

Sky Garden

Green Roof System

Master Specification

December 16th, 2005

Version: 3.04 English

Application:

Sky Garden Intensive Green Roof System (Roof Garden)
Intensive Green Roof (Roof Garden) – Section XXXXX



Eco Innovations Inc. (dba "Green Roof Tops")

☎ 508-1001 Homer St., Vancouver, BC. V6B 1M9

☎ (604) 708-0611 ☎ (604) 357-1315

✉ info@greenrooftops.com

🌐 www.greenrooftops.com

RECOMMENDED SPECIFICATION FOR SKY GARDEN INTENSIVE GREEN ROOF (ROOF GARDEN) ASSEMBLY

THIS SPECIFICATION IS INTENDED ONLY TO PROVIDE A GENERAL UNDERSTANDING OF THE SKY GARDEN INTENSIVE GREEN ROOF SYSTEM ASSEMBLY. IT IS RECOMMENDED THAT A GREEN ROOF TOPS REPRESENTATIVE CONDUCT A TECHNICAL ANALYSIS BEFORE SYSTEM COMPOSITION, PLANT SELECTION AND PLANT LAYOUT ARE DETERMINED TO IDENTIFY ANY ADJUSTMENTS OR ADDITIONS TO SPECIFICATION REQUIREMENTS.

VARIOUS ROOF WATERPROOFING SYSTEMS FROM VARIOUS ROOF WATERPROOFING SYSTEM MANUFACTURERS CAN BE SPECIFIED FOR USE WITH SKY GARDEN INTENSIVE GREEN ROOF SYSTEMS. BUT FOR ANY ASPHALT-BASED MEMBRANE SYSTEM ROOT GUARD™ MUST BE ALWAYS BE INSTALLED:

DIRECTLY OVER THE CAP SHEET OR ACT AS THE CAP SHEET ON THE
MEMBRANE SYSTEM

OR

DIRECTLY OVER THE CONCRETE PROTECTION LAYER

THIS REQUIREMENT ENSURES THAT ROOT GUARD™ WILL BE THE FIRST LAYER BETWEEN THE MEMBRANE SYSTEM AND THE SKY GARDEN INTENSIVE GREEN ROOF SYSTEM. (SEE CAD DETAILS FOR STANDARD AND PROTECTED MEMBRANE SYSTEM EXAMPLES).

NOTE: ASPHALT BASED MEMBRANES CANNOT WITHSTAND PLANT ROOT GROWTH AND WILL FAIL WITHOUT BEING PROTECTED BY ROOT GUARD™. POLYETHYLENE AND NON-WOVEN POLYPROPYLENE FABRICS (CHEMICALLY TREATED OR NOT), WHICH ARE COMMONLY USED AS ROOT PROTECTION SHEETING, ARE NOT ADEQUATE ROOT PROTECTION BARRIERS FOR THE ROOF'S WATERPROOF MEMBRANE. THEY HAVE A WELL DOCUMENTED HISTORY OF FAILURE IN TESTS AND REAL-WORLD APPLICATIONS AND WILL EVENTUALLY ALLOW ROOTS TO PENETRATE INTO THE BUILDING CAUSING LEAKS. ROOT GUARD™ IS THE ONLY PRODUCT AVAILABLE WITH A SUCCESSFUL TRACK-RECORD IN TESTS AND REAL-WORLD APPLICATIONS AND WILL NOT ALLOW ROOTS TO PENETRATE INTO THE BUILDING OVER AN EXTENDED PERIOD OF TIME.

FOR A COMPLETE DESCRIPTION OF PRODUCTS AND APPLICABLE STANDARDS, PLEASE REFER TO THE PRODUCT DATA SHEETS (GREEN ROOF TOPS SPECIFICATIONS AND CAD DETAILS, CD-ROM OR ON-LINE AT WWW.GREENROOFTOPS.COM).

PART I GENERAL

1.01 SUMMARY

- A. This specification serves as a guideline and should be adapted to suit the needs of each individual project by the architect. It is prepared in accordance with the NMS three-part section format and should be included as a separate section under DIVISION 7 – Thermal and Moisture Protection. Improvements and other changes to the contents may be made only with the written approval of the architect.

1.02 SCOPE

- A. Furnish all labour, materials, tools and equipment to furnish and install Sky Garden Intensive Green Roof System provided by GREEN ROOF TOPS (including growth media) as shown on the Drawings or as directed by the Engineer. This work shall also include irrigation systems, if required, on the drawings.

