



BRANZ Appraised

Appraisal No.404 [2008]

BRANZ Appraisals

Technical Assessments of products
for building and construction

**BRANZ
APPRAISAL
No. 404 (2008)**

This Appraisal replaces BRANZ
Appraisal No. 404 (2005) issued
9 August 2005.

**bituFLAME®
ROOF MEMBRANE
SYSTEMS**

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Product

1.1 bituFLAME® Roof Membranes are waterproofing membranes for nominally flat, pitched and curved roofs, gutters and parapets. They are installed as a single or multi-layer system with either a mineral chip finished product (bituFLAME® CS Granule) or a fleece finished layer (bituFLAME® CS Mat) with UV protective paint as the top layer, or as a single layer system (bituFLAME® BS) under heavy protection such as paving slabs or a topping screed.

1.2 Both the products are supplied as torch-on, reinforced, polymer-modified bitumen sheets in roll form. The membranes can be fully torched, mechanically or adhesive fixed.



Scope

2.1 bituFLAME® Roof Membranes have been appraised as roof waterproofing membranes on buildings within the following scope:

- the scope limitations of NZBC Acceptable Solution E2/AS1, Paragraph 1.1 with respect to building height and maximum floor plan areas; and,
- with building structures designed and constructed to meet the requirements of the NZBC; and,
- with roof supporting structures of timber framing with substrates of plywood; and,
- with substrates of suspended concrete slabs; and,
- situated in NZS 3604 Building Wind Zones, up to, and including 'Very High'.

2.2 bituFLAME® Roof Membranes have also been appraised for use as roof waterproofing membranes on specifically designed buildings within the following scope:

- with building structures designed and constructed to comply with the NZBC; and,
- with roof supporting structures of timber framing with substrates of plywood; and,
- with substrates of suspended concrete slab; and,
- subjected to maximum wind pressures (Refer Paragraph 8.2); and,
- with the weathertightness design of all junctions being the subject of specific design by the designer.

Note: The design of these junctions has not been appraised by BRANZ and is outside the scope of this Appraisal.

2.3 Roofs waterproofed with bituFLAME® Roof Membranes must be designed and constructed in accordance with the following limitations:

- nominally flat, curved or pitched roofs constructed to drain water to gutters and drainage outlets complying with the NZBC; and,
- constructed to suitable falls (Refer Paragraph 14.3 and 14.4); and,
- with no integral roof gardens.

2.4 The design and construction of the substrate and movement and control joints is specific to each building, and therefore is the responsibility of the building designer and building contractor and is outside the scope of this Appraisal.

2.5 The membranes must be installed by Waterproofing System Ltd approved installers in accordance with the Waterproofing System Ltd Technical Literature referenced in Paragraph 6.1.

Building Regulations

New Zealand Building Code (NZBC)

3.1 In the opinion of BRANZ, bituFLAME® Roof Membrane Systems, if designed, used, installed and maintained in accordance with the statements and conditions of this Appraisal, will meet or contribute to meeting the following provisions of the NZBC:

Clause B2 DURABILITY: Performance B2.3.1 (b), 15 years. bituFLAME® Roof Membrane Systems meet this requirement. See Paragraph 10.1. Performance B2.3.1 (c), 5 years. Alugard, Sungard and Synroof Hi Build meet this requirement. See Paragraph 10.2.

Clause E2 EXTERNAL MOISTURE: Performance E2.3.1 and E2.3.2. bituFLAME® Roof Membrane Systems meet these requirements. See Paragraphs 14.1 – 14.9.

Clause F2 HAZARDOUS BUILDING MATERIALS: Performance F2.3.1. bituFLAME® Roof Membrane Systems meet this requirement and will not present a health hazard to people.

3.2 This is an Appraisal of an **Alternative Solution** in terms of New Zealand Building Code compliance. The membranes are an alternative to the membranes specified in NZBC Acceptable Solution E2/AS1, and an Alternative Solution subject to specific design for other buildings not covered within E2/AS1.

Technical Specification

4.1 Materials supplied by Waterproofing Systems Ltd are as follows:

bituFLAME® CS Mat

- These are torch-on membranes either 3.0 or 4.0 mm thick with a fleece upper layer and 180 - 200 g/m² spun-bonded polyester fabric reinforcement. They are designed to be used as a single or double layer system with UV protection. They are available in 10 m x 1 m rolls.

bituFLAME® CS Granule Membrane

- A 4.0 mm thick torch-on membrane with a mineral chip finished top surface and a thermofusible polyethylene foil film backing. Designed to be used as a single or a cap layer for double layer systems. It is available in white, green, terracotta or black mineral chip finish.

bituFLAME® BS Membrane

- A 2.0 or 3.0 mm thick membrane with a polythene top surface and 60 g/m² glassfibre mat reinforcement. It is available in 20 m x 1 m rolls and 10 m x 1 m rolls. It is designed to be used as a base sheet for double layer systems or as an underflashing.

bituPRIME Primer

- A solvent-based, fast drying bituminous primer designed to penetrate concrete or plywood surfaces and provide a bondable surface. It is available in 20 litre cans.

