



COOP LIVE

Q28 - TOPSOIL GROWING MEDIUM AND AMELIORANTS

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COOP LIVE

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Q28 TOSOIL GROWING MEDIUM AND AMELIORANTS	1
GENERAL	1
110 WORKS INCLUDED	1
111 APPLICABLE DESIGN RESPONSIBILITY	1
112 TENDER SUBMITTALS	1
113 SAMPLES	2
114 TESTING	2
115 ENVIRONMENTAL PERFORMANCE	3
PRODUCTS	5
210 SYSTEMS	5
211 MATERIALS	7
EXECUTION	8
310 SOILS EXECUTION GENERALLY	8

Q28 TOSOIL GROWING MEDIUM AND AMELIORANTS

GENERAL

110 WORKS INCLUDED

1. Scope of Works: This section of the Specification, when read in conjunction with the Design Drawings, provides particular requirements with respect to the works, which include the following:
 - a. Topsoil.
2. Particular Interfaces
 - a. Complete the Detailed Design of all interfaces with adjoining trades prior to commencement of manufacture.
 - b. Ensure that all interfaces are fully co-ordinated prior to commencement.
3. Related Documents and Sections: Examine the Design Drawings and the Contract Documents for requirements that directly affect or are affected by Work of this Section. Other Documents and Sections that directly relate to work of this Section include, but are not limited to:
 - a. The Preliminaries, general provisions of the Contract, including General and Supplementary Conditions, and Architectural General Requirements Specification Sections.

111 APPLICABLE DESIGN RESPONSIBILITY

1. Design & Build and CDP Procurement Routes
 - a. Appoint a specialist sub-contractor to complete the Detailed Design maintaining at all times the intent portrayed on the Design Drawings whereby the Architect's role post-novation or during subsequent design stages shall be limited to checking compliance with quality, design and visual intent only.

112 TENDER SUBMITTALS

1. Tender Response
 - a. Provide tender submittals in accordance with the requirements of SUBMITTALS clauses of the A Section of the Specification.
 - b. Submit a design response with the Tender proposal, to include all profiles of typical conditions, with dimensions.
 - c. The Tender design response shall include:
 - 1). Samples where specified.
 - 2). List of Tests included.
 - 3). QA/ QC programme.
 - 4). Summary of deviations from the Specification.
 - 5). Outline technical specifications reflecting proposed materials/ systems, etc.
 - 6). A list of proposed suppliers and sub-contractors intended to be used.
2. Contractor Method Statements and ITPs

- a. Supply the Architect with Method Statements and Inspection and Test Plans (ITP) for all soiling operations (e.g. importation, handling, stockpiling, setting out, cell system installation, spreading, cultivations, amelioration, tree pit construction). Each Method Statement shall include details of the methods of working, proposed site machinery and tillage equipment, materials, manpower and Health & Safety requirements.
- b. Each Method Statement and ITP shall be submitted for written acceptance by the Architect before any

113 SAMPLES

1. Sampling Protocol

- a. The soil materials considered for importation shall be sampled while stockpiled off site at their source or manufacture location.
- b. Provide 48 hours' notice to the Architect prior to undertaking the sampling.
- c. The samples shall be representative of the soil being considered. One composite sample shall be taken for every 250m³ of each type of soil to be used. At least 3 No. samples of each soil type shall be tested from each source/supplier.
- d. Each composite sample shall be made up of 10 No. sub-samples taken from evenly spaced locations across the stockpile/field. The sub-samples shall be mixed together and quartered down to form a 5kg composite sample.
- e. Each composite sample shall be placed in a clean, strong plastic bag and a 250ml brown glass, wide-necked jar (for organics testing) and each labelled with the source reference and date of sampling. Glass jar samples shall be stored and delivered to the laboratory in a cool box within 24hrs of sampling.
- f. Soils of different types shall not be mixed to form a composite sample.
- g. The samples shall be analysed and reported on a 10 working day turnaround and the Contractor shall incorporate this into the programme. An accelerated analysis turnaround will be permitted at the Contractor's cost where programme constraints deem this necessary.
- h. The sampled soil materials shall be temporarily stockpiled at the source location while the Contractor awaits receipt of the soil analysis results and until the Architect has reviewed the results and provided written acceptance on its suitability for use within the project.

