Project: **UKPN Substation** at Millman Mews

Architectural specification: **Section J41: Reinforced bitumen roofing and sedum finish**

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Revision		**By**	**Checked**	**Date**
0	Tender issue	JA	KI/EM	16.05.14
1	Construction issue	EM	KI	16.07.14
	Clauses amended: 110, 320, 330, 610, 710, 740, 820			
	Clauses added: 530, 560, 680, 750, 800, 810, 815, 850, 930, 950			

To be read with the Architect's drawings, and all other sections of the Architect's specification, including section A, together with the Structural and Services Engineers' documentation and the Preliminaries / General Conditions.
This section is derived from the NBS version current at the time of preparation of the specification, amended as appropriate, and applies to the architectural work.
In the event of any conflict with other requirements obtain formal clarification from the PM (Project Manager).

CONTENT

GENERAL REQUIREMENTS

01 SCOPE OF SPECIFICATION

- This section of the specification includes requirements for proprietary fully integrated roofing system that includes waterproof membrane and extensive green roof, together with all associated membranes, accessories and incorporated components to achieve a watertight installation that is covered by a single point warranty. The specification must be read with the Architect's drawings and other relevant sections of the Architect's specification, including section A, Architectural general requirements.
- The work is to be fully integrated with, and make provision for, work in connection with structural and services installations as applicable.
- The metal capping to the brick coping is included in section H31.

02 DESCRIPTION

- The work includes a proprietary reinforced bitumen membrane roofing system and extensive green roof finish that is to be a high performance, guaranteed system, including all accessories and finishes, and used strictly in accordance with the manufacturer's recommendations for this particular project / series of applications.
- The roofing includes:

- Waterproofing membrane and root resistant capping sheet.
- Separation layer, protection layer, reservoir / drainage board, filter fleece.
- Extensive growing medium / substrate.
- Pre-grown sedum mat.
- Rainwater outlet and overflow.

- Incorporate manufacturer's recommended drainage outlets suitable for connection to the rainwater downpipes described in section R10.
- Provide temporary sprinkler/watering system for extensive green roof, to be laid on during installation and initial green roof establishment.

03 PRIMARY REFERENCES

- Carry out the work in accordance with this specification and those prepared by the Structural and Services Engineers and all applicable legislation / regulations / industry standards, including: UKPN's requirements.
  BS 5250 CP for control of condensation in buildings
  BS 6229 CP for flat roofs with continuously supported coverings
  BS EN 1991 Actions on structures
  Manufacturer's recommendations.

04 DURABILITY

- Service life, as defined in BS 7543 / BS ISO 15686, of the roofing system, including accessories / incorporated components, is to be not less than 30 years.
- Submit, with tender, a statement setting out the expected life of any components incorporated with the work that will have an expected life less than the specified service life. The statement is to include recommended inspection and maintenance to maximise expected life, together with recommendations for replacement.

05 PERFORMANCE

- Generally as clauses 03 and 04, and particular requirements where specified.
- Performance, certification, validation: Provide independently certified test certificates of performance, durability for the complete roofing system and associated components, relevant for application to this project.

06 INTERFACES / CO-ORDINATION

- Co-ordinate details, setting out and installation with related work / incorporated components – refer to Architect's drawings.

07 SUBMITTALS

- See section A and submit samples and control samples together with test certificates and other information as described.
- Samples: Submit samples of all materials / components that will be visible in the completed work, together with accessories and all types of fixings and metal framing where applicable.
- Control samples: Complete an area / example of each type of work, in sizes and in locations to be agreed and not less than two full size items in approved locations.
- Do not proceed without the PM's agreement to all samples and control samples and ensure the completed installations match the accepted samples and control samples.

TYPES OF ROOF COVERING

110 REINFORCED BITUMEN MEMBRANE ROOFING, WARM DECK ROOF COVERING EXTENSIVE SEDUM FINISH

- Description: See clause 02.
- Generally as clauses 01 – 08 as applicable.

