance a minimum of 10 working days before to the material is transported to site or 10 working days prior to placement for on-site derived materials. Where the Supervisor doubts the consistency of the sources, additional tests will be required at the Contractor's expense.

4.4 Placement and Compaction of Infill Materials

4.4.1 The Contractor shall employ only plant and working methods which are suited to the materials to be handled and traversed. Materials shall be placed as soon as practicable, in layers to meet the compaction requirements of Appendix A as required for each permitted class of material in Table 2. Where Class 6A materials are placed in open water this shall be by end-tipping with no compaction to 250 mm above the standing level of the water.

4.4.2 Any imported fill materials shall be protected from deterioration from wetting and/or drying and wind erosion, and shall be stored on the site for the minimum time necessary.

4.4.3 Areas of fill shall be constructed evenly over their full width and their fullest possible extent and the Contractor shall control and direct constructional plant and other vehicular traffic uniformly over them. Damage by constructional plant and other vehicular traffic shall be made good by the Contractor with material having the same characteristics and strength as the material had before it was damaged. Each of the areas of backfilling shall be properly integrated by benching fills with the areas of previous backfilling and the side slopes of the backfill materials shall be maintained in a stable condition at batters not exceeding 1 in 1.5. Whenever fill is to be deposited against other fills, such faces shall be benched or otherwise shaped as described immediately before placing the subsequent fill.

4.4.4 The Contractor shall carry out compaction as soon as possible following placement of fill materials, for those fills that require compaction. Compaction of fill materials shall be undertaken by a method-based approach, unless end-product compaction is required in the Scope of Work or in the case the Contractor proposes an alternative fill source.

4.4.5 Access slopes. Slopes constructed for access into the gasholder base should be designed and constructed to be incorporated in the permanent works or removed on completion of the works unless stated elsewhere in the Projects Works Information.

4.5 Method Compaction

4.5.1 Method compaction shall be undertaken using the plant and methods in Appendix A Table 3 appropriate to the compaction requirements as listed in Table 2 for relevant class of material.

4.5.2 Method compaction is only to be carried out on material below 1.5 metres beneath formation level. Material above this level is to be subject to end product compaction.

4.5.3 Earthmoving plant shall not be accepted as compaction equipment nor shall the use of a lighter category of plant to provide any preliminary compaction, to assist the use of heavier plant be taken into account when assessing the amount of compaction required for any layer.

4.5.4 If more than one class of material is being used in such a way that it is not practicable to define the areas in which each Class occurs, the Contractor shall compact with plant, operating as if only the material which requires the greater compactive effort is being compacted. The compaction method used must be compatible with each type of material present.

4.5.5 The Employer may carry out field dry density tests as described on material compacted to method requirements. If the results of field tests show densities which indicate the state of compaction to be inadequate, the Contractor shall carry out such further work as is required to comply with the specification.

4.6 End Product Compaction

4.6.1 All material within 1.5 metres of the final formation level shall be compacted to an end product specification in accordance with Table 2.

4.6.2 The frequency of testing shall be in accordance with Table 1b.

4.6.3 The field dry density and CBR shall be measured in accordance with BS1377 Part 9. Where a nuclear density gauge is used for field dry density the gauge shall be calibrated in accordance with BS1377 Part 9. The calibration shall be provided to the employer at least five working days prior to the commencement of compaction, and the calibration certificates included in the test records in the Close out Report.

4.7 Testing Records

4.7.1 The Contractor is to provide the results of acceptability testing to the Employer as specified in Clause 4.3.5.

4.7.2 All geotechnical testing is to be carried out by laboratories or on-site testing providers that are UKAS accredited for all the required tests. Test certificates are required for all tests carried out.

4.7.3 The results of all testing shall be included in the Close Out Report for the works. These records shall include all relevant test and calibration certificates.

5 ENVIRONMENTAL CONTROLS

5.1 Environmental Management Plan

5.1.1 The Contractor is to prepare a site specific Environmental Management Plan, taking due consideration of the site specific environmental aspects and constraints. The plan shall detail the environmental monitoring to be undertaken, action levels and control / mitigation measures to be implemented during the works.

5.1.2 The Contractor shall place emphasis on preventing or controlling emissions at source and adopt best practice means to minimise impacts on the environment, including noise, vibration, dust, particulates, odour and vapour.

