LIVING ROOF LANDSCAPE SPECIFICATION

W ZONE
KINGS CROSS ESTATE

Client:
MIDGUARD

ALD Project Ref:	ALD840/19
Document Ref:	KXC-TRI-W0-001-ALD840-L-90-0923
Document Revision:	P**01**
Current Issue Date:	6th March 2020
Original Issue Date:	*October 2019*
Reason for Issue:	Status Assign

Prepared by:

Applied Landscape Design
The Threshing Barn,
Bignell Park Barns
Chesterton,
Oxfordshire, OX26 1TD

Tel: 01869 249776
Email: mail@appliedlandscape.co.uk

REVISION AND REVIEW RECORD

Revision details

Rev	Date	Amendment	Creator	Checked
P01	6th March 2020	Updated in line with typical sections and coordinated plan layout drawing issue. Species schedules added following communication with specialist suppliers at Emorsgate, and Wildflower Turf Limited.	CB	KmJ

Review Record

Rev	Date	Amendment	Creator	Checked

CONTENTS

INTRODUCTION

1.1 This Living Roof Landscape specification is to be read in conjunction with:

DRAWINGS:

KXC-TRI-W0-001-ALD840-L-90-0003	Masterplan: Green and Brown Roof Layout
KXC-TRI-W0-001-ALD840-L-90-0421	W1W-W1E Green and Brown Roof Layout
KXC-TRI-W0-001-ALD840-L-90-0422	W2 Green Roof Layout
KXC-TRI-W0-001-ALD840-L-90-0423	W3 Green Roof Layout
KXC-TRI-W0-001-ALD840-L-90-0861	W1W Typical Section (planting substrate build ups)
KXC-TRI-W0-001-ALD840-L-90-0862	W1E Typical Section (planting substrate build ups)
KXC-TRI-W0-001-ALD840-L-90-0863	W2 Typical Section (planting substrate build ups)
KXC-TRI-W0-001-ALD840-L-90-0864	W3 Typical Section (planting substrate build ups)

REPORTS

Kings Cross Green Roof Strategy (Date 2014) prepared by the London Wildlife Trust

1.2 **Scope of works:**

The Living Roof Specification encompasses the soft landscape finishes, and soil / substrate related materials required to facilitate the planting, green roof and brown roof proposals illustrated on plan and section. To achieve the planting, the build ups require an edge to avoid soils migrating under adjacent paving slabs or into fire protection margins finished with round cobbles.

The metal edge specification is included here in. Reference is made throughout the drawings and documents prepared by Applied Landscape Design – to drawings prepared by:

a) RADMAT (specialist supplier for elements relating to insulation, waterproofing, outlets, inspection chambers over drainage connections, blue roof details, drainage matts etc)

b) MDS design (paving slabs, pedestals, interfaces with parapets / sky lights etc)

c) ARK (vents, holes through roof slab, drainage coordination, placement for mechanical plant and equipment on the roofs)

d) ARCO (maintenance and management strategy and details providing access for window cleaning, glass replacement, mansafe system on W3 – where indicated all items are indicative only on ALD drawings)

e) RAMBOLL (structural engineers)

1.3 **Development of the ER's:**

The information that has guided the production of this specification is provided in the Green Roof Strategy, the ERs drawing and specification prepared by FABRIK landscape architects, and with input from specialist suppliers relative to the build ups achievable on the roofs. With areas of soils / substrate generally limited to 150mm with up to an additional 50mm depth for localised and small scale mounding or undulations) the larger heathland species indicated in the ER's are not achievable. A focus is therefore given to the species, and habitat incidentals that can be achieved within the technical parameters of the current buildings.

LIVING ROOF SPECIFICATION SECTION TWO

GENERAL INFORMATION/ REQUIREMENTS

1) Contractor is to notify the Clients Agent if any discrepancies are noted between the living roof specification and associated drawings, and those of the architect / consultants involved in the design coordination for the living roof areas.

2) Contractor is to obtain written confirmation prior to actioning any part of the works relating to discrepancies.

3) Summary of living roof finishes

Green roof finishes apply to: W1W roof
W2 roof
W3 roof
Link between W1E and W1W, and between W1E and W3

Brown roof finishes apply to: W1E roof (which also supports solar panels)

Blue roof build ups including 85mm deep geocell are applied to W1E, W1W and W2 roofs

Traditional green roof drainage mats are applied to W3 roof (no geocell).

GRAVEL / HOGGIN / WOODCHIP / PAVINGS NBS Section Q23

To be read with Preliminaries/ General conditions.

TYPES OF SURFACING

171 STONE BALLAST To 'Separation Margins' & around fall protection components

- Plan layout: Drawings KXC-TRI-W0-001-ALD840-L-90-0421 to 0423
- Typical section: Drawings KXC-TRI-W0-001-ALD840-L-90-0841 to 0864
- Material: Stone Ballast / Free Draining Washed, Round Aggregate.
- Gravel: Loose laid and raked to uniform thickness:
  - Supplier: Contractor's Choice.
  - Size: Graded 20-40 mm free from fines and sharps (size to avoid risk of bird lift and drop on to public realm areas below)
  - Colour: Submit sample for Landscape Architect's approval.
  - Application: Type and size to reflect the fact it is visible from adjacent areas and is placed over drainage openings at the edges of the roof and as such the size must not be too small as to allow movement of the gravels through the outlet covers.
  - Thickness: As drawings and to avoid trip hazards / lips forming between material surface finishes

LAYING

320 SAMPLES

- Submit: Representative samples of Stone Ballast / Gravel to be used as separation margin, ahead of installation for sign-off.

340 LAYING GENERALLY

- Channels, gullies, etc: Keep clear.
- Finished surfaces:
  - Lines and levels: To prevent ponding.
  - Overall texture: Even.
  - State at completion: Clean.

