



BRANZ Appraised

Appraisal No.633 [2009]

BRANZ Appraisals

**Technical Assessments of products
for building and construction**

**BRANZ
APPRAISAL
No. 633 (2009)**

Amended 10 July 2014

GRAPHEX INSULATED FACADE SYSTEM

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Product

1.1 The Graphex Insulated Façade System is a cavity-based Exterior Insulation and Finishing System (EIFS) wall cladding. It is an external wall cladding system for residential and light commercial type buildings where domestic construction techniques are used.

1.2 The system consists of Neopor®, a graphite composite board or expanded polystyrene (EPS) sheets fixed over polystyrene battens to form the cavity. The plaster coating system consists of a 3-4 mm thickness of fibreglass mesh reinforced, polymer-modified, cement-based plaster, which is finished with a cement-based finishing plaster that is then painted with a 100% acrylic-based paint system. The chosen finishing plaster is applied to give a range of different appearances, such as a sponge, patterned, adobe or spray textured finish.

1.3 The system incorporates Resene Construction Systems EdgeSeal joinery flashings. It also incorporates a primary and secondary means of weather resistance (first and second line of defence) against water penetration by separating the cladding from the external wall framing with a nominal 20 mm drained cavity.



Scope

2.1 The Graphex Insulated Façade System has been appraised as an external wall cladding system for buildings within the following scope:

- the scope limitations of NZBC Acceptable Solution E2/AS1, Paragraph 1.1; and,
- constructed with timber framing complying with the NZBC; and,
- with a risk score of 0-20, calculated in accordance with NZBC Acceptable Solution E2/AS1, Table 2; and,
- situated in NZS 3604 Wind Zones up to, and including 'Extra High'.

2.2 The Graphex Insulated Façade System has also been appraised for weathertightness and structural wind loading when used as an external wall cladding system for buildings within the following scope:

- the scope limitations of NZBC Acceptable Solution E2/AS1, Paragraph 1.1; and,
- constructed with timber and steel framing subject to specific engineering design; and,
- situated in specific design wind pressures up to a maximum design differential ultimate limit state (ULS) of 2.5 kPa.

2.3 The Graphex Insulated Façade System must only be installed on vertical surfaces (except for tops of parapets, sills and balustrades, which must have a minimum 15° slope and be waterproofed in accordance with the Technical Literature).

2.4 The system is appraised for use with aluminium window and door joinery that is installed with vertical jambs and horizontal heads and sills. (*The Appraisal of the Graphex Insulated Façade System relies on the joinery meeting the requirements of NZS 4211 for the relevant Wind Zone or wind pressure.*)

2.5 Installation of components and accessories supplied by Rockcote Resene Limited and approved installers must be carried out only by Rockcote Resene Limited approved installers.

Building Regulations

New Zealand Building Code (NZBC)

3.1 In the opinion of BRANZ, the Graphex Insulated Façade System 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 B1 STRUCTURE: Performance B1.3.1, B1.3.2 and B1.3.4. The Graphex Insulated Façade System meets the requirements for loads arising from self-weight, wind, impact and creep [i.e. B1.3.3 (a), (h), (j) and (q)]. See Paragraphs 10.1 - 10.4.

Clause B2 DURABILITY: Performance B2.3.1 (b), 15 years, B2.3.1 (c), 5 years and B2.3.2. The Graphex Insulated Façade System meets these requirements. See Paragraphs 11.1 and 11.2.

Clause E2 EXTERNAL MOISTURE: Performance E2.3.2. The Graphex Insulated Façade System meets this requirement. See Paragraphs 16.1 - 16.5.

Clause F2 HAZARDOUS BUILDING MATERIALS: Performance F2.3.1. The Graphex Insulated Façade System meets 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.

Technical Specification

4.1 System components and accessories supplied by Rockcote Resene Limited are as follows:

Cavity Battens

- Graphex peel 'n' stick battens are manufactured from high density (Class H) expanded polystyrene (EPS) with an approximate density of 24 kg/m³. The battens are 21 mm thick by 45 mm wide and are coated on the back face with an acrylic adhesive, which is protected prior to installation by a removable film.

Neopor®

- Neopor® boards are 40, 50 or 60 mm thick with an approximate density of 24 kg/m³. The boards are supplied in lengths ranging from 2.4 to 3.6 m x 1.2 m wide and are manufactured to meet the requirements of AS 1366 Part 3.