114 TESTING

1. Planting Topsoil and Cell System Topsoil Testing

- a. Topsoil samples shall be tested prior to acceptance by the Architect. The following parameters shall be requested (methods in accordance with BS 3882 or as indicated):
 - 1). Visual examination to record Munsell colour, moisture status, aerobic state, the presence of any deleterious materials or unusual odours (e.g. petroleum hydrocarbons).
 - 2). pH Value (1:2.5 soil/water extract).
 - 3). Electrical Conductivity (1:2.5 soil/water extract).
 - 4). Electrical Conductivity (1:2.5 soil/CaSO₄ extract).
 - 5). Exchangeable Sodium Percentage.
 - 6). Particle Size Analysis (clay, silt, 5 sands – ASTM sieve sizes).
 - 7). Stone Content by % weight (2-20mm, 20-50mm, >50mm).

- 8). Total Nitrogen (% - Dumas Method).
 - 9). Extractable Phosphorus, Potassium and Magnesium (RB427 Method).
 - 10). Organic Matter (% - Loss on Ignition).
 - 11). Carbon: Nitrogen ratio (by calculation).
 - 12). Calcium Carbonate (%- BS 7755).
 - 13). Saturated Hydraulic Conductivity (Modified ASTM F1815 for topsoil).
 - 14). Potential Contaminants - See parameters for constituent soil types.
2. Bio-retention Filter Medium Testing
 - a. Hydraulic conductivity (permeability) assessment and testing shall be undertaken. A filter medium that is placed uncompacted will initially show a very high hydraulic conductivity which will then rapidly decrease. It is essential that testing of hydraulic conductivity be carried out on the compacted filter medium before installation.
 - b. The saturated hydraulic conductivity (permeability) shall be checked in situ, using the single ring infiltration test method as described in BS ISO 22282: Part 5. For large volumes of engineered soil, test hydraulic conductivity before delivery to site using a laboratory test using ASTM F1815.
 3. Lightweight Subsoil and Washed Sand Testing
 - a. Lightweight subsoil samples shall be tested prior to acceptance by the Architect. The following parameters shall be requested (methods in accordance with BS 8601 or as indicated):
 - 1). Visual examination to record the presence of any deleterious materials or unusual
 - 2). odours (e.g. petroleum hydrocarbons).
 - 3). pH Value (1:2.5 soil/water extract).
 - 4). Electrical Conductivity (1:2.5 soil/water extract).
 - 5). Particle Size Analysis (clay, silt, 5 sands – ASTM sieve sizes).
 - 6). Saturated Hydraulic Conductivity (Modified percolation test. (ASTM F1815).
 - 7). Saturated Bulk Density (ASTM F1815).
 - 8). Stone Content by % weight (>2mm, >10mm).
 - 9). Potential Contaminants – See parameters for each constituent soil type.

115 ENVIRONMENTAL PERFORMANCE

1. General Requirements
 - a. The following Generic Assessment Criteria (GAC) shall be used as Tier 1 screening values for the assessment of soil(s) to be used, unless Site-Specific Assessment Criteria (SSAC) are provided for this project.
 - b. In circumstances where any of these values are exceeded, further risk assessment and/or testing shall be undertaken to confirm the significance of the non-compliance.

