- *00 Q37 GREEN ROOFS*

To be read with Preliminaries, General Conditions, Contract Conditions and related Architectural Details

- 00.1 GENERAL

- 00.1.0004 EXTENSIVE PITCHED GREEN ROOF

Roof Type:
ZinCo "Pitched Green Roof" with Floraset FS 75
Manufacturer: ZinCo Green Roof Systems Ltd., Wittas House, 2 Rivers Industrial Estate, Station Lane, Witney, OX28 4BH; phone: 01993

Water Proofing:

- .....
- Water Proofing must be root resistant

Insulation

- .....

Protection Layer

- ZinCo Moisture and Protection Mat BSM 64

Shear Force Transferring Drainage Layer

- ZinCo Floraset® FS 75

Growing Medium

- ZinCo System Substrate "Rockery Type Plants"

Vegetation

- Plug plants extensive

Vegetation

- ZinCo Pre-cultivated Vegetation Mat "Sedum Carpet"

Irrigation during initial period

- Thorough irrigation after planting and other early irrigations are required depending on the weather and vegetation type.

Fertilization

- ZinCo "Plantfit 4 M"

Gravel Edge

- Roofing pebbles 20/40 mm

Erosion Protection

- ZinCo Jute Anti-Erosion Net JEG

Inspection Chamber

- ZinCo Parapet Inspection Chamber AKS 8

Eaves Profile for Verge or Monopitch Upper End

- ZinCo Eaves Profile TRP 140

Shear Barrier

- ZinCo Eaves Profile TRP 80

Eaves Profile / Shear Protection

- ZinCo Eaves Profile TRP 140

Support Bracket / Shear Protection

- ZinCo Support Brackets "TSH 80" / "TSH 100"

Support Bracket / Shear Protection

- ZinCo Shear Fix LF 300

Gravel Retainer

- ZinCo Gravel Retainer "KL 60/80"

- 00.2 PERFORMANCE

- 00.2.0010 GENERAL DESIGN

- Green roof and associated features: Complete the detailed design.
- Proposals: Submit drawings, technical information, calculations and manufacturers' literature
- Performance design: As landscape designer's requirements
- It must be ensured, that the waterproofing covering ensures a continuity to a vertical height of at least 100 mm above the finished roof level at all abutments, parapets etc.

- 00.2.0015 MAXIMUM PERMITTED GREEN ROOF LOADS

- It is the strict responsibility of the building owner or their appointed design professional to make sure that the building structure and the roof can hold the different loads
- Dead load: Green roof layers: refer to engineer's specification
- Imposed loads:
  - Activity: refer to engineer's specification
  - Vegetation: refer to engineer's specification
  - Allowance for additional loads during construction: refer to engineer's specification
- Service loads: refer to engineer's specification
- Requirement: Restrict site activities to ensure that loads are not exceeded

- 00.3 PRODUCTS

- 00.3.0004 PROTECTION LAYER

Manufacturer:

- ZinCo Green Roof Systems Ltd

Product reference:

- ZinCo Moisture and Protection Mat BSM 64

Materials and properties:

- Non-rotting synthetic fibre mat of polyester/polypropylene with fleece carrier, biologically neutral
- Thickness: ca. 7 mm
- Weight: ca. 650 g/m²
- Water storage capacity: ca. 7 l/m²
- Protection efficiency according to EN ISO 13428: Residual thickness = 30 %
- Strength class: 4

- 00.3.0008 DRAINAGE LAYER

Manufacturer:

- ZinCo Green Roof Systems Ltd

Product reference:

- ZinCo Floraset® FS 75

Material and Properties:

- for pitched green roofs up to ca. 25° inclination, with high studs for substrate interlocking and shear force bearing, drainage element of expanded polystyrene, without CFC, density 23 kg/m³; with multi-directional channel system underneath
- Height: ca. 75 mm
- Weight: ca. 1.0 kg/m²
- Filling volume: 20 l/m²
- Compressive strength at 10 % compression up to 55 kN/m²
- In-plane water flow capacity tested according to EN ISO 12958

- 00.3.0021 GROWING MEDIUM

Manufacturer:
- ZinCo Green Roof Systems Ltd

Product reference:
- ZinCo System Substrate "Rockery Type Plants"