350 COLD WEATHER WORKING

- Frozen materials: Do not use.
- Freezing conditions: Do not lay pavings.
- Cold bituminous surface dressings: Do not apply when ambient temperature is below 10°C.
- Other dressings or overlays: As manufacturers' recommendations.

TOPSOIL AND GROWING MEDIA NBS Section Q28

To be read with Preliminaries/ General conditions.

260A INSPECTING FORMATIONS

- Note: Waterproofing of the W Zone roofs / structure, installation of drainage outlets, the placement of the insulation, the blue roof geocell components, and works in relation to the maintenance and management rope access, and all fall arrest systems are to be complete prior to commencement of living roof works - as these elements all combine to present the 'formation to the living roof'
- Give notice: Before spreading imported rootzone / planting medium for Living Roof including the green roof finishes and the brown roof finishes.
- Notice period: 7 days.

300A ROOTZONE / PLANTING MEDIUM ANALYSIS

- Soil to be analysed:

  A) Green roof imported rootzone / planting medium specifically for use in living roof area as detailed Q28:521

  B) Broown roof imported material specifically for use in living roof area as detailed Q28:522

- Soil analyst: Appropriately qualified soil scientist or specialist supplier as part of the living roof composition:
  Tim O'Hare Associates LLP
  Howbery Park
  Wallingford
  Oxfordshire, OX10 8BA
  T: +44 (0)1491 822653
  F: +44 (0)1491 822644
  E: info@toha.co.uk
  W: www.toha.co.uk

- Samples: Collect in accordance with BS 3882, provide sample bag of material for record review against future imported material
- Submit:
  - Supplier name and location, date of sampling and details of organisation involved in sampling / testing
  - Declaration of horticultural analysis
  - Statement of visual condition (i.e. free from sharps, hydrocarbons, plant matter, weed seeds or roots, and any other foreign matter or material or substance that would render the rootzone unsuitable for horticultural use).
  - Declaration / record of contaminant free status (both deleterious materials and chemical properties)
  - Details of recycled content (source and volume by %)
  - Details of loading / weights and confirmation of compliance in regard to the roof loading constraints

- Horticultural analysis to include (not limited to) the following parameters, testing methods in accordance with BS 3882:
  - Clay (<0.002mm) .....%
  - Silt (0.002-0.05mm) .....%
  - Sand (0.05-2.0mm) .....%
  - Coarse Fragments (4-20mm) .....%DW
  - Coarse Fragments (>20mm) .....%DW
  - Permeability .....mm/hr

- Bulk Density @ Field Capacity Mg/m3
- Moisture Content @ Field Capacity .....%

- pH Value ..... Unit
- Electrical Conductivity (1: 2.5 water extract) .....µS/cm
- Exchangeable Sodium Percentage .....%

- Organic Matter .....%
- Total Nitrogen .....%

- Extractable Phosphorus ..... mg/l
- Extractable Potassium ..... mg/l
- Available Calcium ..... mg/l

395 PEAT

- Peat or products containing peat: Do not use.

520 IMPORTED MANUFACTURED PLANTING MEDIA Rootzone / Extensive Green Roof Substrate

- Manufacturer: Supplied by Bauder
  Contact: Chris Roddick, Green Roof Product Manager
  Tel: 01473 257671
  Email: c.roddick@bauder.co.uk
- Product reference: Extensive substrate
  https://www.bauder.co.uk/technical-centre/products/green-roof-landscaping/extensive-substrate
- Material: Specialist blend of crushed brick and selected mineral aggregates, enriched with mature compost.
  - Depth 100mm minimum after settlement upto maximum 200mm, with average not exceeding 150mm across the growing medium area.
  - Ameliorant/conditioner: Not Required
  - Declaration of analysis: Submit in accordance with Q28:300
  - Parameters: T BS3882, annexes A-E
- Loading criteria: Loading information, supporting details and evidence to be provided to confirm contractor acceptance of and compliance with the design criteria set out for the W Zone structures.

525 IMPORTED MANUFACTURED PLANTING MEDIA Brown Roof Substrate

- Source: As Q28:520 above, modified locally to provide a more 'brown' roof appearance in terms of stone, aggregate content under and around the solar panels.
- Locally left bare in areas to support evolving brown roof environment with target coverage of 70% planting.

660A SAMPLING

- General:
  - Deliver to site a sample load of not less than 1m³ of green roof substrate.
  - Deliver to site a sample load of not less than 1m³ of brown roof substrate.
- Give notice: Allow inspection before making further deliveries to site. Retain for comparison with subsequent loads.
  - Notice period: 7 days.

670A CONTAMINATION

- General: Do not use planting medium / rootzone / substrate contaminated with subsoil, rubbish or other materials that are:
  - Corrosive, explosive or flammable.
  - Hazardous to human or animal life.
  - Detrimental to healthy plant growth.
- Subsoil: In areas to receive topsoil, do not use subsoil contaminated with the above materials.
- Give notice: If any evidence or symptoms of soil contamination are discovered on the site, or in topsoil to be imported.

681 LIFTING PLANTING MEDIUM / ROOTZONE

- Lifting Method: DETAILS OF PROPOSED LIFTING MECHANISMS & OUTLINE METHOD STATEMENT TO BE SUBMITTED BY LANDSCAPE CONTRACTOR WITH TENDER SUBMISSION

691 HANDLING PLANTING MEDIUM / ROOTZONE

- Aggressive weeds: Give notice and obtain instructions before moving rootzone.
- Plant: Select and use plant to minimize disturbance, trafficking and compaction.
- Contamination: Do not mix rootzone with:
  - Subsoil, stone, hardcore, rubbish or material from demolition work.
  - Other grades of topsoil or rootzone.
- Multiple handling: Keep to a minimum.
- Wet conditions: Handle rootzone in the driest condition possible. Do not handle during or after heavy rainfall or when it is wetter than the plastic limit less 3%, to BS 1377-2.