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- Landscaping finish: Bauder pre-grown sedum vegetation blanket, or equal and approved
- Slope: 1˚
- Drainage / Protection layer: Bauder SDF Mat – 20mm drainage / protection layer
- Vegetation blanket: Bauder Xero Flor XF 301 sedum blanket, applied in standard lenth rolls 2m x 1m
- Landscaping depth: ca. 48mm (excluding vegetation)
- Extensive substrate type: Bauder, lightweight growing medium, nominal depth 80mm.
- Filter fleece type: Bauder 1mm thick polyester.
- Reservoir / drainage board: Bauder DSE40, 40mm thick.
- Separation layer: Type Bauder PE foil.
- Waterproofing system: Bauder Total Green Roof System or equal and approved single point warranty system.
    - System manufacturer: Bauder Limited, 70 Landseer Road, Ipswich, Suffolk, IP3 0DH, Tel 01473 257 671, www.bauder.co.uk
    - Underlayer: Bauder G4E, 4mm thick, 200g/m² glass-fibre reinforced, elastomeric torch applied bitumen underlayer
    - Root resistant capping sheet: Bauder Plant-E, 5mm thick, 250g/m² polyester reinforced, elastomeric bitumen root resistant, torch applied capping sheet, green slate finish. Flashings and detail work: Bauder K5K capping sheet, charcoal grey finish.
    - Waterproof system to return 150mm above drainage level.
- Protection layer: 3mm rubber crumb.
- Insulation: Bauder PIR tapered insulation, highly efficient rigid urethane insulation, shaped to create effective drainage falls towards drainage outlet location.
- Vapour control layer: Bauder VB4-Expal vapour barrier, 4mm thick aluminium lined, elastomeric bitumen torched applied vapour barrier, as advised by single point supplier
    - Aluminium trim: Bauder AL 80/100 edge retention/drainage trim to all open drainage perimeters.
    - Trim to stop at a minimum distance of 300mm away from the vertical surface on the edges where drainage outlets are located – refer to drawings.
    - Drainage outlets to be set just below the level of the roof waterproofing.
- Substrate: New concrete deck(designed and constructed level with no deflections, hollows or backfalls). Roof falls to be provided by the tapered insulation scheme.
- Extensive Roof Accessories:
    - Bauder AL 40 Sedum blanket edge trim, fitted to all perimeters.
    - Gravel: 20 – 40mm rounded river washed pebbles or similar and approved by the Architect vegetation barrier provided to protrusions and perimeters,finish subject to submission of samples for approval.
    - Where waterproof system can return to vertical surfaces more than 150mm, pebbles or gravel fill the difference up to a maximum of 150mm.
    - Bauder Xero Flor organic fertiliser, apply as clause 850A.
- Rainwater outlet:
    - Incorporate rainwater outlet, gravel guard, etc, set into the concrete slab and as described in clause 02.
    - Coordinate the green roof build up with drainage penetrations and ensure watertight installations.
- Rainwater overflow: Incorporate an overflow in a location to be agreed with PM consisting of an aperture through the brick parapet, fully lined with roof waterproofing and projecting not less than 75mm beyond the external face of the brickwork.
    - Material: 2mm thick powder coated aluminium channel, colour to be confirmed.
    - Overflow is to take the excess capacity of the roof in the event of the rainwater outlet being blocked.

PERFORMANCE

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210 ROOF PERFORMANCE
- General: Secure, free draining and weather-tight.

PRODUCTS

320 PRIMER
- Type: Bitumen cut back with volatile solvent.
- Characteristics when tested to BS EN 12846-2:
  - Volatile solvent content (minimum): 40% by mass
  - Viscosity (maximum) (STV at 25°C, 4 mm orifice): 10 s.

330 TIMBER TRIMS, ETC
- Quality: Planed. Free from wane, pitch pockets, decay and insect attack (except ambrosia beetle damage).
- Moisture content at time of covering (maximum): 22%.
- Preservative treatment: Please note organic solvent based timber preservatives are not permitted, as these attack bitumen based materials.

335 ANGLE FILLETS
- Material: Preservative treated timber, planed, free from wane, pitch pockets, decay and insect attack except ambrosia beetle damage.
  - Treatment to be compatible with roofing materials – do not use organic solvent based treatment.
  - Size (minimum): 50mm x 50mm.
- Restriction: Fillets under torch-on bitumen membranes to be non-combustible.