Material and Properties:
- Substrate for extensive green roof applications consisting of Zincolit® Plus (sorted high quality crushed brick with selected aggregates), enriched with Zincohum® (substrate compost enriched with fibre and clay materials), non-flammable, stable in structure and frost resistant, suitable for pumping. All chemical and physical properties meet the requirements of the FLL Guidelines for the Planning, Construction and Maintenance of Green Roofing - Green Roofing Guideline, 2008
- Volume weight dry (compacted): ca 1000 kg/m³
- Volume weight at max. water capacity (compacted): 1400 kg/m³
- Maximum water capacity: ca. 40 vol %
- Compaction factor: ca. 1.2
- Required depth (after compaction):
  Infill of drainage element (filling volume: 20 l/m²) and cover of drainage element with average depth according to drawings, minimum for sedum plants:
  - 50 mm above studs of FS 75 for slopes up to 15°
  - 60 mm above studs of FS 75 for slopes 15°-20°
  - 70 mm above studs of FS 75 for slopes 20°-25°

- 00.3.0023 VEGETATION

Precultivated Vegetation Mat

Manufacturer:
- ZinCo Green Roof Systems Ltd

Product reference:
- ZinCo Pre-cultivated Vegetation Mat "Sedum Carpet"

Material and Properties:
- Mats with firmly rooted vegetation, plant species suitable for extensive green roofs, outdoor pre-cultivated over one growing season, with decomposable carrier, including thorough irrigation of the complete build-up.
- Delivery weight: ca. 16–20 kg/m²
- Height: ca. 30–40 mm
- Vegetation coverage: at least 75%.
- Plant types:
  Minimum 4–5 adapted Sedum types, e.g. Sedum album, Sedum sexangulare, Sedum spurium, Sedum floriferum and Sedum hybridum.

Plug Plants

Product reference:
- Plug plants extensive

Material and Properties:
- Outdoor pre-cultivated root ball plants, suitable for extensive green roof, pregrown in growing medium matching conditions on extensive green roof, according to planting plan and plant list, including first irrigation.
- Sedum species, herbs, small grasses. Species and tray sizes according to planting plan and plant list
- Recommended quantity: minimum 20 pc/m², plant quantity can vary depending on project specific site conditions such as roof slope or climate, please refer to manufacturers recommendations or planting plan
- Quantity: ..... pcs/m²

- 00.3.0024 IRRIGATION

  - Thorough irrigation after planting.
  - Other early irrigations as required depending on the weather. Vegetation has to be watered and kept moist for minimum of:
    3 to 4 weeks for plantings
    4 to 5 weeks for vegetation mats

- 00.3.0025 FERTILIZER

  Manufacturer:
  - ZinCo Green Roof Systems Ltd

  Product reference:
  - ZinCo "Plantfit 4 M"

  Material and properties:
  - Slow release fertilizer NPK 23-5-10, granulated and compacted, with at least 80% coated particles, applied evenly onto the substrate layer after planting.
  - The recommended period to fertilize: March to Mid-June.
  - Amount to be spread: ca: 25 g/m²

- 00.3.0027 GRAVEL EDGE

  Material and Properties:
  - Roofing pebbles 20/40 mm
    at roof perimeters, in areas of upstands, around penetrations, inspection chambers, fixing devices (Ø ca. 50 cm) and similar, according to roof plan
  - Depth of gravel strip: ..... mm
  - Width of gravel strip: ..... mm

- 00.3.0028 EROSION PROTECTION

  Manufacturer:
  - ZinCo Green Roof Systems Ltd

  Product reference:
  - ZinCo Jute Anti-Erosion Net JEG

  Material and Properties:
  - Anti-Erosion Net of 100 % jute
  - Mesh width: ca. 30–40 mm
  - Weight: ca. 500 g/m²

- 00.3.0040 ACCESSORIES - INSPECTION CHAMBERS

  Manufacturer:
  - ZinCo Green Roof Systems Ltd

  Product reference:
  - ZinCo Parapet Inspection Chamber AKS 8

  Material and Properties:
  - Inspection chamber made of galvanised and plastic-coated steel, detachable and walkable cover, one side open, additional three sides slotted with flange, including extension pieces KSA 8 / KSA 20, if necessary.
  - Lateral drainage slots according to DIN 1986
  - Load bearing capacity: Class H, according to DIN 19599
  - Lid openings according to German FLL Guideline
  - Outer dimension of the Chamber: ca. 300 x 300 mm, including flange: ca. 390 x 470 mm
  - Height: ca. 80 mm
  - Also available: extension pieces KSA 8 (height 80 mm) / KSA 20 (height 200 mm) - include where needed
  - With or without set of interlocks (please delete as appropriate)