701 SPREADING SUBSTRATE & HABITAT DIVERSIFICATION

- Temporary protection boards over insulation where present: remove before spreading rootzones.
- Depths after firming and settlement:
  - Depth maximum: 200mm, depth varies locally on roof.
  - Depth minimum: 120mm, only where depressions are designed in to locally modify the environment
  - Depth average: 150mm to accord with loading parameters defined by Ramboll Engineers
- Firm and consolidate rootzone when laying. Tip and grade to approximate levels in one operation with minimum of traffiking by people. Do not compact rootzone.
- Undulations: Refer to drawings indicating requirement for minor undulations / rise and fall in rootzone levels to create minor variations in environmental conditions and habitat establishment.
- Level in relation to edge: Refer to drawings and specification section Q37 for edging details and heights, rootzone to finish below top of edge to allow habitat turf / green roof to be installed without sitting proud.
- Crumb structure: Do not compact rootzone. Preserve a friable texture of separate visible crumbs wherever possible.

800A HABITAT INCIDENTALS DEAD WOOD LOG PILE

- Drawing: Refer to Living Roof Layouts for typical layout and number
- Detail: Refer to Section Four
- Material Supply:
  - Untreated, softwood, dead-wood logs with bark intact, varying sizes and states of decay, to be buried in places down to 50mm.
  - Sourced from a variety of tree species if possible.
  - Species, avoid those with known disease or insect issues
  - Logs should be a minimum of 600mm long and 20mm diameter
  - Secured in place where necessary.
  - Ensure log piles do not exceed the loading requirements
- Contractor to submit proposal and details of source/material and to confirm that material is not from a tree or region showing or recording any signs of disease. Ideally utilise deadwood arising from the tree works on site or local to the Kings Cross Estate.

805A HABITAT INCIDENTALS MOUNDS OF PEBBLES / ROCKS (Aculeate Islands)

- Drawing: Refer to Living Roof Layouts for typical layout and number
- Detail: Refer to Section Four
- Material Supply:
  - To incorporate a central mound area of sand and soil - to be compacted to retain form but not to be overlay compacted ie. must enable penetration by insects.
  - Arrangement of the mound is to be broadly a 30 degree angle (see sketch below) with the sandy exposure facing south.
  - Cover other area of the mound with angular cobbles 50-100mm diameter loosely placed.
  - Ensure mounding arrangements to not exceed local loading requirements.
  - Contractor to submit proposal and details of source/material.

810A HABITAT INCIDENTALS BIRD NESTING / BLACK RED START NESTING

- Drawing: Refer to Living Roof Layouts for typical layout and number
- Detail: Refer to Section Four
- Material Supply:
  - Untreated oak railway sleepers of sizes described in the illustrative detail, Section 4
  - Incorporate opening to allow ground level access for the Black Redstart
  - Integrate suitable nesting box as detailed in Section 4
  - Ensure mounding arrangements to not exceed local loading requirements.
  - Contractor to submit proposal and details of source/material.

920A DOCUMENTATION

- Timing: Maintain records throughout for inspection as requested.
- Contents:
  - Full description of all rootzone components for brown and green roof areas.
  - Record of source for all rootzone components for brown and green roof areas.
  - Analyst's report for each test carried out.
  - Record drawings showing the location and depth of rootzone.
  - Supplier's declaration of compliance with BS 3882 and with loading constraints set out by Ramboll Engineers.
- Number of copies: 3 unless advised otherwise in the project protocols / preliminaries in relation to the Conject database requirements.

GREEN ROOFS NBS Section Q37

To be read with Preliminaries/ General conditions.

GENERAL

130 EXTENSIVE GREEN ROOF Biodiverse Wildflower Green Roof

- Roof type: Wildflower Green Roof by Wildflower Turf or equal and approved.
- Contact:

  Address: Wildflower Turf Ltd
  Ashe Warren Farm,
  Overton, Basingstoke
  Hants, RG25 3AW
  Tel: 01256 771 222
  Email: wildflower@wildflowerturf.co.uk

- Product: Wildflower Turf Roof Turf – WFT-Roof-34
- Description: 20% Grass / 80% Flowers

- Substrate: In situ concrete slab to Engineer's Specification - completed prior to installation of Green Roof.
- Slope: No falls across slab
- Waterproofing: To Architect's Specification.
- Thermal insulation: To Architect's Specification.
- Protection: To Architect's Specification.
- Blue roof: To all roofs except W3, to include RADMAT Geocell product system in accordance with specialist suppliers design and specification.
- Moisture control layers: FD25 drainage / irrigation mat by Bauder or equal and approved. This is to be placed above the geocell, under the soft landscape areas and under the cobbles that link to drainage areas which sit within the green or brown roof finishes.
- Growing medium: Extensive growing medium / rootzone - as clause Q28:520.

  Depth: min. 100mm max. 200mm, average 150mm
- Vegetation: Wildflower Turf WFT-Roof-34 – refer to section 3 for breakdown of species within turf.
- Accessories: Edge retaining profile - as clause Q37:420.
- Supporting documentation:
  - Submit: Product details (trade literature and specific mix information)
  - Precedent information: Provide details of 3no. projects where the plant mix has been successfully installed and established in a similar situation / build ups / height and scale of roof.
  - Planting composition: As Wildflower Turf or equal and approved - designed with a range of species that flower from April to September, have a strong visual appeal and provide excellent habitat for wildlife
  - Maintenance: Confirm requirements prior to installation (typically one light cut in autumn with the removal of all arisings).

