UCLH PHASE 4 AND PROTON BEAM THERAPY BUILDING PROJECT

Architectural Specification

Architectural Specification Section Q10 – Kerbs

Revision	Date	Clauses Updated	Notes
Contract Issue	28/07/2014	-	-
Rev. A – STAGE E ISSUE	14.11.2016	Q10.1102 Q10.1202 k) Q10.1203 Q10.1204	- ñExternal Granite kerbsò added - ñor proposedò added - (in areas with Yorkstone paving slabs and granite setts) - Existing Stone Kerbs specification added
General notes: ~~Omissions to specifcation shown in blue and struck through.~~ Additions to specification shown in red. Updates from Contract Specification to be agreed by ByUK and UCLH where relevant.			

Scott Tallon Walker Architects

Q10 KERBS/ EDGINGS/ CHANNELS/ PAVING ACCESSORIES

Preliminaries

To be read in conjunction with Section A91 and other related sections of the Specification, and Contract Conditions.

Q10.1000 SCOPE, SUBMITTALS, TESTING AND PERFORMANCE

Q10.1100 SPECIFICATION AND SCOPE

Q10.1101 General

a) Works covered in this section are specified by performance and therefore designated as works with specialist sub-contractor Design (SCD). Refer to Section A91.

b) Complete the Detailed Design, manufacture, supply, install and warrant the works whilst complying with the visual intent indicated on the Design Drawings and criteria stated in the Specification.

c) For design and general performance requirements, refer to Section A91 of the Specification. Specific design and performance requirements are as defined in the particular trade sections.

d) Where no material, product or supplier is indicated in the Specification, propose suitable materials and systems prior to Contract award which comply with the visual intent and performance criteria stated and remain fully responsible for the Detailed Design of the works.

e) Where a particular material, product or supplier is indicated in the Specification, such material, product or supplier shall be deemed indicative representing the Architectís design intent only. The Contractor may complete the installation using that product, or such other confirmed as acceptable by the Architect in writing, but shall remain fully responsible for the Detailed Design and performance of the works.

Q10.1102 Scope of Works

This section of the Specification, when read in conjunction with the Design Drawings, provides particular requirements with respect to:

a) External drainage channels.

b) External Granite kerbs

Q10.1103 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.

Q10.1200 SYSTEM TYPES

Drainage Channel

Q10.~~21~~1202 Type EXT-002 Drainage Channel

a) Standard: To BS EN 1340.

b) Manufacturer: Aco or an approved equivalent.

c) Product reference: Aco stainless steel Slot Drain or an acceptable equivalent to suit.

d) Recycled content: 20% (minimum) to BS EN ISO 14021.

e) Designations: Slot drain.

f) Size (width x height x length): Refer to the Design Drawings.

g) Special shapes: Cut at 45º where required. Refer to the Design Drawings.

h) Bedding: Cement mortar.

i) Joints generally: Narrow mortar.

j) Sealant movement joints: At 4.5m or 9m centers.

k) Connect drain to existing or proposed drainage system as required.

l) Accessories: Haunching as required. Refer to the Design Drawings.

Q10.~~21~~1203 Type EXT-013 Stone Kerb (in areas with Yorkstone paving slabs and granite setts)

a) Standard: To BS EN 1343.

b) Granite kerb units.

c) Refer to the Design and Access statement.

d) Designations: ôSplayedö kerb unit (75mm splay).

e) Size (width x height x length): Refer to the Design Drawings.

f) Special shapes: 45 degree splayed corner.

g) Finish: To be confirmed.

h) Colour: To be confirmed.

i) Bedding: Cement mortar.

j) Joints generally: Narrow mortar.

k) Sealant movement joints: At 6m centres.

l) Accessories: Haunching as required. Refer to the Design Drawings

Q10.1204 Existing Stone Kerb

a) Damage or misplaced granite kerbs to be made good and reinstated to mach pre-existing conditions.

b) Size (width x height x length): to mach preexisting conditions.

c) Finish: to mach pre-existing conditions.

d) Colour: To be confirmed.

e) Bedding: to mach pre-existing conditions.

f) Joints generally: to mach pre-existing conditions.

g) Accessories: Haunching as required. to mach pre-existing conditions.

Q10.1300 SUBMITTALS

Tender Submittals

Q10.1301 Tender Response

a) Provide tender submittals in accordance with the requirements of Section A91.4000 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:

i) Samples where specified.

ii) List of Tests included.

iii) QA/ QC programme.

iv) List of proposed Working Drawings.

v) Summary of deviations from the Specification.

vi) Outline technical specifications reflecting proposed materials/ systems.

vii) A list of proposed suppliers and sub-contractors intended to be used.

Samples, Mock-ups, Prototypes and Quality Benchmarks

Q10.1302 Pre-contract Samples

Relevant trade literature and technical specifications shall be provided in accordance with Section A91.4000.

Q10.1303 Post Contract Award Samples

In accordance with Section A91.4000, post contract award samples of the following shall be provided:

a) 1 No. samples of channel type.

Q10.1304 Mock-ups

Not required.

Q10.1305 Prototypes

Not required.

Q10.1306 Quality Benchmark Requirements

The following quality benchmarks shall be provided, in locations to be agreed with the Architect, in accordance with Section A91.4000:

a) Following agreement of samples, a length of channel 2m.

Testing

Q10.1307 Testing of Drainage

a) Test in accordance with the Services Engineerõs requirements.

Q10.1400 PERFORMANCE REQUIREMENTS

Comply with the general performance of Section A91.5000 and the following specific performance requirements.

Structural

Q10.1401 General

Refer to Section A91, clause series 5300.

Q10.1402 Specific Movements

a) The works shall be detailed, manufactured and installed to accommodate all movements of the substrates without damage or any reduction in the performance.

b) The works shall not deflect under loading in any way that is detrimental to any element of the works or adjacent structural or building elements.

Q10.1403 Specific Dead Loads

a) The works' own dead load shall be accommodated locally and without causing deflections or movements that affect abutting elements.

b) The dead loads derived from permanent fixtures or services attached to the surfaces of the works shall be accommodated without any reduction in performance.

Q10.1404 Specific Live Loads

The works shall be capable of accommodating the following live loads without any

reduction in performance:

a) Movements of the concrete slabs and loads imposed upon them.

b) All loads resulting from movements of the structure as a whole.

c) Loads from a 2½ tonne cherry picker type access machine.

d) Working loads up to 11.5-ton axle load shared between two wheels with assumed 300mm x300mm area of tyres producing an ultimate load of 1.8N/ mm².

Environmental

Q10.1405 Thermal Movement

It shall be ensured that the works are capable of withstanding differential surface temperatures without any reduction in the specified performance. Any movement joints, as necessary to cater for any thermal movement, shall be provided.

Q10.1406 Moisture Movement

The works shall withstand the following movement without permanent deformation or any reduction in the specified performance:

a) Due to changes in the moisture content of its components, resulting from variations in the moisture content of the air.

b) Due to drying shrinkage of building components, both short term and long term.

Q10.2000 MATERIALS AND FABRICATION

Q10.2100 GENERAL

Q10.2101 Concrete For Foundations, Races And Haunching

a) Standard: To BS 8500-2.

b) Designated mix: Not less than GEN0 or Standard mix ST1.

c) Workability: Very low.

Q10.2102 Bedding/ Backing Of Units On Fresh Concrete Races

a) Standard: To BS 7533-6.

Q10.2200 MATERIALS

General

Q10.2201 Cement Mortar Bedding

a) General: To section Z21.

b) Mix (Portland cement:sand): 1:3.

c) Portland cement: Class CEM I 42.5 to BS EN 197-1.

d) Sand: to BS EN 12620, grade 0/4 or 0/2 (MP).

e) Bed thickness: 12-40 mm.

Q10.2203 Damage

Materials that are chipped, scratched, damaged or have any other physical imperfections shall not be used in the works.

Q10.3000 SITE INSTALLATION

Q10.3100 WORKMANSHIP

Q10.3101 Channels

a) Installation: To an even gradient, without ponding or backfall.

b) Lowest points of channels: 6 mm above drainage outlets.

Q10.3102 Drainage Channel System

a) Installation: To an even gradient, without ponding or backfall. Commence laying from outlets.

b) Silt and debris: Removed from entire system immediately before handover.

c) Washing and detritus: Safely disposed without discharging into sewers or watercourses.

Q10.3103 Accuracy

a) Deviations (maximum):

i) Level: ± 6 mm but ± 1 mm at adjacent finishes. Alignments shall not result in trip hazzards.

ii) Horizontal and vertical alignment: 3 mm in 3 m.

Q10.3104 Tooled Mortar Joints

a) Jointing: Ends of units buttered with bedding mortar as laying proceeds. Joints completely filled and tooled to a neat flush profile.

b) Joint width: 6 mm.

Q10.3105 Drainage Channel Systems with Built-in fall

a) Installation: Top of channels level, installed in correct sequence to form an even gradient without ponding or backfall. Commence laying from outlets.

b) Silt and debris: Removed from entire system immediately before handover.

c) Washings and detritus: Safely disposed without discharging into sewers or watercourses.

Q10.3106 Inclement Weather

a) Channels shall not be laid if the temperature is below 3°C on a falling thermometer or below 1°C on a rising thermometer.

b) Frozen materials or bedding shall not be used on frozen or frost covered bases.

Q10.3113 Protection from Traffic

a) Paving bedded on mortar shall be kept free from pedestrian traffic as recommended by the manufacturer.

b) Access to paved areas shall be restricted as necessary to prevent damage from Site traffic and plant.

c) Site traffic and plant access to areas with geotextile shall be avoided until the upper granular sub-base has been fully laid with the prior acceptance of the Architect.

End of Section

UCLH PHASE 4 AND PROTON BEAM THERAPY BUILDING PROJECT

Architectural Specification

Architectural Specification Section Q25 – Slab Paving

Revision	Date	Clauses updated	Notes
Contract Issue	28/07/2014	-	-
Rev. A ï STAGE E ï DRAFT ISSUE	14/11/2016	Q25.1201 f) Q25.1201 i) Q25.1202 e) Q25.1203 Q25.1203 Q25.1204 Q25.1205	- ñto mach existingòadded - Loading requirements added - Colour patterns as per Architectsô - Drawings - Section Q25.1203 added - Section Q25.1204 added - Section Q25.1205 added
General notes: ~~Omissions to specifcation shown in blue and struck through.~~ Additions to specification shown in red. Updates from Contract Specification to be agreed by ByUK and UCLH where relevant.			

Scott Tallon Walker Architects

Q25 SLAB PAVING

To be read in conjunction with Section A91 and other related sections of the Specification, Preliminaries and Contract Conditions.

Q25.1000 SCOPE, SUBMITTALS, TESTING AND PERFORMANCE

Q25.1100 SPECIFICATION AND SCOPE

Q25.1101 General

a) Works covered in this section are specified by performance and therefore designated as works with specialist sub-contractor Design (SCD). Refer to Section A91.

b) Complete the Detailed Design, manufacture, supply, install and warrant the works whilst complying with the visual intent indicated on the Design Drawings and criteria stated in the Specification.

c) For design and general performance requirements, refer to Section A91 of the Specification. Specific design and performance requirements are as defined in the particular trade sections.

d) Where no material, product or supplier is indicated in the Specification, propose suitable materials and systems prior to Contract award which comply with the visual intent and performance criteria stated and remain fully responsible for the Detailed Design of the works.

e) Where a particular material, product or supplier is indicated in the Specification, such material, product or supplier shall be deemed indicative representing the Architectõs design intent only. The Contractor may complete the installation using that product, or such other confirmed as acceptable by the Architect in writing, but shall remain fully responsible for the Detailed Design and performance of the works.

Q25.1102 Scope of Works

This section of the Specification, when read in conjunction with the Design Drawings, provides particular requirements with respect to paving.

Q25.1103 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.

Q25.1200 SYSTEM TYPES

Paving

Q25.1201 Type EXT-001 Slab Paving

a) Natural Yorkstone slab external paving to match the existing pavement.

b) Thickness and bedding to match the existing paving and to achieve the required performance criteria stated in the Specification.

c) Natural stone slabs:

i) Nominal size: 600mm x random lengths x 75mm thick.

ii) Finish: Honed to an accepted control sample.

iii) Colour: To match accepted control sample.

d) Sub-base: As required.

e) Bedding: Sand/ cement mortar minimum 40mm thick, with reinforcement.

f) Joints: 3mm mortar joints nominal. To match existing

g) Pattern: As indicated on the Design Drawings.

h) Other requirements: Interface with the building and the slot drain where required.

i) Other requirements: Bedding and installation to suit heavy duty vehicles passing over or pedestrian traffic. Insulation of minimum comprehensive strength (EN 826-A) as per

architects drawings.

Q25.1202 Type EXT-012 Granite Setts

a) Natural stone slab external paving on mortar bedding with grouted joints.

b) Natural stone slabs: Granite setts for vehicular paving.

c) Nominal sizes: 100mm x 200mm and 200mm x 300mm . Refer to the Design Drawings. Minimum 75mm thick.

d) Finish: Sand blasted to achieve the required slip resistance and to an accepted/ agreed control sample.

e) Colour: To match accepted control sample. Colour patterns as per architectsô drawings.

f) Sub-base: Concrete slab as Structural Engineer's specification.

g) Bedding: Sand/ cement mortar minimum 40mm thick, with reinforcement.

h) Joints: 3mm dry mortar joints nominal. To be revised with supplier to achieve a level surface for beds trolleys wheelchairs etc.

i) Pattern: As indicated on the Design Drawings.

j) Other requirements: Bedding and installation to suit heavy duty vehicles passing over or pedestrian traffic. Insulation of minimum comprehensive strength (EN 826-A) as per architects drawings.

Q25.1203 Reinforced in-situ concrete slab

a) Reinforced in-situ concrete slab.

b) In situ concrete finish equivalent to Special Class quality and Type B finish.

c) Thickness 75mm (over existing paramout court basement structure) or 150mm as per architectsôdrawings

d) Bedding to achieve the required performance criteria stated in the Specification. As per architects drawings

e) Sub-base: As required.

f) Joints: 3mm mortar joints nominal.

g) Other requirements: Interface with the building and the slot drain where required. Bedding and installation to suit heavy duty vehicles passing over or pedestrian traffic. Insulation of minimum comprehensive strength (EN 826-A) as per architects drawings.

Q25.1204 Existing road surface to be reinstated

a) Existing road surface to be reinstated to match the existing .

b) Thickness and bedding to match the existing and to achieve the existing required performance criteria.

Q25.1300 SUBMITTALS

Tender Submittals

Q25.1301 Tender Response

a) Provide tender submittals in accordance with the requirements of Section A91.4000 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:

i) Samples where specified.

ii) List of Tests included.

iii) QA/ QC programme.

iv) List of proposed Working Drawings.

v) Summary of deviations from the Specification.

vi) Outline technical specifications reflecting proposed materials/ systems.

vii) A list of proposed suppliers and sub-contractors intended to be used.

Samples, Mock-ups, Prototypes and Quality Benchmarks

Q25.1302 Pre-contract Samples

Relevant trade literature and technical specifications shall be provided in accordance with Section A91.4000.

Q25.1303 Post Contract Award Samples

In accordance with Section A91.4000, post contract award samples of the following shall be provided:

a) 3 No. samples of each type of paving slab type full size.

b) Jointing sand sample.

Q25.1304 Mock-ups

Not required.

Q25.1305 Prototypes

Not required.

Q25.1306 Quality Benchmark Requirements

The following quality benchmarks shall be provided, in locations to be agreed with the Architect, in accordance with Section A91.4000:

a) Following agreement of samples, an area of 15m² of each type of paving.

Testing

Q25.1307 Testing of Paving

a) All sampling and testing of the natural stone slabs shall be carried out in accordance with BS EN 1341.

b) All sampling and testing of the concrete slabs shall be carried out in accordance with BS EN 1339.

c) All sampling and testing of the natural stone setts shall be carried out in accordance with BS EN 1342.

d) Additional testing and sampling shall be performed if the works do not comply with the Specification.

e) Acceptance shall only be given to complying paving. Inform the Architect of test results

for paving not originally complying. The official certification of test results shall be given after acceptance and before manufacture of the paving.

f) As soon as the sources of the units have been accepted, instruct the testing authority to carry out the following tests:

i) Compressive strength.

ii) Absorption percentage.

iii) Soluble salt content.

iv) Drying shrinkage or moisture expansion.

v) Mechanical test on completion, 5% of slabs shall be tested to prove adequate bedding adhesion.

Q25.1308 Mortar Testing

a) All tests on wet or hardened mortar samples shall be carried out in accordance with BS 5628: Part 1, BS EN 1052: Part 1, BS 4551 and BS EN 1015, or to equal standards acceptable to the Architect.

b) Samples shall be taken at the point of mixing or use. The frequency of sampling shall not be less than that specified in BS 5628: Part 1.

c) Additional tests and sampling shall be performed if the mortar does not comply with the Specification.

d) Subject to the test results, the specified nominal mix proportions shall be adjusted and tested.

e) Unless acceptance is obtained to the contrary, the consistency of fresh mixed mortar shall comply with the standard recommended in BS EN 1015: Part 4.

f) Any paving containing mortar that does not comply with the requirements of the Specification shall be demolished and removed.

Q25.1309 Testing Apparatus

On Site the following apparatus shall be maintained in good repair:

a) Maximum and minimum thermometers as and where required.

b) Soil thermometers as required for measuring the mortar and ground temperatures.

c) Apparatus for carrying out the test described in BS EN 932: Parts 1 and 6.

d) Syphon can, Gammon Morgan or Speedy apparatus for measuring the moisture content of aggregate.

e) Apparatus for carrying out the test described in BS EN 1015: Part 4.

f) Apparatus for making mortar cubes or prisms in accordance with BS 4551.

g) Apparatus for measuring the air content of the mortar in accordance with BS EN 1015: Part 7.

Q25.1310 Slip Resistance Testing

a) Testing for slip resistance shall comply with the following documents:

i) 'Assessing the slip resistance of flooring' by The Health and Safety Executive (latest published version).

ii) 'The assessment of floor slip resistance, the UK Slip Resistance Group guidelines' by The UK Slip Resistance Group (latest published version).

b) Testing shall be performed at an independent UKAS accredited laboratory accredited to perform the specified test methods.

c) Pendulum Test: External paving shall be evaluated in both dry and wet conditions using the TRL Pendulum Tester in accordance with BS 7976 (BS EN 1341 for external natural stone slabs and BS EN 1342 for external natural stone setts) and the recommendations of the UK Slip Resistance Group to obtain the pendulum test value (PTV) specified.

d) Roughness Test: External paving shall be evaluated using a surface roughness meter, in accordance with the recommendations of the UK Slip Resistance Group, to obtain the surface

roughness (Rz) value specified.

e) Samples shall be tested at the following stages of the project:

i) Approval.

ii) Production.

iii) Post-installation (in situ).

f) Submit test results to the Architect for acceptance in due time, prior to each of the project stages or as agreed with the Architect.

g) Test samples must include any surface sealer or treatment to be applied to the finished external paving.