1.03 RELATED WORK (Edit to project requirements)

NOTE: Specific Provisions: Edges of the Garden that run up against the parapet or adjoining wall must be protected by GR Cap with GR Pipe (Sky Garden weeping tile) to protect against roots and ensure proper drainage along joints (see CAD DETAILS for examples). Consult a GREEN ROOF TOPS representative to draw up a plan illustrating where the abovementioned items are located.

A permanent drip (or spray) irrigation system is highly recommended for all Sky Garden Intensive Green Roof Systems.

The Sky Garden Intensive Green Roof System, if installed on an asphalt-based roof membrane, must first have Root Guard™ installed above the membrane before the Sky Garden Intensive Green Roof System is installed. Membranes that have adequate inherent root protection against the plants used in the Sky Garden Intensive Green Roof System include PVC and Liquid-applied Fiberglass membranes. EPDM and Polyurethane roof membranes are not root resistant and are not compatible with Root Guard™. They should be substituted for an asphalt-based membrane where Root Guard™ can be applied to protect the roof from plant roots.

- A. Section 02050 – Demolition
B. Section 02660 – Water Distribution
C. Section 02810 – Irrigation System
D. Section 02900 – Landscaping
E. Section 03300 – Concrete

- F. Section 04100 – Masonry
- G. Section 06100 – Carpentry
- H. Section 07600 – Sheet Metal
- I. Section 07710 – Roofing Accessories
- J. Section 07900 – Caulking & Sealants

1.04 ALTERNATES

- A. The following Green Roof materials may come from different suppliers but must meet the standards outlined in the Product Specification Sheets provided by GREEN ROOF TOPS. The materials must meet the following approval schedule before they can be substituted:
 - 1. Soil (Growing Medium) – five (5) soil tests from five (5) unique soil samples taken at different times from different soil batches must be provided to GREEN ROOF TOPS. An approved soil laboratory must clearly identify the soils chemical and physical characteristics using the soil evaluation chart available at:
www.greenrooftops.com/specs/Soil_Eval_Chart.xls
This chart outlines the following characteristics that must be identified for third party supplier growth medium approval.
 - i. pH (H₂O + KCl)
 - ii. EC (mS/cm)
 - iii. Inorganic Nitrogen Condition (immediately after mixing growth medium / NH₄-N & NH₃-N in mg/100g)
 - iv. Inorganic Nitrogen Condition (measured after 4 weeks in an incubator at 30°C / NH₄-N & NH₃-N in mg/100g)
 - v. Forced Nitrogen (mg/100g)
 - vi. Effective Phosphoric Acid Condition (mg/100g)
 - vii. Cat ion Exchange Capacity (me/100g & me/100l)
 - viii. Exchangeable Cat ion (CaO, MgO, K₂O in mg/100g)
 - ix. Cat ion Fatigue (%)
 - x. Compressibility (%)
 - xi. Carrying/Dry Weight (t/m³ or specific gravity)
 - xii. Fully Saturated Weight (t/m³ or specific gravity)
 - xiii. Total Available Water Capacity (L/m³)
 - xiv. pF curve (pF1.5 ~ 3.0 & pF3.0 ~ 3.8)
 - xv. Permeability Coefficient (cm/s & mm/hour)
 - xvi. Three phase circuit distribution, Solid phase, Liquid phase & Vapour phase (%)
 - xvii. Total porosity (%)
 - xviii. Rough porosity (%)
 - 2. Plants – A certificate of warranty must be provided by the third party nursery warranting the plants health for one (1) year after installation. Since installation bears a large factor in the health and viability of the plants survival, the nursery is allowed to inspect the planting quality

during and after planting to ensure that they can responsibly support the plant warranty.

3. Red Lava Rock – Red Lava Rock that meets a 9 ~ 15mm sieve size measurement may be alternated. Bright red "Sunrise" colour is preferred due to its reduced UV absorption characteristics.
4. Composted Bark Mulch – Composted Bark Mulch that meets a 10mm sieve size measurement may be alternated. pH to 6.0 ± 0.5 depending on plant selection. Organic content must be 50% +. Sand must be $15 \pm 3\%$, fines (silt + clay) $15\% \pm 3\%$.

1.05 TECHNICAL DOCUMENTS

- A. Provide two [2] copies of standard maintenance guidelines for the plants selected and installed on the roof as provided by the landscaping maintenance firm contracted to care for the Sky Garden post-installation.

1.06 VERIFICATION OF STRUCTURAL CAPACITY

- A. Obtain prior, written confirmation from an owner-mandated professional engineer certifying that the structure is capable of bearing the additional load of a Sky Garden Intensive Green Roof System. The owner understands that GREEN ROOF TOPS is absolved of any and all liability in the event of collapse.