140 EXTENSIVE BROWN ROOF Biodiverse Wildflower Brown Roof

- Roof type: Emorsgate Seed Application or equal and approved.
- Contact:

  Address: Emorsgate Seeds
  Limes Farm
  Tilney All Saints
  Kings Lynn, PE34 4RT
  Tel: 01553 829028
  Email: info@emorsgateseeds.com

- Product: Bespoke mix suited for dry roofs, with shallow rooting / substrate depths

- Substrate: In situ concrete slab to Engineer's Specification - completed prior to installation of Brown Roof.
- Slope: No falls across slab
- Waterproofing: To Architect's Specification.
- Thermal insulation: To Architect's Specification.
- Protection: To Architect's Specification.
- Additional considerations: Solar panels are positioned within the areas of brown roof finishes.
- Blue roof: To all roofs except W3, to include RADMAT Geocell product system in accordance with specialist suppliers design and specification.
- Moisture control layers: FD25 drainage / irrigation mat by Bauder or equal and approved. This is to be placed above the geocell, under the soft landscape areas and under the cobbles that link to drainage areas which sit within the green or brown roof finishes.
- Growing medium: Extensive growing medium / rootzone - as clause Q28:525

  Depth: min. 100mm max. 200mm, average 150mm
- Vegetation: Bespoke brown roof seed mix – refer to section 3 for breakdown of species within turf.
- Accessories: Edge retaining profile - as clause Q37:420.
- Supporting documentation:
  - Precedent information: Provide details of another project where the brown roof seed species mix has been successfully installed and established in a similar situation / build ups / height and scale of roof.
  - Planting composition: As Emorsgate or equal and approved - designed with a range of species that flower that provide excellent habitat for wildlife in a brown roof matrix
  - Maintenance: Confirm requirements prior to installation (typically one light cut in autumn with the removal of all arisings).

PERFORMANCE

211 GENERAL DESIGN

- Green roof, brown roof and associated features: Detailed design has been prepared to provide an overall site wide matrix of habitats and biodiverse aspirations that reflect the Kings Cross Green and Brown Roof Strategy. The specifications and details are prepared on the information known at the time - this should be thoroughly interrogated prior to material procurement to ensure that no structural changes have occurred in relation to technical information.
- Proposals: To ensure continued management and compliance with opportunities and constraints, submit suppliers drawings and as built information, technical information, calculations and manufacturers' literature.
- Performance criteria:
  - To satisfy aesthetic, weatherproofing, insulation and structural performance criteria
- To satisfy native planting criteria to sit within the surrounding landscape.

255 MAXIMUM PERMITTED GREEN ROOF LOADS

- Dead loads:
  - Refer to Ramboll Engineers Specifications
- Imposed loads:
  - Activity: Refer to Ramboll Engineers Specification.
  - Vegetation: Refer to Ramboll Engineers Specification.
  - Allowance for additional loads during construction: Refer to Engineers Specification.
- Service loads: Refer to Engineers Specification.
- Requirement: Restrict site activities to ensure that design loads are not exceeded, or submit proposals for temporary supports.

PRODUCTS

320A ROOT BARRIER BY OTHERS

- Completed prior to commencement of Living Roof Softworks Package.
- *Where not completed by others: utilise products from the Bauder range to build up the protection layers.*

325A SLIP LAYER BY OTHERS

- Completed prior to commencement of Living Roof Softworks Package.
- *Where not completed by others: utilise products from the Bauder range to build up the protection layers.*

330A PROTECTION LAYER BY OTHERS

- Completed prior to commencement of Living Roof Softworks Package.
- *Where not completed by others: utilise products from the Bauder range to build up the protection layers.*

340A BLUE ROOF LAYER BY OTHERS

- Completed prior to commencement of Living Roof Softworks Package (for information the current product specification and system design is by RADMAT, using their GEOCELL water holding components to a unit depth of 85mm, wrapped in geotextile and connecting to RWOs with access hatches over.

350 DRAINAGE LAYER Including Moisture retentive fleece under and geotextile filter upper

- Manufacturer: Supplied by Bauder
  Contact: Chris Roddick, Green Roof Product Manager
  Tel: 01473 257671
  Email: c.roddick@bauder.co.uk
- Product reference:
  Drainage Board: DSE 20 (20mm drainage board)
  https://www.bauder.co.uk/technical-centre/products/green-roof-landscaping/dse-20
  Filter fleece: https://www.bauder.co.uk/technical-centre/products/green-roof-landscaping/filter-fleece

390A EXTENSIVE GROWING MEDIUM ROOTZONE FOR GREEN ROOF AREAS

- Refer to section Q28 for topsoil / rootzone specification

395A GROWING MEDIUM FOR BROWN ROOF AREAS

- Refer to section Q28 for topsoil / rootzone specification

420 EDGE RETAINING PROFILE Metal Edge - 150mm profile

- Manufacturer: Kinley or equal and approved
- Tel: +44(0)1580 830688.
  Product reference: ExcelEdge RoofEdge - AR150MR.
  https://www.kinley.co.uk/products/edging/exceledge/roofedge/150-mm-perforated-edging
- Material: Aluminium L-shaped retaining profile with perforations for water percolations. Unit length 2.4m, 150mm upstand height, 100mm width, 1.5mm thickness, 5mm top edge bead. Care taken not to pierce/breach waterproofing on installation
- Fixings: To manufacturer's details.
- Height: 150mm as typical sections
- Line and level: Refer to typical sections for placement of metal edge on a localised bed to achieve straight line and level, avoid any bowing or bending of edge on plan and in vertical plane.

440 VEGETATION BARRIER

- TO MAN-SAFE SYSTEM, UTILITY UPSTANDS, VENTS, RWO, ROOF LIGHTS, AGAINST LIFT OVER RUNS AND UPSTANDS (also described as 'separation margin' and as Q23: 171)
- Material: 20-40 mm ballast.
- Depth: As drawings
- Width: As drawings

EXECUTION

710 INSTALLATION GENERALLY

- Preparation: Clear all surfaces of debris.
  Timing: After certification of waterproof membrane integrity.
  Surface condition: Visually inspect waterproof membrane, report any damage.
- Faults in waterproof membrane: Report.
- Contamination: Do not use materials detrimental to healthy plant growth.
- Storage: Do not overload.
  Point loads: Avoid.
- Outlets: Do not block.
  Outlet grilles: Installed.