Q25.1400 PERFORMANCE REQUIREMENTS

Comply with the general performance of Section A91.5000 and the following specific performance requirements.

Structural

Q25.1401 General

Refer to Section A91, clause series 5300.

Q25.1402 Specific Movements

a) The works shall be detailed, manufactured and installed to accommodate all movements of the substrates without damage or any reduction in the performance.

b) Provide all necessary movement joints to accommodate the movements to which the paving is expected to be subjected, whether indicated on the Design Drawings or not.

c) Show all movement joints on the Working Drawings, which shall be subject to acceptance by the Architect.

d) The Contractor shall be responsible for ensuring that movement joint thicknesses are adequate.

e) A method statement for the installation of all the works shall be provided, taking into account movements of the structural slab including:

i) Dimensional setting out and joints alignment.

ii) Floor services.

iii) Construction tolerances.

iv) Movement joints, bay joints and relief joints.

v) Full adhesion.

vi) Full bed without hollows.

vii) Cracking to grouted joints, which will not be acceptable.

viii) Resilient and insulation layer.

f) Refer to and take account of the Structural Movements and Tolerances Report.

g) A full understanding of the behaviour of the building structure, its movements and its effects upon the works is required.

h) The works shall not deflect under loading in any way that is detrimental to any element of the works or adjacent structural or building elements.

Q25.1403 Specific Dead Loads

a) The works' own dead load shall be accommodated locally and without causing deflections or movements that affect abutting elements.

b) The dead loads derived from permanent fixtures or services attached to the surfaces of the works shall be accommodated without any reduction in performance.

Q25.1404 Specific Live Loads

The works shall be capable of accommodating the following live loads without any

reduction in performance:

a) Movements of the concrete slabs and loads imposed upon them.

b) All loads resulting from movements of the structure as a whole.

c) Loads from a 2½ tonne cherry picker type access machine.

d) Working loads up to 11.5-ton axle load shared between two wheels with assumed 300mm x300mm area of tyres producing an ultimate load of 1.8N/ mm².

Environmental

Q25.1405 Thermal Movement

It shall be ensured that the works are capable of withstanding differential surface temperatures without any reduction in the specified performance. Any movement joints, as necessary to cater for any thermal movement, shall be provided.

Q25.1406 Moisture Movement

The works shall withstand the following movement without permanent deformation or any reduction in the specified performance:

a) Due to changes in the moisture content of its components, resulting from variations in the moisture content of the air.

b) Due to drying shrinkage of building components, both short term and long term.

Slip Resistance

Q25.1407 Slip Resistance

a) When tested using the TRL Pendulum Tester, external paving, inclusive of surface treatment, shall achieve the following pendulum test value (PTV):

i) Dry: Not less than 40 PTV.

ii) Wet: Not less than 45 PTV.

b) When tested using the surface roughness meter, external paving shall achieve a surface roughness (Rz) value of not less than 20 µm Rz.

Strength and Physical Properties of Stone

Q25.1408 General

a) Stone supplied for use in accordance with the Specification shall comply with the following Standards:

i) Petrographic description: BS EN 12407.

ii) Density: BS EN 1936.

iii) Water absorption: BS EN 13755.

iv) Flexural strength under concentrated load: BS EN 12372 (3-point loading: Modulus of Rupture).

v) Flexural strength under constant moment: BS EN 13161 (4-point loading).

vi) Abrasion resistance: BS EN 1341.

vii) Slip resistance, to recognised procedure.

viii) Staining potential, to recognised procedure.

ix) Coefficient of thermal expansion, to recognised procedure.

x) Cyclic heating and cooling, to recognised procedure.

b) Provide information and values for review by the Architect for the following test criteria:

i) Petrographic description: No deleterious constituents.

ii) Density: 2560kg/ m³ minimum.

iii) Water absorption: 0.40% maximum.

iv) Flexural strength under concentrated load shall be 10.34 Mpa minimum (wet). Note:

Tests shall be performed at proposed project thickness.

v) Abrasion resistance: Provide values for assessment.

vi) Slip resistance: Provide values for assessment (dry and wet). Note: Tests shall be performed at proposed project thickness.

c) Surface finish:

i) To be confirmed.

ii) Staining potential: Non-susceptible.

Pattern

Q25.1409 Laying Pattern

Paving pattern shall be in accordance with the Architect's requirements and suitable for any vehicular use after consideration of BS 7533: Part 3.

Q25.2000 MATERIALS AND FABRICATION

Q25.2100 GENERAL

Paving Generally

Q25.2101 Generally

a) Paving slabs to match existing.

b) Comply with the Landscaping Consultant's requirements.

c) Provide blister paving slabs as required.

d) Provide natural stone grooved paving to external entrance areas.

e) Substrate: In situ concrete with applied waterproofing overlaid with loose laid insulation.

Q25.2200 MATERIALS

General

Q25.2201 Slabs

a) Natural stone slabs shall be to BS EN 1341.

b) Precast concrete slabs shall be hydraulically pressed to BS EN 1339.

c) Tactile paving shall be to BS 7997.

Q25.2202 Stone Quality

a) Arrangements shall be made for the Architect, and others as necessary, to inspect samples of stone in the respective quarries which represent the range of variations in appearance. The acceptance of the Architect shall be obtained before confirming orders with suppliers or proceeding with production.

b) Stone shall be free from vents, cracks, fissures, discolouration, or other defects, which may adversely affect strength, durability or appearance. It shall be dressed and worked before delivery to Site in accordance with the Design Drawings.

Q25.2203 Damage

Materials that are chipped, scratched, damaged or have any other physical imperfections shall not be used in the works.

Bedding and Reinforcement

Q25.2204 Sand Bedding

a) Sand bedding shall be naturally occurring clean sharp sand or crushed rock.

b) It shall be graded for laying coarse sand in accordance with BS 7533.

c) The clay, silt, fine dust shall not be more than 3% by mass.

d) It shall be free from chlorides or other deleterious salts, contaminants and cement.

e) The moisture content shall be between 3-7%.

f) It shall be obtained from a single source.

Q25.2205 Mortar Bedding

a) Mortar mix proportions shall be cement/ sand nominal mix proportions to BS 5628: Part 3.

b) Sand for mortar:

i) All sand shall comply with BS 1200, unless specified otherwise, and shall be from one source and be well graded in accordance with Table 1 therein.

ii) Where a range is specified (e.g. 1:1:5-6) the lower proportion for grade 'g' sands and higher proportion for grade 's' sands shall be used.

iii) Marine sand shall not be used with sulphate resisting or super sulphated cement.

c) Tests on mortar shall be conducted as specified for special construction control, in accordance with BS 5628: Part 1.

d) Portland Cements shall conform to BS EN 197: Part 1. Unless otherwise stated, the cement shall be of Ordinary Portland Cement and delivered in the original sealed bags of the manufacturer or in accepted bulk containers.

e) All cement used in the works shall be obtained from a supplier chosen as being capable of supplying cement complying with the requirements of the Specification.

f) Any mortar plasticiser used shall be agreed with the Architect prior to commencement of any work, and shall be used in the proportions recommended in writing by the manufacturer. Mortar mixes shall be utilised in accordance with the manufacturer's written recommendations. The suitability of the mixture for use in any particular mortar shall be demonstrated.

g) Admixtures shall not be used in mortar unless specified. Calcium chloride, or any admixtures containing calcium chloride, shall not be used. Admixtures, if specified, shall be to BS EN 934: Part 3.

h) Mixing plant, tools and banker boards shall be kept clean at all times.

i) Materials shall be measured accurately by volume using clean gauge boxes. Proportions of mixes are for dry sand; allow for bulking if sand is damp.

j) Ingredients shall be mixed thoroughly to a consistency suitable for the work and free from lumps. Mortars containing air-entraining admixtures shall be mixed by machine, but not overmixed.

k) Mortar shall be used within about two hours of mixing. Retarded mortar shall be used within the time recommended in writing by the manufacturer. Mortar may be retempered to restore workability, but only within these time limits.

l) The required amount of water shall be determined to achieve a workable mix.

m) If pre-mixed mortars are used, the characteristics, product data, and testing criteria shall be submitted to the Architect for review.

n) The mortar shall have a suitable strength to withstand the live load of vehicles.

Q25.2206 Reinforcement

Reinforcement in mortar bedding shall be in accordance with BS 4483 and of the following types:

a) D49.D98 to unbonded bedding only.

b) Determine the final selection/ type of reinforcement subject to acceptance by the Architect.

Accessories/ Joints

Q25.2207 Jointing Material

a) Jointing material shall comply with BS 7533: Part 4.

b) Jointing sand: Clean dried sand, graded as for jointing sand to BS 7533: Part 4 and free from deleterious salts, contaminants and cement.

Q25.2208 Geotextile Membrane

Geotextile membrane to meet the requirements of the Specification.

Q25.2209 Movement Joint Metal Edgings

Movement joint metal edgings shall be provided as follows:

a) Material shall be brushed stainless steel.

b) Fixing shall be bedded in cement and sand/ screwed to plugs at 600mm centres, to exact finished level of floor/ pavings.

Q25.2210 Sealant Movement Joints

a) Sealant movement joints shall be provided where necessary.

b) Preparation and application shall be in accordance with the Specification, Section Z22. Joints shall extend through paving and bedding to substrate.

c) Joints shall coincide with any movement joints left in the substrate.

Q25.2211 Preformed Strip/ Section Movement Joints

Where indicated on the Design Drawings, preformed strip/ section movement joints shall be provided and fixed in accordance with the manufacturer's written recommendations.

Q25.2300 FABRICATION

Q25.2301 Material Tolerances Generally

Width and lengths of varying sizes shall not deviate by more than ±2mm of the described size.

Q25.2302 Manufacturing Tolerances

a) Paving sizes stated in the Specification are nominal and the actual sizes required to meet the joint sizes, etc. shall be determined by the Contractor.

b) Slabs shall be butted/ manufactured with the tolerance of ±0.5mm.

Q25.3000 SITE INSTALLATION

Q25.3100 WORKMANSHIP

Q25.3101 Setting Out

a) Works shall be set out in relation to defined grids and datums established by the Contractor and accepted by the Architect.

b) Setting out shall recognise the interface of the works with other areas of works and shall, where not otherwise indicated by the Architect, be set out by the Contractor to minimise cutting and avoid narrow cuts.

c) Setting out grids shall be established parallel to walls unless otherwise indicated by the Architect.

d) Paving co-ordination with manhole covers, etc shall be agreed with the Architect prior to the commencement of the construction of the manholes where possible and prior to the laying of the slabs.

Q25.3102 Bedding Method

a) Light filling mixed with mortar, added on top of structural slab shall be used to create an even slope.

b) The light filling shall be added in various thicknesses from 0-90mm.

c) The bitumen sheet membrane shall be torched onto the sloping filling according to the manufacturer's specifications. The membrane shall be protected by a rigid plastic protection sheet. If a flexible bitumen sheet membrane is not used, a sliding layer shall be added consisting of two layers of thin plastic (polythene).

d) Semi-dry mortar shall be added and levelled with a trowel. The mortar shall be well compacted to prevent voids beneath the stone slab. The slab shall be cleaned before fixing, no dust or

stone laitance shall be allowed. The level of the mortar has to be adjusted by carrying out a test mounting of the slab.

e) The adjustment of the level of the mortar is very important in achieving a good result.

f) The adhesive shall be as the manufacturer's recommendations, in accordance with the requirements of the Specification.

Q25.3103 Joints and Grouting

a) The joints shall be totally cleaned of concrete, dust or similar before the grouting can start.

b) The grout shall consist of a mixture of cement and sand (1 part cement and 3 parts sand of particle size 0 to 2mm) that shall be mixed with water to a suitable consistency. This mixture shall be 'poured' into the joints, using a watering can or similar. This work shall be done as quickly and as precisely as possible after the slabs are laid, at the latest one day after laying.

c) The grout shall be in full contact with the stone slabs on both sides (minimum depth 30mm). When the grouted joint has started to dry, excess grout on the surface of the stone slab shall be cleaned away using a clean and wet sponge.

d) When the grouting is finished, the paving shall be covered by plastic and kept humid for 5-7 days to achieve a good setting.

Q25.3104 Laying of Paving

a) Paving units shall be cut neatly and accurately with a masonry saw to give neat junctions with edgings and adjoining finishes, including following the profile of adjacent work where radiused and curved.

b) Paving units shall be suitably bedded so that rocking does not occur or develop.

c) Lines and levels of finished surface shall be smooth and even, with regular falls to prevent ponding.

d) Finished paving shall have an even overall appearance with even joint widths and be free of mortar and sand stains.

e) Where paving is laid in a stack bond pattern, the corners of the paving slabs must meet accurately, unless otherwise agreed with the Architect.

Q25.3105 Cutting Slabs

a) Cut with a masonry saw or disc cutter only.

b) When cutting a notch from the corner of a slab, which exceeds 25% of the slab area, mitre cut the remaining shape from the internal corner of the notch of the opposite external corner.

c) Diagonally cut slabs or portions of slabs to form a mitre at abrupt changes of level at the ends of ramped footpath crossings and the like.

Q25.3106 Inclement Weather

a) Paving shall not be laid if the temperature is below 3°C on a falling thermometer or below 1°C on a rising thermometer.

b) Frozen materials or bedding shall not be used on frozen or frost covered bases.

c) Paving shall be adequately protected with mortar joints and/ or mortar bedding from frost damage. It shall also be protected from rapid drying out or saturation until mortar has hardened.

Q25.3107 Acceptance of Base

Before starting work, the points stated below shall be followed:

a) The base shall be sound, clean and suitably close textured.

b) The levels and falls of the base shall be as detailed, within the specified tolerance of

c) ±12mm.

d) Drainage outlets shall be within +0 to -10mm of the required finished level.

Q25.3108 Levels of Paving

The permissible deviation from the specified levels shall be ±6mm generally. Paving shall be set 6mm above drainage outlets and 2mm above kerbs.

Q25.3109 Regularity

a) Sudden irregularities shall not occur.

b) Where appropriate in relation to the geometry of the surface, the variation in gap under a 3m straightedge (with feet placed anywhere on the surface) shall be not more than 6mm.

c) The difference in level between adjacent paving units shall be not more than 2mm.

Q25.3110 Slab Paving - Mortar Pointed Joints

a) Mortar mix for pointing joints to suit paving of colour to the acceptance of the Architect.

b) Immediately after completing joints, paving shall be covered with polythene sheeting for not less than 5 days.

Q25.3111 Sand Bedding

a) Lay and compact sand to give the specified final thickness using one of the following methods:

i) Either: Lay and compact using a vibrating plate as BS 7533: Part 4and loosen the top 10mm using a rake.

ii) Or, lay and compact as above, then screed out a further 10mm of loose sand.

b) Do not deliver bedding sand to the working area over uncompacted paving. Ensure that there is no disturbance to the bedding course by pedestrian or wheeled traffic. Fill voids left by screed rails.

c) Do not leave areas of bedding exposed; proceed with laying paving immediately.

d) Supply slabs/ flags to laying face over newly laid paving but stack at least 1m back from laying face. Do not allow plant to traverse areas of uncompacted paving.

Q25.3112 Narrow Sand Filled Joints for Sand Bedded Paving

a) Place slabs/ flags squarely with minimum disturbance to bedding, laying away from previously laid slabs/ flags.

b) Lay slabs/ flags with a joint width of 2-5mm. Do not use mechanical force to obtain tight joints.

c) On the same day as laying and before the onset of wet weather, brush clean dry sand over the joints, then bed down the slabs/ flags using a plate vibrator to BS 7533: Part 4. Refill the joints with sand. Repeat the process until the joints are completely filled.

d) Where early trafficking leads to settlement of the jointing sand, refill the joints as specified.

e) Do not use vacuum machines on the completed paving.

Q25.3113 Protection from Traffic

a) Paving bedded on mortar shall be kept free from pedestrian traffic as recommended by the manufacturer.

b) Access to paved areas shall be restricted as necessary to prevent damage from Site traffic and plant.

c) Site traffic and plant access to areas with geotextile shall be avoided until the upper granular sub-base has been fully laid with the prior acceptance of the Architect.

End of Section

UCLH PHASE 4 AND PROTON BEAM THERAPY BUILDING PROJECT

Architectural Specification

Section: J31 - Liquid Applied Above Ground Waterproof Roof Coverings

Revision: A – 100% Stage E Issue

Revision	Date	Clauses revised	Notes
Contract Issue	28/07/2014	-	-
Rev. A – STAGE E – DRAFT ISSUE	14/11/2016	- J31.1201 - J31.1203 J31.1204, J31.1205, J31.1206, J31.1207	- Title updated to reflect this section does not include the ground floor waterproofing. - Green roof system description extended to include intensive sedum roof. - Reference to timber decking removed (no longer in project scope). References to yorkstone updated and replaced with granite setts. - Added
General notes: Omissions to specifcation shown in blue and struck through. ~~Example.~~ Additions to specification shown in red. Example. Updates from Contract Specification to be agreed by ByUK and UCLH where relevant.			

Scott Tallon Walker Architects

J31 LIQUID APPLIED WATERPROOF ROOF COVERINGS

To be read in conjunction with Section A91 and other related sections of the Specification, Preliminaries and Contract Conditions.

J31.1000 SCOPE, SUBMITTALS, TESTING AND PERFORMANCE

J31.1100 SPECIFICATION AND SCOPE

J31.1101 General

a) Works covered in this section are specified by performance and therefore designated as works with specialist sub-contractor Design (SCD). Refer to Section A91.

b) Complete the Detailed Design, manufacture, supply, install and warrant the works whilst complying with the visual intent indicated on the Design Drawings and criteria stated in the Specification.

c) For design and general performance requirements, refer to Section A91 of the Specification. Specific design and performance requirements are as defined in the particular trade sections.

d) Where no material, product or supplier is indicated in the Specification, propose suitable materials and systems prior to Contract award which comply with the visual intent and performance criteria stated and remain fully responsible for the Detailed Design of the works.

e) Where a particular material, product or supplier is indicated in the Specification, such material, product or supplier shall be deemed indicative representing the Architect's design intent only. The Contractor may complete the installation using that product, or such other confirmed as acceptable by the Architect in writing, but shall remain fully responsible for the Detailed Design and performance of the works.

J31.1102 Scope of Works

This section of the Specification, when read in conjunction with the Design Drawings, provides particular requirements with respect to liquid applied roof covering systems.

J31.1103 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.