EPS Sheets

- EPS sheets are 40 mm thick Class H with an approximate density of 24 kg/m³, or 50 or 60 mm thick Class S with an approximate density of 16 kg/m³. The sheets are supplied in lengths ranging from 2.4 to 3.6 m x 1.2 m wide and are manufactured to meet the requirements of AS 1366 Part 3.

Plasters

- Coarse Mesh Render* is a polymer-modified, Portland cement-based plaster supplied in 20 kg bags and mixed on site with clean drinking water. It is applied as the base coat in a minimum 2 mm layer followed by the embedment of fibreglass mesh reinforcement in the outer surface. Coarse Mesh Render can also be used to achieve a spray textured finish.

- Ezytex* is a polymer-modified, Portland cement-based finishing plaster supplied in 20 kg bags and mixed on site with clean drinking water. It is available in three grades to provide a textured, patterned or sponge finish.

Paint System Specification

- Resene Limelock is a water-borne acrylic, polymer dispersion, tintable coating supplied in 10 litre pails. It is brush or roller applied as a primer between the Ezytex textures and the finishing system.
- Resene X200 is an acrylic waterproofing coating for use as a protective finish over Resene Construction Systems Textures. It is supplied in 4 and 10 litre pails and is brush, roller or spray applied. The protective finish coat must have a minimum LRV of 40%.

Accessories

- Reinforcing mesh - alkali-resistant fibreglass mesh with a nominal mesh size of approximately 4 mm square and a weight of 150 g/m² for use in domestic and light commercial situations. Where a greater level of impact resistance is required, 360 g/m² alkali-resistant fibreglass mesh with a nominal mesh size of approximately 3 mm square is available.
- uPVC components – starter strip flashing, standard corner flashing, vertical control joint, horizontal control joint, EdgeSeal sill, jamb and head flashings, and 50 mm ventilated starter strip.
- 3M All Weather Flashing Tape 8067 – flexible flashing tape with a proprietary backing and an acrylic pressure sensitive adhesive to seal the EdgeSeal head flashing to the building underlay. The tape is available 76 mm wide in rolls 22.8 m long.
- Neopor® board and EPS sheet nail fixings (timber frame) – hot-dip galvanised steel flat head nails with 40 mm diameter washers. Refer to Table 1 for fixing length requirements. (Note: Hot-dip galvanising must comply with AS/NZS 4680.)

Table 1: Neopor® board and EPS sheet fixing lengths (timber frame)

Polystyrene Sheet Thickness	Nail Size (mm)
40	90 x 3.55
50	100 x 3.75
60	110 x 4.0

- Neopor® board and EPS sheet screw fixings (timber frame) – 8 gauge AS 3566 Corrosion Class 4 hot-dip galvanised wood screws with 40 mm diameter washers in NZS 3604 defined Exposure Zones B, C and D. Refer to Table 2 for fixing length requirements.

Table 2: Neopor® board and EPS sheet fixing lengths (timber frame)

Polystyrene Sheet Thickness	Minimum Screw Length (mm)
40	80
50	100
60	100

- Neopor® board and EPS sheet screw fixings (steel frame) – 8 gauge self drilling AS 3566 Corrosion Class 4 hot-dip galvanised screws with 40 mm diameter washers in NZS 3604 defined Exposure Zones B, C and D. Refer to Table 3 for fixing length requirements.

Table 3: Neopor® board and EPS sheet fixing lengths (steel frame)

Polystyrene Sheet Thickness	Minimum Screw Length (mm)
40	80
50	95
60	95

- Washers - 40 mm diameter polypropylene washers.
- 4.2 Accessories used with the system which are supplied by the approved applicator are:
- Waterproof membrane tapes - tapes covered by a valid BRANZ Appraisal for use as waterproofing membranes over tops of plastered parapets, balustrades, fixing blocks and the like.
 - Flexible sealant - sealant complying with NZBC Acceptable Solution E2/AS1, or sealant covered by a valid BRANZ Appraisal for use as a weather sealing sealant for exterior use.
 - Adhesive - EPS compatible adhesive for gluing uPVC components to the Neopor® boards and EPS sheets as and where required.
- 4.3 Accessories used with the system which are supplied by the building contractor are:
- Flexible wall underlay – building paper complying with NZBC Acceptable Solution E2/AS1 Table 23, or breather-type membranes covered by a valid BRANZ Appraisal for use as wall underlays.
 - Flexible building underlay support – polypropylene strap, 75 mm galvanised mesh, galvanised wire, or additional vertical battens for securing the flexible building underlay in place and preventing bulging of the bulk insulation into the drainage cavity. (Note: mesh and wire galvanising must comply with AS/NZS 4534.)
 - Rigid wall underlay – Plywood or fibre cement sheet complying with NZBC Acceptable Solution E2/AS1 Table 23, or rigid sheathing covered by a valid BRANZ Appraisal for use as rigid air barrier systems.
 - Flexible sill and jamb flashing tapes - flexible flashing tapes complying with NZBC Acceptable Solution E2/AS1 Paragraph 4.3.11, or flexible flashing tapes covered by a valid BRANZ Appraisal for use around window and door joinery openings.
 - Window and door trim cavity airseal - air seals complying with NZBC Acceptable Solution E2/AS1 Paragraph 9.1.6, or self-expanding, moisture cure polyurethane foam air seals covered by a valid BRANZ Appraisal for use around window, door and other wall penetration openings.