720 ADVERSE WEATHER

- Unfinished work: Secure from damage and wind uplift.
- Conditions: Do not install or work with frozen materials.

730A CLIMATIC CONDITIONS

- General: Carry out the work while rootzone and weather conditions are suitable.

731A WATERING

- Availability: Manual watering points are available around the project, and within 50m hosepipe reach.
  - Watering strategy for installation preparation will be applied by personal safely working on the roof (so as not to direct / move / blow rootzone around)
  - Watering strategy for maintenance purposes is such that once the vegetation mat is secured, water from a hosepipe can be manually applied from the ground level to the north and west of the roof, with periodic access on to the roof using the fall arrest system to ensure even and roof wide application of water is occuring.
- Quantity: Wet full depth of rootzone or brown roof build ups.
- Application: Even and without displacing plants, plug plants, seed, seedlings or rootzone.
- Frequency: As necessary to ensure the establishment and continued thriving of all wildflower enhanced sedum mat areas - but without creating habitats that are water-dependent.

732A WATER RESTRICTIONS

- Timing: If water supply is or is likely to be restricted by emergency legislation do not carry out seeding / planting / sedum - wildflower mat turfing until instructed. If seeding / turfing has been carried out, obtain instructions on watering.

771 DRAINAGE LAYER INSTALLATION

- Joints: Minimize
- Extent: Continuous over entire roof area.
- Fitting: Manufacturer's recommendation.
- Upstands: Fit closely around penetrations and outlets.

PREPARATION

780 PLANTING MEDIUM / ROOTZONE INSTALLATION

- Refer to section Q28 for procurement, handling and installation specification.

785 PREPARATION MATERIALS

- General: Free from toxins, pathogens or other extraneous substances harmful to plant, animal or human life.
- Certification of source, analysis, suitability for purpose and absence of harmful substances: Submit.
  - Certified materials: To Contractor proposal.
  - Give notice: before ordering or using.

786A GRADING

- Rootzone condition: Reasonably dry, slightly moist (moisture content at 15-25%) to avoid separation of soil components, and cleanly workable.
- Contours: Smooth and flowing, with falls for adequate drainage.
  - Hollows and sharp ridges: Not permitted.
- Finished levels after settlement: 5 mm above adjoining edge materials.
  Give notice: If required levels cannot be achieved by movement of existing soil.

790 HERBICIDE FOR LIVING ROOF AREA

- Type: Suitable for suppressing perennial weeds.
- Timing: Allow fallow period before cultivation.
  - Duration: As manufacturer's recommendation
- Application: Timing and logisitics associated with the living roof is to avoid a programme period between rootzone placement and planting, thereby avoiding need to weed kill / supress where possible.

791 SEED BED CLEANING BEFORE SOWING FOR BROWN ROOF AREA

- Operations: Remove weeds by hand weeding and hoeing.

800 DELIVERY AND STORAGE OF WILDFLOWER TURF

- Timing: Lay turf with minimum possible delay after lifting. If delay occurs, lay turf out on topsoil and keep moist.
- Frosty weather or waterlogged ground: Do not lift turf.
- Delivery: Arrange to avoid need for excessive stacking.
- Stacking height (maximum): 1 m.
- Dried out or deteriorated turf: Do not use.

805 INSPECTION OF VEGETATION MAT

- Give notice: Before lifting wildflower turf to roof top installation.

810 SEEDING AND TURFING GENERALLY

- Time of year: To be agreed - subject to Programme.
- Timing of laying:
  - Spring and summer: Within 18 hours of delivery.
  - Autumn and winter: Within 24 hours of delivery.

- Weather conditions: Do not lay turf when persistent cold or drying winds are likely to occur or soil is frost bound, waterlogged or excessively dry.
- Working access: Planks laid on previously laid wildflower turf.
  Do not walk on prepared bed or newly laid areas.
- Jointing: Laid with broken joints, well butted up. Do not stretch wildflower turf.
- Edges: Whole Mats, trimmed to a true line.
- Adjusting levels: Remove high spots and fill hollows with fine soil.
- Consolidating: Lightly and evenly firm as laying proceeds to ensure full contact with substrate. Do not use rollers.
- Dressing, brushed well in to completely fill all joints: with applicable roof top rootzone substrate.
- Watering: Thoroughly water completed turf immediately after laying. Check that water has penetrated into the soil below.

840A WILDFLOWER VEGETATION MAT INSTALLATION

- Handling blankets:
  Timing: Lay within 36 hours of lifting from growing position.
  Excessive stacking: Not permitted.
  Material loss (maximum): 3% of total surface area.
- Growing medium condition: Thoroughly watered and raked level.
- Laying blankets:
  Dry, damaged, frosty or waterlogged blankets: Do not lay.
  Orientation: Diagonal or perpendicular to slope of roof.
  Joints: Stagger. Butt together or slightly overlap to prevent gaps. Do not stretch blankets.
  Edges: Finish with whole blankets.
  Consolidation: Firm as laying proceeds to ensure full contact with the growing medium. Do not use rollers.
- Dressing: Submit proposals.
  Application: Brush in to fill joints.
- Watering: Thorough, immediately after laying and dressing.

850A WILDFLOWER SEED INSTALLATION TO BROWN ROOF

- Quality of seed:
  Produced for the current growing season
  Blue label certified varieties
  EC Purity and germination regulations and Department for Environment, Food and Rural Affairs Higher Voluntary Standard
  Official Seed Testing Station certificate of germination, purity and composition – submit when requested
- Growing medium condition: Thoroughly watered and raked level.
- Sowing: Establish good contact between the seed and the brown roof rootzone
- Dressing: Submit proposals.
- Watering: Thorough, immediately after seeding where climate conditions require.