- Cover: .....
- Height including extension pieces:..... mm

- 00.3.0043 ACCESSORIES - ROOF EDGE: EAVES PROFILES

Manufacturer:
- ZinCo Green Roof Systems Ltd

Product reference:
- ZinCo Eaves Profile TRP 140

Application:
Along verge or monopitch upper end

Material and Properties:
- Heavy-duty angle profile made of stainless steel; with drainage slots for water run-off and perforation in the support leg, with pre-attached butt joint
- Application: along verge or monopitch upper end
- Material thickness: 1.5 mm
- Profile height: ca. 140 mm
- Width of support leg: ca.155 mm
- Available accessories (include if necessary): prefabricated external corner 90°, leg length approx. 250 mm

- 00.3.0045 ACCESSORIES - SHEAR PROTECTION / EAVES PROFILES WITH BRACKETS

Shear Barrier

Manufacturer:
- ZinCo Green Roof Systems Ltd

Product reference:
- ZinCo Eaves Profile TRP 80

Application:
- As shear barrier within the roof area of pitched roofs

Material and Properties:
- Heavy-duty angle profile made of stainless steel; with drainage slots for water run-off and perforation in the support leg, with pre-attached butt joint
- Material thickness: 1.5 mm
- Profile height: ca. 80 mm
- Width of support leg: ca.140 mm
- Available accessories *(include if necessary)*: prefabricated external corner 90°, leg length approx. 250 mm

Eaves Profile / Shear Protection

Manufacturer:
- ZinCo Green Roof Systems Ltd

Product reference:
- ZinCo Eaves Profile TRP 140

Application:
- At eaves of pitched roofs without upstands

Material and Properties:
- Heavy-duty angle profile made of stainless steel; with drainage slots for water run-off and perforation in the support leg, with pre-attached butt joint
- Material thickness: 1.5 mm
- Profile height: ca. 140 mm
- Width of support leg: ca.155 mm
- Available accessories *(include if necessary)*: prefabricated external corner 90°, leg length approx. 250 mm

Support Bracket / Shear Protection

Manufacturer:

- ZinCo Green Roof Systems Ltd

Product reference:

- ZinCo Support Brackets "TSH 80" / "TSH 100"

Material and Properties:

- Support brackets, made of sandblasted stainless steel, material thickness: ca. 5 mm
- Applicable: on roofs with slopes of at least 10° if used for eaves, or at least 17 °, if used for shear barriers within the roof area
- Leg length: ca. 400 mm
- Height of front upstand: ca. 80 mm (TSH 80), ca. 100 mm (TSH 100)
- Max. shear bearing capacity: ca. 150 kg/piece (type TSH 80), ca. 300 kg/piece (type TSH 100)

Support Bracket / Shear Protection

Manufacturer:

- ZinCo Green Roof Systems Ltd

Product reference:

- ZinCo Shear Fix LF 300

Material and Properties:

- Shear retainer made of solid sandblasted stainless steel, 5 x 50 mm, length ca. 400 mm, retaining bracket height ca. 100 mm, incl. base plate, accessories and screws for fastening on timber sub-construction
- approved fastening devices for the installation on concrete structures available upon request

- 00.3.0047 ACCESSORIES - GRAVEL RETAINER

Manufacturer:

- ZinCo Green Roof Systems Ltd

Product reference:

- ZinCo Gravel Retainer
  "KL 60/80"

Material and Properties:

- Angle profile made of extruded aluminium
  with drainage slots on both legs
- Material thickness: ca. 1.5 mm (type KL 60/80 Profile height ca. 60/80 mm. Available accessories *(include as necessary)*
- connectors: 60/80 mm corner connectors: 60 mm, 80 mm Installation height: ..... mm

- 00.7 EXECUTION

- 00.7.0004 PROTECTION LAYER INSTALLATION

- Extent: Install protection layer continuously over entire roof area above the root-resistant waterproofing.
- Joints: Minimize.
- Overlaps: minimum 100 mm
- Fitting: loose laid
- Upstands: Extend to a vertical height of at least 150 mm above the finished roof level.
- Water outlets and roof penetrations: cut the protection mat in situ and fit closely around penetrations and outlets.
- General: Follow manufacturer's specific installation instructions.

