BURO HAPPOLD

NOMA 2 Angel Square

Specification for Earthworks

2AS-BHE-XX-XX-SP-GE-0003

050930

18 March 2024

Revision P03

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Revision	Description	Issued by	Date	Checked
P01	Earthworks Specification – Draft for agreement with the Local Authority			
P02	Earthworks Specification – Draft for agreement with the Local Authority			
P03	Earthworks Specification – Draft for agreement with the Local Authority	PH	18/03/24	COH

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Appendix A Contamination Procedures & Documentation

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1 Introduction

1.1 General

The Site is located to the north of Manchester City Centre, approximately 220 m east of Manchester Victoria Railway Station. It is also in the immediate vicinity of the existing Co-operative Insurance Society (CIS) Tower which lies just beyond the corner of the western boundary. The site area is currently hardstanding/car parking which is managed by RCP, with the main access from Angel Street. The immediate surrounding area comprises the NOMA marketing suite, urban development including residential, warehouses, offices and manufacturing facilities. A site location plan is included below.

The site slopes from 45-47 m AOD in the northeast along Angel Street to 41-44 m AOD in the south adjacent to Miller Street.

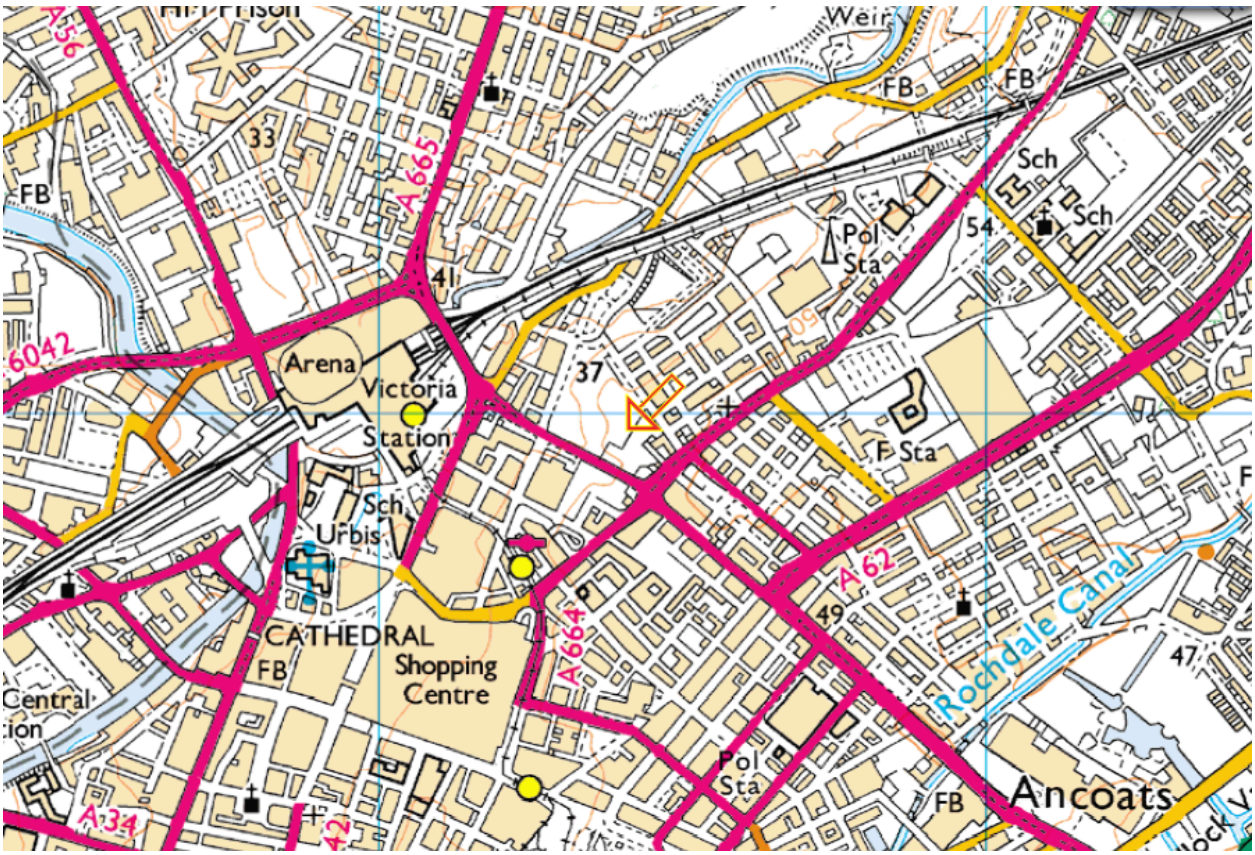


Figure 1—1 Site Location Plan

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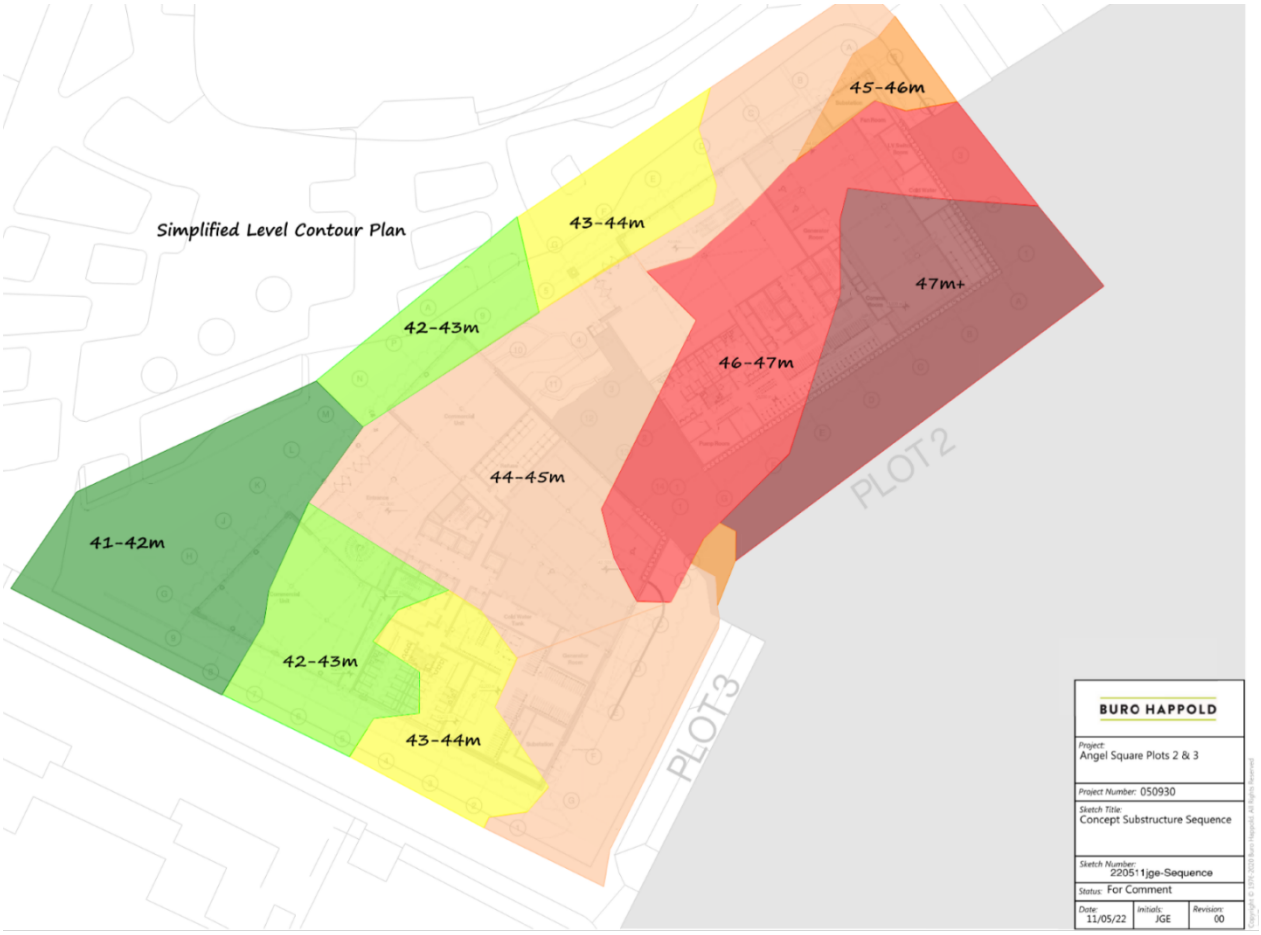


Figure 1—2 Levels Plan

The proposed development is situated in an area identified as being at 'moderate' risk from unexploded ordnance (UXO) as detailed in the relevant Zetica UXB (Unexploded Bomb) risk map for the site[1]. A Detailed Unexploded Ordnance (UXO) Risk Assessment[2] was undertaken by 1st Line Defence on behalf of the Client, MEPC. The conclusion of the UXO Risk Assessment was that the site is 'medium risk' therefore UXO mitigation is considered to be required during construction phases of work.

1.2 Earthworks Scope

Further details of the scope of works and roles and responsibilities are as defined by the Supervisor and Project Manager and in the Contract Documents.

The works covered by this specification include but are not limited to the following items:

- Remodelling of the site topography and associated landscaping;

[1] Zetica, Regional Unexploded Bomb Risk Map, Site Location Map Centre 399468,651513
[2] 1st Line Defence, Detailed Unexploded Ordnance (UXO) Risk Assessment, 2 & 3 Angel Square, Manchester, ref: DA13039-00, 16/04/2021.

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- Removal of existing hardstanding and obstructions as required. Please note, as part of the enabling works to remove obstructions, a watching brief shall be provided by the contractor to ensure any areas of unforeseen contamination are recorded and an appropriate strategy put in place to investigate and remediate (if required). Please note, the area of the brick manhole chamber (recorded in TP110a) is a priority area;
- Use of site won material to achieve cut and fill balance as far as practicable;
- Forming bulk, pit, trench and surface area excavations (excluding those for services);
- Filling holes and excavations (excluding those for services);
- Making up levels by filling in bulk or in layers, including hardcore, but excluding capping layers or sub-bases to roads and paving;
- Structural filling works to underside of substructure;
- Final trimming to final formation levels.

Topsoil in soft landscaped areas and/or tree pits, build-ups beneath slabs (e.g. MOT / Type 1) and road pavement build-ups are not covered by this specification.

