



BRANZ Appraised

Appraisal No. 903 [2018]

VIKING ROOF GARDEN SYSTEM

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BRANZ Appraisals

Technical Assessments of products for building and construction.



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Product

- 1.1 The Viking Roof Garden System is a fully bonded roof garden application for concrete roofs, incorporating Viking Enviroclad membrane, insulation board [optional], root barrier and drainage composite.

Scope

- 2.1 The Viking Roof Garden System has been appraised for use as a roof garden on buildings within the following scope:
 - with substrates of suspended reinforced concrete; and,
 - with each structure the subject of specific structural engineering and weathertightness design.
- 2.2 The design and construction of the substrate and movement and control joints is the responsibility of the building designer and building contractor.
- 2.3 The design and installation of the growing media and plants is the responsibility of the landscaping contractor and is outside the scope of the Appraisal.
- 2.4 The Viking Roof Garden System must be installed by Viking Roofspec Approved Applicators.

Building Regulations

New Zealand Building Code (NZBC)

- 3.1 In the opinion of BRANZ, the Viking Roof Garden System, if designed, used, installed and maintained in accordance with the statements and conditions of this Appraisal, will meet the following provisions of the NZBC:

Clause B1 STRUCTURE: Performance B1.3.1, B1.3.2 and B1.3.4. The Viking Roof Garden System meets the requirements for loads arising from self-weight, imposed gravity loads arising from use, water and other liquids, wind and differential movement [B1.3.3 (a), (b), (e), (h) and (m)]. See Paragraphs 8.1 and 8.2.

Clause B2 DURABILITY: Performance B2.3.1 (b), 15 years and B2.3.2. The Viking Roof Garden System meets these requirements. See Paragraphs 11.1 and 11.2.

Clause E2 EXTERNAL MOISTURE: Performance E2.3.1 and E2.3.2. The Viking Roof Garden System meet these requirements. See Paragraphs 14.1 – 14.8.

Clause F2 HAZARDOUS BUILDING MATERIALS: Performance F2.3.1. The Viking Roof Garden System meets this requirement and will not present a health hazard to people.

Technical Specification

- 4.1 Materials used with the Viking Roof Garden System and supplied by Viking Roofspec are as follows:
- **Viking Enviroclad** – is a fully bonded, polyester fabric reinforced, multilayer, synthetic roof waterproofing membrane based on thermoplastic polyolefin [TPO]. It is 1.5, 2.0 or 2.2 mm thick and supplied in light grey rolls, 3.0 m wide and 30.4 m long.
 - **Carlisle 725TR Membrane** – 1 mm thick self-adhesive, rubberised asphalt sheet waterproofing membrane used as a vapour barrier between the concrete substrate and the insulation when required. Supplied in 1 m wide x 22.9 m long rolls.
 - **Carlisle FAST™ Adhesive Dual Cartridge** – is a two-component, polyurethane adhesive used to bond the insulation to the concrete deck or the Carlisle 725TR membrane. Supplied as a dual cartridge with a total volume of 1.5 litres.
 - **Sure Weld Adhesive** – is a solvent-based contact adhesive used to bond the Viking Enviroclad to the insulation or concrete. It is supplied in 5 US gallon pails
 - **Kingspan Therma TR27LPC/FM Insulation** – is a rigid roof insulation board composed of closed-cell polyisocyanurate foam core bonded on each side to a coated glass tissue. Supplied in various thickness with a board size of 1220 mm x 2270 mm.
 - **Viking MiraDrain G4 Drainage Board** – is a high impact plastic board with ‘cups’ and high flow overflow drain. It has a non-woven 100% post-consumer recycled polyester filter fabric and moisture retention mat bonded to the upper side. It is available in rolls 1.2 m wide x 15.2 m long.
 - **Viking Root Barrier** – is a non-reinforced polypropylene sheet specifically formulated to resist root growth and soil bacteria. It is available in rolls 3.8 m wide x 30.4 m long.
 - **CCW 300 HV Protection Fabric** – is a non-woven polypropylene fabric for use as a protection layer over Viking Enviroclad in medium and deep roof garden assemblies. It is supplied in rolls 1.0 or 3.81 m wide and 61.00 m long.
 - **Aluminium Strainer Box** – is a drainage box with slotted welded flange to keep the growing media clear of the drain.
 - **Aluminium Garden Edge** – is an edge used to separate the growing media from walkways or perimeter edges.