- 00.7.0008 DRAINAGE LAYER INSTALLATION
    - Extent: Install FS 75 continuously over entire roof area on protection or separation layer.
    - Joints: Minimize.
    - Fitting: butt joint
    - Large studs: facing up. Along eaves with parapet, the last row of FS 75 elements is installed with studs facing down for better drainage.
    - Water outlets and roof penetrations: Cut in situ and fit closely around penetrations and outlets.
- 00.7.0021 GROWING MEDIUM INSTALLATION
    - Handling: Minimize.
    - Conditions: Handle in the driest condition possible. Do not handle or install when wet or frozen.
    - Extent: Install System Substrate "Rockery Type Plants" continuously over entire roof area into the drainage element and cover the drainage element
    - Required depth (after compaction): average .....mm above the studs of the FS 75, according to plan.
    - Settlement factor: 1.2
    - Sequence: Gently firm each layer before spreading the next. Apply nutrient regime according to planting plan and rake in.
- 00.7.0023 VEGETATION INSTALLATION

Plug Plants

- Handling:
- Extent: Install plug plants for extensive green roof evenly over area to be planted.
- Timing: within day of delivery
- Storage: must be stored in a cool and shaded area, excessive stacking not permitted, keep growing medium moist in the trays.
- Fitting: Display plants at recommended application rate, the non-carpeting plants can be displayed irregular in small groups of 3, 5 or 7 pcs/m^2.
- Planting: Water plants thoroughly before display, after display plant immediately into growing medium.
- Edges and Corners: In case of increased wind suction, precultivated vegetation mats “Sedum Carpet” are recommended in these areas.
- Watering:
    - Thoroughly water following installation.
    - Keep growing medium moist until plants are established (typically 4-6 weeks following installation).
    - Account for climatic variation and seasonality.

Precultivated Vegetation Mat

- Handling:
- Extent: Install precultivated vegetation mat continuously over area to be vegetated.
- Timing: within day of delivery
- Storage: must be stored in a cool and shaded area, excessive stacking not permitted
- Fitting: Roll out vegetation mat and install on level substrate, do not lay dry, damaged or waterlogged blankets, firm to ensure full contact with growing medium.
- Joints: Stagger, install with tight butt joints, pressing together seams to avoid gaps. Do not stretch blankets.
- Edges: Finish with whole blankets.
- Finishing: If necessary, mat joints can be covered with substrate (Zincohum) and filled with Sedum cuttings to ensure seamless installation.
- Watering:
    - Thoroughly water following installation.

  - To ensure growth, irrigate over a period of 4–5 weeks, if necessary. Irrigate extensively and thoroughly and to let the vegetation mats dry well between the single watering events.
  - Account for climatic variation and seasonality.

- 00.7.0027 GRAVEL EDGE INSTALLATION
  - Extent: Install roofing pebbles in the required depth at non-vegetated areas, including roof edges, flashing, and roof penetrations and according to drawing.
- 00.7.0028 EROSION PROTECTION INSTALLATION
  - Extent: Install continuously over entire roof area on well levelled substrate layer.
  - Joints: Minimize.
  - Fitting: Lay loose with overlaps.
  - Overlaps: minimum 200 mm
  - Planting: Tear net in places for planting.
  - Cover: Cover with at least 10 mm of substrate.
- 00.7.0040 MAINTENANCE CHAMBER INSTALLATION
  - Location: Install AKS 8 centrally over drain outlet, place chamber on top of drainage layer.
  - Orientation: Align parallel with adjacent features.
  - Surround: 300 mm pebbles strip
- 00.7.0043 ROOF EDGE: EAVES PROFILES INSTALLATION
  - Cutting: Neat, accurate and without spalling
  - Junctions: vertical, secured using proprietary connectors
  - Position: true to line and level. Smooth continuous lines.
  - Location: on top of protection mat, or if fixed to the water proofing: on top of the water proofing
  - Fixing: The fixing method depends on the field of application.
    - Along verge or monopitch upper end, the TRP 140 profiles can be placed loosely on top of the waterproofing or the protection mat. The profiles also can be stabilised on the waterproofing by applying short strips of the same waterproofing material and fixing them through the holes in the support leg.
    - General: follow manufacturer's specific installation instructions.
- 00.7.0045 SHEAR PROTECTION / EAVES: PROFILES WITH BRACKETS INSTALLATION

  Shear Barrier Installation
  - Cutting: Neat, accurate and without spalling
  - Junctions: vertical, secured using proprietary connectors
  - Position: true to line and level, smooth continuous lines
  - Location: on top of protection mat
  - Fixing: The fixing method depends on the field of application.
    - As shear barriers within the roof surface of pitched roofs the TRP 80 profiles have to lean against shear brackets or Shear Fix elements installed previously.
    - General: Follow manufacturer's specific installation instructions.

