**SPECIFICATION – VIKING ROOF GARDEN SYSTEM**

**1.01 ROOF GARDEN DESCRIPTION**

The Viking Roof Garden incorporates an adhered membrane waterproofing system with one of three types of Roof Garden Assemblies installed on top.

The waterproofing system utilizes Viking Enviroclad TPO membrane adhered over a structural deck.

Above the waterproofing system is one of three types of Roof Garden Assemblies utilizing various components including protection course; root barrier; drainage board; moisture retention mat – then the growth media and vegetation.

**1.02 ROOF GARDEN DEFINITIONS**

**A. Shallow (Ultra-Extensive) Roof Garden System**

Shallow Roof Garden System (growth media depth 50 to 75mm) is ideally suited for areas that will receive little maintenance. Recommended shallow media plants include sedums, and some herbs. Please note: This depth is too shallow for grasses. The anticipated weight above the membrane assembly is generally around 35kg per square metre, per 25mm of system depth, in a saturated state. i.e.: 100mm depth medium saturated = 35kg x 4 = 140kg / m2 \*

**B. Medium Depth (Extensive) Roof Garden System**

Medium Depth Roof Garden System (growth media depth of 75mm to 150mm) includes grasses plants such as sedums, herbs, grasses and other vegetation, which can grow in this depth of media. Un-irrigated systems can be provided without difficulty; however, drip, mist or spray irrigation systems may be required (very important for grasses) to support more diverse plant types or for installations in semi-arid climates. The anticipated weight above the membrane assembly is less than 240kg per square metre.\*

**C. Deep (Intensive) Roof Garden System**

Deep Roof Gardens typically incorporate a planting system requiring greater growth media depth (exceeding 150mm) that requires regular maintenance, such as watering, fertilizing and mowing/weeding. A variety of plants are available including turf grass, annual or perennial flowers, shrubs and even small trees. This system typically requires a structural concrete roof deck to support the larger dead load. An irrigation system may be utilized in these assemblies.

The anticipated weight above the membrane assembly is generally greater than 240kg per square metre.\*

(\*See 3.02 for notes re Roof Deck Criteria)

**1.03 DESIGN GUIDELINES**

The Roof Garden assemblies will incorporate a minimum 1.5mm thick Viking Enviroclad membrane. This membrane will be adhered with appropriate adhesive to either a plywood substrate (shallow assembly) or a slope structural concrete deck (medium / deep assemblies) or tapered insulation with an acceptable cover board. To facilitate drainage, a minimum roof slope of 1.5 degrees must be provided at the waterproofing membrane level. (Maximum slope = 30 degrees (which would require erosion control). Preferential slopes are less than 10 degrees)

**1.04 QUALITY ASSURANCE**

A. This Roof Garden System must be installed by a Viking Approved Applicator in compliance with architectural drawings as approved by Viking Roofspec. There must be no deviations made from these specifications or the approved drawings without PRIOR approval of Viking Roofspec.

B. A pre-installation meeting should be coordinated by the specifier and attended by the roofing applicator, Viking Roofspec representative and other trades working on the roof system - before and after membrane installation. The purpose of this meeting is to discuss the necessity of ensuring proper membrane protection during all phases of installation and to review other applicable requirements or unusual field conditions.

C. Upon request by the Approved Applicator, an inspection will be conducted by a representative of Viking Roofspec to ascertain that the membrane roofing system has been installed according to Viking Roofspec's specifications and details. This inspection shall be coordinated prior to installing the “above membrane roof garden components” so access to the membrane is not impaired.

D. Flood testing, electronic testing or other leak detection means is required to check the waterproof integrity of the membrane prior to installing any above membrane components.

E. An in-progress inspection is recommended after the membrane installation is completed to ensure proper protection procedures are being followed to prevent possible damage to the membrane during the installation of Roof Garden components.

**1.05 SUBMITTALS**

A. To ensure compliance with Viking Roofspec's warranty requirements, all projects should be forwarded to Viking Roofspec for review prior to installation.

