

Table of Contents

Title	Page
Q37 Green roofs	2

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To be read with Preliminaries/General conditions

SPECIFICATION NUMBER 104000 / Q37

Date: 30-05-12.

Revision: 01 - Title update 28-09-12

Revision: T1 - Updated for Tender Issue 25.01.13

Revision: C1- Updated for Construction Issue 09-06-2014

Revision: C2 - All updated to incorporate full specification for Intensive, Semi-Intensive, Extensive and Brown Roofs following J31 Rev C3, as DCR 007a 19-08-14

Revision: C3 - Update to 110, 120A, 130A, 130B, 310A, 420A. Clause 255 added. as DCR 008 03.09.14

Revision C4 - Update to 130A, 130B, 320, 350A, 350B, 350E, 360A, 360B, 370, 380, 390A,390B, 400, 400B, 400E, 400F, 420A & 120A omitted under DCR A-131 27.11.15

GENERAL

- 110 INTENSIVE GREEN ROOF To Level 2 Courtyard ONLY
- Roof type: Radmat MedO Intensive Green Roof System
" System Manufacture: Radmat Building Products Limited, Esha House, St Mary's Business Park, Albany Road, Market Harborough LE16 7EB Tel: 01858 410372, Fax 01858 410572 email: techenquiries@radmat.com, Web: www.radmat.com .
- Substrate: Dow Verdiseal SG over concrete structure (see J31/130C) .
- Slope: Flat .
 - Waterproofing: Liquid applied coating as section J31/130C .
 - Thermal insulation: n/a .
 - Protection: Root Protection Sheet root barrier as clause 320 .
 - Moisture control layers:
 - Radmat D80 Drainage/Reservoir panel, 80mm deep HDPE with cusplate back filled with AG15 Drainage aggregate as clause 350e
 - Radmat G12 Polyester geo-textile filter fleece 200g/m2. As clause 360b .
 - Growing medium:
 - Radmat Vulkatec GM10 extensive growing medium as clause 370 .
- Depth: minimum 300mm deep after settlement .
Vegetation: Submit proposals based on Phase 2B Stage D Scheme Design Plus Report
- Level 2 Courtyard .
 - Accessories:
 - Vegetation breaks: 300mm wide (on BC approval), 20-40mm rounded pebble margin.
 - Gravel Stop: GS10 Two height Gravel Stop 80x120mm as clause 420A. GS14 Curved Gravel Stop 80mm as clause 420A .
- 120A SEMI - EXTENSIVE GREEN ROOF to Level 4 Cardiac Wing East Annexe roof
Omitted due to weight limitation on roof structure. Now to be extensive green roof as clause 130A

130A EXTENSIVE GREEN ROOF to Level 9 Plant rooms and Level 4 Cardiac Wing West and East Annexe Roof areas

Refer to Specification J31 for details of the waterproof membrane and insulation build up.

- " Roof type: Radmat MedO Sedum Plus Mat Extensive.
- Substrate: Radmat ProTherm G Green Guide to Specification A rated insulation (see J31/340A&B) on PermaQuik PQ6100 Hot Melt monolithic waterproofing membrane over concrete structure (see J31/130A&B).
- Slope: Flat
- " Waterproofing: PermaQuik PQ6100 Hot Melt monolithic waterproofing membrane (see J31/130A&B).
- " Thermal insulation: ProTherm G Green Guide to Specification A rated insulation (see J31/340A&B).
- " Protection: Radmat Root Protection Sheet root barrier as clause 320.
- " Moisture control layers:
 - Radmat D25 Drainage/Reservoir Board, 25mm deep HDPE with cusplate. As clause 350a
 - Radmat G11 Polyester geo-textile filter fleece 100g/m². As clause 360a
- " Growing medium: Radmat Vulkatec GM10 extensive growing medium as clause 390.
 - Depth: minimum 70mm deep after settlement.
 - " Vegetation: Radmat Sedum Plus pre-grown sedum blanket containing 16 species of sedum as clause 400.
 - " Accessories:
 - Vegetation breaks: 300mm wide (on BC approval), 20-40mm rounded pebble margin.
 - Gravel Stop:
 - GS10 Two height Gravel Stop 80x120mm as clause 420A
 - GS14 Curved Gravel Stop 80mm as clause 420A
 - Inspection Chambers:
 - PARA100 Aluminium Inspection Chambers as clause 430A
 - " System Manufacture: Radmat Building Products Limited, Esha House, St Mary's Business Park, Albany Road, Market Harborough LE16 7EB Tel: 01858 410372, Fax 01858 410572 email: techenquiries@radmat.com, Web: www.radmat.com