Handling and Storage

- 5.1 Handling and storage of all materials whether on or off site is under the control of the Viking Roofspec Approved Applicators. Cool and dry storage must be provided for all products and the rolls of membrane must be stored in an upright position.

Technical Literature

- 6.1 Refer to the Appraisals listing on the BRANZ website for details of the current Technical Literature for the Viking Roof Garden System. The Technical Literature must be read in conjunction with this Appraisal. All aspects of design, use, installation and maintenance contained in the Technical Literature and within the scope of this Appraisal must be followed.

Design Information

General

- 7.1 The Viking Roof Garden System is a means for building roof gardens which are defined as roofs onto which vegetation is intentionally grown. It comprises of a vapour control layer, insulation material [optional], Viking Enviroclad waterproofing membrane, root barrier drainage material and growing media. The Viking Roof Garden System is impervious to water, and with the root barrier, will resist penetration by roots.
- 7.2 The structural concrete roofs to which the system is to be applied must be designed to transmit the dead and imposed loads experienced in service. Dead loads, imposed loads and wind load specifications are calculated in accordance with AS/NZS 1170. The growing media requirements should be calculated in accordance with the guidance given by Viking Roofspec.

- 7.3 The drainage system must be correctly designed and provision made for access for maintenance purposes. Dead loads for roof gardens can increase if the drains become partially or completely blocked, causing waterlogging of the drainage layer. Gravel guards must therefore be used on rainwater outlets and be inspected annually.
- 7.4 The weathertightness design of each specific structure, including penetration and termination detailing, is the subject of specific design by or under the supervision of a Licensed Building Practitioner with the relevant License Class.
- 7.5 The effective control of internal moisture must be considered at the design stage due to the impermeability of the membranes.
- 7.6 In the fully bonded roof garden systems, the precise growing media requirements must be calculated. The advice of Viking Roofspec should be sought.

Structure

Concrete

- 8.1 Concrete substrates must be subject to specific engineering design meeting the requirements of the NZBC, such as concrete construction to NZS 3101.

Resistance to Wind Uplift

- 8.2 In areas of wind exposure greater than NZS 3604 Wind Zone Extra High, the advice of Viking Roofspec should be sought. Growing media used in roof gardens should be of a type that will not be removed or become localised by wind scour experienced on site. It must be recognised that the type of plants used in a roof garden can significantly affect the expected wind loads experienced in service.

Resistance to Foot Traffic

- 9.1 Once a roof garden is installed it can be regarded as a suitable protection for the membrane in use. However, it must be recognised that the membrane is taken up beyond the level of the growing media [at least 150 mm] and is therefore vulnerable to damage in those areas.

Resistance to Penetrations of Roots

- 10.1 Results of tests on the root barrier indicate that it is resistant to root penetration and can be used in a roof waterproofing system for roof gardens.

Durability

Serviceable Life

- 11.1 The Viking Roof Garden System is expected to have a serviceable life of at least 15 years, provided it is designed, used, installed and maintained in accordance with this Appraisal and the Technical Literature.

Chemical Resistance

- 11.2 Industrial air pollutants and windborne salt deposits should not significantly affect the durability of the membranes. However, the long term properties of the material may be affected by contact with petroleum-based products such as oils, greases and solvents.

Maintenance

- 12.1 Maintenance requirements for the membrane are provided by Viking Roofspec.
- 12.2 The roof garden system must be regularly [at least annually] checked to ensure that unwanted vegetation and other debris is cleared from the roof and drainage outlets. Damage from wind scour must be repaired.
- 12.3 In the event of damage to the membrane, the membrane must be repaired by removing the damaged portion and applying a patch as for new work.