B. A dimensioned layout of all membrane welds shall be included along with the project submittals (shop drawing and request for warranty).

C. For all projects, prior to project inspection by Viking Roofspec, a final shop drawing must be approved by Viking Roofspec.

**1.06 WARRANTY**

A. A 20-year Product Warranty is available for the complete system installed by an Approved Applicator to these specifications. The membrane system is defined as membrane, flashings, adhesives, sealants and other Viking brand products utilized in this installation. For a complete description of these products, refer to the “Products Section” or the applicable “Attachment” in the specifications.

B. *The formation or presence of mould or fungi in a building is dependent upon a broad range of factors including, but not limited to, the presence of spores and nutrient sources, moisture, temperatures, climatic conditions, relative humidity, and heating/ventilating systems and their maintenance and operating capabilities. These factors are beyond the control of Viking Roofspec who shall not be responsible for any claims, repairs, restoration or damages relating to the presence of any irritants, contaminants, vapours, fumes, moulds, fungi, bacteria, spores, mycotoxins, or the like in any building or in the air, land, or water serving the building.*

**1.07 JOB CONDITIONS**

Material Safety Data Sheets (MSDS) must be on location at all times during transportation, storage, and application of materials. The applicator shall follow all safety regulation as recommended by OSH and other agencies having jurisdiction.

Coordination between various trades is essential to avoid unnecessary rooftop traffic over sections of the roof and to prevent damage to the membrane. Heavily travelled areas must be protected by placing temporary protection courses to prevent damage to the membrane.

**1.08 PRODUCT DELIVERY, STORAGE AND HANDLING**

A. Deliver materials to the job site in the original, unopened containers labelled with the manufacturer's name, brand name and installation instructions.

B. Job site storage temperatures in excess of 32° C may affect shelf life of curable materials (i.e., sealants, cleaners, primers, adhesives, Pourable Sealer, Pressure-Sensitive flashing and uncured flashing.

C. When liquid adhesives and sealants are exposed to lower temperatures, restore to a minimum of 16° C before use. Do not store containers with opened lids due to loss of solvent that will occur from flash off.

D. When Viking Enviroclad FBS (Fleece-backed System) is specified, it should be stored in plastic wrap or covered to protect from moisture. Any moisture absorbed by the fleece-backing must be removed by using a wet-vac system, prior to membrane application.

E. Store Viking Enviroclad membrane in plastic wrap in a cool, shaded area and cover with light-coloured breathable tarpaulins. TPO membrane that has been exposed to the elements for approximately 7 days must be prepared with Weathered Membrane Cleaner prior to hot air welding. (Refer to Enviroclad Specifications)

F. Insulation. If a Warm Roof is specified to go below the Roof Garden, polyiso panels must be stored so they are kept dry and are protected from the elements. Store on a skid and completely cover with a breathable material such as tarp or canvas. It should also be weighted to prevent possible wind damage.

G. Growth Media should be stored under cover whenever possible to avoid direct sunlight exposure. Care should be taken not to damage the packaging to avoid leakage when hoisted to the rooftop.

H. Roof Garden Plants should be planted quickly after delivery to the jobsite. Sedum cuttings should be used within 12 hours of arrival.

**PART II PRODUCTS**

**2.01 GENERAL**

The components of this roofing system are to be products of Viking Roofspec. The installation, performance or integrity of products by others is not the responsibility of Viking Roofspec and is expressly disclaimed by the Warranty.

**2.02 MEMBRANE**

Minimum 1.5mm Viking Enviroclad membrane for shallow and medium assemblies. A minimum of 2.0mm thick (imported on indent) is required for a deep assembly.

**2.03 RELATED MATERIALS FOR WATERPROOFING**

Non reinforced flashing, Sure-Weld Bonding Adhesive, FAST Adhesive (if insulation and or FBS is used), Cut-Edge Sealant, Water Cut-Off Mastic, Pourable Pocket Sealant, Weathered Membrane Cleaner, TPO Coated Metal, Heat Weldable Walkway Rolls, Pre-Moulded Accessories.