6 WORKS RECORDS AND REPORTING

6.1 Weekly Report

6.1.1 The Contractor is to prepare full and detailed records throughout the works. A weekly report is to be provided to the Employer, which shall include:

- Details of works completed
- Plant and materials
- Programme
- Volumes and quantities
- Testing details including materials quality
- Third party liaison
- SHE details including incidents or accidents

6.2 Close Out Report and H&S File in both hard copy and on memory stick

6.2.1 The Contractor shall prepare a Close Out Report providing full details of the works undertaken, which shall include the following:

- a) A general description of the works.
- b) Project Directory
- c) Site location and description.
- d) Details of dewatering and discharge records. Statement of compliance with Discharge Consent or actions implemented to mitigate any exceedance.
- e) Results of structural monitoring undertaken as part of the dewatering design. Statement that structural monitoring indicated no structural damage noted or actions implemented to mitigate any structural movement.
- f) Details of any preparation works undertaken prior to filling.
- g) Source and quality records of site-won and imported materials **plus** location in completed works. Statement that backfill material complied with the Specification prior to placement.
- h) Geotechnical classification testing results and certificates for acceptability and compliance testing, including location in the works.
- i) Geochemical testing certificates. Statement that material passed geochemical future site-use criteria (with criteria supplied) or actions implemented to mitigate any exceedances.
- j) Waste management and disposal records (including any pre-treatment undertaken). Including Summary of Waste materials taken off site including steel for recycling), identifying Dates / Volumes or Weights / Material / Haulier / Ultimate Destination / Waster Transfer Note References, (excluding water, oil and sludge see I below) and a clear statement that waste management and disposal complied with all relevant legislation.
- k) Location of any Asbestos Containing materials remaining on site.
- l) Water oil and sludge management and disposal records.
- m) Materials Management Plan verification.
- n) Details of any on-site treatment or improvement undertaken.
- o) Quality assurance/ quality control procedures adopted.
- p) Records of licences and consents obtained.

- q) As-built records, including:
1. Survey drawing of void prior to infilling
 2. Drawing of topographical survey of completed works
 3. Sources of fill materials, including volumes and location in the works
 4. Compaction records, including plant type, number of passes, and location in the works
 5. Location and treatment of soft spots and other non-compliant areas, with validation testing.
 6. Statement that compacted backfill meets the Specification or actions implemented to mitigate any failures.
- r) Results of any post construction performance monitoring.
- s) Calibration records of all site testing equipment used.
- t) Details of incidents / accidents / including relevant reports.
- u) Collateral Agreements between Consultants.
- v) Completion Certificate and any associated Snagging List.
- w) Pre and post demolition Condition Surveys.
- x) Environmental Monitoring Records and Logs.
- y) Photographs of site at completion of dismantling.
- z) Stakeholder engagement including complaints and complaint resolution.

6.2.2 The Contractor shall prepare a H&S File as a stand alone document, which shall include the following:

- i. Description of Project.
- ii. Project Directory.
- iii. Site Plan showing known buried services, isolation points and items dismantled and or infilled.
- iv. Isolation certificates.
- v. List of known residual site hazards and risks (with drawing if appropriate).

Copy of Close out report (NOTE For hard copy this can be on a Memory Stick or CD)

APPENDIX A: GEOTECHNICAL CLASSIFICATION OF FILL MATERIALS AND COMPACTION REQUIREMENTS

TABLE 1a: Acceptability Testing Requirements

Prior to acceptance of the material the Contractor is to carry out the following geotechnical testing. Test certificates are required for each and every test specified.

A minimum of three of each test per source is required prior to acceptance by the Employer. See Clause 4.3.5

Testing standards are given in Table 2

Acceptable Material				
Class	General Description	Testing	Frequency of Testing	Remarks
1	General granular fill	Grading/uniformity coefficient	1 test per 500 tonnes of material	
		Optimum water content	1 test per 500 tonnes of material	Can be substituted by MCV subject to approval by the Employer. Calibration testing must be carried out to establish acceptability limits.
		Water content (or MCV if used)	Daily	
		Los Angeles coefficient	1 test per 500 tonnes of material	Class 1C only
		IDD/SMC of Chalk	1 test per 500 tonnes of material	Class 1A only
2	General cohesive fill	Grading	1 test per 500 tonnes of material	
		Plastic limit	1 test per 500 tonnes of material	Can be substituted by MCV subject to approval by the Employer.
		Water content	Daily	
		MCV	Daily	Calibration testing must be carried out to establish acceptability limits.
		Undrained shear strength in triaxial compression (remoulded material)	1 test per 500 tonnes of material	Can be substituted by laboratory shear vane in MCV mould. Calibration testing must be carried out to establish acceptability limits.
		Bulk density	1 test per 500 tonnes of material	Class 2E only
		IDD	1 test per 500 tonnes of material	