Table 1 - Generic Assessment Criteria

Parameter	Unit	Generic Assessment Criteria
Inorganic Arsenic	mg/kg	37
Boron (soluble)	mg/kg	290
Cadmium	mg/kg	11
Chromium (III)	mg/kg	910
Chromium (IV)	mg/kg	6
Copper	mg/kg	100
Lead	mg/kg	200
Mercury	mg/kg	1.2
Nickel	mg/kg	60
Selenium	mg/kg	250
Zinc	mg/kg	200
Phenol	mg/kg	280
Benzene	mg/kg	0.087
Toluene	mg/kg	130
Ethylbenzene	mg/kg	47
Xylene - m	mg/kg	59
Xylene - o	mg/kg	60
Xylene - p	mg/kg	56
Aliphatics C5-C6	mg/kg	42
Aliphatics C6-C8	mg/kg	100
Aliphatics C8-C10	mg/kg	27
Aliphatics C10-C12	mg/kg	130
Aliphatics C12-C26	mg/kg	1100
Aliphatics C26-C35	mg/kg	65000
Aromatics C5-C7	mg/kg	70
Aromatics C7-C8	mg/kg	130
Aromatics C8-C10	mg/kg	34
Aromatics C10-C12	mg/kg	74
Aromatics C12-C16	mg/kg	140
Aromatics C16-C21	mg/kg	260
Aromatics C21-C35	mg/kg	1100
Acenaphthene	mg/kg	210
Acenaphthylene	mg/kg	170
Anthracene	mg/kg	2400
Benzo(a)anthracene	mg/kg	7.2
Benzo[a]pyrene	mg/kg	2.2
Benzo(b)fluoranthene	mg/kg	2.6
Benzo(g,h,i)perylene	mg/kg	320
Benzo(k)fluoranthene	mg/kg	77
Chrysene	mg/kg	15
Dibenzo[a,h]anthracene	mg/kg	0.24
Fluoranthene	mg/kg	280
Fluorene	mg/kg	170
Indeno(1,2,3-cd)pyrene	mg/kg	27

Naphthalene	mg/kg	2.3
Phenanthrene	mg/kg	95
Pyrene	mg/kg	620
Asbestos screen	Not Detected	Not Detected

PRODUCTS

210 SYSTEMS

1. Type EXT-551 General Planting Soil
 - a. Provide general planting topsoil as necessary to complete the work.
 - b. Make the necessary allowance for settlement after laying.
 - c. The topsoil shall comply with the following lower and upper limits expressed as Lower / Upper:
 - 1). Clay (<0.002mm) : 4% / 18%.
 - 2). Silt (0.002-0.05): 5% / 35%.
 - 3). Sand (0.05-2.0mm) of which at least 35% shall fall into fine to medium sand range: 63% / 80%.
 - 4). Stones (2-20mm): - / 20% DW.
 - 5). Stones (20-50mm): - / 15% DW.
 - 6). Stones (>50mm): Nil.
 - 7). Saturated Hydraulic Conductivity (@ 40 cm tension): 4mm per hour / -.
 - 8). Bulk Density at Field Capacity: - / 1.8 Mg/m³.
 - 9). pH value: 6.0 / 8.5.
 - 10). Electrical Conductivity (1:2.5 water extract): - / 1500 µS/cm.
 - 11). Electrical Conductivity (CaSO₄ extract): - / 3300 µS/cm.
 - 12). Exchangeable Sodium Percentage: - / 9%.
 - 13). Organic Matter: 4.0% / 8.0%.
 - 14). Total Nitrogen: 0.20% / -.
 - 15). Carbon: Nitrogen Ratio: 20:1.
 - 16). Extractable Phosphorus: 26 mg/l / 100 mg/l.
 - 17). Extractable Potassium: 230 mg/l / 1200 mg/l.
 - 18). Extractable Magnesium: 50 mg/l / 600 mg/l.
 - 19). Calcium Carbonate: - / 3%.

2. Type EXT-552 Tree Cell System Topsoil

- a. Provide a tree cell category topsoil to ground only as necessary to complete the work.
- b. Make the necessary allowance for settlement after laying.
- c. The topsoil to be used within the Rootspace Cell shall comply with the following lower and upper limits expressed as Lower / Upper:
 - 1). Clay (<0.002mm) : 5% / 18%.
 - 2). Silt (0.002-0.05): 5% / 25%.
 - 3). Sand (0.05-2.0mm) of which at least 35% shall fall into fine to medium sand range: 65% / 85%.
 - 4). Stones (2-20mm): - / 15% DW.
 - 5). Stones (20-50mm): Nil.
 - 6). pH value: 5.5 / 8.5.
 - 7). Electrical Conductivity (1:2.5 water extract): - / 1500 μ S/cm.
 - 8). Electrical Conductivity (CaSO₄ extract): - / 3300 μ S/cm.
 - 9). Exchangeable Sodium Percentage: - / 9%.
 - 10). Organic Matter: 5.0% / 10.0%.
 - 11). Total Nitrogen: 0.20% / -.
 - 12). Carbon: Nitrogen Ratio: 20:1.
 - 13). Extractable Phosphorus: 26 mg/l / 100 mg/l.
 - 14). Extractable Potassium: 240 mg/l / 1500 mg/l.
 - 15). Extractable Magnesium: 50 mg/l / 600 mg/l.
 - 16). Calcium Carbonate: - / 3%.