1.3 Ground Conditions

The anticipated geology based on existing ground investigation information is summarised in Table 1-1.

Table 1-1: Summary of ground conditions encountered during site specific ground investigation undertaken by Structural Soils Limited (SSL) in 2015 and 2021.

Depth to Top of Strata (m BGL) [m AOD]	Typical Thickness (m)	Generalised Description
0.00 41.00-47.50	0.15 – 5.00	Black brown slightly clayey slightly sandy angular to subangular GRAVEL of brick and ash with high cobble and medium boulder content. Gravel comprises various materials including sandstone, mudstone, limestone, glass, tarmac, coal, slag, concrete, slate, clinker, brick, rare granite and ceramic fragments. AND Black sandy fine to coarse GRAVEL in clayey matrix with pottery and snail shells (1.80 - 2.20 m BGL in TP5 only – former reservoir) [MADE GROUND]
0.35 – 4.65 45.80-	>0.20 - 14.80	Firm to very stiff brown/red brown slightly sandy silty gravelly CLAY. Gravel is fine to coarse angular to rounded of sandstone & mudstone. AND Dense to very dense orange brown, slightly clayey, slightly gravelly fine to coarse SAND. Gravel is fine to coarse, subangular to rounded of quartzite, limestone, sandstone and ironstone. Occasional layers of brown, sandy, gravel. [GLACIAL TILL / GLACIOFLUVIAL]
11.10 – 15.50 29.85-32.50	>10.00 - >17.00 (thickness not proven)	Very dense reddish brown slightly gravelly fine to coarse SAND. Gravel is subrounded to rounded fine to course of quartzite. AND Very weak to weak, red/brown, medium to coarse grained sandstone with occasional layers of marl. [CHESTER FORMATION]

Note: During the SSL 2015 GI groundwater was recorded in TP1, TP5 and TP7 as 'slight seepage' at 1.10, 1.80 and 0.50 m BGL (44.56, 45.57 and 44.24 m AOD respectively).

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During the SSL 2021 GI groundwater was recorded in: BH101 at 11.70 m bgl, BH103 at 5.70 m bgl, and BH104 at 5.20 m bgl. No groundwater strikes were recorded within the window samples or trial pits during the SSL 2021 GI.

Table 1-2: Generalised strata encountered beneath proposed 2 Angel Square plot.

Depth to Top of Strata (m BGL) [m AOD]	Typical Thickness (m)	Generalised Description
0.00 45.85-47.50	1.00-4.00	Black brown slightly clayey slightly sandy angular to subangular GRAVEL of brick and ash with high cobble and medium boulder content. Gravel comprises various materials including sandstone, mudstone, limestone, glass, tarmac, coal, slag, concrete, slate, clinker, brick, rare granite and ceramic fragments. [MADE GROUND]
0.35 – 4.65 44.85-45.80-	>2.70 – 11.35	Firm to very stiff brown/red brown slightly sandy silty gravelly CLAY. Gravel is fine to coarse angular to rounded of sandstone & mudstone. AND Dense to very dense orange brown, slightly clayey, slightly gravelly fine to coarse SAND. Gravel is fine to coarse, subangular to rounded of quartzite, limestone, sandstone and ironstone. Occasional layers of brown, sandy, gravel. [GLACIAL TILL / GLACIOFLUVIAL]
11.10 – 15.50 31.40-32.50	>10.00 - >17.00 (thickness not proven)	Very dense reddish brown slightly gravelly fine to coarse SAND. Gravel is subrounded to rounded fine to course of quartzite. AND Very weak to weak, red/brown, medium to coarse grained sandstone with occasional layers of marl. [CHESTER FORMATION]

A number of obstructions were recorded within the Made Ground during the SSL 2021 GI which are likely to be associated with relic substructure from historic buildings located on site, most notably a 3.2 m deep chamber in TP110a. This chamber and any other insitu obstructions will require removal during earthworks, prior to installation of the new foundations.

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2 Particular Specification

2.1 General

The earthworks shall be undertaken in accordance with:

- MCHW - Series 600 of the Specification for Highway Works (Vol 1), 2009 and;
- BS6031 Code of Practice for Earthworks, 2009;

Where a conflict exists this specification shall take precedence.

2.2 Submission of information

At time of tendering the Contractor shall submit details of the methods proposed which shall include, but not be limited to, the following:

Submittals at Tender stage:

- Outline method statements covering the proposed scope of work.
- Demonstration of Contractor's competence (including but not limited to team CVs, project experience, delivery of similar schemes, experience with envisaged ground conditions).
- Define any additional ground investigation scope required to carry out the works.

Submittals at 15 days prior to commencement of the works:

- Detailed method statements.
- Any temporary works design.
- Instrumentation and monitoring proposals.

Submittals during the works:

- Weekly progress reports.
- Excavation/construction records as per specification requirements.
- Records of recorded features (known and unknown).
- Records of monitoring.
- Geotechnical laboratory test results.
- Contamination test results.

Submittals following completion of the works:

- Survey of *as-built* levels, detailing areas and depths of cut and fill including drawings and supporting records including material volumes and types re-used on site, details and volumes of materials imported and any materials sent off site to landfill.

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- Clear hand-over plan and documentation.
- Certification for all imported/exported materials (as a result of excavation and filling operations).
- Works completion *close-out* report (including design, construction and health, safety & welfare summary).

All submittals are subject to review (or approval as necessary) by the Supervisor and Project Manager.

2.3 Contractor Obligations

a) The Contractor is responsible for any material disposal, undertaken in accordance with any local regulations/ guidelines/ legislation.

b) Inspection and acceptance of materials, Contract Drawings, and workmanship by the Supervisor, does not in any way relieve the Contractor of their responsibilities under the Contract. The works are to be executed as specified and in accordance with good practice. No changes are permitted without written approval.

c) The Contractor is to review the details of this specification and consider the times required for testing, preparation of samples, and approval of information by the supervisor. Allowance for this is to be included in the contract programme.

d) The Contractor shall allow for all necessary test pieces, testing, trials and attendance to demonstrate compliance with the requirements of this specification. The results of all testing required under the specification shall be submitted to the Supervisor.

e) All publications referred to in this document are to be issues current at the date of invitation to tender.

f) The following materials are specifically precluded from all specifications pertaining to works carried out under this contract:

i. High alumina cement or concrete;

ii. Woodwool slabs as permanent shuttering;

iii. Calcium chloride in admixtures for use in reinforced concrete;

iv. Asbestos in any form;

v. Sea dredged aggregates for use in reinforced concrete unless otherwise instructed by the Project Manager;

vi. Calcium silicate bricks;

vii. Urea formaldehyde;

viii. Hazardous, aggressive or unstable materials:

Do not import or use fill materials which would, either in themselves or in combination with other materials, liquids, vapours and/or gases, give rise to a health hazard, damage to building structures or instability in the filling.

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The Contractor shall ensure that these substances are not incorporated into the works. If the Contractor is unable to comply, the supervisor and Contract Administrator shall be informed in writing immediately.

Other unsuitable materials include: material from marshes or bogs, peat, logs, stumps, slurry, mud, perishable material (including wood fragments), material susceptible to spontaneous combustion, material in a frozen condition, clays of liquid limit exceeding 90 or plasticity index exceeding 65, material with excessive moisture content, and materials containing any plaster, wood, organic material or rubbish.

g) If/ where unrecorded features are encountered, the Contractor shall inform the Supervisor immediately. The Contractor shall survey and document any unrecorded features prior to agreeing clearance action with the Supervisor.

h) The Contractor's attention is drawn to the nature and extent of the materials present on site. It is anticipated that some of the material will be suitable for reuse as part of the permanent works construction. The Contractor shall be responsible for the selection, separation and processing as appropriate for reuse in the permanent works or temporary works as appropriate. The Contractor is also responsible for the disposal of unsuitable material.

i) The Contractor shall implement best practice and industry accepted methods to mitigate the risk related to presence of buried unexploded ordnance (UXO) during excavation works. The Contractor's attention is drawn to the site risk associated with UXO as highlighted in the 1st Line Defence "Detailed Unexploded Ordnance (UXO) Threat and Risk Assessment, 2&3 Angel Square." The Contractor should familiarize themselves with the available UXO associated information detailed therein.

j) The Contractor shall coordinate any particular requirements or concerns with the Supervisor in a timely fashion.

k) Stockpiling of excavated and/or demolished arisings and materials:

- All stockpiling operations are subject to strict approval by the Supervisor. The Contractor shall liaise with the Supervisor during the tender period in order to coordinate the strategy for stockpiling, movement of material around the development and removal of material from site where necessary (to be included in the Tender for review by the Supervisor). The Contractor is responsible for compliance with all relevant legislation and guidance (also including but not limited to liaison with relevant authorities and stakeholders, requirements for permitting, licensing or certification). If appropriate material movements may be covered under a CLARE code of practice Material Management Plan and therefore will fall outside the waste regime.
- Materials that are recovered during the Contractors works shall be separated and placed into temporary stockpiles.
- Materials that are identified as contaminated shall be stockpiled separately on sheeting to prevent cross contamination.
- Any material identified as grossly contaminated by visual and/or olfactory means is to be removed directly from site or stockpiled separately on impermeable sheeting with measures to prevent any contaminated run-off.

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l) The Contractor shall coordinate and agree their intended site set-up, space requirements and mobilisation with the Supervisor and Contract administrator. The Contractor shall also review site access routes and related constraints with the Supervisor and Contract administrator in order to inform their method statements and site logistics proposals.

m) The Contractor shall obtain sufficient information relating to existing services in order to inform their works (means, methods and mitigation measures, as required). The Contractor shall liaise with the Supervisor and Contract administrator as required in order to satisfy themselves with the adequacy and appropriateness of available utilities and services information. Under no circumstances shall any private or public mains, pipes, cables or other apparatus be disturbed in any way without the written consent of the Contract administrator and the local authority, public undertaking or service facility stakeholder concerned.

The contractor shall be responsible for the collection, treatment (if required) and discharge of pumped water from the excavation. The contractor will be responsible for obtaining and complying with the requirements of any licences required for the disposal of pumped water.