- 130B EXTENSIVE BROWN ROOF to Level 9 Plant rooms
- " Roof type: Radmat MedO Extensive Brown Roof
 - Substrate: Radmat ProTherm G Green Guide to Specification Arated insulation (see J31/340A&B) on PermaQuik PQ6100 or equally approved Hot Melt monolithic waterproofing membrane over concrete structure (see J31/130A&B).
 - Slope: Flat
 - " Waterproofing: PermaQuik PQ6100 or equally approval Hot Melt monolithic waterproofing membrane (see J31/130A&B).
 - " Thermal insulation: ProTherm G or equally approval Green Guide to Specification A rated insulation (see J31/340A&B).
 - " Protection: Radmat Root Protection Sheet root barrier as clause 320.
 - " Moisture control layers:
 - Radmat D25 Drainage/Reservoir Board or equally approved, 25mm deep HDPE with cusplate. As clause 350a.
 - Radmat G11 or equally approved Polyester geo-textile filter fleece 100g/m2. As clause 360a.
 - " Growing medium: Radmat Vulkatec GM10 extensive growing medium.
 - Depth: minimum 100mm deep after settlement.
 - " Vegetation: Radmat S1, S2 or S3 seed mix's as clause 400d, 400e & 400f. Plug Planting as clause 400b.
 - " Accessories:
 - Vegetation breaks: 300mm wide (on BC approval), 20-40mm rounded pebble margin.
 - Gravel Stop:
 - GS10 Two height Gravel Stop 80x120mm as clause 420
 - GS14 Curved Gravel Stop 80mm as clause 420
 - Inspection Chambers:
 - PARA100 Aluminium Inspection Chamber as clause 430
 - " System Manufacture: Radmat Building Products Limited or equally approved, Esha House, St Mary's Business Park, Albany Road, Market Harborough LE16 7EB Tel: 01858 410372, Fax 01858 410572 email: techenquiries@radmat.com, Web: www.radmat.com

PERFORMANCE

- 210 GENERAL DESIGN
- Green roof and associated features: Complete the detailed design.
 - Proposals: Submit drawings, technical information, calculations and manufacturers' literature.
 - Performance criteria: As per manufacturers instructions .
- 255 MAXIMUM PERMITTED GREEN ROOF LOADS
- Dead loads:
 - Green roof layers: As Structural Engineer's loading schedule.
 - Imposed loads:
 - Activity: To be advised by structural engineer.
 - Vegetation: To be advised by structural engineer.
 - Allowance for additional loads during construction: To be advised by structural engineer.
 - Service loads: To be advised by structural engineer.
 - Requirement: Restrict site activities to ensure that design loads are not exceeded, or submit proposals for temporary supports.
- 310A INVERTED ROOF INSULATION Extruded Polystyrene Inverted Roof Insulation
- Refer to J31/340A and Architect's 47-series and 90-series detail drawings.