Handling and Storage

5.1 Handling and storage of all materials supplied by Rockcote Resene Limited or the approved installer, whether on or off site, are under the control of Rockcote Resene Limited approved installers. Dry storage must be provided on site for the fibreglass mesh and bags of plaster. Neopor® boards, EPS sheets, battens, uPVC flashings and profiles must be protected from direct sunlight and physical damage, and should be stored flat and under cover. Liquid components must be stored in frost-free conditions.

5.2 Handling and storage of all materials supplied by the building contractor, whether on or off site, are under the control of the building contractor. Materials must be handled and stored in accordance with the relevant manufacturer's instructions.

Technical Literature

6.1 Refer to the Appraisals listing on the BRANZ website for details of the current Technical Literature for the Graphex Insulated Façade 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. The Graphex Insulated Façade System listing on the BRANZ website excludes specific details. These details are outside the scope of this Appraisal.

Design Information

Framing

Timber Treatment

7.1 Timber wall framing behind the Graphex Insulated Façade System must be treated as required by NZBC Acceptable Solution B2/AS1.

Timber Framing

7.2 Timber framing must comply with NZS 3604 for buildings or parts of buildings within the scope limitations of NZS 3604. Buildings or parts of buildings outside the scope of NZS 3604 must be to a specific design in accordance with NZS 3603 and AS/NZS 1170. Where specific design is required, the framing must be of at least equivalent stiffness to the framing provisions of NZS 3604. In all cases studs must be at maximum 600 mm centres for buildings designed to NZS 3604 in Wind Zones up to and including 'Very High' and at maximum 400 mm centres for buildings situated in NZS 3604 Wind Zone 'Extra High' and specifically designed buildings situated in Wind Zones above NZS 3604 defined 'Extra High'. Dwargs must be fitted flush between the studs at maximum 800 mm centres.

7.3 Timber framing must have a maximum moisture content of 24% at the time of the cladding application. (*If Neopor® boards are fixed to framing with a moisture content of greater than 24% problems may occur at a later date due to excessive timber shrinkage.*)

Steel Framing

7.4 Steel framing must be to a specific design meeting the requirements of the NZBC.

7.5 The minimum framing specification is 'C' section studs and nogs of overall section size of 75 mm web and 32 mm flange. Steel thickness must be minimum 0.55 mm.

7.6 For steel framed buildings situated within NZS 3604 defined Wind Zones up to, and including, 'Very High', studs must be at maximum 600 mm centres. For all other buildings studs must be at maximum 400 mm centres. Dwargs must be fitted flush between the studs at maximum 800 mm centres.

Neopor® Board/EPS Sheet Setout

7.7 All vertical Neopor® board or EPS sheet edges must be supported and fixed through the cavity battens to the framing. Horizontal board edges must be supported at fixing locations with cavity spacers in accordance with the requirements of NZBC Acceptable Solution E2/AS1, Paragraph 9.1.8.2(f). At the base of the wall, the Neopor® boards or EPS sheets must hang 50 mm below the supporting framing.

7.8 Additional framing will be required at soffits, internal and external corners and window and door openings for the support and fixing of sheet edges.

General

8.1 When the Graphex Insulated Façade System is used for specifically designed buildings up to 2.5 kPa design differential ULS wind pressure, only the weathertightness aspects of the cladding and maximum framing centres and sheet fixing centres are within the scope of this Appraisal. All other aspects of the building need to be specifically designed and are outside the scope of this Appraisal.

8.2 Openings in the cavity vent strip provide a minimum ventilation opening area of 1000 mm² per lineal metre of wall in accordance with the requirements of NZBC Acceptable Solution E2/AS1, Paragraph 9.1.8.3(b).