2.4 Site Management

2.4.1 TRAFFIC SAFETY AND CONTROL

Controls: Provide, erect and maintain all such traffic signs, barriers and control signals as may be necessary in accordance with the recommendations of Chapter 8 of the Traffic Signs Manual or such other General Directions as are current at the time of execution of the works.

- Where the particular circumstances are not covered by these recommendations submit proposals for approval
- Compliance with this clause does not relieve the Contractor of any other obligations under the Contract or under the relevant provision of the Highway Acts.

Coordination: For works on the Public Highway the Contractor is to co-ordinate their activities with the Highway Authority and to be responsible for obtaining all necessary permits and approvals. Any charges for reinstatement of the Highway are to be met by the Contractor.

Submission by contractor: After consultations with the appropriate authority submit a programme showing the scheme of traffic management. Thereafter provide such further details and information as required by the Contract Administrator (CA).

- No work affecting the public highway is to be started until all traffic control measures are agreed as being fully operational.

Equipment: Unless otherwise specified all traffic signs to comply with BS 873, and Statutory Instruments SI 2002/3113. In addition

- All traffic signs to be kept clean and legible at all times and to be repositioned, covered, or removed as required.
- All adjacent public highways and trafficked/ pedestrian routes to be kept clear of all construction debris. Tracked vehicles are not to travel over public highways without permission of the CA.

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Making good: Any damage caused to public highways and trafficked/pedestrian routes to be made good as directed by the CA.

2.4.2 TEMPORARY DIVERSION OF TRAFFIC

General:

Construct temporary diversion ways wherever:

- the works interfere with existing public or private roads or where there is a public or private right of way.
- the standard of construction and lighting and the width of the diversion route to be agreed with the CA.
- Construct diversion ways in advance of any interference with existing ways. Maintain in such a way as to provide adequately for traffic flows.
- Where any temporary diversion works affect Public Highways the Contractor is responsible for obtaining all necessary Statutory Authority approvals.

The provisions of this clause do not apply to any temporary access or other works that the contractor may construct for their sole usage.

2.4.3 SERVICES

Privately owned services: If any privately owned service (water, electricity, drainage etc.) passing through the site is affected by the works the contractor to provide a satisfactory alternative service and notify the CA of the measures proposed.

Statutory undertakers' services: Verify the positions of all mains, sewers etc and take all measures required by the Statutory Undertaker or Public Authority for the support and full protection of all items concerned.

Liability: The Contractor is responsible for any costs of breakage, damage and interruption of supply. Confirm with the CA that appropriate insurance is held.

Accommodation works: The relocation and/or replacement of fences, walls, accesses etc. to properties bounding the site to be completed in an expeditious manner and within a time as approved by the CA. Give the CA at least 10 day's notice before starting the works.

2.4.4 NOISE, SECURITY

Noise: Comply with the general recommendations of BS 5228 together with any specific requirements described in the Contract Documents.

Security: Erect and maintain temporary fencing as required by the CA. Access in the fencing to be agreed by the CA and/or occupiers of adjacent properties.

- Temporary fencing is to remain in position until it is replaced by permanent fencing or completion of the works. Submit proposals to the CA.
- Regularly inspect all temporary fencing and make good any defects
- If temporary fencing must be removed for any part of the works reinstate it as soon as possible. In the interim provide patrols so as to preclude unauthorised entry into the site.

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2.5 List of Amendments, Additions and Substitute Clauses to Series 600 Specification

601 Definitions (addition):

The following definitions of earthworks materials shall apply to all clauses of the Specification in which reference is made to the defined classes of materials:

i. Unless and until defined by the Landscape Architect, "Topsoil" shall mean the top layer of soil that can support vegetation;

ii. "Soil" shall mean natural or artificial material without inherent cementing with Uniaxial Compressive Strength less than 0.5MPa;

iii. "Rock" shall mean natural or artificial material with inherent cementing or structure and with a Uniaxial Compressive Strength greater than 0.5MPa;

The following definition shall apply to all clauses of the Specification where reference is made to "Supervisor".

iv. "Supervisor (or Overseeing Organisation)" shall be as defined in the Contract Documents.

Excavation (addition):

Blinding surfaces to receive sheet overlays or concrete to have sufficient sand, fine gravel, PFA or other approved fine material applied to fill interstices and provide a close smooth surface.

Permissible deviation on surface level: +0/-25 mm.

612 Compaction of Fills (amendment):

Sub-clause 12 to be replaced with:

The Contractor shall submit the following to the Supervisor for approval at least 7 working days before commencement of compaction.

i. The values of maximum dry density and the optimum moisture content obtained in accordance with BS1377: Part 4, as appropriate for each of the fills the Contractor intends to use (where within any Class of material fill contains material having different maximum dry densities and optimum moisture contents each shall be identified in order to monitor the compacted density);

ii. A graph of density plotted against moisture content from which each of the values in (i) above, the maximum dry density and optimum moisture content, where determined, and, for cohesive material, a plot of the 5% air voids curve to be included for each material. For stabilised materials the 10% air voids line is also required;

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iii. Where the proposed fill material is not suitable for compaction testing in the laboratory due to its coarse grading, the contractor shall carry out field tests in order to determine the dry density/moisture content relationship;

iv. Where small quantities are to be imported the Contractor may submit a method statement for approval to the Supervisor and Contract administrator. This shall detail his proposed method of compaction for the range of soil types the Contractor proposes for use as fill, where the Contractor shall compact with plant operating as if only the material which requires the greater compactive effort is being compacted. Wherever practicable, different classes of soil shall be placed separately, and if necessary stockpiled and not mixed or layered together without the approval of the engineer. Records of different soil classes used and where they are placed as part of the permanent works shall be kept.

General Requirements (addition):

1. Ground Investigation

A combined Desk Study has been prepared for Plots 2 & 3 (Report Ref. 050930-BHE-XX-XX-RP-GE-0001) and is available for information.

Two ground investigations have been undertaken in connection with the proposed development at Plots 2 & 3. These works were both undertaken by Structural Soils Limited and are summarised in Buro Happold Ground Summary report (reference 050930-BHE-XX-XX-RP-GE-0005). The contractor should also make themselves familiar with the Structural Soils Limited Factual Reports;

- 2 & 3 Angel Square and NOMA Marketing Suite, Manchester. Report on Ground Investigation. (ref: 765325-1 (2)), Dated 29th October 2021.
- 2 & 3 Angel Square, Manchester. Factual Report on Ground Investigation. (ref: 763315), Dated July 2015.

2. UXO

The Contractor's attention is drawn to the site risk associated with UXO as highlighted in the 1st Line Defence "Detailed Unexploded Ordnance (UXO) Threat and Risk Assessment, 2&3 Angel Square." The Contractor should familiarize themselves with the available UXO associated information detailed therein.

3. Site Features of Archaeological Interest

Before starting work the Contractor shall verify which areas of the site, if any, are subject to specific archaeological requirements, e.g. archaeological watching brief prior excavation etc.

4. Trees

Before starting work the Contractor shall verify which trees, shrubs and hedges are to be removed. Cut down, grub up main roots and fill voids with approved material. Dispose of all wood.

5. Undergrowth

Clear site of bushes, scrub and undergrowth. Grub up and dispose of large roots.

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6. Japanese Knotweed

None envisaged to be on site.

Japanese Knotweed is an invasive, non-native plant species. The Wildlife and Countryside Act (1981) made it illegal to spread Japanese Knotweed and guidance on the management of Japanese Knotweed on development sites is given in the Environment Agency's (EA) code of practice, 2001.

The Contractor is responsible for ensuring that Japanese Knotweed is not spread across the site. There are a variety of methods available for treating infested areas including spraying with herbicides or digging, spraying and removal to landfill. The Client is responsible for selecting a method of treatment and obtaining approval for the selected method from the Local Authority.

6. Site Clearance

Clear site of all rubbish, debris and vegetation before stripping topsoil. The compaction of topsoil should be avoided.

7. Site Access and Working Area

Access to the site and the Contractor's working area will be shown on the drawings. The Contractor shall provide:

- All necessary signs, safety measures and watchmen to ensure security and safe operation of their traffic.
- All necessary servicing for their own offices, stores, workshops, etc.
- Access routes for the Employer and other contractors as shown on the drawings.

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Table 6/1: (02/16) 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 contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)				Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within: Lower	Acceptable Limits Within: Upper				
GENERAL GRANULAR FILL	1	A	–	Well graded Granular material	General Fill	Any material, or combination of materials, other than material designated as Class 3 in the Contract. (Properties (i), (ii) and (iv) in next column, shall not apply to chalk). Recycled aggregate. 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	Tab 6/2	Tab 6/2	Tab 6/4 Method 2	1	A	–
							(ii) uniformity coefficient	See Note 5	10	–				
							(iii) mc	BS 1377: Part 2 See Note 4	Optimum mc -2%	Optimum mc +2%				
							(iv) MCV	Clause 632	Optimum mc -2%	Optimum mc +2%				
							(v) IDD	Clause 634	–	App 6/1				

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Table 6/1: (02/16) 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 contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)				Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within: Lower	Acceptable Limits Within: Upper				
GENERAL GRANULAR FILL	1	B	–	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	Tab 6/2	Tab 6/2	Tab 6/4 Method 3	1	B	–
							(ii) uniformity coefficient	See Note 5	–	10				
							(iii) mc	BS 1377: Part 2 See Note 4	Optimum mc -2%	Optimum mc +2%				
							(iv) MCV	Clause 632	Optimum mc -2%	Optimum mc+2%				

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	1	C	–	Coarse granular material	General Fill	Any material, or combination of materials, other than material designated as Class 3 in the Contract. (Properties (i) and (ii) in next column, shall not apply to chalk). Recycled aggregate. 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); D2 (air cooled blast furnace slag) G (mining and quarry industry)	(i) grading	BS 1377: Part 2 or BS EN 13242	Tab 6/2	Tab 6/2	Tab 6/4 Method 5	1	C	–
							(ii) uniformity coefficient	See Note 5	5	–				
							(iii) Los Angeles coefficient	Clause 635	–	50				