Termination Bars, and Fasteners/Plates are used depending on the waterproofing assembly.

**2.04 ROOF GARDEN COMPONENTS**

A. Drainage Board system - consists of a high impact plastic core with “cups” and high-flow overflow drains. A non-woven 100% post-consumer recycled polyester combination filter fabric and green moisture retention mat is bonded to the retention side of the moulded core to prevent passage of particles into the water reservoirs. Designed to filter and retain water in all Roof Gardens while allowing excess water to quickly reach the drainage system. Drainage composite is 30mm thick and holds up to 86mm of rainfall per square metre. (Packaged in 1.2m x 15.2m rolls weighing 32kg – supplied cut-to-length)

B. Growth Media and Plants - Growing medium- Please note: normal topsoil alone is inappropriate for a roof garden system which requires a light, fast draining medium with high pumice content. Generally a soil layer of 10-20 cm thickness is sufficient for planting various foliage and flowering plants. A good soil mixture for roof gardening consists of a 2:1:1 split of pumice perlite, topsoil and FYM (farmyard manure) or compost. Other components could include digested fibre, expanded clay or shale, or coir.

Plants - It is necessary to choose drought resilient plants with shallow root system which will not penetrate the roof floor in long run such as grasses, sedums and aloes. At the same time, it is also advisable to grow such plants that flower at various periods of year and are very easily be maintained at roof top. Some recommended plants that thrive on Roof Garden include:

Foliage plants:- Asparagus, coleus, croton, diffenbachia, dracena, paperomias, philodendron rubber plant, etc.

Flowering plants: Seasonal flowers like Anthurhium, Asters, Balsam, Calendula, Celosia, Cosmos, Daisy, Dianthus, Gaillardia, Marigold Nasturtium, Pansies, Phlox, Verbena, Zeinia, etc., and perennial flowers like Carnation, Chrysanthemum, Dahlia, Rose, Tuberose, etc.

Fruits:**-** Gooseberry, strawberry, peach, pear, pineapple pomegranate, etc

Cactii and succulents:-Agave, Aloe, Kalanchoe, Opuntia, Cehpalocereus, Notocactus Nyctocereus, etc.

Vegetables like Bringal, broccoli, chillies, lettuce, tomato, etc

Caution: Do not use plants with aggressive root systems such as flaxes and bamboos.

C. Protection Fabric – is a polypropylene non-woven needle-punched fabric that is stabilized to resist soil chemicals, mildew, and insects and is non-biodegradable. Designed to prevent abrasion to the membrane (Available in 3.8m x 60.8m rolls - supplied cut-to-length)

 D. Root Barrier -

a) non-reinforced Geomembrane Root Barrier is a non-reinforced polypropylene sheet specifically formulated for use in below grade and vegetated applications to resist root growth and soil bacteria. Used in Deep (Intensive) and Medium Depth (Extensive) Roof Garden Systems. (Available in widths of 3.6m' and lengths of 30.4' – sold cut-to-length)

b) Biobarrier – In certain Deep (Intensive) Roof Garden applications, Biobarrier synthetic hormone root barrier is used in selective areas. Biobarrier releases a root-thwarting compound at a few parts per billion, preventing particularly invasive roots from damaging the waterproofing membranes. Biobarrier is available in 1.5m x 30.4m rolls – sold cut-to-length. Contact Viking Roofspec when considering special planting choices.

E. Aluminum Roof Garden Edge – a 2mm thick extruded aluminum edge used to separate roof garden assemblies from adjacent walkways or perimeter stone ballast. The edging comes in 3.0m lengths and 100mm high with a 76mm flange or 200mm high with a 152mm flange.

F. Aluminum Roof Garden Drain Box – extruded aluminum drain box that is 300mm x 300mm with a welded 112mm flange to keep the drain areas clear of stone ballast or growth media. The drain box is available in 100mm or 200mm heights. Drainage holes are pre-punched around the sides. Access to the drain is provided by a removable lid.