J31.1200 SYSTEM TYPES

Inverted Roofs

J31.1201 Type RFS-001 Extensive/ Intensive Sedum Roof System

a) Extensive roof system, monolithic fully bonded vapour barrier system to concrete slab comprising a hot-applied, rubberised bituminous membrane with reinforcement layer, root barrier, insulation, filter fleece and sedum vegetation blanket layer over.

b) Indicative product: Bakor 790-11 monolithic membrane manufactured by Bauder Limited.

c) Base: Concrete slab prepared as recommended by roof membrane manufacturer.

d) Prime all areas receiving the new waterproofing with polymer primer and allow to dry, all in accordance with the manufacturer's written instructions.

e) Membrane: Two 3mm layers sandwiching a reinforcing layer fully bonded to concrete deck in accordance with the manufacturer's recommendations.

f) Provide 2mm thick polyester based elastomeric bitumen access/ protection sheet fully bonded to membrane.

g) Provide 5mm polyester based elastomeric bitumen, mineral surfaced root barrier sheet fully bonded to membrane.

h) Provide high performance, rigid, loadbearing, non absorbent insulation boards on top of protection layer.

i) Vapour permeable geotextile membrane/ filter fleece rolled out loose over the

insulation.

j) Vegetation Blanket: Provide rolls of Bauder XF300 'Sedum' vegetation blanket laid directly over the water retention fleece.

k) Slow release fertiliser: Proprietary organic slow release fertiliser applied at a rate of 80g/ m² onto the newly installed sedum blanket. Distribute the fertiliser evenly, through use of an approved applicator, directly onto the dampened moisture retention fleece.

l) Drainage trim: Supply and install drainage trim to all perimeters that are designed to shed water.

m) Waterproofing to green roof build up subject to landscape designers proposal and specialist recommendations.

J31.1202 Types RFS-002 Liquid Applied Roofing System –Stone Paving over

a) Heavy duty high performance liquid applied roofing system on prepared concrete slab comprising a hot-applied, rubberised bituminous membrane with reinforcement layer, insulation over and with exposed paving slab on supporting pads.

b) Indicative product: Bakor 790-11 monolithic membrane manufactured by Bauder Limited.

c) Base: Concrete slab prepared as recommended by roof membrane manufacturer.

d) Prime all areas receiving the new waterproofing with polymer primer, Bauder polymer primer 930-18, and allow to dry, all in accordance with the manufacturer's written instructions.

e) Membrane: Two 3mm layers sandwiching a reinforcing layer fully bonded to concrete deck in accordance with the manufacturer's recommendations.

f) Provide 2mm thick polyester based elastomeric bitumen access/ protection sheet fully bonded to membrane.

g) Provide high performance, rigid, loadbearing, non-absorbent insulation boards on top of protection layer.

h) Vapour permeable geotextile membrane, Bauder U-max Geotextile membrane, rolled out loose over the insulation, lapped a minimum of 300mm in a direction that helps shed water. The membrane shall be dressed up all upstands and details to the height of the surfacing.

i) Stone paving slabs as clause J31/2106 supported on adjustable pedestals with open joints.

J31.1203 Types RFS-003 Liquid Applied Roofing System –Precast Concrete Paving~~/ Timber Decking~~ over

a) Heavy duty high performance liquid applied roofing system on prepared concrete slab comprising a hot-applied, rubberised bituminous membrane with reinforcement layer, insulation over and with exposed paving slab on supporting pads.

b) Indicative product: Bakor 790-11 monolithic membrane manufactured by Bauder Limited.

c) Base: Concrete slab prepared as recommended by roof membrane manufacturer.

d) Prime all areas receiving the new waterproofing with polymer primer, Bauder polymer primer 930-18, and allow to dry, all in accordance with the manufacturer's written instructions.

e) Membrane: Two 3mm layers sandwiching a reinforcing layer fully bonded to concrete deck in accordance with the manufacturer's recommendations.

f) Provide 2mm thick polyester based elastomeric bitumen access/ protection sheet fully bonded to membrane.

g) Provide high performance, rigid, loadbearing, non absorbent insulation boards on top of protection layer.

h) Vapour permeable geotextile membrane, Bauder U-max Geotextile membrane, rolled out loose over the insulation, lapped a minimum of 300mm in a direction that helps shed water. The membrane shall be dressed up all upstands and details to the height of the surfacing.

i) Precast concrete paving slabs as clause J31/2107 supported on adjustable pedestals with open joints.

j) Timber decking as Section Q55.

J31.1204 Spray Applied waterproofing membrane to the ground floor slab

Premium performance two-part, spray-applied seamless waterproofing membrane which rapidly cures to form a high strength, Elastomeric, and fully-bonded waterproof protection. Extremely durable with excellent wear and chemical resistance.

Insulation over and exposed paving Yorkstone or granite slabs.

a) Suitable for use with concrete surfaces.

b) Tensile strength (ISO 527): 15 MPa.

c) Elongation (ISO 527): 400%.

d) Tear resistance (ISO34-1 Method B): > 64 N/mm.

e) Water vapour permeability (ISO 15106-3): 9.9 g/m².day.

f) Methane permeability (ISO 15105-1): 30.6 mL/m².day.

g) Recovery at 400% elongation: 90%.

h) Shore hardness (ASTM 2240): 91A, 41D.

i) Abrasion resistance (Taber wear index: ASTM D4060): 255 mg.

j) Product reference Silcor 900MP Primer Silcor Primer EPF - Two-part epoxy primer. Silcor P20 PU Primer - Polyurethane primer.

k) Accessories [Dry Quartz Silica Sand] - For use with primers. [Hydroduct] - Geocomposite drainage/ irrigation membrane.

l) [Hydroduct Root Barrier] [Not required]

m) Base: Concrete slab prepared as recommended by roof membrane manufacturer.

n) Prime all areas receiving the new waterproofing all in accordance with the manufacturer's written instructions.

o) Membrane: Two layers sandwiching a reinforcing layer fully bonded to concrete deck in accordance with the manufacturer's recommendations.

p) Provide 2mm thick polyester based elastomeric bitumen access/ protection sheet fully bonded to membrane in accordance with the manufacturer's recommendations.

q) Provide high performance, rigid, load bearing, non-absorbent insulation boards on top of protection layer in accordance with the manufacturer's recommendations.

J31.1205 Waterproofing membranes

Two layers of (Bituminous) waterproofing membranes compatible with thermal insulation system and void former system.

Thermal Insulation

Manufactured from specially graded recycled glass (≥ 60%) and natural raw materials which are available in abundant supply (sand, dolomite, lime…). The insulation is totally inorganic, contains no ozone depleting propellants, flame resistant additives or binders. Without VOC or other volatile substances.

a) Reaction to fire (EN 13501-1) - Material complying with Euroclass A1, non-combustible, no toxic fumes

b) Service temperature limits - from -265°C to +430°C

c) Water vapour resistance (EN ISO 10456) - μ = ∞

d) Hygroscopicity - zero

e) Capillarity - zero

f) Melting point (cf DIN 4102-17) - >1000 °C

g) Thermal expansion coefficient (EN 13471) - 9 x 10-6 K-1

h) Specific heat (EN ISO 10456) - 1000 J/(kg·K)

Product characteristics according to EN 13167 1)

a) Density (± 10%) (EN 1602) - 165 kg/m3

b) Thickness (EN 823) ± 2 mm - from 40 up to 160 mm

c) Length (EN 822) ± 5 mm - 600 mm

d) Width (EN 822) ± 2 mm - 450 mm

e) Thermal conductivity (EN ISO 10456) - λD ≤ 0.050 W/(m·K)

f) Reaction to fire (EN 13501-1) - Euroclass A1

g) Point load (EN 12430) - PL ≤ 1.0 mm

h) Compressive strength (EN 826 annexe A) - CS ≥ 1600 kPa

i) Bending strength (EN 12089) - BS ≥ 550 kPa

j) Tensile strength (EN 1607) - TR ≥ 150 kPa

CE-marking ensures conformity with the mandatory essential requirements of CPD as mentioned in EN 13167; within the CEN Keymark certification all mentioned characteristics are certified by an empowered, notified and accredited 3rd party.

a) Additional product data

b) Thermal diffusivity at 0°C - 3.5 x 10-7 m2 /sec

c) Flexural modulus of elasticity E - 1500 MN/m2

d) BRE Green Guide Rating - B

e) Natureplus certificate - 0406-1101-101-1

f) NBS plus

g) RIBA - CPD Assessed Material

Applications - Flat and Tapered roofs and - Internal floors, which require insulation with the highest compressive strength.

J31.1206 Waterproofing membranes with protective layer of mastic asphalt

Two layers of (Bituminous) waterproofing membranes compatible with insulation system. Requires protective layer of mastic asphalt and separating layer below 40mm reinforced sand cement substrate.

Two layers of (Bituminous) waterproofing membranes compatible with thermal insulation system and void former system.

Thermal Insulation

Manufactured from specially graded recycled glass (≥ 60%) and natural raw materials which are available in abundant supply (sand, dolomite, lime…). The insulation is totally inorganic, contains no ozone depleting propellants, flame resistant additives or binders. Without VOC or other volatile substances.

a) Reaction to fire (EN 13501-1) - Material complying with Euroclass A1, non-combustible, no toxic fumes

b) Service temperature limits - from -265°C to +430°C

c) Water vapour resistance (EN ISO 10456) - μ = ∞

d) Hygroscopicity - zero

e) Capillarity - zero

f) Melting point (cf DIN 4102-17) - >1000 °C

g) Thermal expansion coefficient (EN 13471) - 9 x 10-6 K-1

h) Specific heat (EN ISO 10456) - 1000 J/(kg·K)

Product characteristics according to EN 13167 1)

i) Density (± 10%) (EN 1602) - 165 kg/m3

j) Thickness (EN 823) ± 2 mm - from 40 up to 160 mm

k) Length (EN 822) ± 5 mm - 600 mm

l) Width (EN 822) ± 2 mm - 450 mm

m) Thermal conductivity (EN ISO 10456) - λD ≤ 0.050 W/(m·K)

n) Reaction to fire (EN 13501-1) - Euroclass A1

o) Point load (EN 12430) - PL ≤ 1.0 mm

p) Compressive strength (EN 826 annexe A) - CS ≥ 1600 kPa

q) Bending strength (EN 12089) - BS ≥ 550 kPa

r) Tensile strength (EN 1607) - TR ≥ 150 kPa

CE-marking ensures conformity with the mandatory essential requirements of CPD as mentioned in EN 13167; within the CEN Keymark certification all mentioned characteristics are certified by an empowered, notified and accredited 3rd party.

s) Additional product data

t) Thermal diffusivity at 0°C - 3.5 x 10-7 m2 /sec

u) Flexural modulus of elasticity E - 1500 MN/m2

v) BRE Green Guide Rating - B

w) Natureplus certificate - 0406-1101-101-1

x) NBS plus

y) RIBA - CPD Assessed Material

Applications - Flat and Tapered roofs and - Internal floors, which require insulation with the highest compressive strength.

J31.1207 Hydrophilic water-stop with neoprene strip cavity filler and flexible sealing system for waterproofing and movement joints.

System consists of two products SIKADUR-31 Adhesive (normal, Long Potlife or Rapid), and Combiflex (SikaNorm-Hypalon)
Sikadur-31 Adhesive is epoxy resin based and establishes a strong bond to the substrate and Combiflex (SikaNorm-Hypalon) is a highly elastic, root proof and chemically and UV resistant sheet membrane with a thickness of 1mm or 2mm.

a) Density at 20 degree celcius Sikadur-31 Adhesive 1.6kg/litre approx

b) In heavy traffic areas (eg parking decs) steel cover plates should be used over combiflex joints.

c) Adhesive strength (DIN 53232) on dry concrete 4.0 MPa approx; on moist concrete 4.0MPa approx. rupture of concrete; on sandblasted concrete 6.0MPa rupture of hypalon

d) Water pressure resistance depending on joint design up to 170kPa

e) Temperature of embrittlement -40 celcis degree

f) Pulsation resistance (SIKA test) (approx. 5% expansion approx 4 cycles per sec.) > 100,000 cycles

g) Vibration resistance (SIKA test) (approx. 5% expansion approx 4 cycles per sec.) > 50,000 cycles

J31.1300 SUBMITTALS AND TESTING

Tender Submittals

J31.1301 Tender Response

a) Provide tender submittals in accordance with the requirements of Section A91.4000 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:

i) Samples where specified.

ii) List of Tests included.

iii) QA/ QC programme.

iv) List of proposed Working Drawings.

v) Summary of deviations from the Specification.

vi) Outline technical specifications reflecting proposed materials/ systems.

vii) A list of proposed suppliers and sub-contractors intended to be used.

Samples, Mock-ups, Prototypes and Quality Benchmarks

J31.1302 Pre-contract Samples

Sufficient samples of the following, including relevant trade literature and technical specifications, shall be provided in accordance with Section A91.4000:

a) Waterproof membrane and methods of attachment (including any cushion layers).

b) Insulation types.

c) Filter layer on inverted roof covering.

d) Proposed flashings.

e) Protection and separation layers/ vapour barriers.

f) Timber decking (refer to Section Q55).

g) Stone paving slabs and supports.

h) Precast concrete paving slabs and supports.

i) Stone ballast.

j) Any additional acoustic treatment.

J31.1303 Post Contract Award Samples

In accordance with Section A91.4000, post contract award samples of the following shall be provided:

a) Waterproof membrane and methods of attachment (including any cushion layers).

b) Insulation types.

c) Filter layer on inverted roof covering.

d) Proposed flashings.

e) e) Protection and separation layers/ vapour barriers.

f) Typical syphonic drainage outlet with membrane surround.

g) Timber decking (refer to Section Q55).

h) Stone paving slabs and supports.

i) Precast concrete paving slabs and supports.

j) Stone ballast.

k) Any additional acoustic treatment.

J31.1304 Mock-ups

Not required.

J31.1305 Prototypes

Not required.

J31.1306 Quality Benchmark Requirements

The following quality benchmarks shall be provided, in locations to be agreed with the Architect, in accordance with Section A91.4000:

a) The first structural bay of each type of roofing system.

Testing

J31.1307 Waterproofing and Watertightness

a) Test the watertightness of the roof using one or a combination of the following, as appropriate, to the acceptance of the Architect:

i) A proprietary electronic testing system.

ii) A ponding test by flooding the entire roof area with water to a minimum depth of 50mm for a period of 48 hours to check the integrity of the installation.

iii) A simulated rain test.

b) Details of the system and a proposed method statement shall be submitted for acceptance at least one month prior to the proposed testing on Site.

c) Prior to testing, ensure that the works have been completed to a stage where the integrity of the membrane can be tested, that obvious defects have been made good and that the roof has been cleared of all materials, debris, dust, etc.

d) Testing shall be carried out when all works to the roof areas are complete, including that of all associated and interfacing trades.

e) Each test shall have the following also recorded:

i) The condition of the roof prior to testing.

ii) The make up of the waterproof membrane.

iii) Those elements above the waterproof membrane that were installed.

J31.1308 Electronic Roof Integrity Test

a) Testing to be carried out by an independent testing authority to be accepted by the Architect.

b) The results of each test shall be recorded and passed on to the Architect at the end of each test.

c) A schedule of the programme for roof testing to be carried out shall be submitted to the Architect for acceptance, giving forewarning of when tests are to be carried out.

d) Prior to testing ensure that roofing work has been completed to a stage where the integrity of the membrane can be tested, that obvious defects have been made good and that the roof has been cleared of all materials, debris, dust, etc. Testing shall be carried out before insulation (inverted roof types only) and ballast is laid.

e) If any leaks/ defects are discovered, mark the location on the roof, prepare a report and submit it to the Architect, together with proposals for remedial measures.

f) After the making good of any defects, retest locally to verify the integrity of the repair.

g) On completion certify the waterproof integrity of the roof and flood test.

J31.1309 Flood Test to Flat Roofs

a) Prior to testing, thoroughly check that all necessary roofing work is complete and obvious defects have been remedied.

b) Externally cover and seal all outlets and protect against damage from water

pressure with temporary kerbs. Do not use plugs to seal outlets.

c) Carefully flood to a minimum depth of 50mm, but in no case higher than existing kerb levels, and leave for a period of 2 days. Regularly inspect for leaks.

d) On completion of testing, slowly drain roofs ensuring that outlets do not overload or flood.

e) Where leaks have occurred, submit to the Architect detailed proposals for remedial measures. After acceptance and completion of proposed works the flood test is to be reinstated. Only when a flood tested roof area has shown no leakage for a period of seven days will further work on that part of the roof be permitted.

f) Any area that cannot be flood tested shall be pressure hose tested.

g) Invite the Architect to witness the tests.

h) Tests are to be carried out prior to the laying of ballast, and work shall be phased accordingly.

J31.1310 Simulated Rain Test

a) Rain Test: Subject the designated area of roof to a 15 minute rain test using a spray rack containing sufficient hose nozzles to deliver the acceptable equivalent of 75mm of rain per hour. Check for leaks using endoscopy or other non-destructive methods, or by opening up the construction as directed. Perform repairs or replacements as necessary. Perform additional tests and inspections as directed.

b) Tests are to be carried out prior to the laying of ballast, and work shall be phased accordingly.

J31.1311 Performance under Testing

a) There shall be no leakage through the works at any time during the test.

b) If leaks occur, the water shall be drained completely and the membrane installation repaired and re-tested. Any part of the works that is adversely affected shall be replaced or repaired.

c) At completion of the test there shall be no standing water in locations intended to remain dry. Certify the waterproof integrity of the roof.

d) All tests are to be witnessed by the Architect.

J31.1400 PERFORMANCE REQUIREMENTS

Comply with the general performance of Section A91.5000 and the following specific performance requirements.

Structural

J31.1401 Structure, Movements and Dead Loads

a) The roof coverings shall be capable of accommodating the following movements without any permanent deformation or reduction in the specified performance:

i) Due to deflection under design loads.

ii) Due to the effects of repeated wind loading.

iii) Due to changes in dimension and shape of components arising from building movements, including settlement, creep, twisting and racking.

b) Reference shall be made to the Structural Engineer's specifications and drawings for the anticipated movement of the Building Structure and relevant elements. The precise characteristics of the adjacent structure and any provision for structural support in the works shall be ascertained.

c) The detailed design shall take account of all structural criteria and ensure that the works take account of all movement and tolerances in both permanent and temporary conditions, in order to avoid stress or deformation under these conditions.

d) Ensure that the structure, into which the works are being installed, including tolerances and deflections, is suitable. This shall be verified at all stages of the works.

J31.1402 Attachment/ Wind Loads

a) Design/ select the method(s) of attachment of the roofing system to withstand, without permanent deformation, the positive and negative effects of wind loads on the roofing in accordance with Section A91.

b) Ensure that the method(s) of attachment make sufficient provision for relative movement of materials and effects of vapour pressure, do not perforate covering, and do not reduce performance of vapour control layer below that required.

c) Membrane linings for gutters shall be designed to resist wind uplift. Fixing details to be agreed with the Architect.

d) Floatation of the insulation shall be prevented.