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Table 6/1: (02/16) 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 contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)				Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:					
									Lower	Upper				
GENERAL COHESIVE 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 greater than 50, determined by BS 1377: Part 2, only deadweight tamping or vibratory tamping rollers or grid rollers shall be used.	2	A	–
							(ii) plastic limit (PL)	BS 1377: Part 2	–	–				
							(iii) mc	BS 1377: Part 2 See Note 4	PL -4%	App 6/1				
							(iv) MCV	Clause 632	Optimum mc -2%	Optimum mc +2%				
							(v) Undrained shear strength of remoulded material	Clause 633	App 6/1	App 6/1				
	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	2	B	–
							(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	Optimum mc -2%	Optimum mc +2%				
							(v) undrained shear strength of remoulded material	Clause 633	App 6/1	App 6/1				

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	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	2	C	–
							(ii) plastic limit (PL)	BS 1377: part 2	–	–				
							(iii) mc	BS 1377: Part 2 See Note 4	Optimum mc -2%	Optimum mc +2%				
							(iv) MCV	Clause 632	Optimum mc -2%	–				
							(v) Undrained shear strength of remoulded material	Clause 633	App 6/1	–				

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TABLE 6/1: (02/16) 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 contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)				Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:					
									Lower	Upper				
GENERAL	2	D	–	Silty 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 3	2	D	–
							(ii) mc	BS 1377: Part 2 See Note 4	Optimum mc -2%	Optimum mc+2%				
							(iii) MCV	Clause 632	Optimum mc -2%	Optimum mc +2%				
							(iv) undrained shear strength of remoulded material	Clause 633	App 6/1	App 6/1				
COHESIVE FILL	2	E	–	Reclaimed pulverised fuel ash cohesive material	General Fill	Reclaimed material from lagoon or stockpile containing not more than 20% furnace bottom ash	(i) mc	BS 1377: Part 2 See Note 4	To enable compaction to Clause 612		End product 95% of maximum dry density of BS 1377 : Part 4 (2.5 kg rammer method)	2	E	–
							(ii) bulk density	BS 1377: Part 9	App 6/1	App 6/1				

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GEN CHALK FILL	3	–	–	Chalk	General Fill	Chalk and associated materials all designated as Class 3 in the Contract	(i) mc	BS 1377: Part 2 See Note 4	–	Optimum mc +2%	Tab 6/4 Method 4, or Method 1 if required in App 6/1. All types of vibratory rollers of Categories over 1800 kg shall not be used	3	–	–
							(ii) IDD	Clause 634	App 6/1	App 6/1				

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TABLE 6/1: (02/16) 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 contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)				Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:					
									Lower	Upper				
SELECTED GRANULAR FIL	6	A	–	Selected well graded granular material	Below water	Natural gravel, natural sand, crushed gravel, crushed rock other than argillaceous rock, crushed concrete, chalk, well burnt colliery spoil or any combination thereof. (Properties (i) and (ii) in next column, shall not apply to chalk.) Recycled aggregate Where material is imported onto site which is not 'as dug' it shall be aggregate conforming to BS EN 13242 from one or more of the following source codes, see Notes 8, 9, and 10: P (natural aggregates – except shale, siltstone or slate, see Note 7); A (construction and demolition recycling industries); G1 (red coal shale) G3 (pre-selected all-in from quarrying/mining)	(i) grading	BS 1377: Part 2 (On-site)	Tab 6/2	Tab 6/2	No compaction	6	A	–
								BS EN 933-2 (Imported onto site)	Tab 6/5	Tab 6/5				
							(ii) uniformity	See Note 5	10	–				
							(iii) SMC of chalk index	Clause 634	–	20%				
							(iv) plasticity index	BS 1377: Part 2	Non-plastic					

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L	6	B	–	Selected coarse granular material	Starter layer	Natural gravel, natural sand, crushed gravel, crushed rock, crushed concrete, chalk, well burnt colliery spoil, slag or any combination thereof. (Properties (ii) and (iii) in next column, shall not apply to chalk.) Recycled aggregate Where material is imported onto site which is not 'as dug' it shall be aggregate conforming to BS EN 13242 from one or more of the following source codes, see Notes 8, 9, and 10: P (natural aggregates – except shale, siltstone or slate, see Note 7); A (construction and demolition recycling industries); D2 (air cooled blast furnace slag) D3 (basic oxygen furnace slag) D4 (electric arc furnace slag (EAF C)) G1 (red coal shale) G3 (pre-selected all-in from quarrying/mining)	(i) grading	BS 1377: Part 2 (On-site)	Tab 6/2	Tab 6/2	Tab 6/4 Method 5	6	B	–
								BS EN 933-2 (Imported onto site)	Tab 6/5	Tab 6/5				
							(ii) plasticity index	BS 1377: Part 2	Non-plastic					
							(iii) Los Angeles coefficient	Clause 635	–	50				
							(iv) mc	BS 1377: Part 2 See Note 4	Optimum mc -2%	Optimum mc +2%				

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TABLE 6/1: (02/16) 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 contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)				Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within: Lower	Acceptable Limits Within: Upper				
SELECTED GRANULAR FILL	6	C	–	Selected uniformly graded granular material	Starter layer	Natural gravel, natural sand, crushed gravel, crushed rock other than argillaceous rock, spoil, slag or any combination thereof. (Property (iii) in next column, shall not apply to chalk.) Recycled aggregate Where material is imported onto site which is not 'as dug' it shall be aggregate conforming to BS EN 13242 from one or more of the following source codes, see Notes 8, 9, and 10: P (natural aggregates – except shale, siltstone or slate, see Note 7); A (construction and demolition recycling industries); D2 (air cooled blast furnace slag) D3 (basic oxygen furnace slag) D4 (electric arc furnace slag (EAF C)) G1 (red coal shale) G3 (pre-selected all-in from quarrying/mining)	(i) grading	BS 1377: Part 2 (On-site)	Tab 6/2	Tab 6/2	Tab 6/4 Method 3	6	C	–
								BS EN 933-2 (Imported onto site)	Tab 6/5	Tab 6/5				
							(ii) uniformity coefficient	See Note 5	–	10				
							(iii) plasticity index	BS 1377: Part 2	Non-plastic					
							(iv) Los Angeles coefficient	Clause 635	–	50				
							(v) mc	BS 1377: Part 2 See Note 4	Optimum mc -2%	Optimum mc+2%				

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TABLE 6/1: (02/16) 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 contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)				Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within: Lower	Acceptable Limits Within: Upper				
SELECTED GRANULAR	6	E	–	Selected granular material (Class 9A)	For stabilisation with cement to form capping	Any material, or combination of materials, other than unburnt colliery spoil and argillaceous rock. (Properties (i), (ii) and (iii) in next column, shall not apply to chalk.) Recycled aggregate Where material is imported onto site which is not 'as dug' it shall be aggregate conforming to BS EN 13242 from one or more of the following source codes, see Notes 8, 9, and 10: P (natural aggregates – except shale, siltstone or slate, see Note 7); A (construction and demolition recycling industries); D2 (air cooled blast furnace slag) G (mining and quarry industry – except G2 (black coal shale))	(i) grading	BS 1377: Part 2 (On-site)	Tab 6/2	Tab 6/2	Not applicable	6	E	–
								BS EN 933-2 (Imported onto site)	Tab 6/5	Tab 6/5				
							(ii) mc	BS 1377: Part 2 See Note 4	-	Optimum mc +2%				
							(iii) liquid limit	BS 1377: Part 2	–	45				
							(iv) plasticity index	BS 1377: Part 2	–	20				
							(v) organic matter	BS 1377: Part 3	–	App 6/1				
							(vi) water soluble (WS) sulfate content	BS EN 1744-1 clause 10	–	3000 mg/l as SO_4				
							(vii) oxidisable sulfides (OS) content	BS EN 1744-1 Clause 13	–	0.6% as SO_4				
							(viii) SMC of chalk	Clause 634	–	20%				
F	6	F	1	Selected granular	Capping	Any material, or combination of materials – including recycled aggregates with not more	(i) grading	BS 1377: Part 2 (On site materials only)	Tab 6/2	Tab 6/2	Tab 6/4 Method 6	6	F	1

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I L L				material (fine grading)		than 50% by mass of recycled bituminous planings and granulated asphalt, but 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.	(ii) optimum mc	BS 1377: Part 4 (vibrating hammer method)	–	–				
							(iii) mc	BS 1377: Part 2 See Note 4	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%				

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TABLE 6/1: (02/16) 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 contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)				Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:					
									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. 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)	Tab 6/2	Tab 6/2	Tab 6/4 Method 6	6	F	2
							(ii) optimum mc	BS 1377: Part 4 (vibrating hammer method)	–					
							(iii) mc	BS 1377: Part 2 See Note 4	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%				
	6	F	3	Selected granular material	Capping	Any material, or combination of materials with not less 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 (On-site)	Tab 6/2	Tab 6/2	Tab 6/4 Method 6 Maximum Compacted layer thickness shall be 200mm	6	F	3
								BS EN 933-2 (Imported onto site)	Tab 6/5	Tab 6/5				
							(ii) optimum mc	Clause 613	–	–				

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						Where material is imported onto site which is not 'as dug' it shall be aggregate conforming to BS EN 13242 from the following source codes, see Notes 8, 9 and 10: A1 (reclaimed asphalt) A4 (mixed recycled aggregate) Aggregates from source code A4 shall contain at least 50% of constituents in Class Ra (bituminous materials).	(iii) mc	Clause 613 See Note 4	Optimum mc -2%	Optimum mc				
							(iv) Class Ra (asphalt) content	Clause 710	50%	–				
							(v) bitumen content	BS EN 12697-1 or BS EN 12697-39	–	10%				

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TABLE 6/1: (02/16) 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 contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)				Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:					
									Lower	Upper				
SELECTED GRANULAR FILL	6	N	–	Selected well graded granular material	Fill to structures	Natural gravel, natural sand, crushed gravel, crushed rock, crushed concrete, slag, well burnt colliery spoil or any combination thereof. None of these constituents shall include any argillaceous rock. Recycled aggregate except recycled asphalt. Where material is imported onto site which is not 'as dug' it shall be aggregate conforming to BS EN 13242 from one or more of the following source codes, see Notes 8, 9 and 10: P (natural aggregates – except shale, siltstone or slate, see Note 7); A2 (crushed concrete) A3 (crushed bricks, masonry) D2 (air cooled blast furnace slag) G1 (red coal shale).	(i) grading	BS 1377: Part 2 (On-site)	Tab 6/2	Tab 6/2	End product 95% of maximum dry density of BS 1377: Part 4 (vibrating hammer method)	6	N	–
								BS EN 933-2 (Imported onto site)	Tab 6/5	Tab 6/5				
							(ii) uniformity coefficient	See Note 5	10	–				
							(iii) Los Angeles coefficient	Clause 635	–	40				
							(iv) undrained shear parameters (c and Ø)	Clause 633	App 6/1	–				
							(v) effective angle of internal friction (Ø') and effective cohesion (c')	Clause 636	App 6/1	–				
							(vi) permeability	Clause 640	App 6/1	–				
							(vii) mc	BS 1377: Part 2 See Note 4	Optimum mc -2	Optimum mc +2				
							(viii) MCV	Clause 632	Optimum mc -2	Optimum mc +2				
							(ix) slope stability test (where required in App 6/6)	Clause 610	App 6/6					