Acceptable Material				
Class	General Description	Testing	Frequency of Testing	Remarks
4	Landscape fill	-	-	Not used
5	Topsoil	-	-	Not used
6	Selected granular fill (Classes 6E, 6F3, 6G, 6H, 6I, 6J, 6K, 6L, 6M, 6Q, 6S not used)	Grading/uniformity coefficient	1 test per 500 tonnes of material	
		Optimum water content	1 test per 500 tonnes of material	
		Liquid limit	1 test per 500 tonnes of material	
		Plasticity index	1 test per 500 tonnes of material	
		Water content	Daily	
		Undrained shear strength parameters C_u , ϕ_u	1 test per 500 tonnes of material	Classes 6N/6P only
		Effective cohesion c' , and effective angle of internal friction ϕ'	1 test per 500 tonnes of material	
		Permeability	1 test per 500 tonnes of material	
		Los Angeles coefficient	1 test per 500 tonnes of material	
		10% fines value	1 test per 500 tonnes of material	
		Organic matter content	1 test per 500 tonnes of material	Classes 6E/6R only
		Class Ra asphalt content	1 test per 500 tonnes of material	
		Bitumen content	1 test per 500 tonnes of material	
		Size designation and overall grading category	1 test per 500 tonnes of material	Classes 6F4/6F5 only
		Maximum fines and oversize categories	1 test per 500 tonnes of material	Classes 6F4/6F5 only

Acceptable Material				
Class	General Description	Testing	Frequency of Testing	Remarks
		Volume stability	1 test per 500 tonnes of material	Only applicable to slag materials in Class 6F4/6F5
		Water soluble sulfate content	1 test per 500 tonnes of material	Class 6R only
		Oxidisable sulfide content	1 test per 500 tonnes of material	
7	Selected wet cohesive fill (Classes 7A, 7C and 7D not used)	Grading	1 test per 500 tonnes of material	
		Optimum water content	1 test per 500 tonnes of material	Can be substituted by MCV subject to approval by the Employer.
		Water content	Daily	
		MCV	Daily	Calibration testing must be carried out to establish acceptability limits.
		Undrained shear strength parameters c_u, ϕ_u	1 test per 500 tonnes of material	Class 7A and 7B only Can be substituted by laboratory shear vane in MCV mould. Calibration testing must be carried out to establish acceptability limits.
		Effective cohesion c' , and effective angle of internal friction ϕ'	1 test per 500 tonnes of material	
		Liquid limit	1 test per 500 tonnes of material	
		Plasticity index	1 test per 500 tonnes of material	
		Permeability	1 test per 500 tonnes of material	Class 7J only
8	Lower trench fill			Not used
9	Stabilised materials			Not used

Table 1b: End Product and Formation Testing Requirements

The following testing is to be carried out on all Class 2 materials, and Class 6F materials placed within 1.5 metres of the final formation level.

The Contractor may elect to carry out additional testing in other layers and/or materials in addition to the requirements of this table.

Material Type	Testing	Acceptable Lower Limit	Remarks	Frequency
Class 2	Hand shear vane	50kPa		Every 0.5m vertically. 1 per 500m ² of completed layer, minimum of 3 per layer. Tests in successive layers must be carried out at least ten metres horizontally from the tests in the previous layer.
	In-situ CBR, BS1377 Part 9	2.5%		
	Field dry density, BS1377 Part 9	95% of MDD (BS1377 Part 4, 4.5kg rammer method)	Nuclear density gauge shall be calibrated prior to acceptance of method	
Class 6F (All)	In-situ CBR, BS1377 Part 9	15%		
	Field dry density, BS1377 Part 9	95% of MDD (BS1377 Part 4, vibrating hammer method)	Nuclear density gauge shall be calibrated prior to acceptance of method	

If stated in the Works Information in addition to the tests given above, the following additional testing may be required:

- Shallow pad maintained load test to BS1377 Part 9.

TABLE 2: Acceptable Earthworks Materials: Classification and Compaction Requirements

Class				General Material Description	Typical Use	Permitted Constituents	Material Properties Required for Acceptance (Note 1)				Compaction Requirements (Note 1)
							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.	(i) grading	BS1377 Part 2 or BSEN 13242	MCHW Table 6/2	MCHW Table 6/2	MCHW Table 6/4 Method 2
							(ii) uniformity coefficient		10		
							(iii) optimum water content	BS1377 Part 4 vibrating hammer	-	-	
							(iv) water content	BS1377 Part 2 (Note 5)	Optimum -2%	Optimum +2%	
							(v) contamination	Clause 3.4	-	Note 2	
	1	B		Uniformly graded granular material	General Fill	Any material, or combination of materials, other than chalk. Recycled aggregate.	(i) grading	BS1377 Part 2 or BSEN 13242	MCHW Table 6/2	MCHW Table 6/2	MCHW Table 6/4 Method 3
							(ii) uniformity coefficient		-	10	
							(iii) optimum water content	BS1377 Part 4 vibrating hammer	-	-	
							(iv) water content	BS1377 Part 2 (Note 5)	Optimum -2%	Optimum +2%	
							(v) contamination	Clause 3.4	-	Note 2	
	1	C		Coarse granular material	General Fill	Any material, or combination of materials, other than chalk. Recycled aggregate.	(i) grading	BS1377 Part 2 or BSEN 13242	MCHW Table 6/2	MCHW Table 6/2	MCHW Table 6/4 Method 5
							(ii) uniformity coefficient		5	-	
							(iii) Los Angeles coefficient	BSEN 1097-2	-	50	