1.07 QUALITY ASSURANCE

- A. There should be no deviation made from this specification or the detail drawings without prior written approval fourteen (14) days prior to the start of the project.
- B. The Waterproofing Contractor must be an approved member of the regional Roofing Contractors Association and must qualify for the Roofing Contractors Association Roofing Guarantee or Warranty.
- C. Before installation of the Sky Garden Intensive Green Roof System, the roof shall be inspected by a technical representative of the roofing installer/manufacturer to determine the adequacy of the roof surface to accept the Sky Garden Intensive Green Roof System.
- D. Verification of the integrity of the roof for water tightness shall be the responsibility of the Owner.
- E. The Sky Garden Intensive Green Roof System components will be purchased from GREEN ROOF TOPS.

- F. Pre-Construction Conferences. A representative from GREEN ROOF TOPS will meet with the necessary parties at the jobsite to review and discuss project conditions.

1.08 GREEN ROOF TOPS REPRESENTATIVE

- A. During installation, the contractor must permit and facilitate reasonable access to the work site and roof at all times for a Technical Representative from GREEN ROOF TOPS.
- B. Upon completion of the installation, an inspection shall be conducted by a Technical Representative from GREEN ROOF TOPS to ascertain that the Sky Garden Intensive Green Roof System has been installed according to these specifications and details. This inspection is not intended to be a final inspection for the benefit of the owner but for the benefit of determining whether a warranty shall be issued.

1.09 EQUIVALENCY REQUESTS

- A. Equivalency requests for products specified in this section must be presented in writing to the project architect at least fourteen [14] days prior to the last date of tendering.

1.10 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original, unopened containers of packaging, clearly labeled with manufacturer's name, brand name, instruction for use, all identifying numbers, and related standards.
- B. Before installation, materials must be stored in a dry and ventilated shelter that protects against freezing, inclement weather and any and all harmful substances. Plants must be stored in an area that will provide a healthy environment before installation. Depending on weather conditions, this may be outside or inside a temporary Greenhouse shelter.
- C. During installation, materials shall be stored in neat, safe manner, not to exceed the allowable structural capacity of the storage area.
- D. If installation is not performed within two (2) days of delivery to the site, the plants must be stored in their original containers and watered every two (2) days through the entire balance of the storage period. A GREEN ROOF TOPS representative must also be consulted about any additional instructions.

1.11 PROJECT CONDITIONS

-
- A. Comply with GREEN ROOF TOPS requirements regarding weather, substrate and other project conditions as specified in the Product Data Sheets.
 - B. Regularly clear the work site of any debris or other material that can hinder installation or system performance.
 - C. When moving materials on roofs or installing the G-SKY Extensive Green Roof System, protect exposed work surfaces to avoid damage. [Use sturdy paneling to erect footpaths so as to cover materials installed and permit foot traffic and movement of new materials. GR Protection Board is an adequate paneling to protect against heavy foot traffic.] The contracted installer is fully responsible for any damage.

1.12 WARRANTY (Edit to project requirements)

- A. Plants purchased from GREEN ROOF TOPS includes a one (1) year vegetation warranty starting the date of work acceptance. GREEN ROOF TOPS should be consulted before the specification of plants for a Sky Garden Intensive Green Roof in order to assess the climatic conditions and viability of the plants on the roof in order to determine if the warranty shall be issued.
- B. Upon completion of the work, the contractor must supply the owner with a warranty direct from their regional Roofing Contractors Association covering the watertightness of the membrane and, material integrity of the other system components.
- C. Warranties available from GREEN ROOF TOPS:
 - a. **Material Warranties**, excludes labor.
Duration: 5-, 10, Years
 - b. **Total System Warranties**. Covers root protection of the roof membrane (labor and material) and material integrity of the Sky Garden Intensive Green Roof System components.
Duration: 5-, 10, Years
- D. Each warranty varies in scope and terms. **Contact GREEN ROOF TOPS for exact warranty terms and conditions to meet the specific project requirements.**

1.13 SKY GARDEN INTENSIVE GREEN ROOF SYSTEM MAINTENANCE

- A. Sky Garden Intensive Green Roof System must be maintained as per the standard maintenance guidelines for the plants selected and installed on the roof as provided by the landscaping maintenance firm contracted to care for the Sky Garden post-installation.