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TABLE 6/1: (02/16) 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 contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)				Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within:					
									Lower	Upper				
SELECTED GRANULAR FILL	6	P	–	Selected granular material	Fill to structures	Natural gravel, natural sand, crushed gravel, crushed rock, crushed concrete, slag, chalk, well burnt colliery spoil or any combination thereof. None of these constituents shall include any argillaceous rock. (Properties (i), (ii) and (ix) in next column shall not apply to chalk.) Recycled aggregate except recycled asphalt. Where material is imported onto site which is not 'as dug' it shall be aggregate conforming to BS EN 13242 from one or more of the following source codes, see Notes 8, 9 and 10: P (natural aggregates – except shale, siltstone or slate, see Note 7); A2 (crushed concrete) A3 (crushed bricks, masonry) D2 (air cooled blast furnace slag) G1 (red coal shale).	(i) grading	BS 1377: Part 2 (On-site)	Tab 6/2	Tab 6/2	End product 95% of maximum dry density of BS 1377: Part 4 (vibrating hammer method)	6	P	–
								BS EN 933-2 (Imported onto site)	Tab 6/5	Tab 6/5				
							(ii) uniformity coefficient	See Note 5	5	–				
							(iii) IDD of chalk	Clause 634	–	App 6/1				
							(iv) Los Angeles coefficient	Clause 635	–	60				
							(v) undrained shear parameters (c and Ø)	Clause 633	App 6/1	–				
							(vi) effective angle of internal friction (Ø') and effective cohesion (c')	Clause 636	App 6/1	–				
							(vii) permeability	Clause 640	App 6/1	–				
							(viii) mc	BS 1377: Part 2 See Note 4	Optimum mc -2	Optimum mc +2				
							(ix) MCV	Clause 632	Optimum mc -2	Optimum mc +2				
							(x) slope stability test (where required in App 6/6)	Clause 610	App 6/6					

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TABLE 6/1: (02/16) 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 contract specific Appendix 6/1)	Material Properties Required for Acceptability (In Addition to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)				Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance with:	Acceptable Limits Within: Lower	Acceptable Limits Within: Upper				
SELECTED COHESIVE FILL	7	A	–	Selected cohesive material	Fill to structures	Any material or combination of materials, other than argillaceous rock and materials designated as Class 3 in the Contract. If chalk is used it shall form 100% of constituents. (Properties (i) and (iii) shall not apply to chalk.) (Properties (vii) and (viii) may be increased to 54% and 31% respectively for Lias Clay only and subject to the requirements of contract specific Appendix 6/6)	(i) grading	BS 1377: Part 2	Tab 6/2	Tab 6/2	End product: 100% of maximum dry density of BS 1377 : Part 4 (2.5 kg rammer method) or a dry density corresponding to 5% air voids at field mc whichever is lower	7	A	–
							(ii) mc	BS 1377: Part 2 See Note 4	Optimum mc -2	Optimum mc +2				
							(iii) MCV	Clause 632	Optimum mc -2	Optimum mc +2				
							(iv) undrained shear parameters (c and Ø)	Clause 633	App 6/1	App 6/1				
							(v) effective angle of internal friction (Ø') and effective cohesion (c')	Clause 636	App 6/1	App 6/1				
							(vi) IDD of chalk	Clause 634	App 6/1	App 6/1				
							(vii) liquid limit	BS 1377: Part 2	–	45				
							(viii) plasticity index	BS 1377: Part 2	–	25				

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Footnotes to Table 6/1

1	(02/16) App = contract specific Appendix
2	(02/16) Tab = Table
3	(02/16) 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	(02/16) 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	(02/16) 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.	(02/16) The limiting values for Class U1B material are given in contract specific Appendix 6/14 and contract specific Appendix 6/15.
7	(02/16) For works in Wales see sub-Clause 601.21W.
8	(02/16) Where material source codes are referenced these are as listed in Table 6/7.
9	(02/16) Where materials are required to be aggregates conforming to BS EN 13242 materials certificated as being compliant with BS EN 13285 are acceptable for use provided that they meet all the specification requirements and the Declaration of Performance for constituent parts to BS EN 13242 are provided to the Overseeing Organisation.
10	(02/16) 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.

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TABLE 6/2: (02/17) Grading Requirements for Acceptable Earthworks Materials Other Than Classes 6F4, 6F5 and 6S

Percentage by Mass Passing the Size Shown																					
Class	**Size (mm)**		**Size (mm) BS Series**													**Size (microns) BS Series**				**Size (micr-ons)**	**Class**
	500	**300**	**125**	**90**	**75**	**37.5**	**28**	**20**	**14**	**10**	**6.3**	**5**	**3.35**	**2**	**1.18**	**600**	**300**	**150**	**63**	**2**	
1A		100	95-100																<15		1A
1B			100																<15		1B
1C	100		10-95													0-25			15		1C
2A & 2B			100											80-100					15-100		2A & 2B
2C			100											15-80					15-80		2C
2D			100																80-100	0-20	2D
6A	100									0-100		0-85				0-45			0-5		6A
6B	100		0-10																		6B
6C			100			0-100					0-100		0-35	0-10		0-2					6C
6D										100		89-100		60-100	30-100	15-80	5-48	0-15 except 0-20 for crushed rock			6D
6E & 6R			100	85-100						25-100						10-100				<15	6E & 6R
6F1					100	75-100				40-95		30-85				10-50			<15		6F1
6F2			100	80-100	65-100	45-100				15-60		10-45				0-25			0-12		6F2
6F3			100	80-100	65-100	45-100				15-60		10-45				0-25			0-12		6F3
6H								100				60-100			15-45	0-25		0-5			6H
6I & 6J			100		85-100				25-100					15-100		9-100			<15		6I & 6J
6K								100											0-10		6K
6L										100		89-100		60-100	30-100	15-100	5-70	0-15 except 0-20 for crushed rock			6L

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TABLE 6/2: (02/17) Grading Requirements for Acceptable Earthworks Materials (continued)

Percentage by Mass Passing the Size Shown																					
Class	**Size (mm)**		**Size (mm) BS Series**													**Size (microns) BS Series**				**Size (micr-ons)**	**Class**
	500	**300**	**125**	**90**	**75**	**37.5**	**28**	**20**	**14**	**10**	**6.3**	**5**	**3.35**	**2**	**1.18**	**600**	**300**	**150**	**63**	**2**	
6M					100														0-10		6M
6N & 6P					100														<15		6N & 6P
6S					100									60-100		30-90		4-45	0-16		6S
7A					100														15-100		7A
7C			100		85-100				83100					80-100		60-100			15-45	0-20	7C
7D			100		85-100				40-90					15-79		15-75			15-45	0-20	7D
7E					100		95-100												15-100		7E
7F			100																15-100		7F
7I					100		95-100												15-100		7I

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TABLE 6/3: (02/16) Limits of Material Properties of Fill for Use With Metal Components in Reinforced Soil and Anchored Earth Structures for Class 6H, 6I, 6J, 7C and 7D Materials

Reinforcing Element Material	Properties of Fill								
	pH Value		Max Chloride Ion Content %	Max Organic Content %	Max Water Soluble (WS) Sulfate Content mg/l as SO_4	Maximum Oxidisable Sulfides (OS) Content % as SO_4	Minimum Restivity Ohm.cm	Minimum Redox Potential volts	Microbial Activity Index
	Min	Max							
Galvanised Steel	5	10	0.02	0.2	300	0.06	5000	0.40	Less than 5
Stainless Steel	5	10	0.025	0.2	600	0.12	3000	0.35	

NOTES:

1. (02/16) A method of calculating the Microbial Activity Index may be obtained by reference to TRRL Contractor Report 54 'Soil Corrosivity Assessment'.
2. (02/16) The corrosion potential of frictional fill shall be assessed from resistivity, pH, chloride, water soluble sulfate and oxidisable sulfides tests. For cohesive soil it will be necessary to test additionally for organic content. Should either organic content or sulfate be in excess of the specified levels, then tests shall also be included for Redox Potential and Microbial Activity Index.
3. (02/16) The water soluble sulfate content and oxidisable sulfides content shall be determined in accordance with the methods described in BS EN 1744-1 clause 10, 11 and 13.
4. (02/16) Methods of test (except for Microbial Activity Index, water soluble sulfate content and oxidisable sulfides content) are given in BS 1377: Part 3.