Class				General Material Description	Typical Use	Permitted Constituents	Material Properties Required for Acceptance (Note 1)				Compaction Requirements (Note 1)
							Property (See exceptions in previous column)	Defined and Tested in Accordance With	Acceptable Limits Within		
									Lower	Upper	
GENERAL COHESIVE	2	A		Wet cohesive material	General Fill	Any material, or combination of materials, other than chalk.	(i) grading	BS1377: Part 2	MCHW Table 6/2	MCHW Table 6/2	MCHW Table 6/4 Method 1 except that for materials with liquid limit greater than 50 only deadweight or vibratory tamping rollers or grid rollers shall be used
							(ii) liquid limit	BS1377: Part 2	-	-	
							(iii) plastic limit (PL)	BS1377: Part 2	-	-	
							(iv) water content	BS1377 Part 2 (Note 5)	PL - 4%	-	
							(v) MCV	BS1377 Part 4	Table 1a (Note 4)	Table 1a (Note 4)	
							(vi) Undrained shear strength of re-moulded material	MCHW Clause 633 (Note 1) (Note 3)	50kPa (or as specified by the Permanent Works Designer)		Table 1b
							(vii) contamination	Clause 3.4	-	Note 2	
FILL	2	B		Dry cohesive material	General fill	Any material, or combination of materials, other than chalk.	(i) grading	BS1377: Part 2	MCHW Table 6/2	MCHW Table 6/2	MCHW Table 6/4 Method 2
							(ii) plastic limit (PL)	BS1377: Part 2	-	-	Table 1b
							(iii) water content	BS1377 Part 2 (Note 5)	-	PL - 4%	
							(iv) MCV	BS1377 Part 4	Table 1a (Note 4)	Table 1a (Note 4)	
							(v) Undrained shear strength of re-moulded material	MCHW Clause 633 (Note 1) (Note 3)	50kPa (or as specified by the Permanent Works Designer)		
							(vi) contamination	Clause 3.4	-	Note 2	

Class			General Material Description	Typical Use	Permitted Constituents	Material Properties Required for Acceptance (Note 1)				Compaction Requirements (Note 1)
						Property (See exceptions in previous column)	Defined and Tested in Accordance With	Acceptable Limits Within		
								Lower	Upper	
2	C		Stony cohesive material	General fill	Any material, or combination of materials, other than chalk.	(i) grading	BS1377: Part 2	MCHW Table 6/2	MCHW Table 6/2	MCHW Table 6/4 Method 2 Table 1b
						(ii) plastic limit (PL)	BS1377: Part 2	-	-	
						(iii) water content	BS1377 Part 2 (Note 5)	-	PL - 4%	
						(iv) MCV	BS1377 Part 4	Table 1a (Note 4)	Table 1a (Note 4)	
						(v) Undrained shear strength of re-moulded material	MCHW Clause 633 (Note 1) (Note 3)	50kPa (or as specified by the Permanent Works Designer)		
						(vi) contamination	Clause 3.4	-	Note 2	
2	D		Silty cohesive material	General fill	Any material, or combination of materials, other than chalk.	(i) grading	BS1377: Part 2	MCHW Table 6/2	MCHW Table 6/2	MCHW Table 6/4 Method 3 Table 1b
						(ii) MCV	BS1377 Part 4	Table 1a (Note 4)	Table 1a (Note 4)	
						(iii) Undrained shear strength of re-moulded material	MCHW Clause 633 (Note 1) (Note 3)	50kPa (or as specified by the Permanent Works Designer)		
						(iv) contamination	Clause 3.4	-	Note 2	
2	E		Reclaimed pulverised fuel ash cohesive material	General fill	Reclaimed material from lagoons or stockpile containing not more than 20% furnace bottom ash	(i) water content	BS1377 part 2 (Note 5)	To enable compaction to MCHW Clause 612		End product 95% of maximum dry density of BS1377 Part 4 (4.5kg rammer)
						(ii) bulk density	BS1377 Part 9	1.3Mg/m³	-	
						(iii) contamination	Clause 3.4	-	Note 2	