3. Type EXT-553 Lightweight Subsoil

- a. Provide lightweight subsoil to the lower section of tree pits and planting beds of podium as necessary to complete the work.
- b. Make due allowance for settlement after laying.
- c. Lightweight subsoil shall be a quarried washed sand material blended with LECA (10mm maximum diameter) that meets the following requirements. It shall not be derived from a marine-dredged sand or any form of recycled sand.
- d. Criteria limits expressed as Lower / Upper:
 - 1). Clay and silt (less than 0.05mm): Nil.
 - 2). Very Fine Sand (0.05 – 0.15mm): 0 / 5%.
 - 3). Fine Sand (0.15 – 0.25mm): 5% / 15%.
 - 4). Medium Sand (0.25 – 0.50mm): 45% / 70%.

- 5). Coarse Sand (0.50 – 1.0mm): 25% / 45%.
- 6). Very Coarse Sand (1.0 – 2.0mm): 0% / 5%.
- 7). Stones (2-10mm, excluding LECA): - / 10% DW.
- 8). Stones (>10mm): - / 0%.
- 9). Saturated Hydraulic Conductivity (@ 40 cm tension): 120mm per hour / -.
- 10). Bulk Density at Field Capacity: - / 1.8 Mg/m³.
- 11). pH value: 5.0 / 8.5.
- 12). Electrical Conductivity (1:2.5 water extract): - / 600 µS/cm.

4. ~~Type EXT-554 Washed Sand Subsoil~~

- a. ~~Provide washed sand subsoil to all trees and plants on ground as necessary to complete the work.~~
- b. ~~Make due allowance for settlement after laying.~~
- c. ~~Washed sand shall be a quarried washed sand that meets the following requirements. It shall not be a marine dredged sand or any form of recycled sand.~~
- d. ~~Criteria limits expressed as Lower / Upper:-~~
 - 1). ~~Clay and silt (less than 0.05mm): Nil.~~
 - 2). ~~Very Fine Sand (0.05 – 0.15mm): 0 / 5%.~~
 - 3). ~~Fine Sand (0.15 – 0.25mm): 5% / 15%.~~
 - 4). ~~Medium Sand (0.25 – 0.50mm): 45% / 70%.~~
 - 5). ~~Coarse Sand (0.50 – 1.0mm): 25% / 45%.~~
 - 6). ~~Very Coarse Sand (1.0 – 2.0mm): 0% / 5%.~~
 - 7). ~~Stones (2-10mm, excluding LECA): - / 10% DW.~~
 - 8). ~~Stones (>10mm): - / 0%.~~
 - 9). ~~Saturated Hydraulic Conductivity (@ 40 cm tension): 120mm per hour / -.~~
 - 10). ~~Bulk Density at Field Capacity: - / 1.8 Mg/m³.~~
 - 11). ~~pH value: 5.0 / 8.5.~~
 - 12). ~~Electrical Conductivity (1:2.5 water extract): - / 600 µS/cm.~~

211

MATERIALS

1. Soil Materials Generally
 - a. Free of pests, disease, and fungus.

- b. Foreign matter: On visual inspection, free from non-soil material, brick and other building materials and wastes, sharps, hydrocarbons, plant matter, weed roots, stolons, rhizomes, and any other foreign matter or material or substance that would render the soil or soil ameliorant unsuitable for horticultural use.
 - c. Contamination: Do not use topsoil, subsoil, sand or compost contaminated with rubbish or other materials that are:
 - 1). Corrosive, explosive or flammable.
 - 2). Hazardous to human or animal life.
 - 3). Detrimental to healthy plant growth.
 - d. Provide notice if any evidence or symptoms of soil contamination are discovered on the site or in topsoil, subsoil, sand or compost or other planting media to be imported.
2. Fertiliser for Trees and Shrubs
- a. Indicative manufacturer: Everris.
 - b. Indicative reference: CRF (11%N:22%P2O5:9%K2O:6%MgO).