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TABLE 6/4: (02/16) Method Compaction for Earthworks Materials: Plant and Methods (Method 1 to Method 6) (This Table is to be read in conjunction with sub-Clause 612.10)

Type of Compaction Plant	Ref No	Category	Method 1		Method 2		Method 3		Method 4		Method 5		Method 6		
			D	N	D	N	D	N	D	N	D	N	N for D = 110mm	N for D = 150mm	N for D = 250mm
Smoothed wheeled roller (or vibratory roller operating without vibration)		Mass per metre width of roll:													
	1	over 2100 kg up to 2700 kg	125	8	125	10	125	10*	175	4	Unsuitable		Unsuitable	Unsuitable	Unsuitable
	2	over 2700 kg up to 5400	125	6	125	8	125	8*	200	4	Unsuitable		16	Unsuitable	Unsuitable
	3	kg over 5400 kg	150	4	150	8	Unsuitable		300	4	unsuitable		8	16	Unsuitable
Grid roller		Mass per metre width of roll:													
	1	over 2700 kg up to 5400 kg	150	10	Unsuitable		150	10	250	4	Unsuitable		Unsuitable	Unsuitable	Unsuitable
	2	over 5400 kg up to 8000 kg	150	8	125	12	Unsuitable		325	4	Unsuitable		20	Unsuitable	Unsuitable
	3	over 8000 kg	150	4	150	12	Unsuitable		400	4	Unsuitable		12	20	Unsuitable
Deadweight tamping roller		Mass per metre width of roll:													
	1	over 4000 kg up to 6000 kg	225	4	150	12	250	4	350	4	Unsuitable		12	20	Unsuitable
	2	over 6000 kg	300	5	200	12	300	4	400	4	Unsuitable		8	12	20
Pneumatic-tyred roller		Mass per wheel:													
	1	over 1000 kg up to 1500 kg	125	6	Unsuitable		150	10*	240	4	Unsuitable		Unsuitable	Unsuitable	Unsuitable
	2	over 1500 kg up to 2000 kg	150	5	Unsuitable		Unsuitable		300	4	Unsuitable		Unsuitable	Unsuitable	Unsuitable
	3	over 2000 kg up to 2500 kg	175	4	125	12	Unsuitable		350	4	Unsuitable		Unsuitable	Unsuitable	Unsuitable
	4	over 2500 kg up to 4000 kg	225	4	125	10	Unsuitable		400	4	Unsuitable		Unsuitable	Unsuitable	Unsuitable
	5	over 4000 kg up to 6000 kg	300	4	125	10	Unsuitable		Unsuitable		Unsuitable		12	Unsuitable	Unsuitable
	6	over 6000 kg up to 8000 kg	350	4	150	8	Unsuitable		Unsuitable		Unsuitable		12	Unsuitable	Unsuitable
	7	over 8000 kg up to 12000 kg	400	4	150	8	Unsuitable		Unsuitable		Unsuitable		10	16	Unsuitable
	8	over 12000 kg	450	4	175	6	Unsuitable		Unsuitable		Unsuitable		8	12	Unsuitable

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Vibratory tamping roller		Mass per metre width of a vibrating roll:											
	1	over 700 kg up to 1300 kg	100	12	100	12	150	12	100	10	Unsuitable	Unsuitable	Unsuitable	Unsuitable
	2	over 1300 kg up to 1800 kg	125	12	125	12	175	12*	175	8	Unsuitable	12	Unsuitable	Unsuitable
	3	over 1800 kg up to 2300 kg	150	12	150	12	200	12*	Unsuitable		Unsuitable	8	12	Unsuitable
	4	over 2300 kg up to 2900 kg	150	9	150	9	250	12*	Unsuitable		400	5	6	10	Unsuitable
	5	over 2900 kg up to 3600 kg	200	9	200	9	275	12*	Unsuitable		500	6	6	10	Unsuitable
	6	over 3600 kg up to 4300 kg	225	9	225	9	300	12*	Unsuitable		600	6	4	8	Unsuitable
	7	over 4300 kg up to 5000 kg	250	9	250	9	300	9*	Unsuitable		700	6	3	7	12
	8	over 5000 kg	275	9	275	9	300	7*	Unsuitable		800	6	3	6	10

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TABLE 6/4: (02/16) Method Compaction for Earthworks Materials: Plant and Methods (Method 1 to Method 6) (This Table is to be read in conjunction with sub-Clause 612.10) (continued)

Type of Compaction Plant	Ref No	Category	Method 1		Method 2		Method 3		Method 4		Method 5		Method 6		
			D	N	D	N	D	N	D	N	D	N	N for D = 110mm	N for D = 150mm	N for D = 250mm
Vibratory roller		Mass per metre width of vibratory roll:													
	1	over 270 kg up to 450 kg			75	16	150	16	Unsuitable		Unsuitable		Unsuitable	Unsuitable	Unsuitable
	2	over 450 kg up to 700 kg			75	12	150	12	Unsuitable		Unsuitable		Unsuitable	Unsuitable	Unsuitable
	3	over 700 kg up to 1300 kg	100	12	125	10	150	6	125	10	Unsuitable		16	Unsuitable	Unsuitable
	4	over 1300 kg up to 1800 kg	125	8	150	8	200	10*	175	4	Unsuitable		6	16	Unsuitable
	5	over 1800 kg up to 2300 kg	150	4	150	4	225	12*	Unsuitable		Unsuitable		4	6	12
	6	over 2300 kg up to 2900 kg	175	4	175	4	250	10*	Unsuitable		400	5	3	5	11
	7	over 2900 kg up to 3600 kg	200	4	200	4	275	8*	Unsuitable		500	5	3	5	10
	8	over 3600 kg up to 4300 kg	225	4	225	4	300	8*	Unsuitable		600	5	2	4	8
	9	over 4300 kg up to 5000 kg	250	4	250	4	300	6*	Unsuitable		700	5	2	4	7
	10	over 5000 kg	275	4	275	4	300	4*	Unsuitable		800	5	2	3	6
Vibrating plate compactor		Mass per m^2 of base plate:													
	1	over 880 kg up to 1100 kg	Unsuitable		Unsuitable		75	6	Unsuitable		Unsuitable		Unsuitable	Unsuitable	Unsuitable
	2	over 1100 kg up to 1200 kg	Unsuitable		75	10	100	6	75	10	Unsuitable		Unsuitable	Unsuitable	Unsuitable
	3	over 1200 kg up to 1400 kg	Unsuitable		75	6	150	6	150	8	Unsuitable		Unsuitable	Unsuitable	Unsuitable
	4	over 1400 kg up to 1800 kg	100	6	125	6	150	4	Unsuitable		Unsuitable		8	Unsuitable	Unsuitable
	5	over 1800 kg up to 2100 kg	150	6	150	5	200	4	Unsuitable		Unsuitable		5	8	Unsuitable
	6	over 2100 kg	200	6	200	5	250	4	Unsuitable		Unsuitable		3	8	12
Vibro-tamper		Mass:													
	1	over 50 kg up to 65 kg	100	3	100	3	150	3	125	3	Unsuitable		4	8	Unsuitable
	2	over 65 kg up to 75 kg	125	3	125	3	200	3	150	3	Unsuitable		3	6	12
	3	over 75 kg up to 100 kg	150	3	150	3	225	3	175	3	Unsuitable		2	4	10
	4	over 100 kg	225	3	200	3	225	3	250	3	Unsuitable		2	4	10

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Power rammer		Mass:										
	1	100 kg up to 500 kg	150	4	150	6	Unsuitable	200	4	Unsuitable	5	8	Unsuitable
	2	over 500 kg	275	8	275	12	Unsuitable	400	4	Unsuitable	5	8	14
Dropping-weight compactor		Mass of rammer over 500 kg weight drop:											
	1	over 1 m up to 2 m	600	4	600	8	450	8	Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable
	2	over 2 m	600	2	600	8	Unsuitable		Unsuitable	Unsuitable	Unsuitable	Unsuitable	Unsuitable

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TABLE 6/4: (02/16) Method Compaction for Earthworks Materials: Plant and Methods (Method 7) (This Table is to be read in conjunction with sub-Clause 612.10) (Continued)

Type of Compaction Plant	Ref~ No.	Category	Method 7	
			N for D = 150 mm	N for D = 250mm
Smooth wheeled roller (or vibratory roller operating without vibration)		Mass per metre width of roll:		
	1	Over 2100 kg up to 2700 kg	Unsuitable	Unsuitable
	2	Over 2700 kg up to 5400 kg	Unsuitable	Unsuitable
	3	Over 5400 kg	12	Unsuitable
Grid roller		Mass per metre width of roll:		
	1	Over 2700 kg up to 5400 kg	Unsuitable	Unsuitable
	2	Over 5400 kg up to 8000 kg	16	Unsuitable
	3	Over 8000 kg	8	Unsuitable
Deadweight tamping roller		Mass per metre width of roll:		
	1	Over 4000 kg up to 6000 kg	4	8
	2	Over 6000 kg	3	6
Pneumatic-tyred roller		Mass per wheel:		
	1	Over 1000 kg up to 1500 kg	Unsuitable	Unsuitable
	2	Over 1500 kg up to 2000 kg	12	Unsuitable
	3	Over 2000 kg up to 2500 kg	6	Unsuitable
	4	Over 2500 kg up to 4000 kg	5	Unsuitable
	5	Over 4000 kg up to 6000 kg	4	16
	6	Over 6000 kg up to 8000 kg	Unsuitable	8
	7	Over 8000 kg up to 12000 kg	Unsuitable	4
	8	Over 12000 kg	Unsuitable	4
Vibratory tamping roller		Mass per metre width of vibrating roll:		
	1	Over 700 kg up to 1300 kg	Unsuitable	Unsuitable
	2	Over 1300 kg up to 1800 kg	Unsuitable	Unsuitable
	3	Over 1800 kg up to 2300 kg	16	Unsuitable
	4	Over 2300 kg up to 2900 kg	12	Unsuitable
	5	Over 2900 kg up to 3600 kg	10	Unsuitable
	6	Over 3600 kg up to 4300 kg	8	16
	7	Over 4300 kg up to 5000 kg	7	14
	8	Over 5000 kg	6	12
Vibratory roller		Mass per metre width of vibrating roll:		
	1	Over 270 kg up to 450 kg	Unsuitable	Unsuitable
	2	Over 450 kg up to 700 kg	Unsuitable	Unsuitable
	3	Over 700 kg up to 1300 kg	Unsuitable	Unsuitable
	4	Over 1300 kg up to 1800 kg	Unsuitable	Unsuitable
	5	Over 1800 kg up to 2300 kg	12	Unsuitable
	6	Over 2300 kg up to 2900 kg	10	Unsuitable
	7	Over 2900 kg up to 3600 kg	10	Unsuitable
	8	Over 3600 kg up to 4300 kg	8	Unsuitable
	9	Over 4300 kg up to 5000 kg	8	Unsuitable
	10	Over 5000 kg	6	12

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Vibratory plate compactor		Mass per m^2 of base plate:		
	1	Over 880 kg up to 1100 kg	Unsuitable	Unsuitable
	2	Over 1100 kg up to 1200 kg	Unsuitable	Unsuitable
	3	Over 1200 kg up to 1400 kg	Unsuitable 10	Unsuitable
	4	Over 1400 kg up to 1800 kg	8	Unsuitable
	5	Over 1800 kg up to 2100 kg	6	Unsuitable
	6	Over 2100 kg		Unsuitable
Vibro-tamper		Mass:		
	1	Over 50 kg up to 65 kg	Unsuitable	Unsuitable
	2	Over 65 kg up to 75 kg	Unsuitable	Unsuitable
	3	Over 75 kg up to 100 kg	Unsuitable	Unsuitable
	4	Over 100 kg	8	Unsuitable
Power rammer		Mass:		
	1	100 kg up to 500 kg	8	Unsuitable
	2	Over 500 kg	6	10
Dropping weight compactor		Mass of rammer over 500 kg height drop:		
	1	Over 1 m up to 2m	Unsuitable	Unsuitable
	2	Over 2 m	Unsuitable	Unsuitable