Alugard UV Coating

- A fortified liquid membrane containing polished aluminum flakes. It is applied to sand-finished membranes as a UV protection.

Sungard UV Coating

- A non-fibred aluminum paint used as UV protection for sand finished bituminous membranes.

duroTUFF® UV Coating

- An acrylic high build membrane used for UV protection where a specific colour finish is required

DPC Tapes

- A tape used on all plywood joints under a single layer system. The tapes are 50 mm wide.

bituBOND® Adhesive

- A water-based bitumen adhesive used for glue fixing torch-on membranes to gutters, parapets and other difficult detailing areas.

Table 1: Membrane Systems

System	Single Layer	Double Layer	Protection Required
bituFLAME® CS Mat Membranes	4.0 mm		Alugard, Sungard, duroTUFF®, paving slabs or cement screeds
bituFLAME® BS Membranes		2.0 or 3.0 mm bituFLAME® BS with 4.0 mm top layer	Alugard, Sungard, duroTUFF®, paving slabs or cement screeds
bituFLAME® CS Granule Membrane	4.0 mm		Standard finish of material
bituFLAME® CS Granule Membrane		2.0 or 3.0 mm bituFLAME® BS with 4.0 mm top layer	Standard finish of material

Handling and Storage

5.1 Handling and storage of all materials whether on or off site is under the control of the Waterproofing Systems Ltd trained installers. 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 bituFLAME® Roof Membranes. 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 bituFLAME® Roof Membranes are for use on roofs, gutters and parapets where an impervious waterproof membrane is required to prevent damage to building elements and adjoining areas. The products can be used on new or existing buildings. Waterproofing Systems Ltd should be consulted as to the suitability of any existing substrates prior to using bituFLAME® Roof Membranes.

7.2 The effective control of internal moisture must be considered at the design stage due to the impermeability of the membranes. Refer to BRANZ publication "Good Practice Guide - Membrane Roofing".

7.3 The 2.0 mm or 3.0 mm thick bituFLAME® BS membrane is designed for use on roofs and gutters as the first layer of a double layer system and all areas requiring detailing such as upstands, protrusions, rainwater heads and outlets. The bituFLAME® CS membrane can be used as the top layer of a double layer system, or as a single layer system, see Table 1.

Structure

8.1 Where mechanical fasteners or adhesive fixing is used within the higher wind uplift roof areas (as defined by Figure 10.16 and 10.17 of NZS 3604) on buildings in the 'High' and 'Very High' Building Wind Zones, the fasteners or adhesive fixings must be at maximum 200 mm centres. All other roof areas or the whole roof on buildings in the 'Low' or 'Medium' Building Wind Zones may have mechanical fasteners or adhesive fixings at maximum 300 mm centres. The higher wind uplift roof areas are all roof areas adjacent to roof edges, ridges and hips, and generally for a distance of 1.5 metres away from the roof edge, ridge or hip. It should be noted that all membranes in all Building Wind Zones, including the base layer in two-layer systems, must be fully bonded for a distance of 200 mm from the roof perimeter.

8.2 bituFLAME® Roof Membranes as fully bonded single or double layer systems are suitable for use in areas subject to maximum wind pressures of 10 kPa Ultimate Limit State.

Substrates

Plywood

9.1 Plywood must be treated to H3 (CCA treated). LOSP treated plywood must not be used. Plywood must comply with NZBC Acceptable Solution E2/AS1 Paragraph 8.5.3 and 8.5.5. Where specific design is used (i.e. outside the scope of E2/AS1) the plywood thickness and fixing size may increase and centres may decrease to meet specific wind loadings. Timber framing must comply with NZS 3604, or where specific engineering design is used, the framing shall be of at least equivalent stiffness to the framing provisions of NZS 3604, or comply with the serviceability criteria of AS/NZS 1170. In all cases, framing must be provided so that the maximum span of the substrate as specified by the substrate manufacturer is met and all sheet edges are fully supported.

Concrete

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

Existing Construction

9.3 A thorough inspection of the substrate must be made to ensure it is in fit condition and does not contain any materials that will adversely affect the performance of the membrane.

9.4 Repairs must be undertaken, where applicable, to ensure the substrate is sound, the joints are sealed, and the flashings are sound. Plywood substrates must be checked for screw fixings, and if necessary refixed as for new plywood.