J31.1403 Live/ Imposed Loads

The roof coverings (paving slabs, insulation and all aspects of the waterproofing system) to the areas of roofing shall be capable of accommodating the following live loads without any reduction in performance for the design life specified. Select materials to suit the following loading conditions:

a) Wind loads as Section A91.

b) Vertically applied loads acting on the surface of the roof finishes arising from maintenance and cleaning operations to BS EN 1991.

c) Temporary loading of 7.5 kN/ m² during replacement of mechanical plant.

Environmental

J31.1404 Moisture Movement

The roof coverings shall withstand the following movement without permanent deformation or any reduction in the specified performance:

a) Due to changes in the moisture content of their components.

b) Due to the expansion of absorbed or retained moisture caused by freezing.

J31.1405 Inverted Roof Insulation/ Thermal Performance

The type and thickness of the insulation and any integral or separate overlays/ separating layers are to be determined by the Contractor to satisfy the following criteria:

a) The maximum thermal transmittance of the roof shall comply with the Building Energy/ Thermal Performance Report and Façade Performance Schedule for values.

b) The compressive strength of the insulation shall be capable of supporting the overlaying materials, pedestrian maintenance access loading and temporary loading of 7.5 kN/ m² during replacement of mechanical plant. Compressive strength to be tested to the relevant parts of BS 4370 using the appropriate method recommended therein.

c) U-value calculations shall be based on wet roof conditions.

d) The combination of insulation and ballast shall prevent floatation of the insulation.

e) All insulation shall be adequately protected from ultraviolet light degradation.

J31.1406 Watertightness

a) The installation shall ensure the absolute prevention of water leakage inside the building through the roof finishes, abutments with adjacent works, penetrations for services and all interface conditions.

b) Unless otherwise agreed, all roof finishes shall be installed such that no track migration of water is possible beneath the principal waterproofing membrane.

c) All waterproof membranes shall form continuous waterproofing barriers fully bonded to their substrates.

J31.1407 Drainage

a) The works shall be laid to sufficient falls to ensure effective disposal of water to outlets provided.

b) Provide all drainage outlets and provide flow rate calculations to demonstrate that

the design rate of rainfall is accommodated to BS EN 12056: Part 3. Refer to the Service Engineer's Specifications and Drawings.

c) Ensure that all roof outlets are suitable/ compatible for the roofing membrane(s) used.

J31.1408 Condensation

a) Condensation shall not form, on internal or external surfaces, or interstitially within the thickness of the works such that it may lead to damage or staining under the psychrometric conditions given in clause series A91.5400.

b) Interstitial cavities, or other voids where condensation may occur, shall be adequately drained and ventilated to the outside, such that the formation of such condensation is not detrimental to the performance durability or appearance of the works.

c) Determine the interstitial condensation risk as recommended by BS 5250, BS 6229, BS EN ISO 10211 and BS EN ISO 13788. Calculations shall be submitted for acceptance, based on the atmospheric data specified.

d) Vapour barrier: The necessity for and location of any vapour barrier shall be determined and calculated.

J31.1409 Solar Performance

a) Exposure to sunlight during the lifetime of the works shall not reduce the performance nor adversely affect the visual appearance of any element/ component. Take into consideration expected solar performance under varying conditions of solar radiation and external/ internal air velocity.

b) Submit independently certified test data in respect of solar and visible light performance confirming compliance with the Specification.

c) All insulation shall be adequately protected from ultraviolet light degradation.

J31.1410 Local Factors

a) Visit the Site in order to become familiar with local requirements. Local microclimatic conditions shall be taken into account and grades of materials assessed as suitably durable for the location shall be selected.

b) An assessment of microclimatic conditions shall be made with due allowance for any factors likely to have an adverse effect upon materials intended for the works. More appropriate materials shall be substituted if adverse effects are predicted.

Acoustic

J31.1411 Sound Reduction Requirements

Refer to the Acoustic Report.

Fire

J31.1412 Fire Performance

a) Membrane shall meet category AA to BS 476: Part 3.

b) Insulation to comply with fire classification in accordance with BS EN 13501: Part 1 plus A1.

J31.2000 SYSTEMS AND MATERIALS

J31.2100 GENERAL

J31.2101 Generally

a) On completion of each roof, the integrity of the waterproofing shall be tested by means of an electronic detector system to prove that the waterproofing is 100% free from punctures and defects prior to installation of surfacing.

b) The waterproof integrity certificate for each roof shall be attached to the warranty application.

c) Preformed edge profiles to all parapets and thresholds.

J31.2102 Paving and Ballast

Where paving and/ or ballast lies over insulation, ensure the thickness/ weight of the paving/ ballast is sufficient to prevent floatation of the insulation.

Inverted Roofs

J31.2103 Generally

a) Prepare surfaces and prime as recommended by the manufacturer. Surfaces to be free from unacceptable curing compounds and other surface contaminants, voids and protrusions.

b) Waterproof coating: Hot liquid applied monolithic polymer modified bitumen structural waterproofing membrane.

c) Primer: Suitable surface conditioner as recommended by the manufacturer to suit the substrate condition.

d) Reinforcement: Reinforcement layer as recommended by the manufacturer comprising polyester fabric to all areas. Apply appropriate grade reinforcement at movement joints as recommended by the manufacturer.

e) Coating protection: As recommended by the manufacturer.

f) Insulation: Extruded polystyrene board as indicated on the Drawings Drawings and to satisfy the required U Values.

g) Filter layer: Non-woven polyester fleece as recommended by the insulation manufacturer.

h) Green Roofs:

i) Extensive substrate: Extensive substrate growing medium tray system as recommended by the manufacturer and in accordance with Section Q37.

ii) Depth: As indicated on the Tender Drawings.

iii) Growing medium: Biodiverse sedum substrate suitable for plug planting, plantlets, sedum and wild flower as Section Q37.

iv) Provide moisture control layer, filter layer, root barrier, drainage mat etc as recommended by the membrane and Green Roof manufacturer/ supplier.

i) Provide sub-layers/ interlayers, sealants (colour co-ordinated where visible), fixings and fastenings, fillets, protection boards, adhesives, filter layers, drainage layers, root barriers, separation layers and other accessories applicable the roof system type and as recommended by the system manufacturer to complete the installation.

j) Provide timber decking/ stone/ concrete paving slabs/ ballast as required.

Paving on Support Pedestals

J31.2106 Natural Stone Slab Paving ~~– EXT-10~~ EXT-012

~~a) Natural Yorkstone paving slabs on support pedestals.~~

~~b) Size shall be 600mm x 600mm x minimum 50mm.~~

~~c) Manufacturer: Marshalls (Tel: 0845 3020600).~~

~~d) Reference: Scoutmore Yorkstone.~~

~~e) Colour: Range selection by the Architect.~~

~~f) Finish: Diamond sawn all faces, fine sawn texture.~~

~~g) Joints shall be open as indicated on the Design Drawings.~~

See Q25.1202

J31.2107 Precast Concrete Slab Paving – (Where required)

a) Precast concrete pavers to BS EN 1339, hydraulically pressed laid on proprietary supports in locations indicated on the Design Drawings.

b) Size shall be 600mm x 600mm x 50mm.

c) Manufacturer: Marshalls (Tel: 0845 3020600).

d) Reference: To be confirmed.

e) Colour shall be 'natural' grey.

f) Type of surface: Blister.

g) Joints shall be open as indicated on the Design Drawings.

J31.2109 Pebbles to perimeter – EXT-005

a) Pebbles to perimeter. 30mm diameter white beach pebbles.

b) River washed, smooth, round aggregate graded between 20mm to 40mm nominal diameter, free from fractures, loam, sand or other foreign substances to meet the requirements of BS 6229.

c) Freeze thaw cycle resistant.

d) Ballast shall be solar reflective and of type to be agreed by the Architect.

e) Fit gravel guards to all outlets.

f) The ballast shall be contained in discrete, fine mesh bags or restrained securely under a discrete, fine, continuous mesh. All restrictive materials shall be life long with minimal maintenance requirements. The Contractor shall provide Risk Assessments for review.

J31.2200 MATERIALS

J31.2201 General

a) All components shall be covered by a single source warranty, fully guaranteed by the supplier.

b) Proprietary systems shall be Agrément certified and tested.

c) All products incorporated in the works to be in accordance with the manufacturer's current technical data sheet.

d) Prior to ordering, samples to be submitted of all materials to be used, together with current technical data sheets and copies of relevant test certificates.

e) Where materials overlap or are used in conjunction with other waterproofing products, they shall be compatible.

J31.2202 Insulation

a) Thickness and density of the insulation shall achieve the performance requirements specified.

b) The compressive strength shall accommodate access requirements and imposed loads. Compressive strength to be tested to the relevant parts of BS 4370 using the appropriate method recommended therein.

c) The insulation shall be inert, durable, rot-proof and vermin-proof and not be degradable by moisture, extreme temperatures or water vapour.

d) The insulation shall not bulge, sag, delaminate or detach during its installation or in situ during the life of the works.

e) Insulation shall be LPCB certified to LPS 1181.

f) Insulation shall have zero Ozone Depleting Potential (ODP), be CFC and HFC free and have a Global Warming Potential (GWP) of less than five. Refer also to Section A91.6000 of the Specification.

g) Insulation shall be selected to meet the recommendations of 'The Green Guide to Specification' and shall have a minimal environmental impact when assessed using BREEAM criteria.

h) The selected insulation shall comply with all relevant British Standards and be BBA certified.

J31.2203 Stone Ballast

a) River washed, round aggregate graded 20mm to 40mm to meet the requirements of BS 6229.

b) Fit gravel guards to all outlets.

c) Spread evenly to a minimum depth of 70mm and sufficient to prevent floatation

of insulation. Demonstrate that the depth of ballast is sufficient to prevent floatation.

d) Ballast to be freeze-thaw resistant.

e) Ballast type/ colour to be solar reflective and of type to be agreed by the Architect.

f) Ballast shall be laid on a filter layer recommended by the roofing system manufacturer.

g) Ballast shall be of a type that ensures that birds cannot pick it up.

J31.2204 Paving Slabs – Natural Stone – ~~EXT-010~~ EXT-012

a) Natural stone (~~Yorkstone~~ Granite Setts) laid on proprietary supports in locations indicated on the Design Drawings.

b) Stone shall be free from vents, cracks, fissures, discolouration, or other defects, which may adversely affect strength, durability or appearance. It shall be dressed and worked before delivery to Site in accordance with the Design Drawings.

c) Thickness shall be minimum 75mm minimum and sufficient to prevent the floatation of the insulation. Determine the final thickness depending on overall ballast requirements.

d) Support system: Supports shall comprise rubber paving slab supports diameter 140mm complete with rubber levelling pads of thickness 5mm. Supports shall be provided when necessary. Physical characteristics shall be as follows:

i) Rubber of shore hardness 80.

ii) To suit pedestrian loading.

e) Lay slabs on supports with 5mm open joints.

J31.2205 Precast Paving Slabs (Where required)

a) Precast concrete or natural stone as specified laid on proprietary supports in locations indicated on the Design Drawings.

b) Where specified, tactile paving shall be to DD CEN/TS 15209.

c) Thickness shall be minimum 50mm minimum and sufficient to prevent the floatation of the insulation. Determine the final thickness depending on overall ballast requirements.

d) Support system: Supports shall comprise rubber paving slab supports diameter 140mm complete with rubber levelling pads of thickness 5mm. Supports shall be provided when necessary. Physical characteristics shall be as follows:

i) Rubber of shore hardness 80.

ii) To suit pedestrian loading.

e) Lay slabs on supports with 5mm open joints.

Accessories

J31.2205 Accessories

Adhesives, sealant, fixings, surface primer, conditioner, reinforcement, etc., shall be as recommended by the manufacturer.

J31.2206 Bonding Compound

a) Roof coverings: Type(s) recommended for the purpose by the membrane manufacturer for the conditions and type of surface. Heat and lay at a temperature sufficient to ensure bonding over the whole surface. Do not overheat.

b) Insulation: For bonding of and to heat sensitive insulation materials use cold bonding bituminous adhesive recommended by the insulation manufacturer.

J31.2207 Sealants

a) Sealants shall be compatible with all contact products and finishes, shall comply with BS EN ISO 11600 and shall be selected in accordance with BS 6213 plus A1 from:

i) Silicone.

ii) One or two part polysulphide.

iii) One or two part polyurethane.

b) Refer to Section Z22.

J31.2208 Aluminium Flashings

a) Aluminium flashings shall be formed from aluminium alloy sheets, fabricated from the most appropriate grade and thickness of material complying with BS EN 485, BS EN 515 and BS EN 573, in a temper suitable for the particular type of application and degree of forming to be used. In addition, the alloy shall be selected to satisfy the requirements of the chosen finishing process.

b) Aluminium flashings shall be sufficiently thick to provide a visually flat surface and to eliminate distortion and permanent deformation caused by solar radiation.

c) Flashings to be mill finished unless otherwise specified.

d) Longitudinal joints shall have lapped or interconnecting joints which shall be fully weather sealed. Simple butt joints and butt straps will not be acceptable. Joints, sealants etc. shall be designed to be capable of accommodating thermal movements of all flashings.

e) Electrical continuity shall be achieved between conductive parts. Provision shall be made for lightning protection integration requirements.

f) Aluminium flashings shall be treated with anti-drumming insulation on the hidden face.

J31.3000 SITE INSTALLATION

J31.3100 WORKMANSHIP

J31.3101 General

a) Unless specified otherwise the installation of the works shall be carried out by competent installers using methods in strict accordance with the various manufacturer's written recommendations to BS 8217, BS 6229 and BS 8000: Part 4 to provide a secure, free draining and completely weathertight roof.

b) The works shall make due allowance for the sequencing of the whole of the works including all interfaces.

c) Ancillary products and accessories, where not specified, shall be types recommended for the purpose by the membrane manufacturer.

d) Use operatives trained in the application of the roofing systems specified who have attended a recognised training scheme. Submit evidence of training to the Architect on request.

e) Maintain fully trained operatives on site throughout the installation period.

f) The manufacturer's printed instructions and installation details shall be strictly adhered to except where the Specification is more stringent.

J31.3102 Execution

a) The following shall be established:

i) The exposed substrate surfaces are adequate to receive the roofing system.

ii) Locations of drains and types of outlets to be installed.

iii) Any requirements for structural movement joints.

b) The installation of the works shall not commence until all roof defects have been corrected.

c) Form details with adequate overlapping, staggering of laps and full bonding of successive layers so that all jointing/ junctions are waterproof.

d) Ensure that all membranes are dressed into outlets with fully watertight junctions.

J31.3103 Inverted Roofing Generally

a) Adhere strictly to the manufacturer's printed instructions and installation details.

b) Inverted Roof Membrane Application:

i) Prime surfaces and undertake advance bond tests as recommended by the manufacturer. Apply the membrane in two coats to achieve a minimum overall thickness as recommended by the manufacturer to all surfaces, with additional material at cracks and joints and with polyester reinforcement layer as required

using methods recommended by the manufacturer.

ii) Incorporate heavy duty reinforcement between coats at upstands, penetrations and movement joints and light duty reinforcement elsewhere and fully bed into the membrane to produce a continuous monolithic layer free from pinholes and inclusions.

iii) Apply protection sheet to the tacky membrane as required.

c) Insulation: Install insulation of the required density and compressive strength over the entire membrane and accurately cut boards to accommodate abutments and the roof configuration. Insulate kerbs and upstands.

i) Do not lay insulation until roof is clear of other subtrades.

ii) Clean off all dirt and debris from base.

iii) The insulation shall be kept dry during its installation.

iv) Set out to minimise cutting and avoid small cut pieces at perimeter and penetrations.

v) Loose lay boards tightly butted and to brick pattern, cut cleanly to fit closely around projections and upstands. The insulation shall be cut back from the rainwater outlets so as not to adversely affect flow rate.

vi) On completion of laying, ensure that boards are in good condition, with no springing, or rocking. Secure boards against wind uplift as soon as practicable.

d) Inverted Roof Finish:

i) Overlay the insulation with filter fabric, lapping sheets a minimum of 300mm.

ii) Lay paving slabs on supports along defined route/ over entire area as defined on the Design Drawings, and ballast over the remaining area to a depth as necessary to meet the required performance. Ensure that cut slabs are more than 67% of standard size unless otherwise accepted by the Architect.

iii) Wrap filter fabric around roof drain outlets to prevent unwanted material entering the drainage system.

iv) Paving and ballast to be installed as the laying of insulation proceeds to prevent damage by wind and UV light. Ensure that sufficient ballast has been placed at the end of each day to provide protection of installation against wind uplift.

v) Spread ballast evenly to a depth sufficient to prevent floatation of insulation. Demonstrate that the depth of ballast is sufficient to prevent floatation.

vi) Protect previously laid materials during the spreading of the ballast.

vii) Provide temporary access routes of suitable rigid board if transporting ballast by wheelbarrow.

J31.3104 Roof Access

a) To prevent damage to the works, it shall be ensured that all finished areas of work are not used for the storage of materials, as building platforms or as access routes for other trades. If any work by other trades is unavoidable, adequate and appropriate protection shall be provided for the entire construction period.

b) Where regular foot traffic is envisaged across the finished works, adequate and appropriate construction shall be employed to avoid any damage to the finishes.

J31.3105 Roof Deck Preparation

Temporary drainage shall be installed at the low points of the roof during the installation of the works to ensure dry working conditions and to allow the roof coverings to proceed without undue interruption.

J31.3106 Suitability of Base

Before installing the works ensure that:

a) Surfaces to be covered are firmly fixed, clean, dry, smooth and free from frost, unacceptable curing compounds, form release agents and other surface contaminants, voids and protrusions.

b) The base is to even falls with no areas that will pond.

c) All preliminary work including formation of upstands, kerbs, box gutters, sumps, grooves, chases, pipe sleeves, expansion joints, etc. and fixing of battens, fillets, anchoring plugs/ strips, etc. is complete and satisfactory.

d) The substrate shall be thoroughly swept to receive the works.

e) The substrate shall be blown clean using an air compressor to remove any remaining loose debris.

J31.3107 Attachment of Warm Deck Insulation

a) Lay boards with long edges fully supported and lightly butted together with staggered end joints and in a full bed of bonding compound.

b) Mechanical and adhesive fixing shall be to manufacturer's recommendations to comply with the performance criteria specified.

c) On completion of laying, ensure that boards are in good condition, well fitting and with no springing, flexing or rocking.

J31.3108 Adverse Weather

a) The works shall not be laid in rain, snow or heavy fog or if the temperature falls below 5°C.

b) Provide temporary covers and drainage, as required, to keep unfinished areas of the roof dry.

c) Suspend work in severe or continuously wet weather unless an effective temporary roof is provided over the working area.

d) If unavoidable wetting of the construction does occur, take prompt action to minimise and make good any damage.

J31.3109 Protection

Ensure that from completion of the roof until Practical Completion:

a) The roof is not used as a working platform unless fully protected to the acceptance of the Architect.

b) No petroleum based solvents or other chemicals harmful to bitumen are allowed to come into contact with the roof surface.

c) No building materials are stored on the roof.

d) Finished roof areas are adequately protected from damage by subsequent building operations.