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TABLE 6/5: (02/16) Imported Onto Site Grading Requirements for Class 6 Acceptable Earthworks Materials

Percentage by Mass Passing the Size Shown																				
Class	**Size (mm)**		**Size (mm) BS EN 933-2 Series**													**Size (microns) BS EN 933-2 Series**				**Class**
	500	**300**	**125**	**80**	**63**	**40**	**31.5**	**20**	**16**	**10**	**8**	**6.3**	**4**	**2**	**1**	**500**	**250**	**125**	**63**	**0**
6A	100									0-100		0-85				0-45			0-5	6A
6B	100		0-10																	6B
6C			100			0-100						0-100	0-35	0-10		0-2				6C
6D										100			85-100	60-100	30-100	15-80	5-48	0-15 except 0-20 for crushed rock		6D
6E & 6R			100	85-100						25-100						10-100			<15	6E & 6R
6F3			100	75-99		50-90		30-75		15-60				0-35					0-12	6F3
6F4					100		75-99		50-90		30-75		15-60		0-35				<15	6F4
6F5			100	75-99		50-90		30-75		15-60				0-35					0-12	6F5
6H								100				60-100			15-45	0-25		0-5		6H
6I & 6J			100	85-100					25-100					15-100		9-100			<15	6I & 6J
6K								100											0-10	6K
6L										100			85-100	60-100	30-100	15-100	5-70	0-15 except 0-20 for crushed rock		6L
6M				100															0-10	6M
6N & 6P				100															<15	6N & 6P
6S					100									60-100		30-90		8-45	0-16	6S

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3 Series 600 Specification Appendices

Appendix 6/1: Requirements for Acceptability and Testing of Earthworks Materials

Acceptable limits for fills are defined in Table 6/1 of this specification. Fill used for forming any construction platform required shall comply with Class 1A, 1B or other such materials proposed by the Contractor which when placed and compacted shall perform as a stable platform for trafficking by piling plant and ready mix concrete trucks without damaging the underlying formation.

The Contractor shall be responsible for determining the Class and acceptability of the material to be used for filling. The contractor shall be responsible for acceptability testing which shall be undertaken by an approved independent testing organisation at frequencies given in the table below. All testing shall be undertaken by accredited NAMAS or equivalent approved geotechnical and chemical analysis laboratories to be paid for by the Contractor. The Contractor shall allow sufficient time in their programme for the required testing.

Class / Use	Test	Frequency
General Granular Fill	Grading	1 test / 500m^3
General Cohesive Fill	Grading	1 test / 500m^3
	mc/MCV/PL	1 test / 200m^3
Structural Granular Fill	Grading	1 test / 250m^3
	Shear box	1 test / 1000m^3
	Permeability	1 test / 1000m^3
Imported Fill	ICRCL Contamination Suite Table 3 Groups A&B. See also App 6/15 requirements	1 test / 250 tonnes

Appendix 6/2: Requirements for Dealing with Class U2 Unacceptable Material.

1. The Contractor is responsible for disposal.

2. A 'watching-brief' should be maintained during all stages of the work (included trial pitting) to remain vigilant to possibility of hitherto undetected areas of contamination.

Where materials that appear to be contaminated (either visually or on the basis of odour) are encountered during the excavation works, the Contractor shall inform the Supervisor immediately to obtain further instruction. The Contractor shall be responsible for carrying out laboratory testing to enable the materials to be classified for hazard assessment and waste disposal purposes, and for disposal to suitably licensed tip if unsuitable to remain on site. Test methods and appropriate assessment criteria for chemical analysis shall be as required by the relevant authority or otherwise agreed with the Supervisor.

The Contractor shall maintain records and copies of assignment notes and duty of care documentation for all materials disposed of off-site and shall submit copies on completion of the work.

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Appendix 6/3: Requirements for Excavation, Deposition and Compaction

1. Earthworks requirements are defined in the relevant contract drawings. For general working conditions and contract specific requirements refer to the Contract Documents:

2. Proposed Levels of Formation

Refer to Contract Drawings. Permissible deviations from formation levels:

- Embankments and cuttings: ±50mm;

3. Constraints on excavation phasing.

At tender stage the Contractor shall produce an Enabling Works Plan which clearly shows the phasing of the bulk excavation with respect to the other specific Enabling Works.

4. Cut slopes

The Contractor is to ensure that the slopes of all cuttings are such that stability and safety are maintained at all times. Any temporary cuttings should be identified in the Contractor's method statements, and slope angles agreed in advance with the Contract Supervisor.

5. Groundwater

The anticipated groundwater level to be encountered on site is between 24.97-30.10 mOD. The Contractor should expect that seasonal effects may lead to groundwater actually being encountered at a different level to this.

During the works groundwater must be controlled to ensure no flooding of the site or degradation of excavated materials or exposed slopes.

6. Working Platform

It is currently envisaged that the permanent works will place some reliance on the presence of the working platform and so it is to be left in place. The platform is to be designed by the Contractor and the Contractor shall provide this design to the Engineer for review ahead of start on site. The bearing capacity shall be validated on site through a programme of plate load tests. These shall be undertaken on a 25m grid and utilise a minimum 600mm diameter plate. The required bearing capacity is a minimum of 150kPa and settlement at this load shall be limited to 5mm, not withstanding the requirements of the platform during construction. Testing is to be undertaken after required pre slab construction preparations are complete, i.e. debris removal and formation preparation.

Appendix 6/4: Requirements for Class 3 Material

Not used.

Appendix 6/6: Fill to structures and fill above Structural Foundations

This specification is in respect of the permanent works only.

1. First Layer of Compacted Filling

To be of suitable hard granular material thoroughly compacted to 150 mm thickness.

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2. Protection of Compacted Filling

The Contractor shall be responsible for making good any damage to the compacted fill.

3. Deterioration of Fill Materials

If the material to be deposited as fill subsequently reaches a condition where it cannot be compacted to the requirements of this specification the Contractor shall:

- make good by removing the material from site until it is in a suitable condition for reuse and/or replace with suitable material; or
- make good the material by mechanical or chemical means; or
- cease work until the physical condition of the material is such that it can be compacted as described in this specification.

4. Blinding

Surfaces to receive sheet overlays or concrete to have sufficient sand, fine gravel, PFA or other approved fine material applied to fill interstices and provide a close smooth surface.

- Permissible deviations on surface level: +0/-25 mm.

Appendix 6/8: Topsoiling, Grass Seeding and Turfing

Please refer to Landscape Architect's specification.

Appendix 6/12: Instrumentation and Monitoring

Not used.

Appendix 6/14: Limiting Values for Pollution of Controlled Waters

Not used.

Appendix 6/15: Limiting Values for Harm to Human Health and the Environment

Site won and Imported material validation and re-use criteria

Please refer to Appendix 6/1 for geotechnical testing requirements. The Manchester City Council Planning and Contaminated Land Technical Guidance (February 2021 – MCC PCLTG) provides recommendations on validation sampling frequencies for imported and site-won soils which shall be adhered to as part of this specification. As an absolute minimum sampling shall comprise at least three samples for each source used. The MCC PCLTG states *'One sample for every 200m^3 from proven 'greenfield' sources and one sample every 50m^3 from 'unknown', 'mixed' or 'brownfield' sources (for residential gardens)'* are required. Please note, validation testing of imported material shall be undertaken in-situ. No offsite validation results are permitted.

For all site won, imported recycled fill and greenfield/manufactured soils, testing shall be carried out to demonstrate that no contaminant listed in **Table 3-1**, **Table 3-2**, or **Table 3-3** is in excess of its Trigger Concentration. This validation testing shall be carried out in accordance with Table 2 in the MCC PCLTG, which is extracted as Figure 3—1 for ease of reference.

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For all crushed hardcore, stone and brick, testing shall be carried out to demonstrate that no contaminant listed in **Table 3-1**, **Table 3-2**, or **Table 3-3** is in excess of its Trigger Concentration. This validation testing shall be carried out in accordance with Table 2 in the MCC PCLTG, which is extracted as Figure 3—1 for ease of reference.

Table 2 Sampling frequencies for imported or site-won fill materials

End-Use	Greenfield Soils	Remediated Soils	Brownfield Soils	Unknown Soil Source
Residential Gardens	1:200m^3	1:100m^3	1:50m^3	1:50m^3
Soft landscaping	1:200m^3	1:150m^3	1:150m^3	1:150m^3
Other	1:200m^3	1:200m^3	1:200m^3	1:200m^3

Figure 3—1 Extract of Table 2 Validation Sampling Frequencies (MCC PCLTG)

In addition, any materials arising or imported that appear suspect in terms of contamination based on either appearance or smell shall be stockpiled separately and tested for the contaminant suites listed in **Table 3-1**, **Table 3-2**, or **Table 3-3** in addition to any other appropriate contaminant as indicated by appearance or by smell and either accepted into the Works or disposed of off-site as appropriate.

Note: All laboratory contamination testing shall be carried out in a UKAS and MCerts accredited laboratory, in accordance with the standards and procedures defined by MCerts. All information shall be provided on a plan showing the locations of sampling points, accreditation details of the laboratory used and a summary table of results.

Site won or imported fill materials must not contain any contaminant in the suite listed in **Table 3-1** below that is in excess of the Specified Trigger Concentration:

Table 3-1 Material validation and reuse criteria – general

Determinand	Site Won Material and Imported Material Concentration (mg/kg)
Asbestos	See Note **
Cyanide	760
Arsenic	79
Cadmium	120
Copper	12,000
Chromium (total)	1,500
Chromium (VI)	7.7
Lead	630
Mercury	16
Zinc	81,000

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Determinand	Site Won Material and Imported Material Concentration (mg/kg)
Nickel	230
pH	5<pH<9
Polycyclic Aromatic Hydrocarbons (USEPA 16)	See Table 3-2
Selenium	1,100
TPH	See Table 3-3
Phenol Index	1,300

**Site won material: free fibres <0.1% and no cement bound asbestos. Imported material: none detectable.

Note: Values used are all C4SL's or S4UL's: with the exception of free cyanide (BH Generic Assessment Criteria – GAC).