EXECUTION GENERALLY

515 ADVERSE WEATHER
- General: Do not lay coverings in high winds, wet or damp conditions or in extremes of temperature unless effective temporary cover is provided over working area.
- Unfinished areas of roof: Keep dry. Protect edges of laid membrane from wind action.

520 INCOMPLETE WORK
- End of working day: Provide temporary seal to prevent water infiltration.
- On resumption of work: Cut away tail of membrane from completed area and remove from roof.

530 GREEN ROOF RELATED REQUIREMENTS
- Additional protection: A planned or contractual delay between the installation of the waterproofing and landscape will necessitate additional/increased protection to the waterproofing.
- Minimum upstand height requirements: The waterproofing should be taken up all abutment upstands, pipes, detailing protrusions etc. a minimum of 150mm above finished landscape surface level to comply with British Standards and current code practice BS8217:2005
- Provision for living products in hot weather conditions: During hot weather conditions, living products such as plants, turf, sedum blankets etc. must be laid on the day of delivery to site. Any sedum blanket rolls not installed must be laid out and kept watered prior to final installation.
- Watering / Irrigation: Adequate provision for watering the installed any form of planting must be in place on site before the product is installed. Initial watering should be by surface sprinklers to water in the fertilizer. All watering should be carried out in strict accordance with the Bauder watering requirements and guidance document.

- Final inspection: No landscaping work should be installed until Bauder have carried out a final inspection to the waterproofing and have passed this as suitable for guarantee. It is the responsibility of the roofing contractor to advise and organize this inspection with Bauder.
- Damage risk from other trades: No landscaping should be installed while the roof area is subject to other site traffic. Bauder will carry out an inspection of the completed roof 4-6 weeks following installation and any site related damage by others will be reported to the client.
- First year maintenance: The contractor must price into his tender the cost of post installation maintenance for a minimum period of 1 year to ensure the handover of a flourishing green roof.

560 GENERAL WORKMANSHIP AND SITE INSPECTION REQUIREMENTS

- In accordance with manufacturers detail requirements.

SUBSTRATES

610 SUITABILITY OF SUBSTRATES

- Substrates generally: Secure, clean, dry, smooth, and free from frost, contaminants, voids and protrusions.
- Preliminary work: Complete including:
  - Grading to correct falls.
  - Formation of upstands, kerbs, box gutters, sumps, grooves, chases and expansion joints.
  - Fixing of battens, fillets and anchoring plugs/ strips.
- Moisture content and stability of substrate: Must not impair roof integrity.
- Preparation: The new concrete deck to be allowed to cure thoroughly, remove rough edges, and surface defects. If the surface is very rough a skin screed of concrete to be applied to give a smooth surface. Prime all areas receiving the new waterproofing with bitumen primer, as clause 320, and allow it to dry.

670 LAYING VAPOUR CONTROL LAYER

- Attachment: Applied and bonded to substrate in accordance with manufacturer's requirements.
- Side and end laps: As recommended by the manufacturer.
- Penetrations: Fully seal using bonding methods recommended by manufacturer.
- Edges of insulation at roof edges, abutments, upstands, kerbs, penetrations and the like: Enclose with vapour control layer in accordance with manufacturer's requirements.

680 LAYING WARM ROOF INSULATION

- Setting out: Laid strictly in accordance with the manufacturer's scheme plan and installation instructions. It is the responsibility of the installing contractor to check the roof deck surface and report any discrepancies.
  - Long edges: Fully supported
  - End edges: Fully supported
  - Joints: close butted together
  - End joints: stagger.
- Before installing: No tapered boards should be laid on site without a copy of the latest scheme to hand. Refer to Bauder plan with regard to the recommended start point and layout of boards.
- Wastage: All off-cuts over 300mm must be considered as usable and are included as such within the scheme plan.
- Bedding: Bonded to the upper surface of the Vapour barrier using Bauder Polyurethane Insulation Adhesive. The adhesive should be applied in strips following the direction of the board length giving 6 no. 8mm wide continuous and equally spaced adhesive beads within each 600mm board width.
- Bauder Perimeter Insulation facing strip: Apply a 500mm wide strip of self-adhesive, 2mm thick, BauderTEC Sprint DUO to the surface of the insulation boards at all perimeter edges, rainwater outlets, penetrations and any other similar abutments, to create a full bonding zone once the underlayer is applied. The self-adhesive membrane is cold applied by removing the peel off release

film and smoothing into place. Adjacent lengths of strip to be close butted. Care must be taken to avoid creating water checks, especially around rainwater outlets, chutes and gutters.
- Completion: Boards must be in good condition, well-fitting and stable.