EXECUTION

310 SOILS EXECUTION GENERALLY

- 1. Programme for Sourcing Soils and Growing Media
 - a. Allow sufficient time for sourcing the necessary soils to meet the requirements of this section.
 - b. At least 8 weeks shall be allowed for sourcing soils so that the soil supplier(s)/ manufacturer(s) can review the soil specifications and develop and test the necessary soil types themselves to ensure compliance with the specifications.
 - c. Carry out verification tests on the soil materials and await written acceptance from the Architect prior to importing the material to site.
- 2. Soil Scientist
 - a. A suitably qualified and approved, independent Soil Scientist shall be appointed by the Contractor to undertake the sampling and testing of the soil materials considered for importation, and inspection of soil materials once imported and placed.
 - b. Details of the proposed Soil Scientist (including company information, qualifications, track record) shall be submitted to the Architect for written acceptance prior to appointment.
 - c. All sampling, testing and inspection costs shall be borne by the Contractor.
- 3. Sample Loads
 - a. Deliver to site a sample load of each soil material in a bulk bag (e.g. 900mm x 900mm x 800mm).
 - b. Give 72 hours notice to allow inspection before making further deliveries to site. Retain for comparison with subsequent loads.
- 4. Quality Control Verification on Site

- a. Quality control checks will be carried out by the Architect as appropriate and prior to any planting or seeding to ensure that the soil conditions, soil types and depths are satisfactory and compliant with the specification/design. It is the responsibility of the Contractor to inform the Architect when the stages of the work have been completed to a satisfactory standard in accordance with the quality levels indicated.
 - b. This shall include, but not necessarily limited to, the following stages of landscape works:
 - 1). Soil importation.
 - 2). Temporary soil storage.
 - 3). Setting out landscape areas.
 - 4). Cell system installation.
 - 5). Subsoil spreading.
 - 6). Topsoil spreading.
 - 7). Soil cultivations.
 - 8). Soil amelioration (fertilisers, compost).
 - 9). Tree pit construction and backfilling.
 - 10). Tree planting
 - c. The Architect will either confirm that the correct soil quality/type/depth has been achieved and further landscape works may commence, or that the soil quality/type/depth is not acceptable and further soiling works are required. The non-compliances and recommendations for remedial works shall be issued in a written report. Only when written acceptance is given shall further landscape works commence.
 - d. Each stage will be offered for inspection by the Architect prior to work on the next stage commencing. Work shall not proceed to the next stage until the Architect has given written authorisation. It is recognised that the Contractor may wish to carry out the work stages with more than one stage continuing at any one time.
 - e. After all soil treatments have been completed and prior to carrying out any planting, seeding or turfing, all soils shall be inspected by the Architect to establish that there is no surface or subsurface compacted soil layers or other subsurface materials likely to impede drainage or cause other damage to the plants.
 - f. Where compacted soil layers or consolidated materials are found, the soil shall be cultivated to an appropriate depth and in an appropriate manner to improve soil conditions to the satisfaction of the Architect.
 - g. All final topsoil levels/ landforms/ topography are to be to the acceptance of the Architect. All final grading (fine turning) of finished topography is to be as instructed by the Architect.
5. Notice Period
- a. Notice shall be sent to the Architect giving, on receipt, at least 72 hours' notice of the start of each stage of work as indicated under quality control checks. Quality control checks will be carried out on all areas as determined by the Architect.
6. Soil Handling