8.3 The ground clearance to finished floor levels as set out in NZS 3604 must be adhered to at all times. At ground level, paved surfaces, such as footpaths, must be kept clear of the bottom edge of the cladding system by a minimum of 100 mm, and unpaved surfaces by 175 mm in accordance with the requirements of NZBC Acceptable Solution E2/AS1, Table 18.

8.4 At balcony, deck or roof/wall junctions, the bottom edge of the Graphex Insulated Façade System must be kept clear of any adjacent surface, or above the top surface of any adjacent roof flashing by a minimum of 35 mm in accordance with the requirements of NZBC Acceptable Solution E2/AS1, Paragraph 9.1.3.

8.5 All external walls of buildings must have barriers to airflow in the form of interior linings with all joints stopped for wind zones up to and including Very High, and rigid underlays for buildings in the Extra High wind zone and specifically designed buildings up to 2.5 kPa design differential ULS wind pressure. Unlined gables and walls must incorporate a rigid sheathing or an air barrier which meets the requirements of NZBC Acceptable Solution E2/AS1, Table 23. For attached garages, wall underlays must be selected in accordance with NZBC Acceptable Solution E2/AS1, Paragraph 9.1.3.4. Where rigid underlays are used, the fixing lengths must be increased by a minimum of the thickness of the underlay.

8.6 Where penetrations through the Graphex Cavity System are wider than the cavity batten spacing, allowance must be made for airflow between adjacent cavities. A minimum 10 mm gap must be left between the bottom of the vertical cavity batten and the flashing to the opening.

8.7 Where the system abuts other cladding systems, designers must detail the junction to meet their own requirements and the performance requirements of the NZBC. The Technical Literature provides some guidance. Details not included within the Technical Literature have not been assessed and are outside the scope of this Appraisal.

Electrical Cables

8.8 PVC sheathed electrical cables must be prevented from direct contact with the Neopor® or EPS sheet. When cables must penetrate the Neopor® or EPS sheet for exterior electrical connections, the cable must be directly supported by passing through an electrical conduit.

Control Joints

9.1 Control joints must be constructed in accordance with the Technical Literature, and be provided as follows:

- Horizontal control joints - at maximum 6 m centres.
- Vertical control joints - at maximum 20 m centres; aligned with any control joint in the structural framing; where the system abuts different cladding types, or where the system covers different structural materials.

(Note: Horizontal and Vertical Control joints must be located over structural supports. The design of vertical control joints where the system abuts different cladding types is outside the scope of this Appraisal and is the responsibility of the designer - see Paragraph 8.7.)

Inter-storey Junctions

9.2 Inter-storey drained joints must be constructed in accordance with the Technical Literature. Inter-storey joints must be provided to limit continuous cavities to the lesser of 2-storeys or 7 metres in height, in accordance with the requirements of NZBC Acceptable Solution E2/AS1, Paragraph 9.1.9.4(b).

(Note: Refer to Paragraph 14.2 for the requirements for barriers to vertical fire spread at inter-storey junctions for buildings of three or more floors.)

Structure

Mass

10.1 The mass of the Graphex Insulated Façade System is approximately 7 kg/m², therefore it is considered a light wall cladding in terms of NZS 3604.

Impact Resistance

10.2 The system has adequate resistance to hard body impacts likely to be encountered in normal residential use. Where a greater level of impact protection is required a heavier grade of reinforcing mesh may be used. The heavy-grade fibreglass reinforcing mesh (360 g/m²) embedded in 5 mm thick plaster provides approximately 4 times the hard body impact strength of the standard grade mesh in 3 mm thick plaster. The likelihood of impact damage to the system when used in light commercial situations should be considered at the design stage, and appropriate protection such as the installation of bollards and barriers should be considered for vulnerable areas.

Wind Zones

10.3 The Graphex Insulated Façade System is suitable for use in all Wind Zones of NZS 3604, up to, and including Extra High where buildings are designed to meet the requirements of NZBC Acceptable Solution E2/AS1, Paragraph 1.1, or up to 2.5 kPa design differential ULS wind pressure where buildings are specifically designed.

Neopor® Board/EPS Sheet Fixing

10.4 Neopor® boards or EPS sheets must be fixed through the cavity battens and cavity spacers to the wall framing at maximum centres specified in Table 4.