**2.05 OTHER PRODUCTS**

Buzon Screwjack Pedestals - to elevate the surface of pavers above the roof membrane to the same height as the garden whilst and promoting positive drainage and protection from freeze/thaw.

Stone Ballast – Nominal 25-35mm diameter rounded water worn gravel which conforms to ASTM D448, gradation size #4, applied at a minimum of 45 kg / m2.

**PART III EXECUTION**

**3.01 GENERAL**

When feasible, begin the application at the highest point of the highest roof level and work to the lowest point to prevent moisture infiltration and minimize construction traffic on completed sections. This will include completion of all flashings and terminations.

**3.02 ROOF DECK CRITERIA**

Proper decking shall be provided by the building owner. The building owner or its designated representative must ensure that the building structure is investigated by a registered structural engineer to assure its ability to withstand the total weight of the specified roofing system, as well as construction loads and live loads, in accordance with all applicable codes. The specifier must also designate the maximum allowable weight and location for material loading and storage on the roof.

A. For Shallow (Ultra-Extensive) Roof Garden Systems - any roof deck capable of withstanding the roof loading may be accepted.

B. For Medium Depth (Extensive) and Deep (Intensive) Roof Garden Systems - structural concrete roof decks are recommended due to the increased weight of the roof assembly when the system is at its maximum water capacity

Defects in the roof deck must be reported and documented to the specifier, general contractor and building owner for assessment. The Approved Applicator shall not proceed unless the defects are corrected.

**3.03 SUBSTRATE REQUIREMENTS**

The substrate must be dry, relatively smooth and free of protrusions, debris, sharp edges or foreign materials and must be free of accumulated water, ice and snow. Cracks or voids in the substrate greater than (6 mm) must be filled with a suitable material such as Holdfast Gorilla Grip.

**3.04 WATERPROOFING INSTALLATION**

Before beginning installation, refer to the applicable Material Safety Data Sheets, OSH safety requirements, and Technical / Product Data Bulletins for cautions and warnings.

A. Insulation Attachment (If a Warm Roof is specified underneath)

As an alternate to mechanically attaching the base layer of polyiso insulation, Dual Cartridge FAST Adhesive can be used

B. Membrane Installation

1. Viking Enviroclad or Enviroclad FBS (Fleece-backed) membranes may be adhered with the appropriate adhesive directly over sloped structural concrete or wood roof decks.

2. Follow Viking Roofspec’s’s applicable Adhered Roofing System Specifications for surface preparation procedures, membrane positioning, and adhesive application requirements.

C. Flashing

1. Walls, curbs, skylights and all other penetrations through the membrane must be flashed in accordance with Viking Roofspec’s published specifications/details for the applicable membrane specified. Refer to Roof Garden Typical Details.

2. Flashing heights shall be greater in height than the specified depth of the Roof Garden assembly

D. Roof Drains

1. Drains should be covered with Aluminum Drain Box or a perforated drain box by others with removable lid (at the growth media surface height) for inspection purposes. 25-35mm nominal diameter rounded river washed gravel is applied around the drain box a minimum 450mm to promote drainage. Refer to Roof Garden Typical Details

2. In Shallow (Ultra-Extensive) and Medium Depth (Extensive) Roof Garden Waterproofing assemblies, standard cast iron compression ring clamping drains may be able to be used with 25-35mm nominal diameter rounded river washed gravel applied around the drain sump area (minimum 450mm in width) for drainage.

**3.05 ROOF GARDEN INSTALLATION**

**A. Prior to installation of Roof Garden Components**

1. Limit foot traffic over completed waterproofing system. Heavily travelled areas (staging areas, corridors used to transport roof garden components) must be protected using 12mm thick plywood or other sheathing.

2. Perform a flood test or electronic test of Enviroclad Membrane to ensure the watertight integrity of the waterproofing system. Testing should take place after the membrane and flashings have been in place a minimum of 24 hours. Plug drains and provide necessary barriers to contain water. Flood test the membrane surface with water for 48 hours at a minimum depth of 50mm. Inspect for leaks and repair membrane if damage to waterproofing assembly is found. Retest after repairs have been made.