Prevention of Fire Occurring

- 13.1 Separation or protection must be provided to the Viking Roof Garden System from heat sources such as fire places, heating appliances, flues and chimneys. Part 7 of NZBC Acceptable Solutions C/AS1 – C/AS6 and NZBC Verification Method C/VM1 provide methods for the separation and protection of combustible materials from heat sources.

External Moisture

- 14.1 Roofs must be designed and constructed to shed precipitated moisture to meet the requirements of NZBC Performance Clause E2.3.1.
- 14.2 The Viking Roof Garden System membrane is impervious to water. The membrane, including joints when completely sealed, will adequately resist the passage of moisture into the building and enable the roof to meet the requirements of NZBC Performance Clause E2.3.2. Compliance with the requirements of NZBC Performance Clause E2.3.2 for penetration and termination detailing, is the responsibility of the building designer.
- 14.3 Roof falls must be built into the concrete substrate. The minimum fall to roofs is 1 in 30 and gutters is 1 in 100. All falls must slope to an outlet. Inadequate falls will allow moisture to collect and increase the risk of deterioration of the membrane.
[Note: Where possible, a fall of 1 in 60 in the gutters is preferred.]
- 14.4 Allowance for settlement of the substrate must be made in the design of the roof to ensure falls are maintained and no ponding of water can occur.
- 14.5 The Viking Roof Garden System is impermeable, therefore a means of dissipating construction moisture must be provided in the building design to meet compliance with NZBC Performance Clause E2.3.6.
- 14.6 Drainage flanges must be used for any outlet and must be fitted with a gravel guard to reduce potential sources of blockages. An overflow must be provided where the roof does not drain to an external gutter.
- 14.7 Penetrations and upstands must be raised above the level of any possible flooding caused by the blockage of roof drainage.

Condensation Control

- 15.1 In Climate Zone 3, as defined by the definitions, NZBC H1/VM1 & AS1, a vapour control membrane must be installed. Where required, Carlisle 725TR Membrane, must be installed over the concrete roof deck prior to installation of the insulation. This only applies if there is insulation in the system.

Energy Efficiency

- 16.1 The thermal resistance [R-Value] of building elements may be verified by using NZS 4214. The R-Values for the Therma TR27 LPC/FM Insulation are given in Table 1.

Table 1: R-Values

Therma TR27 LPC/FM Insulation – Thickness	R-Value
25 mm	0.930
50 mm	1.870
75 mm	2.80

Installation Information

Installation Skill Level Requirement

- 17.1 Installation of the Viking Roof Garden System must be completed by Viking Roofspec Approved Applicators.
- 17.2 Installation of the concrete substrate must be completed by or under the guidance of a Licensed Building Practitioner with the relevant Licence Class, in accordance with the instructions of the building designer, the Technical Literature and this Appraisal.

Preparation of Concrete Substrate

- 18.1 The concrete substrates must be surface dry, clean and stable before installation commences. Surfaces must be smooth and free from nibs, sharp edges, dust, dirt or other materials such as oil, grease or concrete formwork release agents. All surface defects must be filled to provide an even and uniform surface.
- 18.2 The relative humidity of concrete substrates must be 75% or less before application of the Viking Roof Garden System. The concrete can be checked for dryness by using a hygrometer, as set out in BRANZ Bulletin No. 585.

System Installation

- 19.1 The installation of the Viking Roof Garden System is very complex and is limited to licensed and trained applicators only. The Viking Roofspec Applicator's Manual must be referred to in all instances.

Inspections

- 20.1 Critical areas of inspection for roof garden systems are:
- Construction of substrates, including crack control and installation of movement control joints.
 - Moisture content of the substrate prior to the application of the system.
 - Acceptance of the substrate by the membrane installer prior to application of the system.
 - Installation of the system including vapour barrier, geotextile cloth, insulation material, root barrier and membrane to Viking Roofspec instructions.
 - Installation of plastic drainage cell, filter cloth and growing media.