Durability

Serviceable Life

10.1 bituFLAME® Roof Membranes are expected to have a serviceable life of at least 15 years, provided they are designed, used, installed and maintained in accordance with this Appraisal and the Technical Literature.

10.2 Alugard, Sungard and duroTUFF® are expected to have a serviceable life of at least 5 years provided they are used, installed and maintained in accordance with this Appraisal and the Technical Literature.

Chemical Resistance

10.3 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

11.1 The membrane roof system, including any areas with a UV coating applied, must be regularly (at least annually) checked for damage, rubbish, debris or coating breakdown. Damage, such as small punctures and tears must be repaired and coatings reapplied as recommended by Waterproofing Systems Ltd.

11.2 Special care must be taken when inspecting the membrane roof systems to ensure the continuing prevention of moisture ingress, and repairs must be undertaken where required.

11.3 Drainage outlets must be maintained to operate effectively.

Outbreak of Fire

12.1 Separation or protection must be provided to the membranes and plywood substrate from heat sources such as flues and chimneys.

12.2 NZBC Acceptable Solution C/AS1 Part 9 and Verification Method C/VM1 provide methods for separation and protection of combustible materials from heat sources.

Spread of Fire

13.1 The membranes may be used on roofs of buildings intended for all Purpose Groups, including SC and SD, subject to the requirements of NZBC Acceptable Solution C/AS1 Part 7, Paragraph 7.11.1.

13.2 The membranes may be used for cladding fire-rated roof construction, providing the roof construction complies with the requirements of NZBC Acceptable Solution C/AS1 Part 7.

External Moisture

14.1 Roofs must be designed and constructed to shed precipitated moisture. They must also take account of snowfalls in snow prone areas.

A means of meeting code compliance with NZBC Clause E2.3.1 is given by the Technical Literature which aligns with details in NZBC Acceptable Solution E2/AS1.

14.2 When installed in accordance with this Appraisal and the Technical Literature, bituFLAME® Roof Membranes will prevent the penetration of water and will therefore meet code compliance with Clause E2.3.2. The membranes are impervious to water and will give a weathertight roof.

14.3 Roof falls must be built into the substrate and not created with mortar screeds applied over the membrane.

14.4 The minimum fall to roofs is 1 in 40 and gutters are 1 in 60. All falls must slope to an outlet. Inadequate falls will allow moisture to collect and increase the risk of deterioration of the membrane.

14.5 Allowance for deflection and 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.

14.6 bituFLAME® Roof Membranes are impermeable; therefore a means of dissipating construction moisture must be provided in the building design and construction to meet code compliance with Clause E2.3.6.

14.7 Drainage flanges must be used for any outlet and must be fitted with a grate or cage to reduce potential sources of blockages. An overflow must be provided where the roof does not drain to an external gutter or spouting.

14.8 Penetrations and upstands of the membranes must be raised above the level of any possible flooding caused by the blockage of roof drainage.

14.9 The design of details not covered by the Technical Literature is subject to specific weathertightness design and is outside the scope of this Appraisal.

Water Supplies

15.1 bituFLAME® Roof Membranes have not been assessed for roofs used for the collection of potable water.

Installation Information

Installation Skill Level Requirement

16.1 Installation of the membranes must be completed by trained installers, approved by Waterproofing Systems Ltd.

16.2 Installation of substrates must be completed by tradespersons with an understanding of roof construction, in accordance with instructions given within the Waterproofing Systems Ltd Technical Literature and this Appraisal.

Preparation of Substrates

17.1 Substrates must be 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 achieve an even and uniform surface.

17.2 The relative humidity of concrete substrates must be 75% or less before membrane application. The concrete can be checked for dryness by using a hygrometer, as set out in BRANZ Bulletin No. 424.

17.3 The moisture content of the plywood and timber substructure must be a maximum of 20% and the plywood sheets must be dry at time of membrane application. This will generally require plywood sheets to be covered until just before the membrane is laid, to prevent rain wetting.

17.4 Substrates must be primed with bituPRIME Primer and left to dry (4-5 hours) before the membrane is installed.

Membrane Installation

18.1 The membrane must be installed in accordance with the Technical Literature.

18.2 Plywood joints under a single layer must be taped with 50 mm wide DPC tape. All roof and wall junctions must have a 20 mm x 20 mm wooden fillet installed at the junction. Concrete substrate junctions must have a 20 mm x 20 mm cement mortar fillet installed. All external edges must be chamfered to a 5 mm radius to remove sharp edges.

18.3 The membrane must be unrolled without tension onto the prepared substrate and allowed to 'relax' for at least 30 minutes prior to installation.