PART II PRODUCTS

2.01 ROOT BARRIER SHEETING – LAYER 1

- A. Description: a root barrier sheeting comprised of a weather-resistant matte-finish UV-resistant coating, PET (polyethylene terephthalate) sheeting reinforced by black EPDM, with or without a high-tack rubberized asphalt adhesive made of at least 60% recycled asphalt secured by a paper backing for peel-and-stick application.
1. Specified product: ROOT GUARD™ C by GREEN ROOF TOPS (peel-and-stick applied)
 2. Alternate product: ROOT GUARD™ H by GREEN ROOF TOPS (mopped asphalt applied)

2.02 ROOT BARRIER SHEETING SEAM TAPE

- A. Description: Tape for the seams of root barrier sheeting which is comprised of a weather-resistant matte-finish UV-resistant coating, PET (polyethylene terephthalate) sheeting and modacrylic adhesive.
1. Specified product: ROOT GUARD™ TAPE by GREEN ROOF TOPS.

2.03 ROOF EDGE AND JOINT PROTECTION LAYER

- A. Description: a root protection sheeting comprised of a weather-resistant matte-finish UV-resistant coating, PET (polyethylene terephthalate) sheeting with a high-tack rubberized asphalt adhesive made of at least 60% recycled asphalt secured by a paper backing for peel-and-stick application. Seams are secured by GR Cap Tape.
1. Specified product: GR CAP by GREEN ROOF TOPS
 2. Specified product: GR CAP TAPE by GREEN ROOF TOPS

2.04 ROOT BARRIER SHEETING – LAYER 2 (OPTIONAL)

- A. Description: a root barrier sheeting comprised of polyethylene.
1. Specified product: GR FILM by GREEN ROOF TOPS

2.05 MEMBRANE/ROOT BARRIER PROTECTION LAYER (OPTIONAL)

- A. Description: a membrane/root barrier protection layer consisting of either recycled felt or corrugated polypropylene of at least 5mm thick.
1. Specified product: GR Mat by GREEN ROOF TOPS
 2. Specified product: GR Protection Board by GREEN ROOF TOPS

2.06 SECURING TAPE FOR DRAINAGE LAYER AND RETENTION WALLS (OPTIONAL)

- A. Description: a double-faced tape used to adhere drainage layer and retention walls to root protection sheeting to protect the system against wind and allow for sloped installations up to 30%.
1. Specified product: GR TAPE 20 by GREEN ROOF TOPS.

2.07 DRAINAGE LAYER

- A. Description: a three-dimensional profile recycled HIPS (high-impact polystyrene) panel (not to be confused with expanded polystyrene) that performs three functions, drainage, water retention and aeration. Clearance above the roof is 20mm.
1. Specified product: GR DRAIN 20 by GREEN ROOF TOPS.

2.08 DRAINAGE AGGREGATE (OPTIONAL)

- A. Description: obsidian-derived expanded perlite of a maximum sieve size of 20mm used to fill the cups of GR Drain 20 when deep soil depths are used.
1. Specified product: PERLITE by GREEN ROOF TOPS.

2.09 FILTER FABRIC

- A. Description: a non-woven polypropylene filter fabric with a gauge of at least 1mm and has been tested for plugging resistance against soils containing 10% fines.
1. Specified product: GR FILTER by GREEN ROOF TOPS.

2.10 SECURING PIN

- A. Description: a steel pin used to secure filter fabric to drainage layer before installing growing medium to prevent spreading of the drainage panels during installation.
1. Specified product: GR PIN by GREEN ROOF TOPS.

2.11 SOIL (GROWING MEDIUM)

- A. Description: an engineered lightweight blend of inorganic and organic components. The composition is specially formulated by GREEN ROOF TOPS for SKY GARDEN INTENSIVE GREEN ROOF SYSTEMS to provide optimal water retention, permeability, structural stability and density.
1. Specified product: ROOF SOIL™ by GREEN ROOF TOPS

2.12 ORGANIC MULCH

- A. Description: a composted bark mulch with a maximum particle size of 10mm used to retain moisture in the soil, provide organic material and trace

elements to plants, prevent soil erosion and secure plants against strong winds.

1. Specified product: GR BARK MULCH by GREEN ROOF TOPS

2.13 DRAIN WAY WEEPING TILE (optional)

- A. Description: obsidian-derived expanded perlite filled permeable tube laid inside the outer edges of the garden and drainage inspection covers. Required on all installations that extend to the parapet to discourage root establishment at corners and joints and to allow vertical/lateral drainage at joints to GR Drain 20.

1. Specified product: GR PIPE by GREEN ROOF TOPS

2.14 DRAINAGE TROUGH (optional)

- A. Description: stainless steel drainage trough to be placed at entrance/exits or to provide additional drainage through the green roof system.