Table 3-2 Material validation and reuse criteria – hydrocarbons

Determinand		Site Won Material and Imported Material Concentration (mg/kg)
Aliphatic	C5-C6	600,000
	C6-C8	620,000
	C8-C10	13,000
	C10-C12	13,000
	C12-C16	13,000
	C16-C21	250,000
	C21-C35	250,000
Aromatic	C5-C7	56,000
	C7-C8	56,000
	C8-C10	5,000
	C10-C12	5,000
	C12-C16	5,000
	C16-C21	3,800
	C21-C35	3,800
Benzene		73

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Determinand	Site Won Material and Imported Material Concentration (mg/kg)
Ethylbenzene	25,000
Toluene	56,000
Xylene	43,000

Table 3-3 Material validation and reuse criteria – PAHs

Determinand	Site Won Material Placed <1m Depth and Imported Material Concentration (mg/kg)
Naphthalene	4,900
Acenaphythylene	15,000
Acenaphthene	15,000
Fluorene	9,900
Phenanthrene	3,100
Anthracene	74,000
Fluoranthene	3,100
Pyrene	7,400
Benzo(a)anthracene	29
Chrysene	57
Benzo(b)fluoranthene	7.2
Benzo(k)fluoranthene	190
Benzo(a)pyrene	5.7
Indendo(123-cd)pyrene	82
Dibenzo(ah)anthracene	0.58
Benzo(ghi)perylene	640

Soluble sulphate content (SO4) of imported materials for filling under concrete slabs or within 1m of substructures must not exceed 0.50g/l when tested BS 1377:Part 3, Clause 5 using a 2:1 water-soil extract.

Other unsuitable materials include: material from marshes or bogs, peat, logs, stumps, slurry, mud and perishable material, material susceptible to spontaneous combustion, material in a frozen condition, clays of liquid limit exceeding 80% and/or plasticity index exceeding 55, material with excessive moisture content.

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Appendix A Contamination Procedures & Documentation

The Contractor's attention is drawn to the reports, which outlines the existing historical site investigations in the surrounding area. It should be noted that unexpected or previously unrecorded contamination 'hot spots' may still be present, and that the Validation Strategy outlined below must be followed by the Contractor.

A1 Unforeseen Contamination

The ground investigation data does not indicate the presence of widespread and/ or gross contamination. However, there is a potential that unforeseen contamination may be present on the Site which may be encountered during the enabling works and construction of the proposed development. The potential risks related to any such contamination will be mitigated by the following management regime;

1. A "watching brief" shall be held by the Main Contractor to involve periodic inspection, appropriately recorded in a site diary. This will supplement the daily records maintained by the Works Contractor.

2. The Main Contractor's tool box talk will alert the construction workforce to the potential for such unforeseen contamination. Encountering any such unforeseen contamination will require immediate cessation of excavation and notification of the Contractor's Site Manager and the Engineer;

3. In the event of any such unforeseen contamination being encountered, an appropriately qualified environmental specialist will be contacted and will visit the Site as soon as practicable (but within a minimum of 48 hours) to determine the need for and scope of any remedial action. Proposals for any such action (investigation, analysis, monitoring or remedial action) will be discussed and agreed with the local authority (and EA if appropriate) prior to implementation.

The validation strategy for unforeseen contamination shall be as follows:

- All materials should be stockpiled separately to allow their material/chemical properties to be assessed and their re-use potential appraised against the reuse criteria outlined in Appendix 6/15.

- All placed fill material, both site won and imported, is to be validated for the suite of chemicals and the frequency detailed in Appendix 6/15.

- Anticipated areas of elevated concentrations or 'hot spots' shall be excavated and removed to at least 1.00m beyond any visual or olfactory (odorous) indication of contamination. As a minimum, 5 No. samples will be required (four sides and base) but for larger 'hot spots' sample spacing should not exceed 10m with the requisite increase in number of samples.

- Samples of the surrounding soil will be taken from the excavation formed and tested for the suite of determinands listed in Appendix 6/15 in addition to any other appropriate contaminant as indicated by appearance or by smell.

- If the chemical concentrations of the soil samples are less than the concentrations recorded in Appendix 6/15 or other appropriate guidance in respect of other appropriate contaminant, the elevated concentrations or 'hot spot' can be considered to have been removed and no further remedial action is required.

- If the chemical concentrations of the soil samples are greater than the concentrations recorded in Appendix 6/15, further excavation is required and the sequence of sampling and testing should be repeated.

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Incremental excavation and testing should continue until the chemical concentrations encountered are less than the concentrations recorded in Appendix 6/15 or other appropriate guidance in respect of other appropriate contaminant.

- During this procedure, the following information should be collected and recorded:
    - The exact extent of each phase of excavation should be recorded using 3D topographical surveying techniques.
    - The exact position and depth of each sample taken should be recorded using 3D topographical surveying techniques.
    - The samples should be given a unique reference number.
    - The laboratory testing results for each unique sample shall be recorded.
    - A photographic record of each phase of excavation and sampling will be collected and recorded.
    - A general photographic record of the works should also be collected and recorded to provide a general record of the nature and characteristics of the materials encountered and/or laid to form formations etc. Where practicable, the photographic record should be cross referenced with any chemical testing available for the material type.

As soon as is practicable after the completion of the groundworks and removal of any anticipated or unexpected 'hot spots' a **Validation Report** shall be prepared and submitted by the Contractor and agreed with the relevant Local Authority Planning Development Department.

A2 Sitewide Validation / Verification Strategy

This section provides a summary of the works required to confirm and verify that the site has been remediated successfully. The documentation of these works will form part of the Verification Report for the site.

The Contractor will be required to provide evidence that the works, including installation of the cover system / hardstanding, removal of unexpected areas of contamination, construction of below ground infrastructure and waste management have been completed in accordance with the relevant legislation and guidance (see also Appendix 6/15).

The Verification Report will be submitted to the Local Authority in connection with the discharge of planning conditions. It is recommended that a suitably qualified Environmental Consultant is appointed to collate the data required, as specified in the subsequent sections, for the verification and to author the report. The Verification Report will be prepared in general accordance with relevant good practice guidance and will include:

- An executive summary;
- A summary of the design and a record design changes;
- Site investigation data;
- A record of the remediation actions, including details of treated areas, volumes;
- Record photographs of the works, relevant drawings, of both the as found and as built conditions;
- Validation results and monitoring results;

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- Materials processing, waste management;
- Health and safety, quality assessment; and
- Final site condition including As built plans including topographic survey data of all relevant levels in three dimensions, to an accuracy of X,Y,Z (+/- 0.01m), and to National Grid and Datum. All electronic data shall be reported in industry standard formats.

Environmental Consultant Watching Brief

The Environmental Consultant shall undertake a part-time watching brief during the earthworks and any remedial works. It is envisaged that this will comprise part time site attendance during the demolition and removal of hardstanding, the bulk dig, piling works, and the placement of landscaping materials.

The Contractor shall liaise with the Environmental Consultant with regards to the programme and timing of the works, to ensure that the Environmental Consultant can attend site at appropriate times.

Verification of Materials (Sampling Requirements)

Prior to import onto site the Contractor shall provide the Environmental Consultant with information on the topsoil, to include:

- The source of origin (be it one site or multiple sites);
- The volume of topsoil / subsoil required;
- The name and address of the producer;
- Any quality information on the sub-soil/ topsoil from the producer/vendor, including laboratory testing; and
- Analytical sample results to confirm compliance with the characteristics set out in Appendix 6/15.

Verification samples shall be collected from the topsoil by the Environmental Consultant once placed in-situ at the development, to verify that the soil is not contaminated. Verification sampling and analysis of the following soils is envisaged:

- Imported topsoil shall be sampled in-situ, with at least three samples per source site. The results should be analysed for the suite of contaminants specified in Appendix 6/15 and should not exceed the soil import criteria.
- Verification samples shall be collected from the topsoil by the Environmental Consultant once placed in-situ at the development, to verify that the soil is not contaminated.
- Imported engineering fill for areas that are filled, should be sampled at a frequency as defined in Appendix 6/15 with at least three samples per source site.

Other Contractor Documentation

The Contractor shall provide the Environmental Consultant with the following information:

- Documentation on any environmental controls during excavation works (e.g. dust / noise monitoring);

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- 'As-dug' plans showing the location and depth of excavations and verification samples, sub-surface voids and obstructions (if encountered), location and description of unexpected contamination (if encountered) and detailed of where any backfill materials have been placed on site;
- Results of laboratory analysis, consents, exemptions and permits for the works;
- Waste duty of care information (including the types and amounts of waste disposed of, waste classification and WAC analysis, waste transfer and consignment notes and applicable site and carriers' licenses;
- Documentation obtained from the producer of any imported recycled aggregate and topsoil and delivery notes for imported materials.

A3 Verification / Validation Documentation Requirements

The following documentation shall be prepared by the Contractor and submitted to the relevant Local Authority Planning Development Department.

- Plan or plans showing earthworks movement of materials on site (cut and fill) and imported if appropriate. This is to include confirmation of the volumes of each material placed (i.e. volume of site won and volume of imported).
- Plan or plans showing the location of any 'hot spots' located, if any, or confirmation that none were encountered.
- Plan or plans showing location of chemical testing undertaken as appropriate plus supporting information.
- Plan or plans showing surface finishes and thickness of build-ups, topsoil or clean cover as appropriate.
- Plan or plans showing the location of any hotspots encountered during service trench excavation, if any, and plan sections of remedial measures undertaken for water pipe provision.
- Appropriate records of material removed from site including testing records.
- Appropriate records of material imported to site including testing records.
- Appropriate records of topsoil imported to site including testing records.
- Appropriate photographic records of the earthworks plus any specific areas of interest ('hotspots', tanks etc).
- Appropriate photographic records demonstrating the required thickness of material has been placed in soft landscaped areas.
- Records of any water control of groundwater that may have been contaminated, if any, or confirmation that none were encountered.
- Other records, if appropriate, not included in above summary.
- A statement confirming the earthworks was undertaken in accordance with this specification.

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