  Eaves Profile Installation
  - Cutting: Neat, accurate and without spalling
  - Junctions: vertical, secured using proprietary connectors
  - Position: true to line and level, smooth continuous lines
  - Location: on top of protection mat
  - Fixing: The fixing method depends on the field of application:
    - At eaves of pitched roofs without parapet the TRP 140 profiles have to lean against shear brackets or Shear Fix elements installed previously.
    - General: Follow manufacturer's specific installation instructions.

Support Bracket "TSH" - Installation

- Applicable: on roofs with slopes of at least 10° if used for eaves, or at least 17 °, if used for shear barriers within the roof area
- Location: on top of water proofing
- Mounting and water proofing:
    - varies depending on the type of the waterproofing material used. Usually the support brackets are installed onto timber rafters made of solid wood, structural timber (KVH) or similar suitable base material. The rafter width should be at least 100 mm. The TSH 100 are to be positioned centrally on top of the rafters.
    - The profiles are fixed by 3 (TSH 80) resp. 4 (TSH 100) wood screws (stainless steel, Ø 8 mm, length 100 mm) directly in the rafters, afterwards the support brackets have to be sealed professionally with strips of sealing material.
    - In case of installation on wooden formwork or on multi-layered solid wood suitable fasteners for the material have to be provided meeting the requirements of a load of at least 3 kN for the TSH 100 or 1,5 kN for TSH 80.
    - General: Follow manufacturer's specific installation instructions.

Support Bracket "LF 300" Installation

- Location: on top of water proofing
- Mounting and water proofing:
    - General: follow manufacturer's specific installation instructions.
    - Usually the support brackets are installed onto timber rafters made of solid wood, structural timber (KVH) or similar suitable base material. The rafter width should be at least 100 mm. The TSH 100 are to be positioned centrally on top of the rafters.
    - Set out and mark the base plate position. If a bitumen waterproofing is used it is possible to cut out the bitumen in the dimensions of the base plate in order to avoid a higher build-up in this area.
    - Fix base plate using the 5 wood screws (included in the delivery) directly in the rafters.
    - In case of installation on wooden formwork or on multi-layered solid wood suitable fasteners for the material have to be provided meeting the requirements of a load of at least 3 kN LF 300
    - Seal with pieces of the used waterproofing material. The waterproofing of the base plate varies slightly depending on the sealing material used. Details see manufacturer's installation instruction.
    - Mark the positions for the threaded bolts onto the sealing pieces and cut out with a 12 mm Ø hollow puncher. In case of waterproofing with plastic or elastomeric membranes, place the smaller EPDM-intermediate layer over the threaded bolts.
    - Place retaining bracket (loose flange) over the threaded bolts and fix with the two included nuts M10.
    - Check the correct application of the nuts twice over a period of 24 hours and adjust if necessary.
    - At the end double-check all welding joints of sealing pieces and the stable connection of all screws.

- 00.7.0047 GRAVEL RETAINER INSTALLATION

    - Installation: If used as separation between gravel and growing medium the profiles are applied loosely on top of the filter sheet. As separation of the entire build-up e.g. to a lower gravel strip the profile can be placed loosely on the protection mat.
    - Orientation: Depending on the desired height install the profile with the smaller or larger leg facing up.
    - Joints: The suitable joint connectors are inserted from the inside between the folded edge at the top and the supporting leg.
    - Corners: Place two gravel retainers next to each other, with their supporting legs facing outwards for internal corners, with their supporting legs facing inside for external corners, and insert the corner connector.
    - Fitting: Cut the retainers on site and deburr any sharp grates.

- 00.9 COMPLETION

- 00.9.0010 INSPECTION

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

- 00.9.0020 COMPLETION

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

- 00.9.0030 DOCUMENTATION

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

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