Health and Safety

- 21.1 Safe use and handling procedures for the Viking Roof Garden System are provided in the Technical Literature.

Basis of Appraisal

The following is a summary of the technical investigations carried out:

Tests

- 22.1 Testing has been carried out on the membrane for tensile strength, elongation, shrinkage, flexibility at low temperature, puncture resistance, watertightness, joint strength under shear, heat aging resistance, chemical resistance and artificial weathering followed by tensile strength, elongation, low temperature flexibility retention and root penetration resistance. Results and test methods have been reviewed by BRANZ and found to be satisfactory.

Other Investigations

- 23.1 A durability opinion has been provided by BRANZ technical experts.
- 23.2 Installation of the system has been assessed by BRANZ for practicability and found to be satisfactory.
- 23.3 The Technical Literature has been examined by BRANZ and found to be satisfactory.

Quality

- 24.1 The manufacture of Viking Roof Garden System components have not been examined by BRANZ, but details regarding the quality and composition of the materials used were obtained by BRANZ and found to be satisfactory. BRANZ has taken note of the product certifications covering quality aspects associated with this product.
- 24.2 The quality of supply of the products to the market is the responsibility of Viking Roofspec.
- 24.3 Quality on site is the responsibility of the Viking Roofspec Approved Applicators.
- 24.4 Designers are responsible for the substrate design, and building contractors are responsible for the quality of construction of the substrate.



Sources of Information

- AS/NZS 1170: 2002 Structural design actions - General principles.
- NZS 3101: 2006 Concrete Structures Standard.
- BRANZ Bulletin No. 585. Measuring Moisture in Timber and Concrete, June 2015.
- The GRO Roof garden Code - Roof garden Code of Best Practice for the UK 2011.
- Acceptable Solutions and Verification Methods for New Zealand Building Code External Moisture Clause E2, Ministry of Business, Innovation and Employment, Third Edition July 2005 (Amendment 7, 01 January 2017).
- Ministry of Business, Innovation and Employment Record of amendments - Acceptable Solutions, Verification Methods and handbooks.
- The Building Regulations 1992.



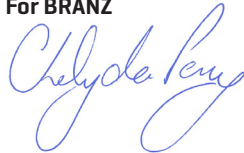
In the opinion of BRANZ, **Viking Roof Garden System** is fit for purpose and will comply with the Building Code to the extent specified in this Appraisal provided it is used, designed, installed and maintained as set out in this Appraisal.

The Appraisal is issued only to **Viking Roofspec**, and is valid until further notice, subject to the Conditions of Appraisal.

Conditions of Appraisal

1. This Appraisal:
 - a) relates only to the product as described herein;
 - b) must be read, considered and used in full together with the Technical Literature;
 - c) does not address any Legislation, Regulations, Codes or Standards, not specifically named herein;
 - d) is copyright of BRANZ.
2. **Viking Roofspec**:
 - a) continues to have the product reviewed by BRANZ;
 - b) shall notify BRANZ of any changes in product specification or quality assurance measures prior to the product being marketed;
 - c) abides by the BRANZ Appraisals Services Terms and Conditions;
 - d) warrants that the product and the manufacturing process for the product are maintained at or above the standards, levels and quality assessed and found satisfactory by BRANZ pursuant to BRANZ's Appraisal of the product.
3. BRANZ makes no representation or warranty as to:
 - a) the nature of individual examples of, batches of, or individual installations of the product, including methods and workmanship;
 - b) the presence or absence of any patent or similar rights subsisting in the product or any other product;
 - c) any guarantee or warranty offered by **Viking Roofspec**.
4. Any reference in this Appraisal to any other publication shall be read as a reference to the version of the publication specified in this Appraisal.
5. BRANZ provides no certification, guarantee, indemnity or warranty, to **Viking Roofspec** or any third party.

For BRANZ



Chelydra Percy

Chief Executive

Date of Issue:

31 August 2018