Table 4: Sheet Fixing Centres for Edges and Body of the Sheet

NZS 3604 Wind Zone	Maximum Fixing Centres (mm)
Low ¹	300
Medium ¹	300
High ¹	300
Very High ²	200

1. One fixing is also required into each dwang and top and bottom plates at mid length.

2. Fixings are also required to each dwang at 200 mm centres and top and bottom plates at mid-dwang length.

NZS 3604 Wind Zone Extra High and specifically designed buildings up to 2.5 kPa design differential ULS wind pressure with studs at maximum 400 mm centres.		
Maximum vertical fixing centres (mm) along studs	Maximum horizontal fixing centres (mm) along top and bottom plates	Maximum horizontal fixing centres (mm) along dwangs
150	200	150

Durability

11.1 The Graphex Insulated Façade System meets code compliance with NZBC Clause B2.3.1 (b), 15 years for the cavity system and plaster finish, and code compliance with NZBC Clause B2.3.1 (c), 5 years for the exterior paint system.

Serviceable Life

11.2 The Graphex Insulated Façade System is expected to have a serviceable life of at least 30 years provided the system is maintained in accordance with this Appraisal, and the Neopor® boards, EPS sheets, fixings and plaster are continuously protected by a weathertight coating and remain dry in service.

11.3 Microclimatic conditions, including geothermal hot spots, industrial contamination and corrosive atmospheres, and contamination from agricultural chemicals or fertilisers can convert mildly corrosive atmosphere into aggressive environments for fasteners. The fixing of Neopor® Boards and EPS sheets in areas subject to microclimatic conditions requires specific design in accordance with NZS 3604 Paragraph 4.2.4, and is outside the scope of this Appraisal.

Maintenance

12.1 Regular maintenance is essential to ensure the performance requirements of the NZBC are continually met and to ensure the maximum serviceability of the system.

12.2 Regular cleaning (at least annually) of the paint coating is required to remove grime, dirt and organic growth and to maximise the life and appearance of the coating. Grime may be removed by brushing with a soft brush, warm water and detergent. Paint systems must be recoated at approximately 5-10 yearly intervals in accordance with the paint manufacturer's instructions.

12.3 Annual inspections must be made to ensure that all aspects of the cladding system, including the coating system, plaster, flashings and any sealed joints remain in a weatherproof condition. Any cracks, damaged areas or areas showing signs of deterioration which would allow water ingress, must be repaired immediately. Sealant, coatings and the like must be repaired in accordance with the instructions of Resene Construction Systems.

12.4 Minimum ground clearances as set out in this Appraisal and the Technical Literature must be maintained at all times during the life of the system. *(Failing to adhere to the minimum ground clearances given in this Appraisal and the Technical Literature will adversely affect the long term durability of the Graphex Insulated Façade System.)*

Control of Internal Fire and Smoke Spread

13.1 The Neopor® board and EPS sheet used with the system meets the flame propagation criteria of AS 1366 as specified in NZBC Acceptable Solution C/AS1 Paragraph 4.2.2 or NZBC Acceptable Solutions C/AS2 to C/AS6 Paragraph 4.17.2. The completed wall system, including the surface lining product enclosing the Neopor® board and EPS sheet from the adjacent occupied space, must achieve the Group Number for internal surface finish requirements as specified in the relevant NZBC Acceptable Solutions C/AS1 to C/AS6.

Control of External Fire Spread

14.1 The Graphex Insulated Façade System does not have a peak heat release or total heat released rating. It is suitable for use on buildings with an SH Risk Group classification, a building height of ≤ 10 m and at a distance of ≥ 1.0 m to the relevant boundary. Refer to NZBC Acceptable Solutions C/AS2 – C/AS6 Paragraph 5.8.1 for the specific exterior surface finishes requirements for other building Risk Groups.

14.2 When buildings in all Risk Groups, apart from SH and VP, are of the three storeys maximum permitted by NZBC Acceptable Solution E2/AS1, Paragraph 1.1 (a), and when the cladding system extends to cover the walls of all three floors, the requirements for barriers to vertical fire spread in accordance with NZBC Acceptable Solutions C/AS2 to C/AS6 Paragraph 5.7.17 must be met. NZBC Acceptable Solution C/AS2 – C/AS6, Figure 5.8 gives an acceptable detail for barriers, however these do not consider NZBC Clause E2 requirements. Design of the barrier joint must be specifically detailed by the designer to meet the NZBC, including blocking of the cladding cavity and wall framing cavity, and installation of flashing and sealing systems to collect and direct any moisture to the outside of the cladding system at this point. These joints are not covered by the Technical Literature, and therefore are outside the scope of this Appraisal.