- 320 ROOT BARRIER Protection Sheet
- Manufacturer: Radmat Building Products Limited or equally approved, Esha House, St Mary's Business Park, Albany Road, Market Harborough LE16 7EB Tel: 01858 410372, Fax 01858 410572 .
 - Product reference: Radmat Root Protection Sheet .
 - Material: FLL Certified SBS modified reinforced bitumen membrane. .
 - Thickness: 4.0 mm .
- 350A DRAINAGE LAYER EXTENSIVE
- " Manufacturer:Radmat Building Products Limited or equally approved, Esha House, St Mary's Business Park, Albany Road, Market Harborough LE16 7EB Tel: 01858 410372, Fax 01858 410572
 - Product reference:Radmat D25 Drainage/Reservoir Board or equally approved, 25mm deep HDPE with cusplate.
 - " Material:HDPE.
 - Depth:25mm.
 - " Infill: None
- 350B DRAINAGE LAYER SEMI-INTENSIVE
- " Manufacturer:Radmat Building Products Limited, Esha House, St Mary's Business Park, Albany Road, Market Harborough LE16 7EB Tel: 01858 410372, Fax 01858 410572
 - Product reference: Radmat D40 Drainage/Reservoir Board or equally approved, 40mm deep HDPE with cusplate.
 - " Material:HDPE.
 - Depth:40mm.
 - " Infill: None
- 350E DRAINAGE LAYER INTENSIVE
- " Manufacturer:Radmat Building Products Limited, Esha House, St Mary's Business Park, Albany Road, Market Harborough LE16 7EB Tel: 01858 410372, Fax 01858 410572
 - Product reference: Radmat D80 Drainage/Reservoir Board or equally approved, 80mm deep HDPE with cusplate.
 - " Material:HDPE.
 - Depth:80mm.
 - " Infill: AG15 aggregate infill.
- 360A FILTER MEMBRANE Filter Fleece
- " Manufacturer:Radmat Building Products Limited, Esha House, St Mary's Business Park, Albany Road, Market Harborough LE16 7EB Tel: 01858 410372, Fax 01858 410572
 - Product reference:Radmat G11or equally approved filter fleece.
 - " Material:Polyester geo-textile.
 - Mass:100g/m2
- 360B FILTER MEMBRANE Filter Fleece
- " Manufacturer:Radmat Building Products Limited, Esha House, St Mary's Business Park, Albany Road, Market Harborough LE16 7EB Tel: 01858 410372, Fax 01858 410572
 - Product reference: Radmat G12 or equally approved filter fleece.
 - " Material:Polyester geo-textile.
 - Mass:200g/m2

- 370 INTENSIVE GROWING MEDIUM Blended peat free substrate
- Manufacturer: Radmat Building Products Limited, Esha House, St Mary's Business Park, Albany Road, Market Harborough LE16 7EB Tel: 01858 410372, Fax 01858 410572 .
 - Product reference: Radmat Vulkatec GM10 or equally approved Intensive growing medium..
 - Material: Vulkamineral (a combination of volcanic lava rock and natural pumice) blended with three organic components (green compost, composted bark and Xylith*) to store high levels of the micronutrients required for healthy plant growth. Compliant with RAL-GZ 253 and RAL Certified. Peat free
 - " Depth:minimum 300mm deepafter settlement. .
 - Ameliorant/ conditioner: Not required. .
 - Coverage: n/a .
 - Fertilizer: Submit proposals .
 - Coverage: n/a .
 - Declaration of analysis: Submit.
 - Parameters: manufacturer declared values .
- 380 SEMI INTENSIVE GROWING MEDIUM Blended peat free substrate
- Manufacturer: Radmat Building Products Limited, Esha House, St Mary's Business Park, Albany Road, Market Harborough LE16 7EB Tel: 01858 410372, Fax 01858 410572..
 - Product reference: Radmat Vulkatec GM10 or equally approved Semi Intensive growing medium..
 - Material: Vulkamineral (a combination of volcanic lava rock and natural pumice) blended with three organic components (green compost, composted bark and Xylith*) to store high levels of the micronutrients required for healthy plant growth. Compliant with RAL-GZ 253 and RAL Certified. Peat free..
 - Depth: minimum 150mm deepafter settlement.
 - Ameliorant/ conditioner: Not required.
 - Coverage: n/a.
 - Fertilizer: Submit proposals.
 - Coverage: n/a.
 - Declaration of analysis: Submit.
 - Parameters: manufacturer declared values.
- 390A EXTENSIVE GROWING MEDIUM SEDUM BLANKET Blended peat free substrate
- " Manufacturer:Radmat Building Products Limited, Esha House, St Mary's Business Park, Albany Road, Market Harborough LE16 7EB Tel: 01858 410372, Fax 01858 410572
 - Product reference:Radmat Vulkatec GM10 or equally approved extensive growing medium.
 - " Material:Vulkamineral (a combination of volcanic lava rock and natural pumice) blended with three organic components (green compost, composted bark and Xylith*) to store high levels of the micronutrients required for healthy plant growth. Compliant with RAL-GZ 253 and RAL Certified. Peat free.
 - " Depth:minimum 70mm deepafter settlement.
 - " Ameliorant/conditioner:Not required.
 - Coverage: n/a
 - " Declaration of analysis: Submit
 - Parameters: manufacturer declared values.