855A PLANTING / PLUG PLANTING

- Species: Refer to section three for species lists.
- Handling plug plants:
  Keep plants watered and in shade until planted. Do not allow to dry out
- Growing medium condition: Thoroughly watered and raked level.
- Planting plug plants:
  Planting in areas of wildflower turf – create localised slits in turf, ensure contact with and into rootzone below the turf
  Planting in areas of seed – plant plugs prior and spread seed around to ensure and even spread
  Plant into a hole to suit plug plant size and shape. Create a cleft at bottom of hotel to improve rooting. Gently firm plant into the hole.

- Layout:
  - To green roof areas - to be randomised, in clusters of species. Setting out for plug and shrub species planting to be agreed on site with Landscape Architect in relation to the localised mounding, hollows and undulations.
  - To brown roof areas – to be randomised, in clusters of species. Extent and areas to be agreed on site with the Landscape Architect and coordinated with the shade / water shadows which will arise in relation to the layout of the solar panels.
- Watering: Thorough, immediately after planting

860 EDGE RETAINING PROFILE INSTALLATION

- Cutting: Neat, accurate and without spalling.
  Junctions: vertical, secured using proprietary connectors.
- Position: True to line and level. Smooth continuous lines.
- Fixing: To manufacturer's details (avoid puncturing waterproofing).

870A SITE INSPECTION VISITS FOR LIVING ROOF

- Number: A minimum of 2no site inspection by the project Landscape Architect is required prior to and during the planting period.
- Timing:
  - Site inspection shall take place immediately after final grading and before the final cultivation.
  - Site inspection shall take place during installation of the wildflower turf and seeding applications.

880A FAILURES OF WILDFLOWER VEGETATED MAT

- Defective materials or workmanship: Areas that have failed to thrive.
  - Exclusions: Theft or malicious damage.
- Method of making good: Recultivation and reseeding/ replacement of the vegetated mat / turf.
- Timing of making good: The next suitable planting season.

COMPLETION

910 INSPECTION

- Timing: Before handover.
  Give notice (minimum): 3 days.

920 COMPLETION

- General: Leave the works in a clean, tidy condition.
- Surfaces: Clean immediately before handover.
- Outlets: Clean and clear of obstructions.
- Completed green roof: Protect from adjacent or high level working.

930 DOCUMENTATION

- Timing: Submit at handover.
- Contents:
  Growing medium declaration of analysis.
  Manufacturers' guarantees and warranties.
  Procedures for maintenance of the green roof.
  Record drawings showing the location of planting and associated features.
- Number of copies: 3

SPECIES MIXES SECTION THREE

A: GREEN ROOF SPECIES

3.1 To create the desired effect on the W Zone green roof it is intended that a wildflower turf is used as the basis for this, and it will be interplanted occasionally in specific areas with Shrubs and Ferns that are also suitable for this roof / substrate environment. .

3.2 The following list of **Shrubs** to be incorporated into the roof, to be installed through the wildflower turf into the substrate below. RIBA Stage 5 drawings are to be prepared as part of the procurement process to confirm, and seek approval to the specific placement and numbers of these species.

Calluna vulgaris	– Heather
Calluna vulgaris 'Firefly'	– Heather
Cytisus scoparius	– Broom
Erica cinerea 'December Red'	– Heather
Erica cinerea 'Whitehall'	– Heather
Genista tinctorial	– Dyer's Greenweed
Hebe albicans	– White Hebe
Hypericum calycinum	– Rose of Sharon
Hyssopus officinalis	– Hyssop
Mahonia aquifolium	– Oregon Grape
Pyracantha coccinea	– Firethorn
Spirea japonica 'Little Princess'	– Spirea

3.3 The following list of **Ferns** to be incorporated into the roof in shady areas that will retain moisture, to be installed through the wildflower turf into the substrate below. RIBA Stage 5 drawings are to be prepared as part of the procurement process to confirm, and seek approval to the specific placement and numbers of these species.

Asplenium trichomanes	– Maidenhair Spleenwort
Polypodium vulgare	– Common Polypody

3.4 **Wildflower Turf Specification**

From Wildflower Turf Limited

Address:	Wildflower Turf Ltd Ashe Warren Farm, Overton, Basingstoke Hants, RG25 3AW
Tel:	01256 771 222
Email:	wildflower@wildflowerturf.co.uk
Product:	Wildflower Turf Roof Turf – WFT-Roof-34
Description:	20% Grass / 80% Flowers