Specified product: GR CHANNEL by GREEN ROOF TOPS

2.15 VEGETATION

NOTE: Vegetation should be selected for its resistance to cold and dry extreme conditions. For growing medium depths of 100mm+ the plants should be composed of herbaceous perennials (succulent, ground-cover, flowers, grasses and bulbous plants), grass lawns, may include several hardy low to medium growing shrubs (0.5~2m) and low to medium growing trees (1~4m) (see PDS-22 - G-SKY Sedum Plugs.pdf and PDS-27 - G-SKY Grand Plants.pdf product data sheets for lists of plants that GREEN ROOF TOPS produces). Consult GREEN ROOF TOPS for advice on appropriate plant types for the project and to order plants for a project. GREEN ROOF TOPS can produce almost any plant species known in nurseries located across the United States and Canada, please consult us for more details on contract growing.

2.16 ROOT BALL SECURING GRID (optional)

- A. Description: stainless steel grid with 100mm mesh installed within soil layer to secure root balls within the soil on large shrubs or trees.

1. Specified products: GR SUPPORT by GREEN ROOF TOPS

2.17 RETENTION WALLS (optional)

- A. Description: glass-reinforced concrete or aluminum wall system with main wall piece, inside and outside corner pieces, joints and screws used to hold soil within the green roof system.

1. Specified products: GR WALL GRC 150/300/400 + CORNERS OR G-SKY WALL 150A + CORNERS by GREEN ROOF TOPS

2.18 RETENTION WALL CORNER TAPE (optional)

- A. Description: fiberglass mesh tape used to tape the corners of the aluminum retention walls when placed at greater or less than 90° angles to each other on non-square green roofs. Also used to tape the seams of roof drain covers and other wall products placed at non-square angles.

1. Specified products: GR WRAP TAPE by GREEN ROOF TOPS

2.19 DRAIN INSPECTION COVERS (optional)

- A. Description: stainless steel covers with aluminum feet with removable lids used to prevent soil from flowing into the roof drain and to allow easy access for inspection and maintenance of the drain within the green roof system.

1. Specified products: GR COVER C & GR COVER W by GREEN ROOF TOPS

2.20 DRIP IRRIGATION SYSTEM (optional)

- A. Description: 17mm polystyrene tubing with internal flow controlling emitters. Emitter rate and spacing will be determined by plant selection. Irrigation controller and water supply requirements vary based on the size of the irrigated area. Requires a water supply to be installed on the roof.

1. Specified products: GR DRIPLINE SYSTEM by GREEN ROOF TOPS

2.21 DECKING SYSTEM (optional)

- A. Description: FSC-Certified cedar decking panels that are 550mm when installed. Panels are 545mm x 545mm x 50mm and are installed on slope-adjustable pedestals and interlocked using precut polyethylene interlocking crosses. When installed with GR Stands with 4.5mm separation tabs, the total area covered by a single panel is 550mm x 550mm.

1. Specified products: SKY DECKS, SKY LOCKS & GR STANDS by GREEN ROOF TOPS

PART III EXECUTION

NOTE: Take all necessary action to maintain the roof waterproofing warranty. The roofing contractor must always be informed of the green roof system to be installed on the roof.

3.01 INSTALLATION SEASON

- A. Unless otherwise permitted, green roof installation shall be done between April 1 and October 15, but not when the outside ambient temperature is below 10°C.

3.02 INSPECTION AND PREPARATION

- A. Before beginning the installation, the owner's representative and the roofer and the contracted installer's representatives must inspect and approve the roof conditions, including the waterproofing membrane, roof drains, construction joints, etc.
- B. The area to be greened shall be a smooth free draining and even surface.
- C. The area shall be thoroughly cleaned of debris that might interfere with the installation of Root Guard™ C, Root Guard™ H or GR Cap.
- D. Examine finish surfaces, grades and roof quality. Do not start Root Guard™ C, Root Guard™ H or GR Cap installation work until unsatisfactory conditions are corrected.
- E. In the event of non-compliance, a notice is to be provided to the contractor listing the corrective action to be taken. Starting the work will be taken to signify approval of the work conditions.
- F. Ensure that all waterproofing, plumbing, woodworking and other work has been duly completed.

NOTE: Retain the following item for warranty.

3.03 SUPERVISION OF WORK BY CONTRACTED ROOFER

- A. The contracted roofer must supervise the installation of the Sky Garden Intensive Green Roof System to ensure that no damage occurs to the roof that could affect the waterproofing warranty.
- B. Immediately notify [the consultant] and [the owner] in writing in case of damage to the roof.