Class				General Material Description	Typical Use	Permitted Constituents	Material Properties Required for Acceptance (Note 1)				Compaction Requirements (Note 1)
							Property (See exceptions in previous column)	Defined and Tested in Accordance With	Acceptable Limits Within		
									Lower	Upper	
	4			Various	Fill to landscape areas	Not used					
	5			Topsoil or Turf	Topsoiling	Not used					
S E L E C T E D G R A N U L A R	6	A		Selected well graded granular material	Below water	Natural gravel, natural sand, crushed gravel, crushed rock (other than argillaceous rock and chalk) crushed concrete, well burnt colliery spoil, or any combination thereof. Recycled aggregate. Where material is imported onto site which is not “as-dug” it shall be aggregate conforming to BSEN13242 from one or more of the following source codes (Note 6): P – natural aggregates except shale, siltstone or slate A – construction and demolition recycling industries	(i) grading	BS1377 Part 2 (On-site)	MCHW Table 6/2	MCHW Table 6/2	No compaction
								BSEN933-2 (Imported onto site)	MCHW Table 6/5	MCHW Table 6/5	
							(ii) uniformity coefficient		10	-	
							(iii)	BS1377 Part 2	Non plastic		
							(iv) contamination	Clause 3.4	-	Note 2	
F I L L	6	B		Selected coarse granular material	Starter layer	Natural gravel, natural sand, crushed gravel, crushed rock (other than argillaceous rock and chalk) crushed concrete, well burnt colliery spoil, or any combination thereof. Recycled aggregate. Where material is imported onto site which is not “as-dug” it shall	(i) grading	BS1377 Part 2 (On-site)	MCHW Table 6/2	MCHW Table 6/2	MCHW Table 6/4 Method 5
								BSEN933-2 (Imported onto site)	MCHW Table 6/5	MCHW Table 6/5	
							(ii) uniformity coefficient		10	-	
							(iii)	BS1377 Part 2	Non plastic		

Class				General Material Description	Typical Use	Permitted Constituents	Material Properties Required for Acceptance (Note 1)				Compaction Requirements (Note 1)
							Property (See exceptions in previous column)	Defined and Tested in Accordance With	Acceptable Limits Within		
									Lower	Upper	
					be aggregate conforming to BSEN13242 from one or more of the following source codes (Note 6): P – natural aggregates except shale, siltstone or slate A – construction and demolition recycling industries D2 – air-cooled blast furnace slag D3 – basic oxygen furnace slag D4 – electric arc furnace slag G1 – red coal shale G3 – pre-selected all-in from quarrying/mining	(iv) Los Angeles coefficient	BSEN 1097-2	-	50		
						(v) optimum water content	BS1377 Part 4 vibrating hammer	-	-		
						(vi) water content	BS1377 Part 2 (Note 5)	Optimum -2%	Optimum +2%		
						(vii) contamination	Clause 3.4	-	Note 2		
6	C		Selected uniformly graded granular material	Starter layer	Natural gravel, natural sand, crushed gravel, crushed rock (other than argillaceous rock and chalk) crushed concrete, well burnt colliery spoil, or any combination thereof. Recycled aggregate. Where material is imported onto site which is not “as-dug” it shall be aggregate conforming to BSEN13242 from one or more of the following source codes (Note 6): P – natural aggregates except shale, siltstone or slate A – construction and demolition recycling industries	(i) grading	BS1377 Part 2 (On-site)	MCHW Table 6/2	MCHW Table 6/2	MCHW Table 6/4 Method 3	
							BSEN933-2 (Imported onto site)	MCHW Table 6/5	MCHW Table 6/5		
						(ii) uniformity coefficient		-	10		
						(iii)	BS1377 Part 2	Non plastic			
						(iv) Los Angeles coefficient	BSEN 1097-2	-	50		
						(v) optimum water content	BS1377 Part 4 vibrating hammer	-	-		
						(vi) water content	BS1377 Part 2 (Note 5)	Optimum -2%	Optimum +2%		

Class				General Material Description	Typical Use	Permitted Constituents	Material Properties Required for Acceptance (Note 1)				Compaction Requirements (Note 1)
							Property (See exceptions in previous column)	Defined and Tested in Accordance With	Acceptable Limits Within		
									Lower	Upper	
					D2 – air-cooled blast furnace slag D3 – basic oxygen furnace slag D4 – electric arc furnace slag G1 – red coal shale G3 – pre-selected all-in from quarrying/mining	(vii) contamination	Clause 3.4	-	Note 2		
6	D		Selected uniformly graded granular material	Starter layer below pulverised fuel ash	Natural gravel, natural sand, crushed gravel, crushed rock (other than argillaceous rock and chalk) crushed concrete, well burnt colliery spoil, or any combination thereof. Recycled aggregate. Where material is imported onto site which is not “as-dug” it shall be aggregate conforming to BSEN13242 from one or more of the following source codes (Note 6): P – natural aggregates except shale, siltstone or slate A – construction and demolition recycling industries D2 – air-cooled blast furnace slag D3 – basic oxygen furnace slag D4 – electric arc furnace slag G1 – red coal shale G3 – pre-selected all-in from quarrying/mining	(i) grading	BS1377 Part 2 (On-site)	MCHW Table 6/2	MCHW Table 6/2	MCHW Table 6/4 Method 4	
							BSEN933-2 (Imported onto site)	MCHW Table 6/5	MCHW Table 6/5		
						(ii) uniformity coefficient		-	10		
						(iii)	BS1377 Part 2	Non plastic			
						(iv) optimum water content	BS1377 Part 4 vibrating hammer	-	-		
						(v) water content	BS1377 Part 2 (Note 5)	Optimum -2%	Optimum +2%		
						(vi) contamination	Clause 3.4	-	Note 2		