18.4 The membrane is installed from the lowest point and each layer is installed across the roof fall allowing a 100 mm side overlap and a 150 mm end overlap. If a double system is being installed, the cap sheet layer must be offset against the base sheet layer.

Inspections

19.1 Critical areas of inspection for waterproofing systems are:

- Construction of substrates, including crack control and installation of bond breakers and movement control joints.
- Moisture content of the substrate prior to the application of the membrane.
- Acceptance of the substrate by the membrane installer prior to application of the membrane.
- Installation of the membrane to the manufacturer's instructions.

Health and Safety

20.1 Safe use and handling procedures for bituFLAME® Roof Membrane Systems are provided in the Technical Literature. The products must be used in conjunction with the relevant Material Safety Data Sheets for each membrane.

Basis of Appraisal

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

Tests

21.1 The following is a summary of the testing of bituFLAME® Membranes undertaken by BRANZ, and testing by other organizations as listed that has been reviewed by BRANZ and found to be satisfactory:

- BRANZ – Cyclic joint movement to ASTM D5849-95, and nail pull-through and spot bonding peel to ascertain load resistances and tensile adhesion.
- Bitumat Company – Q.U.V. to ASTM G-53; and softening point, penetration, low temperature flexibility, heat resistance of product after artificial ageing, and lap joints after artificial ageing for joint integrity and tensile strength of joint, all to UEATc methods.
- Materials Science and Engineering Consultants, USA – breaking strength, ultimate elongation, load strain, water resistance, low temperature flexibility, water vapour transmission, dynamic impact, lap joint strength, strength after accelerated weathering and crack bridging capability to CGSB 37-GP-56M and various ASTM standards.
- Al Hoty-Stanger Ltd, Kingdom of Saudi Arabia - thickness, width, cold flexibility, low temperature, softening point, penetration, tear resistance, tensile strength, elongation, load strain, lap joint strength, heat resistance, static indentation, dynamic punching test, all to UEATc methods; water absorption to ASTM D 570; compressibility; and resistance to hydrostatic pressure to DIN 1048.

- Bureau Veritas International – thickness, weight, flexibility, water absorption, permeability, elongation and shore hardness.
- Saudi Socotec – width, length, weight, thickness, resistance to heat, tensile strength, elongation, tear resistance, softening point, penetration, lap joint strength, cold pliability and puncture resistance all to UEAtc methods.
- Saudi Veritas Ltd – tensile strength, softening point, penetration, cold flexibility, thickness, width, weight, flow, elongation, tear resistance and puncture resistance.

Other Investigations

- 22.1 A durability opinion has been provided by BRANZ technical experts.
- 22.2 Installation of the membranes has been assessed by BRANZ for practicability of installation and found to be satisfactory.
- 22.3 The Technical Literature has been examined by BRANZ and found to be satisfactory.

Quality

- 23.1 The manufacture of the membranes has 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.
- 23.2 The quality of the supply of products to the New Zealand market is the responsibility of Waterproofing Systems Ltd.
- 23.3 Quality on site is the responsibility of the Waterproofing Systems Ltd approved installers.
- 23.4 Designers are responsible for the building design, and building contractors are responsible for the quality of construction of substrate systems in accordance with the instructions of Waterproofing Systems Ltd and this Appraisal.
- 23.5 Building owners are responsible for the maintenance of the membrane systems in accordance with the instructions of Waterproofing Systems Ltd and this Appraisal.

Sources of Information

- AS/NZS 1170: 2002 Structural design action - General principles
- AS/NZS 2269: 1994 Plywood – Structural.
- BRANZ Good Practice Guide – Membrane Roofing, reprint October 2003.
- NZS 3101: 1995 The design of concrete structures.
- NZS 3604: 1999 Timber framed buildings.
- Compliance Document for New Zealand Building Code External Moisture Clause E2, Department of Building and Housing, Third Edition July 2005.
- New Zealand Building Code Handbook and Approved Documents, Building Industry Authority, 1992.
- The Building Regulations 1992, up to, and including October 2004 Amendment.



BRANZ

In the opinion of BRANZ, bituFLAME® Roof Membrane Systems are fit for purpose and will comply with the Building Code to the extent specified in this Appraisal provided they are used, designed, installed and maintained as set out in this Appraisal.

The Appraisal is issued only to Waterproofing Systems Ltd, 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. Waterproofing Systems Ltd:
 - 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.
3. 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.
4. 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 Waterproofing Systems Ltd.
5. 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.
6. BRANZ provides no certification, guarantee, indemnity or warranty, to Waterproofing Systems Ltd or any third party.

For BRANZ

P Burghout
Chief Executive

Date of issue: 19 December 2008