3. Sweep the surface of the membrane to remove all debris and loose or foreign material.

**B**. **Shallow (Ultra-Extensive) Roof Garden Installation**

1. Drainage Board

a. Unroll the drainage composite and flip over so green or white moisture retention mat is facing upwards.

b. Place drainage composite directly over the waterproofing membrane with the built-in overlapping flap facing the direction of the slope.

c. Position additional drainage composite rolls next to each other with green moisture retention mat butted against the long side. Once in place, flip 150mm retention mat flap over the first drainage composite. For runs of drainage board exceeding 15m in length, peel back both fabrics approximately 76mm on the adjacent ends of the rolls and insert two rows of the “cups” into the cups of the abutting roll. This locks the rolls together and does not allow for passage of growth media directly onto the waterproofing membrane.

d. Continue with placement of drainage component until the designated roof garden area is covered.

2. Growth Media

a. If possible, hoist growth media in sacks by crane to the roof area that is receiving the Roof Garden.

b. Distribution of the growth media shall be directly over the roof from sacks that are lowered by crane 600mm to 1200mm above the drainage board composite.

c. Slit the bottom of the sack with a knife or other cutting device to dispense the growth media directly over the drainage composite or into wheelbarrows for transportation to difficult access areas.

Caution: Location points for distribution of growth media must not overload the structural capacity of building.

Caution: Care must be taken when distribution of growth media is during windy conditions to limit potential scouring of media. (Coir matting can be commissioned in exceptionally windy areas). If growth media is not used on the day of arrival, product should be stored under a trap or other opaque cover to prevent direct exposure to sunlight and moisture.

3. Plants

a. Sedum Cuttings

i. Broadcast sedum cuttings by hand with a coverage rate of 0.5 kg per m2 (Ensure the roof is more than 90% covered)

ii. Immediately water the assembly until the system is saturated

iii. Irrigate the Roof Garden for a minimum of 60 days following installation

**C. Medium (Extensive) Roof Garden Installation**

1. Protection Fabric

a. Unroll protection fabric directly over the waterproofing membrane.

b. Position the next roll of protection fabric to overlap the first a minimum of 50mm.

c. Additional rolls shall follow the above procedure.

2. Root Barrier

a. Unroll root barrier over the protection fabric.

b. Position the next roll of root barrier to overlap the first a minimum of 76mm.

c. Clean splicing area with Carlisle Weather Membrane Cleaner to remove any dirt /contaminants.

i. Root barrier sheets shall be spliced together by heat welder.

ii. Seaming root barrier with a heat welder refer to Enviroclad Application -

Heat Welding Procedure.

d. Extend root barrier up walls, curbs, etc. to the height of the top of the growth media depth.

Caution: Placement of root barrier must not impede drainage for the roof area.

3. Drainage Board (Refer to section 3.05-B1 for installation instructions.)

4. Growth Media

a. Refer to Shallow assembly instructions except use a depth of 200mm.

5. Plants

a. If building owner requires special planting needs, contact Viking Roofspec for assistance.

**D. Deep (Intensive) Roof Garden Installation**

1. Protection Fabric

a. Refer to section 3.05-C1 for installation instructions.

2. Root Barrier

a. Refer to section 3.05-C2 for installation and seaming instructions with the following addition: Root Barrier shall be loose laid over the protection fabric

3. Drainage Board

a. Refer to section 3.05-B1 for installation of the drainage board:

4. Growth Media

a. Refer to section 3.05-B2 for installation instruction of growth media

5. Plants

a. Because of unique design nature of Deep Roof Garden Assemblies, contact Viking Roofspec for assistance on design and choices of plants.

**E. After installation of Roof Garden Components**

 Irrigate the Roof Garden with a lawn sprinkler, hand sprayer, or with a designed irrigation system until saturation to the point of runoff.