J31.3110 Skirtings/ Upstands

a) Angle fillets shall be a type recommended by the roof covering manufacturer, and shall not be less than 50mm x 50mm.

b) Form all upstands to the manufacturer's recommendations.

c) Return insulation up all upstands as indicated on the Design Drawings.

d) Fix suitable protection boarding to protect insulation to all upstands. Protection boarding, insulation and flashings shall be designed and detailed to withstand wind loads/ pressures as specified.

e) Ensure that the membrane is dressed up (and over) all upstands to form continuous waterproofing as indicated on the Design Drawings.

f) Install all necessary termination and flashing bars.

g) Submit details of all upstands for acceptance.

J31.3111 General Sealants

a) For general sealant application refer to Section Z22.

b) Ensure that where adhesives/ sealants are used, careful preparation for and application of correct de-greasing solvents and bonding agents are carried out. Ensure that the adhesive/ sealant is entirely suitable for the purpose intended, and that it is used in strict accordance with

the manufacturer's instructions.

i) Excess sealant shall be removed and all joints shall be neat and clean.

ii) Sealed joints shall be adequately protected during the curing process to avoid contamination by dust and other debris.

J31.3112 Completion

a) Roof areas shall be left clean with all outlets clear.

b) Any interface with work by others necessary to provide a weathertight finish shall be satisfactorily completed.

c) Defects shall be repaired without delay, to minimise damage and nuisance.

d) A representative of the membrane manufacturer shall inspect the roof coverings and notify the Contractor of any defects. All defects shall be corrected.

Green Roof Landscaping

J31.3113 General

a) The supporting build-up of drainage layer, filter sheet, substrate and any hard landscaping shall be completed before installing the plants.

b) The drainage layer and moisture mat shall be thoroughly soaked prior to planting.

c) Selected sedum plants shall be planted at a minimum rate of 25 plants per m². There shall be a minimum of six varieties planted within each square metre. The plants shall be pre-watered in their trays immediately prior to removal and planting.

d) Fertilise with suitable slow release green roof fertiliser at a rate recommended by the supplier.

e) Plants shall be gently watered in, and the substrate kept moist for the initial 4-6 weeks, to ensure that the plants establish themselves.

f) Sedum plugs shall generally be planted in late September/ early October or late March/ early April. Sedum plants shall not be planted during the months of June, July and August.

J31.3114 Maintenance During Establishment

a) Allow for post-installation maintenance for a period of 2 years to the full establishment of a flourishing green roof.

b) The post-installation maintenance shall consist of a minimum of two visits per year by the appropriate labour force, which will be dictated by the roof area. No irrigation will be required once the plant layer is established:

i) At the end of Autumn, strim the roof surface to remove all dead vegetation, rake off debris and cart away.

ii) In early Spring:

- Inspect substrate surface and vegetation barriers and remove all unwanted grasses, weeds, saplings, etc.
- Any bare areas of substrate shall be re-seeded and lightly raked over, or re-planted.
- Ensure that perimeters and roof outlets are free from weeds and other blockages.
- Periodically, as required, fertilise with a suitable slow release green roof fertiliser at a rate recommended by the supplier.

J31.3200 TOLERANCES

J31.3201 Installation Tolerances

a) The permissible deviation in level of surface of the works from datum shall be ±3mm under a 2000mm straightedge.

b) Sudden irregularities shall not occur.

End of Section

UCLH PHASE 4 AND PROTON BEAM THERAPY BUILDING PROJECT

Architectural Specification

Section: N25 Permanent Access and Safety Equipment.

Revision: A – 100% Stage E Issue

Revision	Date	Clauses revised	Notes
Contract Issue	28/07/2014	**-**	-
Rev. A **100% STAGE E ISSUE**	04/11/2016	**-**	-

General notes:
Omissions to specifcation shown in blue and struck through. ~~Example.~~
Additions to specification shown in red. Example.
Updates from Contract Specification to be agreed by ByUK and UCLH where relevant.

Scott Tallon Walker Architects

N25 PERMANENT ACCESS AND SAFETY EQUIPMENT

To be read in conjunction with Section A91 and other related sections of the Specification, Preliminaries and Contract Conditions.

N25.1000 SCOPE, SUBMITTALS, TESTING AND PERFORMANCE

N25.1100 SPECIFICATION AND SCOPE

N25.1101 General

a) Works covered in this section are specified by performance and therefore designated as works with specialist sub-contractor Design (SCD). Refer to Section A91.

b) Complete the Detailed Design, manufacture, supply, install and warrant the works whilst complying with the visual intent indicated on the Design Drawings and criteria stated in the Specification.

c) For design and general performance requirements, refer to Section A91 of the Specification. Specific design and performance requirements are as defined in the particular trade sections.

d) Where no material, product or supplier is indicated in the Specification, propose suitable materials and systems prior to Contract award which comply with the visual intent and performance criteria stated and remain fully responsible for the Detailed Design of the works.

e) Where a particular material, product or supplier is indicated in the Specification, such material, product or supplier shall be deemed indicative representing the Architect's design intent only. The Contractor may complete the installation using that product, or such other confirmed as acceptable by the Architect in writing, but shall remain fully responsible for the Detailed Design and performance of the works.

N25.1102 Scope of Works

This section of the Specification, when read in conjunction with the Design Drawings, provides particular requirements with respect to the following:

a) Fall restraint systems to roofs.

b) Restraint anchors.

N25.1200 SYSTEM TYPES

Fall Restraint Systems

N25.1201 Type ASE-001 Fall Restraint System

Access & Safety Equipment, stainless steel cable system on stainless steel pedestal support brackets with structural fixings within walkable roof gutters.

N25.1300 SUBMITTALS AND TESTING

Tender Submittals

N25.1301 Tender Response

a) Provide tender submittals in accordance with the requirements of Section A91.4000 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:

i) Samples where specified.

ii) List of Tests included.

iii) QA/ QC programme.

iv) List of proposed Working Drawings.

v) Summary of deviations from the Specification.

vi) Outline technical specifications reflecting proposed materials/ systems.

vii) A list of proposed suppliers and sub-contractors intended to be used.

Samples, Mock-ups, Prototypes and Quality Benchmarks

N25.1302 Pre-contract Samples

In accordance with Section A91.4000, pre-contract samples of the following shall be provided:

a) Pedestal brackets with safety eyebolts of each proposed type.

b) Travelling anchor/ sliding mechanism of each proposed type.

c) Fixed anchor brackets of each proposed type.

N25.1303 Post Contract Award Samples

In accordance with Section A91.4000, post contract award samples of the following shall be provided:

a) Full size pedestal bracket with safety eyebolt of each agreed type.

b) Travelling anchor/ sliding mechanism of each agreed type.

c) Full size fixed anchor brackets of each agreed type.

N25.1304 Mock-ups

Not required.

N25.1305 Prototypes

Not required.

N25.1306 Quality Benchmark Requirements

The following quality benchmarks shall be provided, in locations to be agreed with the Architect, in accordance with Section A91.4000:

a) The first complete system installed of each type.

Testing

N25.1307 Test Requirements

a) Include for testing by an accredited testing specialist or provide independent certified test data to demonstrate compliance with the Specification.

b) On completion of the installation, the installer shall carry out all tests to confirm the system's competence in accordance with BS EN 795 class C and A1 anchorage system and issue a test certificate and two copies of user instructions and maintenance manuals for the overall installation.

N25.1400 PERFORMANCE REQUIREMENTS

N25.1401 Fall Restraint System

a) Provide suitable safety support systems for the purpose of carrying out periodic maintenance and cleaning (capable of taking the load of 2 operatives) for areas of roofing as indicated on the Design Drawings.

b) Take full responsibility for the design, final detailing, supply and installation of the works and associated components/ accessories specified herein including satisfying all testing requirements to meet the requirements of this Specification and Building Control, based on the Design Intent as indicated on the Design Drawings.

c) Systems shall be designed and installed by a specialist in accordance with BS 8437, BS EN 795, BS 7883, BS EN 353, BS EN 365 and BS EN 360.

d) Co-ordinate with the specialist safety harness manufacturer to ensure that all work related to the above is provided and agreed in the correct/ exact locations.

e) Comply with all relevant CDM Regulations and Health and Safety requirements.

f) Provide calculations and documentary evidence to demonstrate that system components, fixings and support posts as detailed on the Design Drawings are capable of satisfying the

design loadings of the system. These shall be supplied to the Architect for acceptance and for submission to the Local Authorities.

g) The works shall be designed and fabricated to resist all dynamic and impact loads likely to be placed upon it without any permanent deformation, failure damage or reduction of performance as a result of the following dynamic and impact loads:

i) The dynamic load exerted by operatives performing their intended tasks.

ii) The impact loads exerted by the operation of any safety devices or sudden arrest or braking of motion.

h) The system loading requirements shall be based on the principle of supporting a minimum of 2 operatives.

i) The maintenance operative shall be attached to the system at all times to satisfy the Health and Safety Executive requirements.

j) Travelling anchors/ sliding mechanisms shall be capable of traversing over the support brackets without detachment, and capable of accepting an industry standard shock absorbing lanyard attachment.

N25.1402 Abseiling Equipment

a) Provide suitable safety support systems for the purpose of carrying out periodic maintenance and cleaning (capable of taking the load of 2 operatives) for areas of roofing as indicated on the Design Drawings.

b) Systems shall be designed and installed by a specialist in accordance with BS 8437, BS 7985, BS EN 795 and BS 7883.

c) The works shall be designed to provide anchorage for use with abseiling/ rope access techniques for the cleaning and maintenance of façade elements indicated on the Design Drawings. Indicate locations of anchorage points on the Working Drawings.

d) Comply with all relevant CDM Regulations, Health and Safety requirements, including The Work at Height Regulations 2005, and IRATA recommendations.

e) Provide calculations and documentary evidence to demonstrate that system components, fixings and support brackets are capable of satisfying the design loadings of the system. These shall be supplied to the Architect for acceptance, and for submission to the local authorities.

f) The system loading requirements shall be based on the principle of supporting a minimum 2 operatives.

N25.1403 Corrosion Protection

Refer to Section A91 of the Specification.

N25.2000 SYSTEMS, MATERIALS AND FABRICATION

N25.2100 SYSTEM DESCRIPTIONS

Fall Restraint Systems

N25.2101 Type ASE-001 Fall Restraint System

a) Mansafe system fixed within walkable roof gutters.

b) Indicative manufacturer: Latchways plc. or acceptable equivalent.

c) Product reference: To be determined by the Contractor to suit the application and as agreed with Building Control.

d) System shall comprise:

i) Minimum 8mm thick stainless steel cable to BS MA 29 connected to and including anchor brackets fixed to structure to meet the performance requirements.

ii) All transfasteners, anchor brackets, shock absorbers, clamps and associated fittings as required.

iii) Suitable travelling mechanisms.

iv) Stainless steel 'D' rings and anchorage supports.

v) Body harness including energy shock absorbing lanyards to BS EN 354, BS EN 355, BS EN 358 and BS EN 360.

vi) All material shall be grade 1.4401 stainless steel to provide corrosion protection. Refer to Section Z11.

e) Steel: All elements shall be grade 1.4401 stainless steel electro polished.

f) Travelling mechanisms and associated equipment shall have protective rubber or similar covering to cushion and prevent damage, breaking or scratching to glass, flashings or sealants.

g) Provide suitable identification and safety signage in accordance with all relevant standards.

N25.2200 MATERIALS

N25.2201 Stainless Steel

Stainless steel plate, strip and sheet shall be to BS EN 10095, BS EN 10029, BS EN 10048, BS EN 10051 and BS EN ISO 9445.

N25.2202 Fixings

a) Refer to Section Z20 of the Specification for general requirements.

b) All structural fixings shall be stainless steel grade 1.4401 of a size recommended by the manufacturer to achieve the performance criteria of the Specification.

c) All structural fixings shall be capable of physical inspection in accordance with BS 6037 and Health and Safety Directives.

N25.3000 SITE INSTALLATION

N25.3100 WORKMANSHIP

N25.3101 General

a) Installation shall be strictly in accordance with the manufacturer's written instructions by an approved installer.

b) Upon completion of the installation, the system shall be inspected and fully tested (as specified) and a test certificate covering a time period as agreed with the Architect is to be issued to the Architect. A 'non-perishable' notice showing date and period of validity of the test certificate shall be attached, as applicable, to the system at each access point, or device.

c) Protect all elements of the system against damage, corrosion, disfigurement and any other occurrence that will cause detriment to the performance of the system.

d) Before commencing installation carry out a visual and geometrical survey of the supporting building structure and fabric. Report immediately to the Architect if the structure/ fabric will not allow the required accuracy, security and achievement of performance when erected and fixed.

N25.3102 Installation

a) All fixings shall be installed in accordance with the manufacturer's recommended procedures.

b) Isolating tape, plastics washers, or other suitable means to prevent bi-metallic corrosion shall be provided between dissimilar metals.

c) Workmanship shall be to BS EN 795 and BS EN 365 and Section Z11 of the Specification.

d) External systems shall be securely bonded to the lightning protection system.

N25.3103 Identification and Registration Label(s)

Provide and fix to each system a permanent label giving:

a) Manufacturer's name, address and telephone number.

b) Name and/ or reference code of site and system.

c) Serial number and year of manufacture.

d) Maximum number of users to be attached at any one time.

e) Date of installation and last inspection.

f) PPE requirements.

g) Whether the system is designed for 'arrest' or 'restraint'.

h) Label(s) shall be located in positions such that they can be easily read.

N25.3104 Operating Instructions

Provide two complete sets of user instructions applicable to the installed works, refer also to Section A91.

N25.3105 Operating/ Maintenance Manual

a) Refer to Section A91.6000.

b) Before Practical Completion provide printed instructions and recommended procedures to be established by the Architect for operating and routinely maintaining the equipment. Provide drawings and diagrams where appropriate. The information must include:

i) Instructions for assembling/ erecting equipment for use.

ii) Comprehensive operating instructions, including safety and emergency procedures, for all motions including upward, downward and lateral travel, and slew.

iii) Servicing and planned maintenance procedures, including assembly instructions where maintenance necessitates dismantling of machinery parts.

iv) List of replacement parts, with references.

v) Recommended procedures for testing equipment.

End of Section

UCLH PHASE 4 AND PROTON BEAM THERAPY BUILDING PROJECT

Architectural Specification

Architectural Specification Section Q25 – Slab Paving

Revision	Date	Clauses updated	Notes
Contract Issue	28/07/2014	-	-
Rev. A – STAGE E – DRAFT ISSUE	14/11/2016	Q25.1201 f) Q25.1201 i) Q25.1202 e) Q25.1203 Q25.1203 Q25.1204 Q25.1205	- "to mach existing" added - Loading requirements added - Colour patterns as per Architects' - Drawings - Section Q25.1203 added - Section Q25.1204 added - Section Q25.1205 added

General notes:
~~Omissions to specifcation shown in blue and struck through.~~
Additions to specification shown in red.
Updates from Contract Specification to be agreed by ByUK and UCLH where relevant.

Scott Tallon Walker Architects

Q25 SLAB PAVING

To be read in conjunction with Section A91 and other related sections of the Specification, Preliminaries and Contract Conditions.

Q25.1000 SCOPE, SUBMITTALS, TESTING AND PERFORMANCE

Q25.1100 SPECIFICATION AND SCOPE

Q25.1101 General

a) Works covered in this section are specified by performance and therefore designated as works with specialist sub-contractor Design (SCD). Refer to Section A91.

b) Complete the Detailed Design, manufacture, supply, install and warrant the works whilst complying with the visual intent indicated on the Design Drawings and criteria stated in the Specification.

c) For design and general performance requirements, refer to Section A91 of the Specification. Specific design and performance requirements are as defined in the particular trade sections.

d) Where no material, product or supplier is indicated in the Specification, propose suitable materials and systems prior to Contract award which comply with the visual intent and performance criteria stated and remain fully responsible for the Detailed Design of the works.

e) Where a particular material, product or supplier is indicated in the Specification, such material, product or supplier shall be deemed indicative representing the Architect's design intent only. The Contractor may complete the installation using that product, or such other confirmed as acceptable by the Architect in writing, but shall remain fully responsible for the Detailed Design and performance of the works.

Q25.1102 Scope of Works

This section of the Specification, when read in conjunction with the Design Drawings, provides particular requirements with respect to paving.

Q25.1103 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.

Q25.1200 SYSTEM TYPES

Paving

Q25.1201 Type EXT-001 Slab Paving

a) Natural Yorkstone slab external paving to match the existing pavement.

b) Thickness and bedding to match the existing paving and to achieve the required performance criteria stated in the Specification.

c) Natural stone slabs:

i) Nominal size: 600mm x random lengths x 75mm thick.

ii) Finish: Honed to an accepted control sample.

iii) Colour: To match accepted control sample.

d) Sub-base: As required.

e) Bedding: Sand/ cement mortar minimum 40mm thick, with reinforcement.

f) Joints: 3mm mortar joints nominal. To match existing

g) Pattern: As indicated on the Design Drawings.

h) Other requirements: Interface with the building and the slot drain where required.

i) Other requirements: Bedding and installation to suit heavy duty vehicles passing over or pedestrian traffic. Insulation of minimum comprehensive strength (EN 826-A) of more or

equal 1600KPA is required for drop off areas and delivery bay. Insulation of minimum comprehensive strength (EN 826-A) of more or equal 900KPA is required for within pedestrian traffic zones.

Q25.1202 Type EXT-012 Granite Setts

a) Natural stone slab external paving on mortar bedding with grouted joints.

b) Natural stone slabs: Granite setts for vehicular paving.

c) Nominal sizes: 100mm x 200mm and 200mm x 300mm . Refer to the Design Drawings. Minimum 75mm thick.

d) Finish: Sand blasted to achieve the required slip resistance and to an accepted/ agreed control sample.

e) Colour: To match accepted control sample. Colour patterns as per architects' drawings.

f) Sub-base: Concrete slab as Structural Engineer's specification.

g) Bedding: Sand/ cement mortar minimum 40mm thick, with reinforcement.

h) Joints: 3mm dry mortar joints nominal. To be revised with supplier to achieve a level surface for beds trolleys wheelchairs etc.

i) Pattern: As indicated on the Design Drawings.

j) Other requirements: Bedding and installation to suit heavy duty vehicles passing over.

Q25.1203 Reinforced in-situ concrete slab

a) Reinforced in-situ concrete slab.

b) In situ concrete finish equivalent to Special Class quality and Type B finish.

c) Thickness 75mm (over existing paramout court basement structure) or 150mm as per architects' drawings

d) Bedding to achieve the required performance criteria stated in the Specification. As per architects drawings

e) Sub-base: As required.

f) Joints: 3mm mortar joints nominal.

g) Other requirements: Interface with the building and the slot drain where required.

Q25.1204 Existing road surface to be reinstated

a) Existing road surface to be reinstated to match the existing .

b) Thickness and bedding to match the existing and to achieve the existing required performance criteria.