3.04 METHOD OF INSTALLATION

- A. Install temporary roof walkways over clean surfaces, as specified and recommended by the waterproof membrane supplier.
- B. Ensure that the work site ambient temperature is at least 10°C and that the site ambient temperature is high enough after the vegetation is installed to prevent frost damage.

3.05 WORK EXECUTION RECOMMENDATIONS

- A. Maintain equipment and tools used to install the vegetation in good condition.
- B. Ensure that during use of equipment and tools, waterproofing membranes will not be damaged.

3.06 ROOT GUARD™ C/ROOT GUARD™ H INSTALLATION

NOTE: Coordinate with the roofing contractor to install Root Guard™ C or Root Guard™ H over the membrane or the concrete protection layer.

NOTE: Root Guard™ C and Root Guard™ H are not primary methods of waterproofing. They are only to be installed over installed and inspected asphalt-based waterproof membranes. Please contact GREEN ROOF TOPS for a current list of recommended asphalt waterproof membrane products that are compatible and maintain their system warranties with Root Guard™ products installed.

No installation should take place below -10°C (14°F). Always ensure that installation takes place under dry weather conditions.

- A. Prepare the surface.
 - 1. On all non-insulated concrete decks evenly apply a primer that consists of either:
 - i. petroleum asphalt modified with thermoplastic polymers and volatile solvents, or
 - ii. a comparable water-based primerInstall primer at a rate of 1 L/m² (1 gallon/200 ft²). Follow the primer manufacturers instructions and wait the proper amount of time for the primer to dry before adhering Root Guard™. (NOTE: Concrete decks must be completely dried and cured before installation of the Root Guard™ begins. Fins and sharp protrusions may have to be ground smooth prior to the application of Root Guard™.)
 - 2. Exposed asphalt membranes require no further preparation if the surface is clean of dust and debris. In rare conditions, the waterproof membrane may not be able to be cleaned satisfactorily to allow good

adhesion of the self-adhering layer of Root Guard™ C, in this situation, apply a primer to the surface of the membrane first (see above).

- B. Root Guard™ C is cold-applied (also known as self-adhering).** It is installed in a similar manner to typical asphalt based membranes.
- 1. POSITIONING ROLL:** Begin by unrolling Root Guard™ C along the lowest part of the roof and position in place. On a roof deck sloped more than 5%, the first row of Root Guard™ C should run horizontally along the roof edge. The remaining rows will be installed vertically up the slope, perpendicular to the first row. On flat roof decks, unroll the first row of membrane with the roll edge centered through the drain holes. The remaining rows will run parallel to the first row. On exposed membranes, align Root Guard™ C parallel to the underlying cap sheet and offset side laps a minimum of 300mm (12") and end laps a minimum of 450mm (18") from those of the underlying cap sheet. Under no circumstances superimpose the laps of Root Guard™ C over those of the underlying cap sheet. Carry Root Guard™ C to the bottom edge of the cant when installing the Green Roof edge off of the parapet. Carry Root Guard™ C to the termination point of the waterproof membrane when the Green Roof edge will carry up to the parapet.
 - 2. PREPARING ROLL:** Backroll Root Guard™ C to allow you to work out from the centre to the edges in both directions. All Root Guard™ C laps should offset the underlying cap sheet by a minimum of 300mm (12"). Ensure Root Guard™ C is laid smooth and is free of air pockets and wrinkles.
 - 3. ADHERING:** Peel off release paper from the back as you unroll and position Root Guard™ C. Collect the release paper as you are removing and adhering Root Guard™ C to the prepared surface.
 - 4. PRESS INTO PLACE.** All misaligned rolls must be cut off and reset. Cut out and patch all fishmouths and buckles.
 - 5.** Ensure that all side laps are overlapped a minimum of 100mm (4") along the guidelines of Root Guard™ C and end laps are also overlapped a minimum of 100mm (4").
- C. Root Guard™ H is hot-mopped applied.** It is installed with a mopping of hot asphalt in the same manner as installing a built-up roof. Use the type of asphalt appropriate to the slope of the roof deck. Use Type 2 Asphalt on slopes of 1:16 to 1:8. Use Type 3 Asphalt on slopes between 1:8 and 1:4. Do not use low melt asphalt (Type 1) to apply Root Guard™ H. Mop carefully to avoid excessive asphalt seeping from the laps.
- 1. POSITIONING ROLL:** Begin by unrolling Root Guard™ H along the lowest of the roof and position in place. On a roof deck sloped more than 5%, the first row of Root Guard™ H should run horizontally along the roof edge. The remaining rows will be installed vertically up the