- a. Plant: Select and use plant to minimise disturbance, trafficking and compaction.
 - b. Contamination: Do not mix topsoil, rootzone or subsoil with stone, hardcore, rubbish, spoil debris from any demolition works or alien/dissimilar topsoil types.
 - c. Multiple handling shall be kept to a minimum. Use or stockpile topsoil immediately.
 - d. It is important to avoid physical degradation to the soil during all phases of soil handling (e.g. spreading, cultivation, amelioration, planting and seeding). As a consequence, soil handling operations shall be carried out when soil is non-plastic (friable) in consistency (i.e. at least 5% below the soil's lower plastic limit) unless authorised by the Architect.
 - e. Soil shall not be unnecessarily compacted by trampling or trafficking by site machinery.
 - f. Soil shall not be handled when frozen unless authorised by the Architect.
 - g. Soil handling shall be stopped during and after heavy rainfall, and not continue until the soil has regained a non-plastic (friable) consistency.
 - h. If, during the course of the soiling and landscape works, the soil is compacted, it shall be suitably cultivated to relieve the compaction and restore the structure prior to any planting or seeding.
7. Temporary Soil Stockpiles
- a. Location: To be agreed.
 - b. Height (maximum): 4m.
 - c. Protection:
 - 1). To protect from wet weather once the final height is achieved, a tracked excavator shall regrade the sides and top of each stockpile to encourage water to runoff. The excavator shall then compact down the surface of the stockpile by tracking across it to seal in the dry soil and reduce rainfall infiltration.
 - 2). Do not place any other material on top of or adjacent to each stockpile.
 - 3). Do not place different soil types on top of or adjacent to each stockpile.
 - 4). Once formed, do not allow construction plant to pass over the stockpile.
 - 5). Prevent compaction and contamination, by fencing and restricting as appropriate.
 - d. Prior to use, soil quality shall be checked by the Architect and they shall provide recommendations for reconditioning or amelioration as required.
8. Spreading Lightweight Subsoil or Washed Sand
- a. Remove all temporary surfacing /building materials from the basal layer (top of formation level) before spreading lightweight subsoil.
 - b. The lightweight subsoil shall be transported to a suitable location and loose tipped into heaps on the edge of the spreading area.
 - c. The subsoil shall be spread using appropriate equipment (e.g. small tracked excavator).
 - d. The subsoil shall be spread and then consolidated by trampling in (restricted access areas), tracking in or using the excavator bucket (as deemed appropriate).

- e. Grade to smooth flowing contours to achieve specified finished depths of subsoil. Depths after firming and settlement (minimum) to be as specified.
- f. No topsoil to be laid until subsoil formation levels have been accepted by the Architect.

9. Spreading Planting Topsoil

- a. Remove all temporary roads/surfacing before spreading planting topsoil/ lawn rootzone.
- b. The planting topsoil/ lawn rootzone shall be transported to a suitable location and loose tipped into heaps on the edge of the spreading area.
- c. The planting topsoil/ lawn rootzone shall be spread using appropriate equipment (e.g. small tracked excavator).
- d. The planting topsoil/ lawn rootzone shall be spread and then consolidated by trampling in (restricted access areas), tracking in or using the excavator bucket (as deemed appropriate).
- e. Grade to smooth flowing contours to achieve specified finished depths of planting topsoil/ lawn rootzone to the acceptance of the Architect.
- f. The Architect reserves the right to require modifications to grading to achieve appearance required.
- g. After topsoiling all areas shall be protected from contamination and compaction by restricting access to only persons involved with soft landscape operations.

10. Installing Cell System Topsoil

- a. The cell system shall be installed in accordance with the manufacturer's instructions.
- b. Soil handling and placement operations shall be carried out when the soil is non-plastic (friable) in consistency and capable of in-filling the cell voids (preferably at a moisture content of at least 10% below the soil's Plastic Limit).

11. Soil Depths

- a. As a general guide, soil depths shall be as follows:

Table 2 - Soil Depths		
Planting Type	Depth (mm)	Minimum Subsoil Depth (mm)
Trees	400	600
Shrubs	400	300
Lawn	150	150

- b. Refer to Design Drawings for confirmation of soil depths in each landscape area.

12. Soil Compaction

- a. If the soils are found to be compacted (as deemed by penetrometer) at any stage during the landscape construction works, appropriate decompaction treatment shall take place.
- b. Submit the type of equipment to be used for soil decompaction for the written acceptance of the Architect. A tooth bucket shall NOT be used for this operation.

13. Finished Levels of Topsoil After Settlement

- a. Above adjoining paving or kerbs: 25mm.
- b. Below dpc of adjoining buildings: Not less than 150mm.
- c. Shrub areas: Higher than adjoining grass areas by 20mm.
- d. Adjoining soil areas: Marry in.

14. Use of Fertilisers

- a. The use of additional fertilisers or any other soil ameliorants is dependent on the findings of the soil tests (as presented in submitted documentation) and the written approval of the Soil Scientist.