Class			General Material Description	Typical Use	Permitted Constituents	Material Properties Required for Acceptance (Note 1)				Compaction Requirements (Note 1)
						Property (See exceptions in previous column)	Defined and Tested in Accordance With	Acceptable Limits Within		
								Lower	Upper	
6	E		Selected granular material (Class 9A)	For stabilisation with cement to form capping	Not used					
6	F	1	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. Excluding materials contaminated with tar and tar-bitumen 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	BS1377 Part 2 (On-site only)	MCHW Table 6/2	MCHW Table 6/2	End product 95% of maximum dry density of BS1377 Part 4 (vibrating hammer method) CBR ≥15% Maximum layer thickness 200mm
						(ii) optimum water content	BS1377 Part 4 vibrating hammer	-	-	
						(iii) water content	BS1377 Part 2 (Note 5)	Optimum -2%	Optimum	
						(iv) Los Angeles coefficient	BSEN 1097-2	-	60	
						(v) Class Ra (asphalt) content	BSEN933-11	-	50%	
						(vi) bitumen content	BSEN12697-1 or BSEN12697-39	-	2%	
						(vii) contamination	Clause 3.4	-	Note 2	
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. Excluding materials contaminated with tar and tar-	(i) grading	BS1377 Part 2 (On-site only)	MCHW Table 6/2	MCHW Table 6/2	End product 95% of maximum dry density of BS1377 Part 4 (vibrating hammer method) CBR ≥15%
						(ii) optimum water content	BS1377 Part 4 vibrating hammer	-	-	
						(iii) water content	BS1377 Part 2 (Note 5)	Optimum -2%	Optimum	

Class			General Material Description	Typical Use	Permitted Constituents	Material Properties Required for Acceptance (Note 1)				Compaction Requirements (Note 1)
						Property (See exceptions in previous column)	Defined and Tested in Accordance With	Acceptable Limits Within		
								Lower	Upper	
					bitumen 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.	(iv) Los Angeles coefficient	BSEN 1097-2	-	50	Maximum layer thickness 200mm
						(v) Class Ra (asphalt) content	BSEN933-11	-	50%	
						(vi) bitumen content	BSEN12697-1 or BSEN12697-39	-	2%	
						(vii) contamination	Clause 3.4	-	Note 2	
6	F	3	Selected granular material	Capping	Not used					
6	F	4	Selected granular material (fine grading) imported onto site	Capping	Unbound mixture complying with BSEN13285 containing aggregate conforming to BSEN13242 from one or more of the following source codes (Note 6) P – natural aggregates except chalk, shale, siltstone or slate A2 – crushed concrete A3 – crushed bricks, masonry A4 – mixed recycled aggregate B1 – municipal incinerator bottom ash D2 – air-cooled blast furnace slag D3 – basic oxygen furnace slag	(i) size designation and overall grading category	BSEN13285 0/31.5 and G _E	MCHW Table 6/5	MCHW Table 6/5	End product 95% of maximum dry density of BS1377 Part 4 (vibrating hammer method) CBR ≥15% Maximum layer thickness 200mm
						(ii) maximum fines and oversize categories	BSEN13285 UF ₁₅ and OC ₇₅	MCHW Table 6/5	MCHW Table 6/5	
						(iii) Los Angeles coefficient	BSEN13242 LA ₆₀	-	60	
						(iv) volume stability of blast furnace slag	BSEN13242	Free from dicalcium silicate and iron disintegration		
						(v) volume stability of stell (BOF and EAF) slag	BSEN13242 V ₅			