3.5 Breakdown of Species (extract from suppliers specification / product information):

Wildflower Turf Roof Turf: *WFT-Roof-34

SEED SPECIFICATION – 20% grass / 80% flowers

- Subject to seed availability

	FLORA		
1	Autumn Hawkbit	(*Leontodon autumnalis*)	P
2	Betony	(*Stachys officinalis*)	P
3	Bird's foot Trefoil	(*Lotus corniculatus*)	P
4	Black Medic	(*Medicago lupulina*)	A/P
5	Bladder Campion	(*Silene vulgaris*)	P
6	Cat's ear	(*Hypochaeris radicata*)	P
7	Common Knapweed	(*Centaurea nigra*)	P
8	Common Sorrel	(*Rumex acetosa*)	P
9	Common Toadflax	(*Linaria vulgaris*)	P
10	Common Vetch	(*Vicia sativa*)	P
11	Cowslip	(*Primula veris*)	P
12	Field Scabious	(*Knautia arvensis*)	P
13	Hoary Plantain	(*Plantago media*)	P
14	Lady's Bedstraw	(*Galium verum*)	P
15	Meadow Buttercup	(*Ranunculus acris*)	P
16	Meadow Cranesbill	(*Geranium pratense*)	P
17	Meadowsweet	(*Filipendula ulmaria*)	P
18	Musk Mallow	(*Malva moschata*)	P
19	Ox Eye Daisy	(*Leucanthemum vulgare*)	P
20	Perforate St John's Wort	(*Hypericum perforatum*)	P
21	Ragged Robin	(*Lychnis flos-cuculi*)	P
22	Red Campion	(*Silene dioica*)	P
23	Ribwort Plantain	(*Plantago lanceolata*)	P
24	Rough Hawkbit	(*Leontodon hispidus*)	P
25	Salad Burnet	(*Sanguisorba minor*)	P
26	Self-heal	(*Prunella vulgaris*)	P
27	Small Scabious	(*Scabiosa columbaria*)	P
28	Thrift	(*Armeria maritima*)	P
29	Tufted Vetch	(*Vicia cracca*)	P
30	Viper's Bugloss	(*Echium vulgare*)	B
31	White Campion	(*Silene latifolia*)	P
32	Wild Marjoram	(*Origanum vulgare*)	P
33	Wild Red Clover	(*Trifolium pratense*)	P
34	Yarrow	(*Achillea millefolium*)	P
	GRASSES		
35	Sheep's Fescue	(*Festuca ovina*)	P

Key: P = Perennial; B = Biennial; A = Annual

B: BROWN ROOF SPECIES

3.5 Brownfield Roof Specification:

- vegetation cover is typically less than 70% (30-50% is best)
- the plants typically have a sedum and / or moss component (can be 100% sedum or moss)
- the substrate is shallow and is typically sandier and gravellier
- the roof type is simple intensive or extensive
- microhabitat piles of stones, scattered pieces of wood, bricks, broken concrete and other man-made items are typical on these roofs. These items could be items of Kings Cross heritage.
- Habitat aspiration as part of the Green Roof Strategy is that of a 'brownfield roof'

3.6 Vegetation for these habitats are best created from scratch rather than from seed mixes. Species that will thrive in these environments (dry, shallow rooting zones) are:

Arabis glabra	– Tower Mustard	F	Seed
Anthyllis vulenraria	– Kidney Vetch	E	Seed
Bellis perennis	– Daisy	F	Seed
Campanula glomerata	– Clustered bellfower	E	Seed
Clinopodium vulgare	– Wild Basil	E	Seed
Galium verum	– Lady's Bedstraw	E	Seed
Helianthemum nummularium	– Common Rock Rose	E	Seed
Hippocrepis comosa	– Horseshoe Vetch	E	Seed
Iberis amara	– Wild Candytuft	E	Seed
Lotus corniculatus	– Bir's Foot trefoil	E	Seed
Medicago lupulina	– Black Medic	E	Seed
Plantago media	– Hoary plantain	E	Seed
Primula veris	– Cowslip	E	Seed
Picris echiodes	– Prickly Ox-tongue	F	Seed
Salvia verbenaca	– Wild Clary	E	Seed
Trifolium dubium	– Lesser Trefoil	F	Seed
Trifolium arvense	– Hare's-foot Clover	E	Seed
Tussilago farfara	– Coltsfoot	F	Seed
Verbascum nigrum	– Dark Mullein	E	Seed
Veronica arvensis	– Wall Speedwell	E	Seed
Vicia sativa ssp segetalis	– Common Vetch	E, F	Seed
Sedum rupestre		F	Plug plant
Sedum album		F	Plug plant
Sedum telephium		F	Plug plant
Sedum acre	– Stonecrops	F	Plug plant

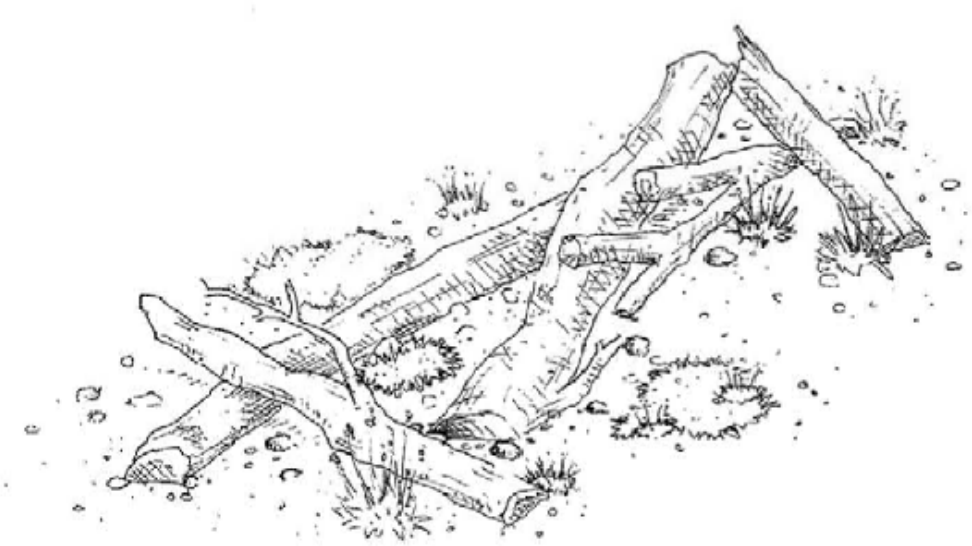
Species identified as 'E' are collated in coordination with the specialist seed supplier Emorsgate – from a long list of species Emorsgate hold in relation to brown roof seed mixes. Emorsgate confirmed the ability to make up bespoke mixes to suit the area and conditions.

Species identified as 'F' are part of the ER's proposals – it is noted that the long list provided at that time, are not all suited to the build ups now provided, the proximity of the solar panel shading and the upper roof level environment.