Q25.1300 SUBMITTALS

Tender Submittals

Q25.1301 Tender Response

a) Provide tender submittals in accordance with the requirements of Section A91.4000 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:

i) Samples where specified.

ii) List of Tests included.

iii) QA/ QC programme.

iv) List of proposed Working Drawings.

v) Summary of deviations from the Specification.

vi) Outline technical specifications reflecting proposed materials/ systems.

vii) A list of proposed suppliers and sub-contractors intended to be used.

Samples, Mock-ups, Prototypes and Quality Benchmarks

Q25.1302 Pre-contract Samples

Relevant trade literature and technical specifications shall be provided in accordance with Section A91.4000.

Q25.1303 Post Contract Award Samples

In accordance with Section A91.4000, post contract award samples of the following shall be provided:

a) 3 No. samples of each type of paving slab type full size.

b) Jointing sand sample.

Q25.1304 Mock-ups

Not required.

Q25.1305 Prototypes

Not required.

Q25.1306 Quality Benchmark Requirements

The following quality benchmarks shall be provided, in locations to be agreed with the Architect, in accordance with Section A91.4000:

a) Following agreement of samples, an area of 15m² of each type of paving.

Testing

Q25.1307 Testing of Paving

a) All sampling and testing of the natural stone slabs shall be carried out in accordance with BS EN 1341.

b) All sampling and testing of the concrete slabs shall be carried out in accordance with BS EN 1339.

c) All sampling and testing of the natural stone setts shall be carried out in accordance with BS EN 1342.

d) Additional testing and sampling shall be performed if the works do not comply with the Specification.

e) Acceptance shall only be given to complying paving. Inform the Architect of test results

for paving not originally complying. The official certification of test results shall be given after acceptance and before manufacture of the paving.

f) As soon as the sources of the units have been accepted, instruct the testing authority to carry out the following tests:

i) Compressive strength.

ii) Absorption percentage.

iii) Soluble salt content.

iv) Drying shrinkage or moisture expansion.

v) Mechanical test on completion, 5% of slabs shall be tested to prove adequate bedding adhesion.

Q25.1308 Mortar Testing

a) All tests on wet or hardened mortar samples shall be carried out in accordance with BS 5628: Part 1, BS EN 1052: Part 1, BS 4551 and BS EN 1015, or to equal standards acceptable to the Architect.

b) Samples shall be taken at the point of mixing or use. The frequency of sampling shall not be less than that specified in BS 5628: Part 1.

c) Additional tests and sampling shall be performed if the mortar does not comply with the Specification.

d) Subject to the test results, the specified nominal mix proportions shall be adjusted and tested.

e) Unless acceptance is obtained to the contrary, the consistency of fresh mixed mortar shall comply with the standard recommended in BS EN 1015: Part 4.

f) Any paving containing mortar that does not comply with the requirements of the Specification shall be demolished and removed.

Q25.1309 Testing Apparatus

On Site the following apparatus shall be maintained in good repair:

a) Maximum and minimum thermometers as and where required.

b) Soil thermometers as required for measuring the mortar and ground temperatures.

c) Apparatus for carrying out the test described in BS EN 932: Parts 1 and 6.

d) Syphon can, Gammon Morgan or Speedy apparatus for measuring the moisture content of aggregate.

e) Apparatus for carrying out the test described in BS EN 1015: Part 4.

f) Apparatus for making mortar cubes or prisms in accordance with BS 4551.

g) Apparatus for measuring the air content of the mortar in accordance with BS EN 1015: Part 7.

Q25.1310 Slip Resistance Testing

a) Testing for slip resistance shall comply with the following documents:

i) 'Assessing the slip resistance of flooring' by The Health and Safety Executive (latest published version).

ii) 'The assessment of floor slip resistance, the UK Slip Resistance Group guidelines' by The UK Slip Resistance Group (latest published version).

b) Testing shall be performed at an independent UKAS accredited laboratory accredited to perform the specified test methods.

c) Pendulum Test: External paving shall be evaluated in both dry and wet conditions using the TRL Pendulum Tester in accordance with BS 7976 (BS EN 1341 for external natural stone slabs and BS EN 1342 for external natural stone setts) and the recommendations of the UK Slip Resistance Group to obtain the pendulum test value (PTV) specified.

d) Roughness Test: External paving shall be evaluated using a surface roughness meter, in accordance with the recommendations of the UK Slip Resistance Group, to obtain the surface

roughness (Rz) value specified.

e) Samples shall be tested at the following stages of the project:

i) Approval.

ii) Production.

iii) Post-installation (in situ).

f) Submit test results to the Architect for acceptance in due time, prior to each of the project stages or as agreed with the Architect.

g) Test samples must include any surface sealer or treatment to be applied to the finished external paving.

Q25.1400 PERFORMANCE REQUIREMENTS

Comply with the general performance of Section A91.5000 and the following specific performance requirements.

Structural

Q25.1401 General

Refer to Section A91, clause series 5300.

Q25.1402 Specific Movements

a) The works shall be detailed, manufactured and installed to accommodate all movements of the substrates without damage or any reduction in the performance.

b) Provide all necessary movement joints to accommodate the movements to which the paving is expected to be subjected, whether indicated on the Design Drawings or not.

c) Show all movement joints on the Working Drawings, which shall be subject to acceptance by the Architect.

d) The Contractor shall be responsible for ensuring that movement joint thicknesses are adequate.

e) A method statement for the installation of all the works shall be provided, taking into account movements of the structural slab including:

i) Dimensional setting out and joints alignment.

ii) Floor services.

iii) Construction tolerances.

iv) Movement joints, bay joints and relief joints.

v) Full adhesion.

vi) Full bed without hollows.

vii) Cracking to grouted joints, which will not be acceptable.

viii) Resilient and insulation layer.

f) Refer to and take account of the Structural Movements and Tolerances Report.

g) A full understanding of the behaviour of the building structure, its movements and its effects upon the works is required.

h) The works shall not deflect under loading in any way that is detrimental to any element of the works or adjacent structural or building elements.

Q25.1403 Specific Dead Loads

a) The works' own dead load shall be accommodated locally and without causing deflections or movements that affect abutting elements.

b) The dead loads derived from permanent fixtures or services attached to the surfaces of the works shall be accommodated without any reduction in performance.

Q25.1404 Specific Live Loads

The works shall be capable of accommodating the following live loads without any

reduction in performance:

a) Movements of the concrete slabs and loads imposed upon them.

b) All loads resulting from movements of the structure as a whole.

c) Loads from a 2½ tonne cherry picker type access machine.

d) Working loads up to 11.5-ton axle load shared between two wheels with assumed 300mm x300mm area of tyres producing an ultimate load of 1.8N/ mm².

Environmental

Q25.1405 Thermal Movement

It shall be ensured that the works are capable of withstanding differential surface temperatures without any reduction in the specified performance. Any movement joints, as necessary to cater for any thermal movement, shall be provided.

Q25.1406 Moisture Movement

The works shall withstand the following movement without permanent deformation or any reduction in the specified performance:

a) Due to changes in the moisture content of its components, resulting from variations in the moisture content of the air.

b) Due to drying shrinkage of building components, both short term and long term.

Slip Resistance

Q25.1407 Slip Resistance

a) When tested using the TRL Pendulum Tester, external paving, inclusive of surface treatment, shall achieve the following pendulum test value (PTV):

i) Dry: Not less than 40 PTV.

ii) Wet: Not less than 45 PTV.

b) When tested using the surface roughness meter, external paving shall achieve a surface roughness (Rz) value of not less than 20 µm Rz.

Strength and Physical Properties of Stone

Q25.1408 General

a) Stone supplied for use in accordance with the Specification shall comply with the following Standards:

i) Petrographic description: BS EN 12407.

ii) Density: BS EN 1936.

iii) Water absorption: BS EN 13755.

iv) Flexural strength under concentrated load: BS EN 12372 (3-point loading: Modulus of Rupture).

v) Flexural strength under constant moment: BS EN 13161 (4-point loading).

vi) Abrasion resistance: BS EN 1341.

vii) Slip resistance, to recognised procedure.

viii) Staining potential, to recognised procedure.

ix) Coefficient of thermal expansion, to recognised procedure.

x) Cyclic heating and cooling, to recognised procedure.

b) Provide information and values for review by the Architect for the following test criteria:

i) Petrographic description: No deleterious constituents.

ii) Density: 2560kg/ m³ minimum.

iii) Water absorption: 0.40% maximum.

iv) Flexural strength under concentrated load shall be 10.34 Mpa minimum (wet). Note:

Tests shall be performed at proposed project thickness.

v) Abrasion resistance: Provide values for assessment.

vi) Slip resistance: Provide values for assessment (dry and wet). Note: Tests shall be performed at proposed project thickness.

c) Surface finish:

i) To be confirmed.

ii) Staining potential: Non-susceptible.

Pattern

Q25.1409 Laying Pattern

Paving pattern shall be in accordance with the Architect's requirements and suitable for any vehicular use after consideration of BS 7533: Part 3.

Q25.2000 MATERIALS AND FABRICATION

Q25.2100 GENERAL

Paving Generally

Q25.2101 Generally

a) Paving slabs to match existing.

b) Comply with the Landscaping Consultant's requirements.

c) Provide blister paving slabs as required.

d) Provide natural stone grooved paving to external entrance areas.

e) Substrate: In situ concrete with applied waterproofing overlaid with loose laid insulation.

Q25.2200 MATERIALS

General

Q25.2201 Slabs

a) Natural stone slabs shall be to BS EN 1341.

b) Precast concrete slabs shall be hydraulically pressed to BS EN 1339.

c) Tactile paving shall be to BS 7997.

Q25.2202 Stone Quality

a) Arrangements shall be made for the Architect, and others as necessary, to inspect samples of stone in the respective quarries which represent the range of variations in appearance. The acceptance of the Architect shall be obtained before confirming orders with suppliers or proceeding with production.

b) Stone shall be free from vents, cracks, fissures, discolouration, or other defects, which may adversely affect strength, durability or appearance. It shall be dressed and worked before delivery to Site in accordance with the Design Drawings.

Q25.2203 Damage

Materials that are chipped, scratched, damaged or have any other physical imperfections shall not be used in the works.

Bedding and Reinforcement

Q25.2204 Sand Bedding

a) Sand bedding shall be naturally occurring clean sharp sand or crushed rock.

b) It shall be graded for laying coarse sand in accordance with BS 7533.

c) The clay, silt, fine dust shall not be more than 3% by mass.

d) It shall be free from chlorides or other deleterious salts, contaminants and cement.

e) The moisture content shall be between 3-7%.

f) It shall be obtained from a single source.

Q25.2205 Mortar Bedding

a) Mortar mix proportions shall be cement/ sand nominal mix proportions to BS 5628: Part 3.

b) Sand for mortar:

i) All sand shall comply with BS 1200, unless specified otherwise, and shall be from one source and be well graded in accordance with Table 1 therein.

ii) Where a range is specified (e.g. 1:1:5-6) the lower proportion for grade 'g' sands and higher proportion for grade 's' sands shall be used.

iii) Marine sand shall not be used with sulphate resisting or super sulphated cement.

c) Tests on mortar shall be conducted as specified for special construction control, in accordance with BS 5628: Part 1.

d) Portland Cements shall conform to BS EN 197: Part 1. Unless otherwise stated, the cement shall be of Ordinary Portland Cement and delivered in the original sealed bags of the manufacturer or in accepted bulk containers.

e) All cement used in the works shall be obtained from a supplier chosen as being capable of supplying cement complying with the requirements of the Specification.

f) Any mortar plasticiser used shall be agreed with the Architect prior to commencement of any work, and shall be used in the proportions recommended in writing by the manufacturer. Mortar mixes shall be utilised in accordance with the manufacturer's written recommendations. The suitability of the mixture for use in any particular mortar shall be demonstrated.

g) Admixtures shall not be used in mortar unless specified. Calcium chloride, or any admixtures containing calcium chloride, shall not be used. Admixtures, if specified, shall be to BS EN 934: Part 3.

h) Mixing plant, tools and banker boards shall be kept clean at all times.

i) Materials shall be measured accurately by volume using clean gauge boxes. Proportions of mixes are for dry sand; allow for bulking if sand is damp.

j) Ingredients shall be mixed thoroughly to a consistency suitable for the work and free from lumps. Mortars containing air-entraining admixtures shall be mixed by machine, but not overmixed.

k) Mortar shall be used within about two hours of mixing. Retarded mortar shall be used within the time recommended in writing by the manufacturer. Mortar may be retempered to restore workability, but only within these time limits.

l) The required amount of water shall be determined to achieve a workable mix.

m) If pre-mixed mortars are used, the characteristics, product data, and testing criteria shall be submitted to the Architect for review.

n) The mortar shall have a suitable strength to withstand the live load of vehicles.

Q25.2206 Reinforcement

Reinforcement in mortar bedding shall be in accordance with BS 4483 and of the following types:

a) D49.D98 to unbonded bedding only.

b) Determine the final selection/ type of reinforcement subject to acceptance by the Architect.

Accessories/ Joints

Q25.2207 Jointing Material

a) Jointing material shall comply with BS 7533: Part 4.

b) Jointing sand: Clean dried sand, graded as for jointing sand to BS 7533: Part 4 and free from deleterious salts, contaminants and cement.

Q25.2208 Geotextile Membrane

Geotextile membrane to meet the requirements of the Specification.

Q25.2209 Movement Joint Metal Edgings

Movement joint metal edgings shall be provided as follows:

a) Material shall be brushed stainless steel.

b) Fixing shall be bedded in cement and sand/ screwed to plugs at 600mm centres, to exact finished level of floor/ pavings.

Q25.2210 Sealant Movement Joints

a) Sealant movement joints shall be provided where necessary.

b) Preparation and application shall be in accordance with the Specification, Section Z22. Joints shall extend through paving and bedding to substrate.

c) Joints shall coincide with any movement joints left in the substrate.

Q25.2211 Preformed Strip/ Section Movement Joints

Where indicated on the Design Drawings, preformed strip/ section movement joints shall be provided and fixed in accordance with the manufacturer's written recommendations.

Q25.2300 FABRICATION

Q25.2301 Material Tolerances Generally

Width and lengths of varying sizes shall not deviate by more than ±2mm of the described size.

Q25.2302 Manufacturing Tolerances

a) Paving sizes stated in the Specification are nominal and the actual sizes required to meet the joint sizes, etc. shall be determined by the Contractor.

b) Slabs shall be butted/ manufactured with the tolerance of ±0.5mm.

Q25.3000 SITE INSTALLATION

Q25.3100 WORKMANSHIP

Q25.3101 Setting Out

a) Works shall be set out in relation to defined grids and datums established by the Contractor and accepted by the Architect.

b) Setting out shall recognise the interface of the works with other areas of works and shall, where not otherwise indicated by the Architect, be set out by the Contractor to minimise cutting and avoid narrow cuts.

c) Setting out grids shall be established parallel to walls unless otherwise indicated by the Architect.

d) Paving co-ordination with manhole covers, etc shall be agreed with the Architect prior to the commencement of the construction of the manholes where possible and prior to the laying of the slabs.

Q25.3102 Bedding Method

a) Light filling mixed with mortar, added on top of structural slab shall be used to create an even slope.

b) The light filling shall be added in various thicknesses from 0-90mm.

c) The bitumen sheet membrane shall be torched onto the sloping filling according to the manufacturer's specifications. The membrane shall be protected by a rigid plastic protection sheet. If a flexible bitumen sheet membrane is not used, a sliding layer shall be added consisting of two layers of thin plastic (polythene).

d) Semi-dry mortar shall be added and levelled with a trowel. The mortar shall be well compacted to prevent voids beneath the stone slab. The slab shall be cleaned before fixing, no dust or

stone laitance shall be allowed. The level of the mortar has to be adjusted by carrying out a test mounting of the slab.

e) The adjustment of the level of the mortar is very important in achieving a good result.

f) The adhesive shall be as the manufacturer's recommendations, in accordance with the requirements of the Specification.

Q25.3103 Joints and Grouting

a) The joints shall be totally cleaned of concrete, dust or similar before the grouting can start.

b) The grout shall consist of a mixture of cement and sand (1 part cement and 3 parts sand of particle size 0 to 2mm) that shall be mixed with water to a suitable consistency. This mixture shall be 'poured' into the joints, using a watering can or similar. This work shall be done as quickly and as precisely as possible after the slabs are laid, at the latest one day after laying.

c) The grout shall be in full contact with the stone slabs on both sides (minimum depth 30mm). When the grouted joint has started to dry, excess grout on the surface of the stone slab shall be cleaned away using a clean and wet sponge.

d) When the grouting is finished, the paving shall be covered by plastic and kept humid for 5-7 days to achieve a good setting.

Q25.3104 Laying of Paving

a) Paving units shall be cut neatly and accurately with a masonry saw to give neat junctions with edgings and adjoining finishes, including following the profile of adjacent work where radiused and curved.

b) Paving units shall be suitably bedded so that rocking does not occur or develop.

c) Lines and levels of finished surface shall be smooth and even, with regular falls to prevent ponding.

d) Finished paving shall have an even overall appearance with even joint widths and be free of mortar and sand stains.

e) Where paving is laid in a stack bond pattern, the corners of the paving slabs must meet accurately, unless otherwise agreed with the Architect.

Q25.3105 Cutting Slabs

a) Cut with a masonry saw or disc cutter only.

b) When cutting a notch from the corner of a slab, which exceeds 25% of the slab area, mitre cut the remaining shape from the internal corner of the notch of the opposite external corner.

c) Diagonally cut slabs or portions of slabs to form a mitre at abrupt changes of level at the ends of ramped footpath crossings and the like.

Q25.3106 Inclement Weather

a) Paving shall not be laid if the temperature is below 3°C on a falling thermometer or below 1°C on a rising thermometer.

b) Frozen materials or bedding shall not be used on frozen or frost covered bases.

c) Paving shall be adequately protected with mortar joints and/ or mortar bedding from frost damage. It shall also be protected from rapid drying out or saturation until mortar has hardened.

Q25.3107 Acceptance of Base

Before starting work, the points stated below shall be followed:

a) The base shall be sound, clean and suitably close textured.

b) The levels and falls of the base shall be as detailed, within the specified tolerance of

c) ±12mm.

d) Drainage outlets shall be within +0 to -10mm of the required finished level.

Q25.3108 Levels of Paving

The permissible deviation from the specified levels shall be ±6mm generally. Paving shall be set 6mm above drainage outlets and 2mm above kerbs.

Q25.3109 Regularity

a) Sudden irregularities shall not occur.

b) Where appropriate in relation to the geometry of the surface, the variation in gap under a 3m straightedge (with feet placed anywhere on the surface) shall be not more than 6mm.

c) The difference in level between adjacent paving units shall be not more than 2mm.