WATERPROOF MEMBRANES / ACCESSORIES

710 LAYING REINFORCED BITUMEN MEMBRANES GENERALLY
- Direction of laying: Unrolled up the slope.
  - Where practicable, install so that water drains over and not into laps.
- Side and end laps: As recommended by the manufacturer.
- Head and side laps: Offset.
- Intermediate and top layer/ capsheet: Fully bond.
- Successive layers: Apply without delay. Do not trap moisture.
- Strips of bitumen membrane for 'linear' details: Cut from length of roll.
- Detailed flashings: to be cut from width of roll.
- Completed coverings: Firmly attached, fully sealed, smooth, weatherproof and free draining.

735 POUR AND ROLL BONDING OF REINFORCED BITUMEN MEMBRANES
- Bonding compound:
  - Hot and fluid when bitumen membranes are laid.
  - Application: Spread evenly so that a small quantity is squeezed out at each edge.
- Bond: Full over whole surface, with no air pockets.
- Excess compound at laps:
  - First and intermediate layers: Spread out.
  - Top layer/ capsheet: Remove.

740 TORCH-ON BONDING OF REINFORCED BITUMEN MEMBRANES
- Bond: Partially bonded in accordance to manufacturer's detail requirements.
- Laps, underlayer inspection and alternative detailing membrane in accordance to manufacturer's detail requirements.

750 LAYING REINFORCED BITUMEN TORCH-ON CAPPING SHEET
- To be installed in accordance to manufacturer's detail requirements.

775 SKIRTINGS AND UPSTANDS
- Angle fillets: Fix by bitumen bonding or nailing.
- Venting first layer of bitumen membrane: Stop at angle fillet. Fully bond in bitumen for 300 mm strip around perimeters. Overlap onto upstand with strips of BS 8747, Class S1P1 bitumen membrane, fully bonded.
- Other layers of bitumen membrane: Carry in staggered formation up upstand, with each layer fully bonded. Where practicable, carry top layer over top of upstand.
- Upstands:
  - At ends of rolls: Form with bitumen membrane carried up without using separate strip.
  - Elsewhere: Form with matching strips of bitumen membrane, maintaining laps.

785 FIXING PERIMETER TRIMS
- Co-ordinate perimeter details and installation with the capping profile described in section F30.
- First/ Intermediate layers bitumen membrane: Lay over roof edge upstand. Project free edge 25 mm from wall or fascia.
- Trim:
  - Setting out (minimum): 3 mm clear from wall or fascia.
  - Fasteners: Stainless steel countersunk screws.
  - Fixing: 30 mm from ends and at 300 mm (maximum) centres.
  - Jointing sleeves: Fix one side only.

  - Corner pieces: Purpose made.
- Completion:
  - Contact surfaces: Prime.
  - Joints: Cover with 150 mm long pads of bitumen membrane, bonded to trim.
- Completion of bitumen membrane:
  - Top layer/ capsheet: Butt joint to rear edge of trim.
  - Cover strip: Fully bond to trim and top layer/ capsheet of bitumen membrane. Carry over roof edge upstand and lap 75 mm onto roof.
    Cover strip material: Cap sheet.