slope, perpendicular to the first row. On flat roof decks, unroll the first row of membrane with the roll edge centered through the drain holes. The remaining rows will run parallel to the first row. On exposed membranes, align Root Guard™ H parallel to the underlying cap sheet and offset side laps a minimum of 300mm (12") and end laps a minimum of 450mm (18") from those of the underlying cap sheet. Under no circumstances superimpose the laps of Root Guard™ H over those of the underlying cap sheet. Carry Root Guard™ H to the bottom edge of the cant when installing the Green Roof edge off of the parapet. Carry Root Guard™ H to the termination point of the waterproof membrane when the Green Roof edge will carry up to the parapet.

2. **PREPARING ROLL:** Backroll Root Guard™ H to allow you to work out from the centre to the edges in both directions. All Root Guard™ H laps should offset the underlying cap sheet by a minimum of 300mm (12"). Ensure Root Guard™ H is laid smooth and is free of air pockets and wrinkles.
 3. **ADHERING:** Root Guard™ H: Apply 1.2 ~ 1.5kg/m² (25 ~ 30lbs/100ft²) of hot asphalt (minimum 220°C/430°F) evenly and consistently. Mop a maximum of 1m (3ft.) ahead of the roll. Unroll sheet into the hot asphalt, applying even pressure on the rolls and ensuring no fishmouths, buckles or wrinkles. **DO NOT** kick out the roll. Ensure that a small amount of asphalt exudes out of the seams at the laps (12 ± 6mm). Upon cooling check laps with a round nosed roofing trowel.
 4. **PRESS INTO PLACE.** All misaligned rolls must be cut off and reset. Cut out and patch all fishmouths and buckles.
 5. Ensure that all side laps are overlapped a minimum of 100mm (4") along the guidelines of Root Guard™ H and end laps are also overlapped a minimum of 100mm (4").
- D. Centre Root Guard™ Tape directly over the side and end laps of Root Guard™ C or H. Tape the seams of Root Guard™ C or H with Root Guard™ Tape. Ensure that Root Guard™ Tape is laid smooth and is free of air pockets and wrinkles.

3.07 GR CAP INSTALLATION

NOTE: Coordinate with the roofing contractor to install GR Cap over Root Guard™ C/ Root Guard™ H.

- A. GR Cap Installation
1. Pre-cut GR Cap to correct length (or width) to and extend onto roof a minimum of 200mm/8" (from the toe of cant). Carry GR Cap flashing up cant and terminate at the same point as Root Guard™ C/Root Guard™ H or where counter flashing will be applied. Side laps will be

100mm (4") and staggered a minimum of 100mm (4") from the laps of the underlying cap sheet membrane. Peel off release paper from the back and adhere GR Cap to the prepared surface. Collect the release paper as you are removing and adhering GR Cap to Root Guard™ C/Root Guard™ H. Check laps with round-nosed roofing trowel as work progresses. Use CRAC or your local roofing contractors association specifications for standard flashing details.

2. Tape all seams of GR Cap with GR Cap Tape.

3.08 G-SKY WALL 150A INSTALLATION

- A. According to the drawings, measure and chalk out the edges of the green roof system.
- B. Adhere GR Tape 20 down the inside of the chalk line. Do not overlap GR Tape 20.
- C. Remove release paper as you install G-SKY Wall 150A, G-SKY Corners and G-SKY Joints.

3.09 GR WALL GRC 150/300/450 INSTALLATION

- A. According to the drawings, measure and chalk out the edges of the green roof system.
- B. Place GR Wall GRC pieces in place and secure inside holes by sticking a bolt through them (do not secure bolt).
- C. Insert V-washer onto bolt ends and secure using wing-nut.
- D. Run angle iron along edges of V-washer and secure with nut and bolt.
- E. Run weeping tile along GR Wall GRC where main pieces with drainage holes are installed.

3.10 GR FILM INSTALLATION

- A. Run GR Film up the edges of green roof edges and cut to run around extrusions, such as those that exist with GR Wall GRC installations (see PDS-15 – GR Wall GRC-150-300-450 System for photos of installation). Overlap edges of GR Film by 1000mm to deter lateral root growth. Where specified, tape the seams of GR Film with Root Guard™ Tape.

3.11 GR MAT INSTALLATION

- A. Run GR Mat up the edges of green roof edges and cut to run around extrusions, such as those that exist with GR Wall GRC installations (see PDS-15 – GR Wall GRC-150-300-450 System for photos of installation). Overlap seams 100mm. Run up to flashing when parapet or adjoining wall is used as green roof edge.