Q25.3110 Slab Paving - Mortar Pointed Joints

a) Mortar mix for pointing joints to suit paving of colour to the acceptance of the Architect.

b) Immediately after completing joints, paving shall be covered with polythene sheeting for not less than 5 days.

Q25.3111 Sand Bedding

a) Lay and compact sand to give the specified final thickness using one of the following methods:

i) Either: Lay and compact using a vibrating plate as BS 7533: Part 4and loosen the top 10mm using a rake.

ii) Or, lay and compact as above, then screed out a further 10mm of loose sand.

b) Do not deliver bedding sand to the working area over uncompacted paving. Ensure that there is no disturbance to the bedding course by pedestrian or wheeled traffic. Fill voids left by screed rails.

c) Do not leave areas of bedding exposed; proceed with laying paving immediately.

d) Supply slabs/ flags to laying face over newly laid paving but stack at least 1m back from laying face. Do not allow plant to traverse areas of uncompacted paving.

Q25.3112 Narrow Sand Filled Joints for Sand Bedded Paving

a) Place slabs/ flags squarely with minimum disturbance to bedding, laying away from previously laid slabs/ flags.

b) Lay slabs/ flags with a joint width of 2-5mm. Do not use mechanical force to obtain tight joints.

c) On the same day as laying and before the onset of wet weather, brush clean dry sand over the joints, then bed down the slabs/ flags using a plate vibrator to BS 7533: Part 4. Refill the joints with sand. Repeat the process until the joints are completely filled.

d) Where early trafficking leads to settlement of the jointing sand, refill the joints as specified.

e) Do not use vacuum machines on the completed paving.

Q25.3113 Protection from Traffic

a) Paving bedded on mortar shall be kept free from pedestrian traffic as recommended by the manufacturer.

b) Access to paved areas shall be restricted as necessary to prevent damage from Site traffic and plant.

c) Site traffic and plant access to areas with geotextile shall be avoided until the upper granular sub-base has been fully laid with the prior acceptance of the Architect.

End of Section

UCLH PHASE 4 AND PROTON BEAM THERAPY BUILDING PROJECT

Architectural Specification

Section: Q31 External Planting

Revision: A – 100% Stage E Issue

Revision	Date	Clauses revised	Notes
Contract Issue	28/07/2014	**-**	-
Rev. A **100% STAGE E ISSUE**	04/11/2016	**-**	-

General notes:
Omissions to specifcation shown in blue and struck through. ~~Example.~~
Additions to specification shown in red. Example.
Updates from Contract Specification to be agreed by ByUK and UCLH where relevant.

Scott Tallon Walker Architects

Q31 EXTERNAL PLANTING

To be read in conjunction with Section A91 and other related sections of the Specification, Preliminaries and Contract Conditions.

Q31.1000 SCOPE, SUBMITTALS, TESTING AND PERFORMANCE

Q31.1100 SPECIFICATION AND SCOPE

Q31.1101 Scope

a) Works covered in this section are specified by performance and therefore designated as works with specialist sub-contractor Design (SCD). Refer to Section A91.

b) Complete the Detailed Design, manufacture, supply, install and warrant the works whilst complying with the visual intent indicated on the Design Drawings and criteria stated in the Specification.

c) For design and general performance requirements, refer to Section A91 of the Specification. Specific design and performance requirements are as defined in the particular trade sections.

d) Where no material, product or supplier is indicated in the Specification, propose suitable materials and systems prior to Contract award which comply with the visual intent and performance criteria stated and remain fully responsible for the Detailed Design of the works.

e) Where a particular material, product or supplier is indicated in the Specification, such material, product or supplier shall be deemed indicative representing the Architect's design intent only. The Contractor may complete the installation using that product, or such other confirmed as acceptable by the Architect in writing, but shall remain fully responsible for the Detailed Design and performance of the works.

Q31.1102 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) External planting.

b) Associated planters and irrigation systems.

Q31.1103 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.

Q31.1200 DESCRIPTIONS/ TYPES

Plants/ Shrubs/ Planters

Q31.1201 Type EPL-001 Planting to planters EXT-003

a) Planting to planters EXT-003 – low maintenance type planting.

b) Low maintenance planting.

c) Minimum installation of plants 3ltr pots @5/m².

d) Species to be determined but based on the Design and Access Statement.

e) Planter box design as indicated on the Design Drawings.

Q31.1202 Type EPL-002 Mounding Planting

a) Mounded planting with ornamental trees.

b) Soil profiled planter bed with ornamental, multi-stemmed trees and under planting.

c) Trees: Multi-stem. Container grown. Minimum installation height 3-4m ht.

d) Species to be determined but based on the Design and Access Statement.

Q31.1203 Type EPL-003 High level Planting

High level planting (tall).

Q31.1204 Type FX-021 Planters at ground floor level within the public atrium

a) Material to match main reception desk (Refer to Section N20) – Corian with no visible joints.

b) Moveable with concealed lockable castors.

c) Ornamental tree within each planter.

d) Lighting to be concealed within skirting of planter.

e) Tree uplighter.

f) System to have integrated drip feed irrigation system.

g) Low maintenance planting.

h) Minimum installation of plants 3ltr pots @5/m².

i) Plant species to be determined but based on the Design and Access Statement.

Q31.1300 SUBMITTALS AND TESTING

Tender Submittals

Q31.1301 Tender Response

a) Provide tender submittals in accordance with the requirements of Section A91.4000 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:

i) List of Tests included.

ii) QA/ QC programme.

iii) Summary of deviations from the Specification.

iv) Outline technical specifications reflecting proposed materials/ systems.

v) A list of proposed suppliers and sub-contractors intended to be used.

Samples, Mock-ups, Prototypes and Quality Benchmarks

Q31.1302 Pre-contract Samples

Not required.

Q31.1303 Post Contract Award Samples

Required. Include cost to visit selected nurseries. Note : Orders to be placed in good time.

Q31.1304 Mock-ups

Not required.

Q31.1305 Prototype Requirements

Not required.

Q31.1306 Benchmark Requirements

The following quality benchmarks shall be provided in accordance with Section A91.4000:

a) The first installation of a completed planter with planting.

b) The first installation of each planting type.

Q31.2000 MATERIALS/ PRODUCTS

Q31.2100 SYSTEMS

Plants

Q31.2101 Plants Generally

a) Condition: Materially undamaged, sturdy, healthy and vigorous.

b) Appearance: Of good shape and without elongated shoots.

c) Hardiness: Grown in a suitable environment and hardened off.

d) Health: Free from pests, diseases, discoloration, weeds and physiological disorders.

e) Budded or grafted plants: Bottom worked.

f) Root system and condition: Balanced with branch system.

i) Standard: To be agreed with the Landscaping Consultant.

g) Species: True to name.

h) Origin/ Provenance: To be agreed with the Landscaping Consultant.

i) Definition: Origin and Provenance have the meaning given in the National Plant Specification.

i) Refer to the Landscape architect's 'Plant Palette'.

Q31.2102 Preparation, Planting And Mulching Materials

a) General: Free from toxins, pathogens or other extraneous substances harmful to plant, animal or human life.

b) Certification of source, analysis, suitability for purpose and absence of harmful substances: Submit.

c) Certified materials: To be agreed with the Landscaping Consultant.

d) Give notice before ordering or using.

Q31.2103 Soil Conditions

a) Soil for cultivating and planting: Moist, friable and (excepting aquatic/ marginal planting) not waterlogged.

b) Frozen or snow covered soil: Give notice before planting. Provide additional root protection. Prevent planting pit sides and bases and backfill materials from freezing.

Q31.2104 Underground Guys

a) One No. kit per tree will be required. The kit will consist of galvanised guying wire fixed to anchors or approved deadmen, with ratchet tensioner and Plati-Mats to top of rootball. The kit types are to be specified by the contractor, relevant to the size of tree being planted and to the approval of the Landscape Architect.

b) Anchors as supplied by Platipus Anchors Ltd, Perrywood Business Park, Honeycrock Lane, Salfords, Nr Redhill, Surrey, RH1 5DZ, telephone: 01737 762300. Refer to manufacturer's guidelines for additional fixing information/detail.

c) The Contractor may submit an appropriate alternative for approval, if supported by a fully compatible technical specification.

Q31.2105 Watering Pipes

a) One No per each tree location will be required.

b) Root Rain Civic System, inlet 80mm diameter 80/60 reducer and 60mm diameter PE perforated pipe.

c) Shall be supplied by Greenleaf, Haywood Way, Hastings, East Sussex or an equivalent.

Q31.2106 Soil

a) For intensive roof level applications. Intensive lightweight planting soil mix.

b) Shall be supplied by Bourne Amenity Ltd., The Wharf, Rye Road, Newenden, Kent, TN18 5QG.

Q31.2107 Mulch

a) Approved stone mulch is to be used. Mulch shall be spread 50 mm thick to all planted areas following planting and watering.

b) Stone Mulch:

i) Stone slate mulch from an approved supplier. CED Ltd. 728 London Road, West Thurrock, Grays, Essex RM20 3LU. www.ced.ltd.uk. Telephone 01708 867 230, email sales@ced.ltd.uk.

ii) Samples to be provided for the approval of the Landscape Architect. A 5 kg sample to be kept on site. The Contractor may submit an appropriate alternative for approval, if supported by a fully compatible technical specification.

Q31.2109 Irrigation System

a) Indicative supplier/ installer: Watermatic Sustainable Solutions.

b) System:

i) The irrigation system shall be a fully programmable automatic control unit with moisture/ rain sensor, allowing individual plant zone programming.

ii) The water supply shall be from a separate storage tank and submersible pump with float switch operation.

iii) Planters/ planting areas shall have a combination of mini sprinklers, biodrips and a root zone watering system for internal planters to achieve maximum coverage, with a series of solenoid isolation valves. Internal planters shall not have mini-sprinklers.

iv) Pipes and fittings shall be durable and of very high quality.

c) The following irrigation systems shall be installed:

i) Internal Ground Level: Biodrip and root zone watering.

ii) Ground: Internal biodrip and root zone watering.

iii) First floor: Biodrip, mini spiders' sprinklers and RZWS.

iv) Third floor: Biodrip, mini spiders' sprinklers and RZWS.

v) Fifth floor: Biodrip and mini spiders' sprinklers and RZWS.

d) System Components:

i) Controller:

· Weathermatic Modular Controller Computer.

· To provide different watering schedules for each particular zone.

· the system shall be programmable to irrigate overnight to minimise evaporation and to maximise water flow and pressure.

· Location of the computer to be agreed with the Architect.

ii) Moisture/ Rain Sensor:

· Moisture sensor or mini click rain sensor.

· To detect moisture or rain and shall stop the system from operating if too much moisture or rain is detected.

· When dry conditions return, the sensor shall reactivate the system without interfering with the running programme.

iii) Storage tank:

· Material: Extra thick quality recyclable polyethylene.

· Approximate size: 1750mm long x 670mm wide x 1260mm high

· Capacity: 1115 litres.

· Location to be agreed with the Architect and the Engineer.

iv) Submersible pump: Submersible Espa pump (7,4/ 6) located within the storage tank.

v) Mini sprinklers: Flow regulated, with robust ground stake and anti-insect intrusion, allowing increase or decrease of the watering radius.

vi) Drip irrigation: BioDrip line with anti-siphon mechanism and built-in device to eliminate water draining from the drip lines.

vii) Solenoid valves: The valves shall be first class solenoid valves from a reputable manufacturer, control via a special multi core cable from the computer.

viii) Pipes: Polyethylene pipe conforming to BS 6572 spec s,d.r .11.

e) Maintenance: Maintenance of the system shall be provided for 12 months from Practical Completion.

Q31.2200 MATERIALS

Fertilisers and Ameliorants

Q31.2201 Generally

a) Materials for use in the works shall be as identified below.

b) Amendments to specified quantities due to agreed product substitutes shall be acceptable to the Architect.

Q31.2202 Anti-desiccants

a) Foliar spray.

b) Apply in accordance with the manufacturer's written recommendations.

c) The product(s) shall be acceptable to the Architect.

Q31.2203 Other Ameliorants

a) A long life crosslinked polyacrylamide water-storing polymer capable of absorbing 400 times its own weight of water, of which 95% shall be plant available, shall be used.

b) Cultivate into a depth of 200-350mm.

c) It shall be applied in accordance with the manufacturer's written recommendations.

Plants/ Shrubs

Q31.2204 General

a) Material shall be adequately and carefully packed and protected against mechanical damage, extremes of temperature and drying out.

b) A certificate stating that plants comply with the Employer's Requirements shall be submitted.

Q31.2205 Condition of Material

All plant material shall be healthy, vigorous and sound transplanted nursery stock, with well-formed fibrous roots and heads and to have been grown at, or grown on, the supply nursery for a minimum of one year.

Q31.2206 Contract Grown Material (Shrubs)

a) All base material for contract growing shall be inspected and tagged according to the relevant section of the Specification.

b) The Contractor is required to provide a Method Statement with his priced tender giving full details of his intended sources for all the material and where it is to be held between tagging and delivery to Site.

c) All plants shall be healthy, vigorous and of normal habit for the species/ cultivar and clone specified, and accord fully with the relevant clauses of BS 3936.

d) All contract grown material shall comply with the following:

i) Shrubs shall have a minimum of 4-5 strong, healthy shoots and shall have been pruned back (depending on the species) to produce a sturdy, well-balanced and bushy plant.

ii) Shrubs shall be lined out with sufficient space to encourage unrestricted, sturdy

growth and shall not be cramped or overshadowed.

iii) Sizes indicated by the schedules are the minimum acceptable, measured from the soil level in the container to the outer extent of the general crown.

iv) Container sizes listed in the schedule shall be the minimum size acceptable and shall be of rigid plastic or similar. Plants grown in plastic grow bags or similar are not acceptable.

v) Plants shall be maintained in prime condition for the duration of the contract growing period and shall be available for inspection by the Architect at all times and on a regular basis to be agreed.

vi) Plants shall be of the highest quality and free of dead material, fungus, pest and disease.

vii) At the time of delivery, plants shall be fully established in the containers, so that on removal the entire root ball remains fully intact. However, plants shall not, under any circumstances be supplied in a cramped or potbound condition.

viii) Climbers shall be grown on timber frame supports at a height of 1.2m and of sufficient sturdiness to withstand handling and transportation to Site.

ix) Allowance shall be made for delivery of all plants to Site as shall the provision of all necessary protection and shelter during transit/ loading. This shall be in full accordance with the latest relevant British Standard.

Q31.2207 Pre-delivery Inspection

All plant stock shall be inspected by the Architect before supplying to Site, then clearly identified as being reserved for use on this project. The quality and health of plant material shall be monitored prior to delivery on Site.

Planters

Q31.2208 Generally

a) All planters to have integrated drip feed irrigation system.

b) Refer to the Design Drawings for details and design.

Q31.3000 SITE INSTALLATION

Q31.3100 PLANTING GENERALLY

Q31.3101 Climatic Conditions

a) The work shall be carried out while soil and weather conditions are suitable for the relevant operations. Plants moved in warm weather conditions shall be sprayed and watered regularly.

b) Planting shall not be carried out when persistent drying winds are likely to occur or soil is waterlogged or excessively dry.

c) Times Of Year For Planting:

i) Deciduous trees and shrubs: Late October to late March.

ii) Conifers and evergreens: September/ October or April/ May.

iii) Herbaceous plants (including marginal): September/ October or March/ April.

iv) Container grown plants: At any time if ground and weather conditions are favourable.

v) Watering and weed control: Provide as necessary.

vi) Dried bulbs, corms and tubers: September/ October.

vii) Colchicum (crocus): July/ August.

viii) Green bulbs: After flowering in spring.

ix) Wildflower plugs: Late August to mid-November or March/ April.

x) Aquatic plants: May/ June or September/ October.

Q31.3102 Use of Chemicals Generally

a) Chemicals shall only be used where specified and accepted.

b) Only chemicals on the current list of the Agricultural Chemicals Approval Scheme shall be used.

c) When near water, drainage ditches or land drains comply with DEFRA's Code of Practice (formerly the Ministry of Agriculture, Fisheries and Food).

d) A certified operator shall be used to take appropriate safety precautions and to comply with all relevant statutory legislation.

e) The Architect shall be notified of any intention to apply chemicals, of the product to be used and of the dose rates. Permission to do so shall be received from the Architect.

f) All empty or unwanted containers and chemicals shall be disposed of, including unused diluted tank mixture, in a safe way in accordance with all relevant statutory legislation. Disposal shall be off Site unless prior arrangements have been made.

Q31.3103 Machines and Tools

Only machinery and tools suitable for the Site conditions and the work to be carried out shall be used. Hand tools shall be used around trees, plants and in confined spaces where it is impracticable to use machinery.

Q31.3104 Irrigation

Water shall be provided from the irrigation system, which shall be fully commissioned before planting begins.

Q31.3105 Drought Conditions

If the water supply is or is likely to be restricted by emergency legislation:

a) Inform the Architect without delay and ascertain the availability and additional cost of water from an alternative source.

b) If shrub planting has not been carried out, do not do so until instructed.

c) If shrub planting has been carried out, obtain instructions on supply of water.

Q31.3106 Notice to the Architect

Make advance arrangements with the Architect to give him the opportunity of being present during:

a) Setting out.

b) Application of fertiliser.

c) Planting of shrubs.

d) Planting of trees into previously dug pits.

Q31.3107 Setting Out

Clearly mark the position of all trees and the boundaries of shrub beds as set out on the Design Drawings. Invite the Architect to inspect and agree the setting out before digging tree pits or starting planting work.

Q31.3200 MAINTENANCE DURING GROWING ON PERIOD

Q31.3201 General

a) The health, quality and achievement of the plant prior to delivery to Site shall be monitored. In particular, it shall be ensured that the plant material to be grown is lined out at centres appropriate to the full achievement of the plant, allowing for lateral as well as vertical growth. It shall also be ensured that the roots have been properly prepared for lifting and long-term plant development.

b) The supply nursery shall be visited every three months with provision made for the Architect to accompany also. The quality and health of the plant material shall, at the time, be checked.

Q31.3300 STORAGE

Q31.3301 General

a) Plants that are not to be planted on the day of delivery to Site shall be stored by accepted methods as recommended by the supply nursery.

b) Plants awaiting planting shall not at any time be exposed to drying winds, sun or drought.

c) Plants so stored shall not be subject to any extra cost. Any losses, damage or vandalism to the material whilst so stored shall be the sole responsibility of the Contractor.

d) The location of stored stock shall be agreed with the Architect.

Q31.3400 PROTECTION OF PLANT MATERIAL

Q31.3401 Generally

a) Shrubs/ plants shall be supplied with protection in accordance with BS 3936. All plants shall be adequately and carefully packed and protected to survive transport to Site without damage.

b) Particular care shall be taken to ensure that roots are not allowed to dry out, and all plants shall be protected by damp straw, moss, sacking or the like.

Q31.3403 Protection Generally

The work and plants shall be protected from damage by weather, traffic and other causes.

Q31.3404 Surplus Material

Subsoil, stones, debris, wrapping material and prunings shall be removed from Site.