- 390B EXTENSIVE GROWING MEDIUM FOR BROWN ROOFS Blended peat free substrate
- " Manufacturer: Radmat Building Products Limited, Esha House, St Mary's Business Park, Albany Road, Market Harborough LE16 7EB Tel: 01858 410372, Fax 01858 410572
 - Product reference: Radmat Vulkatec GM10 or equally approved extensive growing medium.
 - " Material: Vulkamineral (a combination of volcanic lava rock and natural pumice) blended with three organic components (green compost, composted bark and Xylith*) to store high levels of the micronutrients required for healthy plant growth. Compliant with RAL-GZ 253 and RAL Certified. Peat free.
 - " Depth: minimum 100mm deep after settlement.
 - " Ameliorant/conditioner: Not required.
 - Coverage: n/a
 - " Declaration of analysis: Submit
 - Parameters: manufacturer declared values.
- 400 VEGETATION BLANKET Sedum Blanket
- Manufacturer: Radmat Building Products Limited, Esha House, St Mary's Business Park, Albany Road, Market Harborough LE16 7EB Tel: 01858 410372, Fax 01858 410572 .
 - Product reference: Radmat Sedum Plus or equally approved pre-grown sedum blanket T1 .
 - Planting mix: Pre cultivated, tightly rooted plant mats containing a minimum of 16 varieties of sedum on a 450 g/m² bio-degradable Grassfelt carrier. Sedum stoloniferum (Stolon Stonecrop), Sedum pulchellum (Widow's-cross), Sedum oreganum (Oregon stonecrop), Sedum montanum (Jenny), Sedum hybridum (Czars Gold), Sedum hispanicum (Spanish Stonecrop), Sedum floriferum (Bailey's Gold), Sedum ellacombianum (Selskianum hort), Sedum aizoon (Euphorbioides), Sedum acre (Oktoberfest), Sedum acre (Yellow), Sedum album (White), Sedum spurium (Coccineum), Sedum sexangulare (Tasteless Stonecrop), Sedum reflexum (Crooked Yellow Stonecrop) and Sedum telephium (Fabaria) .
 - Thickness: 25mm .
 - Vegetation coverage (minimum): 75%.
- 400B VEGETATION FOR EXTENSIVE BROWN ROOFS Sedum plugs
- Manufacturer: Radmat Building Products Limited, Esha House, St Mary's Business Park, Albany Road, Market Harborough LE16 7EB Tel: 01858 410372, Fax 01858 410572 .
 - Product reference: Radmat Sedum or equally approved plug Plants PLG1 .
 - Planting mix: Choice of species, including Sedum album, Sedum Cautcolum, Sedum Floriferum, Sedum Hybridum, Sedum Reflexum, Sedum Sexagulare, Sedum Spurium. .
 - Vegetation coverage (minimum): 16-20 No per m²
- 400E VEGETATION FOR EXTENSIVE BROWN ROOFS Seed mix
- Manufacturer: Radmat Building Products Limited, Esha House, St Mary's Business Park, Albany Road, Market Harborough LE16 7EB Tel: 01858 410372, Fax 01858 410572 .
 - Product reference: Radmat Cast Seed Mix S1 or equally approved .
 - Planting mix: Contact manufacturer for data sheet .
 - Vegetation coverage (minimum): 4g/m²
- 400F VEGETATION FOR EXTENSIVE BROWN ROOFS Seed mix
- " Manufacturer: Radmat Building Products Limited, Esha House, St Mary's Business Park, Albany Road, Market Harborough LE16 7EB Tel: 01858 410372, Fax 01858 410572
 - Product reference: Radmat Cast Seed Mix S3 or equally approved
 - " Planting Mix: Please see datasheet for listed species
 - " Vegetation coverage (minimum): 4g/m²