LANDSCAPING INSTALLATION

800 DRAINAGE LAYER INSTALLATION
- Extent: Continuous over designated roof area
- Fitting: Loose laid over waterproofing and butt jointed with 100mm fleece overlap
- Upstands: Carefully cut to fit closely around penetrations and outlets

810 VEGETATION BLANKET INSTALLATION
- Handling blankets:
  - Timing: Lay within 36 hours of lifting from growing position
  - Method: laid manually – two-man operation
  - Excessive stacking: not permitted
  - Material loss (maximum): 3% of total surface area
  - Growing medium condition: Thoroughly watered
- Laying blankets:
  - Do not lay dry, damaged, frosty or waterlogged blankets
  - Orientation: Diagonal or perpendicular to slope of roof
  - Joints: stagger. Butt together or slightly overlap to prevent gaps. Do not stretch blankets. All excess vegetation should be removed from the overlap and the opposite leading edge of the blanket to ensure that the joints butt together tightly (as per the Bauder installation guideline).
  - Edges: finish with the whole blankets
  - Consolidation: N/A
  - Dressing: Bauder Xero Flor substrate
  - Application: Brush in to fill joints
  - Watering: Thoroughly, immediately after laying and dressing.
  - Roll size: 2m x 1m.

815 EDGE RETAINING PROFILE INSTALLATION
- Cutting: Neat, accurate and without spalling
- Junctions: use pre-formed 90˚ corners where required and connector pieces
- Position: True to line and level. Smooth continuous lines.
- Fixing: The AL40 Sedum blanket edge trim is to be secured in place by separate pieces of torch applied Bauder Plant-E capping sheet cut into strips 1000mm x 200mm, these bituminous flashings should be torched through the holes in the trim to the waterproofing surface and set at intervals of 400mm between each one metre long flashing piece, bonding onto the main capping sheet by a minimum 100mm.
- Precautionary note: when cutting metal, please ensure that appropriate tools and personal protection equipment are used.

820 LAYING STONE BALLAST / VEGETATION AND DRAINAGE BARRIER
- Condition of substrate: Clean.

- 20/40mm rounded river washed pebbles to be used. Stones or aggregates with sharp edges must not be used.
- Gravel guards: Fit to outlets.
- Previously laid materials: Protect during laying of ballast.
- Laying: Spread evenly. Do not pile to excessive heights.
  - Depth (minimum): 50mm and to top of sedum roofing.
- Ballast/ Vegetation barrier to cover the edges of the sedum blanket by a minimum of 100mm in order to protect the exposed edge of the blanket against wind uplift and substrate erosion.
- At all open drainage perimeters Bauder AL80/100 drainage trim must be used to contain the vegetation barrier.

850 FERTILISER

- Bauder Organic Fertiliser slow release must be applied at a rate of 80g/m² onto the installed planting.
- This product is to be supplied by Bauder Ltd.
- Care must be taken to distribute the fertiliser evenly, through use of an approved applicator. The vegetation / vegetation blanket should then be thoroughly saturated by the use of sprinklers so as to promote rapid establishment. It is the responsibility of the roofing contractor to liaise with the main contractor/ building owner to provide water to ensure that the growing medium/ blanket does not dry out within the first month – refer to document 'Watering Requirement Guidelines for Extensive and Bio-diverse green roof installations'.

COMPLETION

910 INSPECTION

- Interim and final roof inspections: Submit reports.

920 ELECTRONIC ROOF INTEGRITY TEST

- Carry out water-tightness tests, using an electronic system as Leaktector or accepted equivalent, to be witnessed by an independent inspector approved by the CA.
- Test when waterproof membrane is complete, including completion of gutters / interfaces with rooflights where applicable, and before installing finishes.
- Carry out any remedial work necessary and re-test until completed satisfactorily.
- Provide certificate of integrity on completion.

930 ESTABLISHMENT WATERING REQUIREMENTS

- It is the responsibility of the roofing contractor to liaise with the main contractor/ building owner to provide water to ensure that the vegetation mat does not dry out within the first month.
- An adequate mains supply of sufficient pressure must be available and operational prior to the sedum blanket being delivered and installed.

940 COMPLETION

- Roof areas: Clean.
- Outlets: Clear.
- Work necessary to provide a weather-tight finish: Complete.
- Storage of materials on finished surface: Not permitted.
- Completed membrane: Do not damage. Protect from chemicals, traffic and adjacent or high level working.

950 DOCUMENTATION

- Timing: Submit at handover
- Contents:
  - Manufacturer's guarantees and warranties

- Procedures for maintenance of the green roof
- Record drawings showing the location of planting and associated features.
- Number of copies to be confirmed by the Client.

End of section J41.