3.12 GR TAPE 20 FOR GR-SW/GR-SWP INSTALLATIONS

- A. Measure in 150mm from the inside of edge of green roof edge and chalk a line for the first line of GR Tape 20 running equidistance (150mm) from the green roof edge to the next corner.

3.13 GR DRAIN 20 INSTALLATION

- A. Butt sheets of GR Drain 20 up to the green roof edge and continue to butt edges up to each GR Drain 20 adjacent until entire green roof are is covered. DO NOT overlap or insert the side cups of GR Drain 20 into the side cups of the next drainage panel. This will inhibit drainage possibly killing plants.
- B. When installing with GR Tape 20, bend GR Drain 20 back and remove release paper from the top of GR Tape 20 while GR Drain 20 is rolled onto GR Tape 20.

3.14 PERLITE INSTALLATION

- A. To keep the perlite from blowing, fully saturate the bags with water before spreading. Spread perlite across GR Drain until cups are filled and top impressions are still visible.

3.15 GR FILTER + GR PIN INSTALLATION

- A. Roll GR Filter across the surface of GR Drain 20. Overlap at least 100mm on every edge. Secure laps with GR Pin and secure GR Filter where needed with GR Pin (recommended: 4 pins/m²).

3.16 GR DRIPLINE INSTALLATION

- A. Install the GR Dripline system in accordance with the system type, please refer to the manufacturers specification, design and installation documents before installation.
 - 1. Install GR Dripline hose with embedded 2LPH emitters every 450 ~ 500mm or 18 ~ 20". Do not bend the hose to fit, use T and L fittings to install hose.
- B. Install the GR Dripline Controller in a location where it can be easily accessed and is near the water supply line. Set the controller to respond to moisture

settings (requires an optional moisture sensor line be installed) or on a timed schedule.

- C. Test system and check all points for leaks.

3.17 ROOF SOIL™ INSTALLATION

- A. Supply and install Roof Soil to the specified depths. Rake to distribute evenly. Thickness must be checked at multiple locations. Add 15% to the total volume to account for settling.
- B. Fully saturate the growing medium layer with water and allow it to sit overnight.

3.18 GR SUPPORT INSTALLATION

- A. Root Ball Support: Install GR Support at the desired depth in the soil while installing Roof Soil.
- B. Slope Soil Stability Support: Install GR Support at the desired depth in the soil while installing Roof Soil. Secure GR Support using aluminum or stainless steel wire to the securing points on GR Drain 20.

3.19 PLANT INSTALLATION

- A. Plant plants individually by hand (or with the careful use of a trowel) at the density specified GREEN ROOF TOPS, the Landscape Architect or Garden Designer.

3.20 GR BARK MULCH INSTALLATION

- A. Spread GR Bark Mulch around the plants and then evenly distribute at a thickness of 40mm around the plant stems by hand.
- B. ALTERNATIVE INSTALLATION METHOD: Spread GR Bark Mulch first and then plant after. Spread GR Bark Mulch over the soil and spread out into an even layer with a rake. Plant plugs individually being careful to bury the plants 5 ~ 10mm below the soils surface (not the red lava rock surface).

3.21 HARDSCAPE/ACCESSORY INSTALLATION

- A. Install strips/areas of stone/paver/decking ballast for walkways and maintenance paths and at all roof perimeters, building walls, penetrations, and access hatches to act as vegetation barriers for the flashings as well as safety strips (wind, fire).

- B. All drains should be fitted with GR Cover C/W inspection/maintenance boxes and grills, built up to ensure access at soil level.

3.22 POST-INSTALLATION IRRIGATION AND INSPECTION PERIOD

- A. Fully saturate the soil once a day for the first week of installation. Thereafter, water as needed.
- B. Diligently maintain the plants for thirty (30) days post-installation and acceptance of installation. Thereafter, adhere to the maintenance schedule.

3.23 ACCEPTANCE

- A. Inspection to determine acceptance of installation will be made by the Owner, upon Contractor's request. Provide notification at least seven (7) working days before requested inspection date.
- B. Upon acceptance, the Owner will assume maintenance tasks unless a maintenance contract is entered into forthwith.

3.24 CLEANING

- A. Perform cleaning during installation of the work and upon completion of the work. Remove all excess materials, debris and equipment from the site. Repair any damage that has resulted from installation.

NOTICE: GREEN ROOF TOPS reserves the right to alter the composition and conditions of use of its materials without notice as knowledge and techniques evolve.

END OF SECTION