420A EDGE RETAINING PROFILE

- " Manufacturer: Radmat Building Products Limited, Esha House, St Mary's Business Park, Albany Road, Market Harborough LE16 7EB Tel: 01858 410372, Fax 01858 410572
- Product reference:
Radmat GS10 Two height Gravel Stop 80x120mm as clause 420
Radmat GS14 or equally approved Curved Gravel Stop 80mm as clause 420
- " Material: Aluminium.
- " Height: To suit depth of growing medium. Refer to 47 and 90 series drawings

440 VEGETATION BARRIER To Perimeter and All Upstands.

- Material: River-stone .
- Depth: minimum 50mm .
- Width: tbc .

450A ROOF DRAINAGE OUTLETS to green roofs

- " Manufacturer: Wade or similar approved with clamping ring arrangement. Cold metal.
- Product reference: As recommended by manufacturer.
- " Material: Aluminium
- " Size: To M&E engineers specification
- " Fixing: As recommended by manufacturer.

460 SUPPORT PEDESTALS TO SUPPORT PAVING SLABS.

- Manufacturer: Contractor's choice.
- Product reference: Contractor's choice.
- Type: Non-adjustable.
- Material: Recycled polypropylene.
- Dimensions: To achieve a minimum clearance of 50mm.
- Additional pedestals: Adjacent to perimeters.
- Accessories: Not required.

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.

730 INSTALLATION OF INVERTED ROOF INSULATION

- Preparation: Clear roof of other trades.
- Condition of substrate: Clean.
- Fitting: Loose lay.
- Joints: Butt together.
 - End joints: Stagger.
- Cutting: Minimize.
 - Perimeters and upstands: Fit full sized pieces.
 - Penetrations: Cut cleanly and fit closely.
- Stability: Springing and rocking not permitted.
- Protection: Cover to prevent wind uplift.

740 ROOT BARRIER INSTALLATION

- Joints: Minimize.
 - Overlaps (minimum): 80mm .
- Upstands: Extend to top of growing medium.

750 PROTECTION LAYER INSTALLATION

- Joints: Minimize.
 - Overlaps (minimum): 50mm .
- Upstands: Extend to top of growing medium.

770A DRAINAGE LAYER INSTALLATION

" Extent: Continuous over entire roof area except where omitted locally in build-up to increase diversity of habitat created.

" Fitting: Loose-laid, close-butted.

" Upstands: Cut to fit closely against abutments, roof penetrations and where butt joints are required. Rainwater outlets must not be covered

780 FILTER MEMBRANE INSTALLATION

- Joints: Minimize.
 - Overlaps (minimum): Manufacturer's recommendation .
- Fitting: Manufacturer's recommendation .
- Upstands: Extend to top of growing medium.

790A GROWING MEDIUM INSTALLATION

" Handling: Minimise. Deliver to Roof in Bulk Bag, spreading the specified depth on filter sheet, allowing for a settlement factor of 12%.

- Conditions: Handle in the driest condition possible. Do not handle or install when wet or frozen.

" Layers:

- Depth (maximum): 80mm.

- Sequence: Gently firm each layer before spreading the next.

800 VEGETATION BLANKET 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.
- 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: To manufacturers recommendation .
 - Application: Brush in to fill joints.
- Watering: Thorough, immediately after laying and dressing.

820 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: As per manufacturers instructions .

840 PEDESTAL INSTALLATION

- Ensure that surface to accept pedestals is clean and free of debris.
- Setting out: Mark centre-point of pedestal on substrate surface, with perpendicular guidelines to ensure square layout.
 - Orientation: Align parallel with adjacent features.
 - Spacing: To suit paving material and dimensions.
- Overall movement tolerance (maximum): 3 mm.

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.

930A 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.
 - FLL Guidelines for the planning, execution and upkeep of green-roof sites page 59 paragraph 11.6 titled Readiness for Handover DIN18916 DIN 18917
- " Number of copies: 5.

940 MAINTENANCE

- 15 months maintenance period of the Sedum roof vegetation and growing medium.