Class			General Material Description	Typical Use	Permitted Constituents	Material Properties Required for Acceptance (Note 1)				Compaction Requirements (Note 1)
						Property (See exceptions in previous column)	Defined and Tested in Accordance With	Acceptable Limits Within		
								Lower	Upper	
					D4 – electric arc furnace slag 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.	(vi) other aggregate requirements	BSEN13242	Category NR – no requirements		
						(vii) laboratory dry density and optimum water content	BSEN13285	Clause 5.3 declared values		
						(viii) water content	BSEN1097-5	Optimum -2%	Optimum	
						(ix) Class Ra (asphalt) content	BSEN933-11	-	50%	
						(x) bitumen content	BSEN12697-1 or BSEN12697-39	-	2%	
						(xi) contamination	Clause 3.4	-	Note 2	
6	F	5	Selected granular material (coarse grading) imported onto site	Capping	Unbound mixture complying with BSEN13285 containing aggregate conforming to BSEN13242 from one or more of the following source codes (Note 6) P – natural aggregates except chalk, shale, siltstone or slate A2 – crushed concrete A3 – crushed bricks, masonry A4 – mixed recycled aggregate B1 – municipal incinerator	(i) size designation and overall grading category	BSEN13285 0/80 and G _E	MCHW Table 6/5	MCHW Table 6/5	End product 95% of maximum dry density of BS1377 Part 4 (vibrating hammer method)
						(ii) maximum fines and oversize categories	BSEN13285 UF ₁₂ and OC ₇₅	MCHW Table 6/5	MCHW Table 6/5	CBR ≥15%
						(iii) Los Angeles coefficient	BSEN13242 LA ₅₀	-	50	Maximum layer thickness 200mm
						(iv) volume stability of blast furnace slag	BSEN13242	Free from dicalcium silicate and iron disintegration		

Class			General Material Description	Typical Use	Permitted Constituents	Material Properties Required for Acceptance (Note 1)				Compaction Requirements (Note 1)
						Property (See exceptions in previous column)	Defined and Tested in Accordance With	Acceptable Limits Within		
								Lower	Upper	
					bottom ash D2 – air-cooled blast furnace slag D3 – basic oxygen furnace slag D4 – electric arc furnace slag 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.	(v) volume stability of stell (BOF and EAF) slag	BSEN13242 V ₅			
						(vi) other aggregate requirements	BSEN13242	Category NR – no requirements		
						(vii) laboratory dry density and optimum water content	BSEN13285	Clause 5.3 declared values		
						(viii) water content	BSEN1097-5	Optimum -2%	Optimum	
						(ix) Class Ra (asphalt) content	BSEN933-11	-	50%	
						(x) bitumen content	BSEN12697-1 or BSEN12697-39	-	2%	
						(xi) contamination	Clause 3.4	-	Note 2	
6	G		Selected granular material	Gabion filling	Not used					
6	H		Selected granular material	Drainage layer to reinforced soil and anchored earth structures	Not used					
6	I		Selected	Fill to	Not used					

Class				General Material Description	Typical Use	Permitted Constituents	Material Properties Required for Acceptance (Note 1)				Compaction Requirements (Note 1)
							Property (See exceptions in previous column)	Defined and Tested in Accordance With	Acceptable Limits Within		
									Lower	Upper	
6	6	J		granular material	reinforced soil and anchored earth structures						
	6	K		Selected granular material	Bedding and surround to corrugated steel buried structures	Not used					
	6	L									
	6	M									
	6	N		Selected granular material	Fill to structures	Not used					
	6	P									
	6	Q									
	6	R		Selected granular material	For stabilisation with lime and cement to form capping (Class 9F)	Not used					
	6	S		Selected granular material	Filter layer below sub-base	Not used					
SELECTED CO	7			Selected cohesive material	Various	Not used					
	7	J		Selected wet cohesive material	Clay cut-off walls/barrier layer	Any material, or combination of materials, other than chalk.	(i) grading	BS1377 Part 2 (On-site)	Table 3	Table 3	MCHW Table 6/4 Method 1 except that for materials with liquid limit greater than 50 only deadweight or vibratory tamping
								BSEN933-2 (Imported onto site)	Table 3	Table 3	
									(ii) permeability	BS1377 Part 6	

Class				General Material Description	Typical Use	Permitted Constituents	Material Properties Required for Acceptance (Note 1)				Compaction Requirements (Note 1)
							Property (See exceptions in previous column)	Defined and Tested in Accordance With	Acceptable Limits Within		
									Lower	Upper	
H E S I V E F I L L							(iii) optimum water content	(Note 6)	-	-	rollers shall be used
							(iv) water content	BS1377 Part 2 (Note 5)	Optimum -2%	Optimum +2%	
							(v) liquid limit	BS1377 Part 2		90	
							(vi) plasticity index	BS1377 Part 2		65	
							(vii) contamination	Clause 3.4	-	Note 2	
	8			Lower trench fill	Not used						
	9			Stabilised capping	Not used						

Notes:

Note 1: MCHW Clause 633 refers to the Manual of Contract Documents for Highway Works, Volume 1: Specification for Highway Works, Series 600 – Earthworks.

Note 2: Contamination limit to be Materials Reuse Target Criteria or Imported Material Contamination Limits for the site, as appropriate. If recycled bituminous planings are to be used, the chemical test suite shall include leachate testing to confirm the absence of tar and tar-bitumen binders.