HABITAT INCIDENTALS

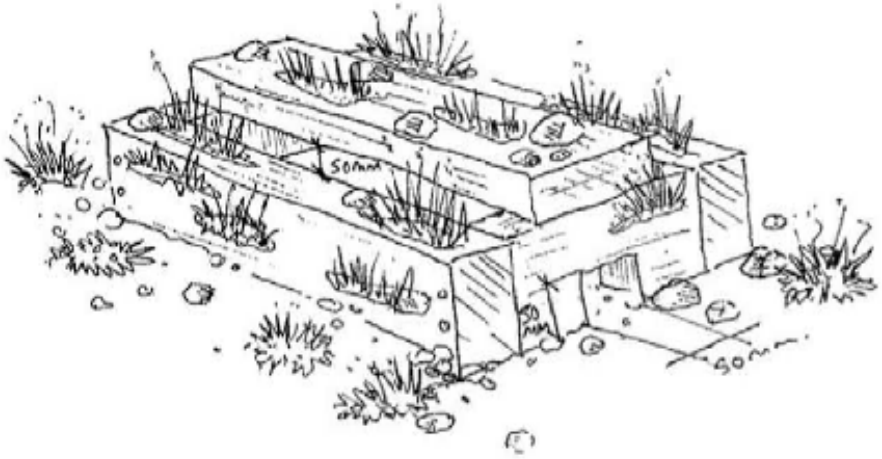
SECTION FOUR

Log Pile



- Piles of untreated, softwood and hardwood, dead-wood logs with bark intact, of varying size/states of decay to be buried in places down to 50mm.
- Ensure that sizing and installation is such that there is negligible risk of the wood being blown of the roof in the position installed.
- If availability allows, source logs from a variety of tree species.
- Ensure that the log piles do not exceed the local loading requirements of the green roof.
- Log piles to be situated only in the areas indicated on the Green Roof Masterplan drawings as the symbol:

Black Redstart Refuge



- Untreated oak railway sleepers of approximate size 1200 x 250 x 125mm to be bolted together with and cut pieces of approximately 350 x 250 x 125mm as indicated above, allowing a 50mm gap between side pieces and unbolted top piece. (Ensure the top piece remains unbolted should it need to be removed for maintenance reasons).

- In one of the side pieces cut a 50mm x 50mm square to allow ground access to refuge by Black Redstart.

- On the ground, before assembly begins, score grooves into the untreated railway sleepers. Once refuge is assembled on roof, fill grooves with a general purpose potting compost and plug plant up, add to the top of the refuge large stones/pebbles.

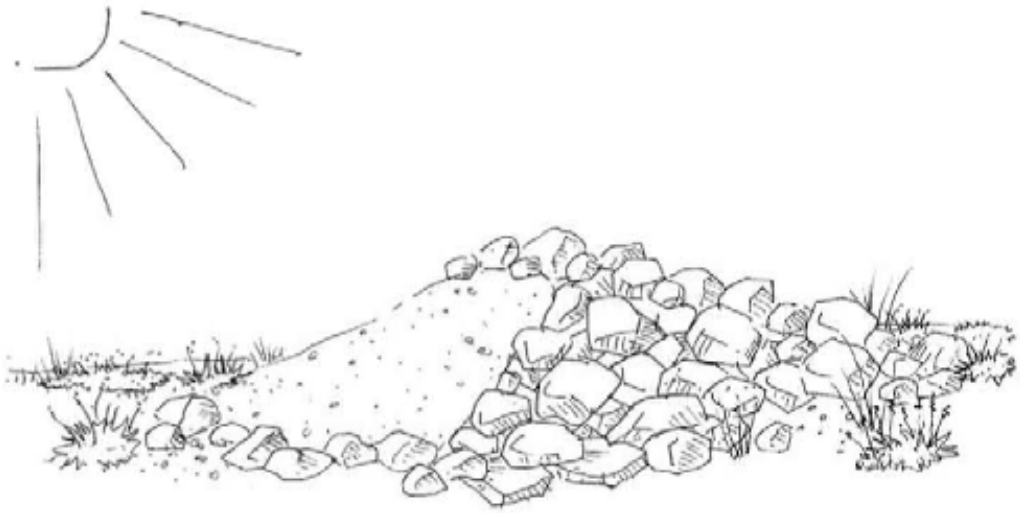
- Within refuge securely place a suitable nesting box for Black Redstart such as the open fronted woodcrete box (2HW) produced by Schwegler. [2]

- Ensure that the Black Redstart refuge does not exceed the local loading requirements of the green roof.

- Black Redstart refuges to be situated only in the areas indicated on the Green Roof Masterplan drawings as the symbol:

[2] Refer to: http://www.schwegler-nature.com/BirdCare/V_Frameside-02.htm

Mound of Rocks and Sand



- A central mound area of sand/soil to be compacted so that it readily maintains its form, but not over-compacted to the point of concretion or impenetrability (see below) - angled at 30 degrees with the broadest sandy exposure facing south.
- The south-facing slope to be made of sand mixed with enough clay and gravels to hold its form, and allow for a 6mm diameter round dowling rod to be pushed into the soil composite to create a tunnel that does not collapse when the rod is withdrawn from the substrate.
- The rest of the mound is then covered with angular cobbles approximately 100mm to 150 mm in diameter that are loosely placed to allow entry by invertebrates into the central soft substrate.[1]
- Mounded pebbles/boulders to vary from site to site in rock composition, dependent on availability / loading restrictions, this could include: limestone / sandstone / broken slates of varying sizes and shapes. A mixture of rock chemistries would be advantageous.
- Ensure that mound does not exceed the local loading requirements of the green roof.
- Mounds to be situated only in the areas indicated on the Green Roof Masterplan drawings as the symbol:

[1] Refer to: http://www.gmbp.org.uk/site/images/stories/black%20redstart%20sap%2009_draft.pdf