Q31.3600 PREPARATION OF PLANTING BEDS

Q31.3601 Weed Control

Planting beds shall be treated with a suitable accepted herbicide complying with the manufacturer's written recommendations.

Q31.3602 Fertilisers and Ameliorants

Quantities/ rates of application of fertilisers and ameliorants shall be in accordance with the manufacturer's written recommendations based on the topsoil analysis.

Q31.3603 Soil conditioner

Soil conditioner shall be spread over all planting areas at $1m^3$ of loosened material per $6m^2$ prior to cultivation.

Q31.3604 Cultivation

a) Any compacted topsoil shall be broken up to full depth.

b) A few days before planting, the top 300mm of all planting beds shall be cultivated by rotovating and/ or double digging. Leave the surface regular and even.

c) Undesirable material brought to the surface, including stones and clay balls larger than 50mm in any dimension, roots, tufts of grass and foreign matter, shall be removed.

Q31.3605 Final Grading

When the topsoil is reasonably dry and workable it shall be graded to smooth, flowing contours, with falls for adequate drainage. All minor hollows and ridges shall be removed.

Q31.3606 Edges

Unless otherwise stated, finished levels of topsoil, after settlement, shall be to:

a) 25mm for grass areas above adjoining paving or kerbs.

b) 25mm for shrub areas above adjoining paving or kerbs.

c) Not less than 150mm below the dpc of adjoining buildings.

d) 25mm higher for shrub areas than for adjoining grass areas.

e) Married in with adjoining soil areas.

Q31.3607 Acceptance

The acceptance of the Architect shall be obtained for all levels and grading before grassing or planting.

Q31.3700 PLANTING SHRUBS/ SEASONAL PLANTS

Q31.3701 Evergreens

All shrubs shall be dipped in or sprayed with anti-desiccant before delivering to Site. Shrubs shall be sprayed with anti-desiccant soon after planting.

Q31.3702 Planting Generally

a) Before planting, any non-perishable containers shall be removed. The Architect shall be advised of any damaged roots and instructions shall be obtained.

b) Plants shall be planted upright or well balanced with the best side to the front. Backfilling material shall be carefully packed around evenly spread roots or root ball and heeled well in.

c) Plants shall be watered thoroughly immediately after planting, using a fine rose.

d) The Architect shall be advised of any damage to shrubs resulting from planting operations and instructions shall be obtained.

e) After planting, forked and/ or raked soil shall be to a fine tilth with accepted cambers and with hollows.

Q31.3703 Shrubs

a) Shrubs and ground cover shall be to BS 3936.

b) The finished level shall be at the original soil mark on shrubs and 25mm above the surrounding level to allow for settlement.

c) Spacing of Plants: Plants shall be positioned at spacings and in groupings as scheduled.

Q31.3705 Seasonal Installations

a) Plants shall be positioned in locations indicated on the drawings and evenly placed to achieve even spacing. Planting holes shall be at least 150mm wider than the root spread.

b) Previous installations shall be lifted and the arisings shall be removed off Site prior to the planting of the new installation.

c) Base fertiliser shall be accepted by the Architect prior to use. It shall be applied to prepared beds prior to each installation in accordance with the manufacturer's written recommendations.

d) Surplus stock shall be held to replace any plants that fail immediately.

Q31.3706 Identification of Plants

A plastic label clearly marked with species and variety shall be attached to each group of trees/ shrubs/ plants.

Q31.3800 PROTECTION/ MAINTAINING/ MAKING GOOD DEFECTS

Q31.3801 Protective Fencing

Newly planted areas shall be protected. The type of protection and the required timescale shall be agreed with the Architect. It shall then be removed. Any damage to planting shall be made good until the area is accepted. The fencing shall remain the property of the Contractor.

Q31.3802 Watering (Before Practical Completion)

During the establishment of the plants ensure that the irrigation system is operated to maintain healthy growth.

Q31.3803 Maintenance Before Practical Completion

Plants and planting areas shall be maintained in good condition and in accordance with the Post Completion Maintenance Requirements, undertaking all necessary operations up to the Practical Completion of this Contract.

Q31.3804 Cleanliness

Soil shall be removed from all hard surfaces and grassed areas and the works shall be left in a clean tidy condition at Practical Completion.

Q31.3805 Failures of Planting

Post Practical Completion, maintenance of the planting shall be carried out as specified in this Section. Any trees/ shrubs/ plants/ grass that are dead, dying or otherwise defective at the end of the 24 months Defects Liability Period shall be regarded as defects due to materials or workmanship not being in accordance with the Contract. They shall be replaced by equivalent trees/ shrubs/ plants/ grass at the next suitable planting season unless otherwise instructed. This shall not apply if the defects are caused by damage done by another party after Practical Completion.

Q31.3807 Watering/ Irrigation

a) Sufficient water shall be applied to maintain healthy growth of trees/ shrubs/ plants.

b) During dry periods the crown of plants shall be thoroughly sprayed with water in early mornings or late evenings, but on no account in bright sunny weather.

Q31.3808 Weed Control

Cultivation: All beds shall be kept clear of weeds by cultivating and using accepted herbicides. Beds shall be forked over as necessary to keep soil loose, with accepted cambers and no hollows.

Q31.3809 Fertiliser

A top dressing of an accepted compound fertiliser shall be applied in accordance with the manufacturer's written recommendations and at the times and frequency recommended in writing by the manufacturer.

Q31.3810 Pruning

Plants shall be pruned at appropriate times to remove dead, dying and diseased wood and suckers to promote healthy growth and natural shape and to encourage flowering. Cut ends exceeding 25mm diameter shall be dressed with fungicidal sealant.

Q31.3811 Cutting Formal Clipped Shrubs

The tops and sides of shrubs shall be clipped using hand or mechanical shears as required to maintain box shape and to encourage dense growth.

Q31.3812 Pest Control

a) Accepted pesticides shall be applied as necessary to control any insect or fungal attack.

b) Any signs of insect and/ or fungal attack shall be reported to the Architect. Accepted pesticides shall be applied immediately as instructed.

Q31.3813 Refirming

Trees and shrubs, and where appropriate their stakes, shall be regularly checked, particularly after high winds, and re-firmed and reset to proper grades or upright positions as necessary.

Q31.3815 Cleanliness

a) All deleterious materials shall be removed from hard surfaces/ planting beds, and Site shall be maintained in a clean and tidy condition.

b) Litter removal: Litter/ tipped material shall be removed from planted areas during each visit for weed control.

Q31.3816 Maintenance Instructions

a) Before the end of the Defects Liability Period a typewritten and bound maintenance specification for all works shall be submitted for the following five years.

b) Provide separate price to maintain the planting for 2 years after defects liability period including replacement of any dead or ill plants.

End of Section

UCLH PHASE 4 AND PROTON BEAM THERAPY BUILDING PROJECT

Architectural Specification

Section: Q37 Green Roofs

Revision: A – 100% Stage E Issue

Revision	Date	Clauses revised	Notes
Contract Issue	28/07/2014	**-**	-
Rev. A **100% STAGE E ISSUE**	04/11/2016	**Q37.1201**	Green roof system extended to include an Intensive system and subject to landscape designers propsals and specialists recommendations.

General notes:
Omissions to specifcation shown in blue and struck through. ~~Example.~~
Additions to specification shown in red. Example.
Updates from Contract Specification to be agreed by ByUK and UCLH where relevant.

Scott Tallon Walker Architects

Q37 GREEN ROOFS

To be read in conjunction with Section A91 and other related sections of the Specification, Preliminaries and Contract Conditions.

Q37.1000 SCOPE, SUBMITTALS, TESTING AND PERFORMANCE

Q37.1100 SPECIFICATION AND SCOPE

Q37.1101 General

a) Works covered in this section are specified by performance and therefore designated as works with specialist sub-contractor Design (SCD). Refer to Section A91.

b) Complete the Detailed Design, manufacture, supply, install and warrant the works whilst complying with the visual intent indicated on the Design Drawings and criteria stated in the Specification.

c) For design and general performance requirements, refer to Section A91 of the Specification. Specific design and performance requirements are as defined in the particular trade sections.

d) Where no material, product or supplier is indicated in the Specification, propose suitable materials and systems prior to Contract award which comply with the visual intent and performance criteria stated and remain fully responsible for the Detailed Design of the works.

e) Where a particular material, product or supplier is indicated in the Specification, such material, product or supplier shall be deemed indicative representing the Architect's design intent only. The Contractor may complete the installation using that product, or such other confirmed as acceptable by the Architect in writing, but shall remain fully responsible for the Detailed Design and performance of the works.

Q37.1102 Scope of Works

This section of the Specification, when read in conjunction with the Design Drawings, provides particular requirements with respect to green roof systems.

Q37.1103 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.

Q37.1200 SYSTEM TYPES

Extensive/ Intensive Green Roofs

Q37.1201 Extensive Sedum Roof System

a) Roof type: Refer to Section J31.

b) Substrate: Refer to Section J31.

c) Waterproofing: Refer to Section J31.

d) Thermal insulation: Refer to Section J31.

e) Protection: High impact root barrier system as recommended by the manufacturer. Refer also to Section J31 for root barriers.

f) Filter layers: Provide filter layers as recommended by the manufacturer.

g) Growing medium: Suitable growing medium for extensive bio-diverse green roof system as recommended by the manufacturer.

h) Depth: Refer to the Design Drawings.

i) Vegetation: Native species wild flowers, native grasses, plug plants and sedum. The Contractor shall propose suitable vegetation product system as recommended by a specialist green roof system manufacturer from the UK native Bio-Diverse species selection for approval by the Architect.

j) Accessories:

i) Provide extruded anodised aluminium edge retention trims where required as shown on the Design Drawings fixed to the roofing system as recommended by the manufacturer.

k) Green roof system subject to landscape designers proposals and specialist recommendations.

Q37.1300 SUBMITTALS AND TESTING

Tender Submittals

Q37.1301 Tender Response

a) Provide tender submittals in accordance with the requirements of Section A91.4000 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:

i) Samples where specified.

ii) List of Tests included.

iii) QA/ QC programme.

iv) List of proposed Working Drawings.

v) Summary of deviations from the Specification.

vi) Outline technical specifications reflecting proposed materials/ systems.

vii) A list of proposed suppliers and sub-contractors intended to be used.

Samples, Mock-ups, Prototypes and Quality Benchmarks

Q37.1302 Pre-contract Samples

Sufficient samples of the following, including relevant trade literature and technical specifications, shall be provided in accordance with Section A91.4000:

a) Root barriers, slip layers, drainage layers, moisture retention mats, protection layer, separation layer, filter layer.

b) Growing medium.

c) Anti-erosion matting.

d) Proposed trims/ edgings/ flashings.

Q37.1303 Post Contract Award Samples

In accordance with Section A91.4000, post contract award samples of the following shall be provided:

a) Root barriers, slip layers, drainage layers, moisture retention mats, protection layer, separation layer, filter layer.

b) Growing medium.

c) Anti-erosion matting.

d) Proposed trims/ edgings/ flashings.

Q37.1304 Mock-ups

Not required.

Q37.1305 Prototypes

Not required.

Q37.1306 Quality Benchmark Requirements

The following quality benchmarks shall be provided, in locations to be agreed with the Architect, in accordance with Section A91.4000:

a) The first structural bay of each type of green roof system.

Testing

Q37.1307 Waterproofing and Watertightness

a) Refer to Section J31.

Q37.1400 PERFORMANCE REQUIREMENTS

Comply with the general performance of Section A91.5000 and the following specific performance requirements.

General

Q37.1401 General Design

a) Green roof and associated features: Complete the detailed design.

b) Proposals: Submit drawings, technical information, calculations and manufacturers' literature.

c) Performance criteria: Comply with the performance requirements as specified in Section J31 as relevant.

d) Green roof systems shall comply with the requirements of the 'Guidelines for the Planning, Execution, and Upkeep of Green Roof Sites' as published by the Forschungsgesellschaft Landschaftsentwicklung Landschaftsbau e.V. (FLL).

e) Provide pressed metal flashings with polyester powder coated finish to all upstands and perimeter conditions as required.

f) Provide drainage outlets such as recommended by the system manufacturer with compatible leaf/ gravel guards.

g) Provide sub-layers/ interlayers, sealants (colour co-ordinated where visible), fixings and fastenings, fillets, protection boards, adhesives, filter layers, drainage layers, root barriers, separation layers and other accessories recommended by the system manufacturer to complete the installation.

h) The components of the system shall be covered by a single source warranty. Therefore, guarantees shall be obtained on the basis of a "back to back" type agreement provided jointly by the membrane manufacturer and the Contractor for the complete roofing system(s). The warranty shall cover the entire roof assembly and be obtained for the full warranty period with an insurance company backing based upon a single whole term premium paid at the inception of the policy with no requirement for periodic renewal premiums.

Q37.1402 Maximum Permitted Green Roof Loads

a) Dead loads:

i) Green roof layers: Refer to the Structural Engineer’s Loading Documentation.

b) Imposed loads:

i) Activity: In accordance with BS EN 1991 (UDL to be agreed with the Structural Engineer).

c) Vegetation: The Contractor shall submit proposals for review by the Architect.

d) Allowance for additional loads during construction: To be agreed with the Structural Engineer.

e) Service loads: To be agreed with the Structural Engineer.

f) Requirement: Restrict site activities to ensure that design loads are not exceeded, or submit proposals for temporary supports.

Q37.1406 Watertightness

a) Refer to Section J31.

Q37.1410 Local Factors

a) Visit the Site in order to become familiar with local requirements. Local microclimatic conditions shall be taken into account and grades of materials assessed as suitably

durable for the location shall be selected.

b) An assessment of microclimatic conditions shall be made with due allowance for any factors likely to have an adverse effect upon materials intended for the works. More appropriate materials shall be substituted if adverse effects are predicted.

Q37.2000 SYSTEMS AND MATERIALS

Q37.2100 MATERIALS

Q37.2101 Generally

a) Moisture control layer, filter layer, root barrier, drainage mat, combination layers, anti-erosion matting etc as recommended by the Green Roof manufacturer/ supplier.

b) Extensive Growing Medium: Biodiverse extensive green roof comprising a range of native grasses, wildflowers and sedums with 100% recycled crushed brick/rock and green waste compost UK sourced and manufactured or as recommended by the system manufacturer.

c) Ameliorant/ conditioner: 2-5mm horticultural grit or as recommended by the system manufacturer.

d) Coverage: As recommended by the system manufacturer.

e) Declaration of analysis: Submit for review by the Architect.

f) Parameters: Nutrient content/ Phytotoxicity/ To BS 3882, annex E as relevant.

Q37.2102 Edge Retaining Profile

a) Material: Brushed stainless steel grade 1.4401.

b) Profile/ dimensions: As indicated on the Design Drawings with a minimum of 250mm high x 100mm wide angle 5mm thick in lengths to co-ordinate and align with the building grid with secret fixings.

Q37.2103 Inspection Chambers

a) Size: The Contractor shall propose for approval by the Architect.

b) Depth: The Contractor shall propose for approval by the Architect.

Q37.2104 Roof Drainage Outlets

a) Type and location: Refer to the M&E Specification.

b) Material: Refer to the M&E Specification..

Q37.3000 SITE INSTALLATION

Q37.3100 WORKMANSHIP

Q37.3101 Execution/ Installation

a) Preparation: Clear all surfaces of debris.

b) Timing: After certification of waterproof membrane integrity.

c) Surface condition: Visually inspect waterproof membrane, report any damage.

d) Faults in waterproof membrane: Report.

e) Contamination: Do not use materials detrimental to healthy plant growth.

f) Storage: Do not overload.

g) Point loads: Avoid.

h) Outlets: Do not block.

i) Outlet grilles: Install as required.

Q37.3102 Adverse Weather

a) Unfinished work: Secure from damage and wind uplift.

b) Conditions: Do not install or work with frozen materials.

Q37.3103 Root Barrier Installation

a) Joints: Minimize.

b) Overlaps (minimum): As recommended by the manufacturer.

c) Upstands: Extend to top of growing medium.

Q37.3104 Protection Layer Installation

a) Joints: Minimize.

b) Overlaps (minimum): As recommended by the manufacturer.

c) Upstands: Extend to top of growing medium.

Q37.3105 Separation Layer Installation

a) Joints: Minimize.

b) Overlaps (minimum): As recommended by the manufacturer.

c) Upstands: Extend to top of growing medium.

Q37.3106 Moisture Retention Mat Installation

a) Joints: Minimize.

b) Overlaps (minimum): As recommended by the manufacturer.

c) Upstands: Fit closely around penetrations and outlets.

Q37.3107 Drainage Layer Installation

a) Extent: Continuous over entire roof area.

b) Fitting: As recommended by the manufacturer.

c) Upstands: Fit closely around penetrations and outlets.

Q37.3108 Filter Membrane Installation

a) Joints: Minimize.

b) Overlaps (minimum): As recommended by the manufacturer.

c) Fitting: As recommended by the manufacturer.

d) Upstands: Extend to top of growing medium.

Q37.3109 Growing Medium Installation

a) Handling: Minimize.

b) Conditions: Handle in the driest condition possible. Do not handle or install when wet or frozen.

c) Layers:

i) Depth (maximum): 150 mm.

ii) Sequence: Gently firm each layer before spreading the next.

Q37.3110 Anti-Erosion Mat Installation

a) Joints: Minimize.

b) Overlaps (minimum): As recommended by the system manufacturer.

c) Fixing: As recommended by the system manufacturer.

d) Frequency: As recommended by the system manufacturer.

e) Mat durability: Until vegetation is firmly rooted to growing medium.

Q37.3111 Edge Retaining Profile Installation

a) Joints: Minimize.

b) Cutting: Neat, accurate and without spalling.

c) Junctions: vertical, secured using proprietary connectors.

d) Position: True to line and level. Smooth continuous lines.

e) Fixing: As recommended by the system manufacturer to suit the performance requirements.

Q37.3112 Inspection Chamber Installation

a) Location: Install centrally over drain outlet.

b) Orientation: Align parallel with adjacent features.

c) Bedding: As recommended by the system manufacturer to suit the performance requirements.

d) Backfill: As recommended by the system manufacturer to suit the performance requirements.

e) Surround: As recommended by the system manufacturer to suit the performance requirements.

Q37.3115 Inspection

a) Timing: Before handover.

b) Give notice (minimum): 7 days.

Q37.3116 Completion

a) General: Leave the works in a clean, tidy condition.

b) Surfaces: Clean immediately before handover.

c) Outlets: Clean and clear of obstructions.

d) Completed green roof: Protect from adjacent or high level working.

Q37.3117 Documentation

a) Timing: Submit at handover.

b) Contents:

i) Growing medium declaration of analysis.

ii) Manufacturers' guarantees and warranties.

iii) Procedures for maintenance of the green roof.

iv) Record drawings showing the location of planting and associated features.

c) Number of copies: As agreed with the Architect.

End of Section