Note 3: See also testing requirements in Table 1a

Note 4: If the Contractor proposes to use MCV as the acceptance criterion, the MCV/moisture content relationship must first be established in accordance with BS1377 Part 4 method 5.5, and agreed with the employer prior to importing or placing material.

Note 5: Where BS1377 Part 4 is specified for water content, this shall mean BS1377 Part 4 where the material is a soil or BSEN1097-5 where the material is required to conform to a harmonised European Standard.

Note 6: Material source codes are listed in MCHW Table 6/7. Where materials are required to be aggregates conforming to BSEN13242 materials certified as being compliant with BSEN13285 are acceptable for use provided that they meet all the specification requirements and the Declaration of Performance for constituent parts to BS13242 are provided to the Employer.

Note 7: for Class 7J material the optimum water content shall be determined by compacting five specimens at different water contents and measuring permeability in accordance with BS1377 Part 6. A plot of permeability vs. compaction water content shall be prepared, and the optimum water content determined as that which gives the lowest permeability.

Table 3: Grading for Class 7J material

	Percentage by Mass Passing the Sieve Size Shown		
Class	Size (mm) BS Series		
	20	2.0	0.063
7J	100	80 – 100	15 – 100

APPENDIX B: POSSIBLE CHEMICAL ANALYTICAL SUITE**SOILS:**

Inorganics
<i>If gasworks derived material to be used:</i> Easily-liberatable Cyanide ¹ , Complex Cyanide, Total Cyanide, Thiocyanate, Elemental Sulphur
<i>All materials:</i> Water Soluble Sulphate, Water Soluble Chloride, Exchangeable Ammonium
Metals
<i>If Made Ground derived material to be used:</i> Arsenic, Boron, Cadmium, Chromium, Hexavalent Chromium, Cobalt, Lead, Mercury, Selenium, Copper, Nickel, Vanadium, Zinc NOTE: this list should be reviewed based on previous site usage.
Phenolics
<i>If gasworks derived material to be used:</i> Phenol, Catechol, Resorcinol, Cresols, Xylenols & Ethylphenols, Naphthols, Trimethylphenol, Total Phenols
PAHs
<i>If Made Ground derived material from sites with history of having oil based products on-site:</i> Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Di-benz(a,h,)anthracene, Benzo(g,h,i)perylene, Total PAH (US:EPA 16)
BTEX/Fuel Hydrocarbons
<i>If Made Ground derived material from sites with history of having oil based products on-site:</i> Benzene, Toluene, Ethylbenzene, Xylenes, Speciated Total Petroleum Hydrocarbons - banded as per - CWG
PCB Congeners
<i>If Made Ground derived material from substation sites to be used:</i> PCB 28, PCB 52, PCB 101, PCB 118, PCB 138, PCB 153, PCB 180
Miscellaneous
<i>All materials:</i> Fraction of organic Carbon
<i>All materials:</i> pH
<i>All materials:</i> Asbestos quantification (0.001% detection limit), % Loss on Ignition, % Moisture, % Stones

Note:

- Any analytical test adopted by the Contractor or Consultant for measuring easily liberatable cyanide should measure those compounds containing cyanide groups which can form hydrogen cyanide at pH 4

The following additional tests may be required to avoid the site being constrained for future development:

Chemical Test on Potentially Aggressive Ground (soils)		
Acid soluble SO ₄ (<i>If PYRITE Present</i>)	BS 1377 Part 3	Method 5.2 + 5.5
Total sulphur (<i>If PYRITE Present</i>)	BR 279 Ignition in oxygen TRL 447	Test 4B or Test 4A
Mg (<i>only required if water soluble SO₄ > 3 g/l</i>)	BR 279	Atomic Absorption Spectrum method
NO ₃ in 2:1 water/soil extract (<i>only required if pH < 5.5</i>)	BR 279	
Cl in 2:1 water/soil extract (<i>only required if pH < 5.5</i>)	BR 279 BS 1377 Part 3	Method 7.2

EXAMPLE LEACHATE ANALYTES

Where groundwater risk is a factor in choosing infill, the following analytes may be required.

pH	Chromium
Phenols (total)	Lead
Naphthalene	Mercury
Benzo(a)pyrene	Copper
PAHs(total)*	Nickel
Ammonium (as N)	Zinc
Cyanide(total)	Iron
Sulphate	
Arsenic	
Cadmium	

Note:

*sum of four PAHs (benzo(b)fluoranthene, benzo(k)fluoranthene, indeno(1/2/3-cd)pyrene and benzo(g/h/i)perylene)

It is recognised that laboratory detection limits may not be able to achieve the Contamination Limits specified. Any instances where this is the case must be reported to the Engineer prior to the start of site works.