Prevention of Fire Occurring

15.1 Separation or protection must be provided to the Graphex Insulated Façade 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 separation and protection of combustible materials from heat sources.

External Moisture

16.1 The Graphex Insulated Façade System, when installed in accordance with this Appraisal and the Technical Literature, prevents the penetration of moisture that could cause undue dampness or damage to building elements.

16.2 The cavity must be sealed off from the roof and sub-floor space to meet code compliance with Clause E2.3.5.

16.3 The Graphex Insulated Façade System allows excess moisture present at the completion of construction to be dissipated without permanent damage to building elements to meet code compliance with Clause E2.3.6.

16.4 The details given in the Technical Literature for weather sealing are based on the design principle of having a first and second line of defence against moisture entry for all joints, penetrations and junctions. The ingress of moisture must be excluded by detailing joinery and wall interfaces as shown in the Technical Literature. Weathertightness details that are developed by the designer are outside the scope of this Appraisal and are the responsibility of the designer for compliance with the NZBC.

16.5 The use of the Graphex Insulated Façade System where there is a designed cavity drainage path for moisture that penetrates the cladding, does not reduce the requirement for junctions, penetrations, etc to remain weather resistant.

Internal Moisture

17.1 The Graphex Insulated Façade System alone does not meet NZBC Acceptable Solution E3/AS1, Paragraph 1.1.1(a). Buildings must be constructed with an adequate combination of thermal resistance and ventilation, and space temperature must be provided to all habitable spaces, bathrooms, laundries and other spaces where moisture may be generated or may accumulate.

Water Vapour

17.2 The Graphex Insulated Façade System is not a barrier to the passage of water vapour, and when correctly installed will not create or increase the risk of moisture damage resulting from condensation.

17.3 When the Graphex Insulated Façade System is installed over a steel frame, the EPS battens and insulated drainage cavity will act as a thermal break to the steel frame in accordance with NZBC Acceptable Solution E3/AS1.

Energy Efficiency

Building Thermal Envelope

18.1 NZBC Acceptable Solution H1/AS1 or NZBC Verification Method H1/VM1 can be used for housing, communal residential, communal non-residential and commercial buildings.

Determining Thermal Resistance

18.2 The thermal resistance (R-values) of building elements may be verified by using NZS 4214. The BRANZ 'House Insulation Guide' Fourth Edition provides thermal resistances of common building elements and is based on calculations from NZS 4214. Calculations in accordance with NZS 4214 require that the ventilated air gap and the thermal resistance of each layer between the ventilated air gap and outside air be de-rated by a factor of 0.45. Therefore, in the Graphex Insulated Façade System, unless better information is available for a specific case, the R-value of the Neopor® layer must be taken as R0.69 (40 mm thick) R0.86 (50 mm thick) and R1.03 (60 mm thick) based on a thermal conductivity (k value) of 0.032 W/m °C; the R-value of 40 mm thick Class H EPS must be taken as R0.58 based on a k value of 0.038 W/m°C, and the R-value of Class S EPS must be taken as R0.67 (50 mm thick) and R0.80 (60 mm thick) based on a k value of 0.041 W/m°C.

20.2 Where studs are at greater than 450 mm centres and a flexible wall underlay is being used, a building underlay support must be installed over the underlay at maximum 300 mm centres horizontally.

Aluminium Joinery Installation

20.3 Aluminium joinery and associated head flashings must be installed by the building contractor in accordance with the Technical Literature. A 7.5-10 mm nominal gap must be left between the joinery reveal and the wall framing so a PEF rod and air seal can be installed after the joinery has been secured in place.

Graphex Insulated Façade System

20.4 The system must be installed in accordance with the Technical Literature by Rockcote Resene Limited approved installers.

20.5 The Graphex plaster system must only be applied when the air and substrate temperature is within the range of +5°C to +30°C.

Inspections

20.6 The Technical Literature must be referred to during the inspection of Graphex Insulated Façade System installations.

Finishing

20.7 The paint manufacturers' instructions must be followed at all times for application of the paint finish. The plaster must be cured for a minimum of 2-3 days and must be dry before commencing painting.

Health and Safety

21.1 Safe use and handling procedures for the components that make up the Graphex Insulated Façade System are provided in the relevant manufacturer's Technical Literature.

Installation Information

Installation Skill Level Requirements

19.1 Installation and finishing of components and accessories supplied by Resene Construction Systems and the approved installers must be completed Licensed Building Practitioners, approved by Resene Construction Systems.

19.2 Installation of the accessories supplied by the building contractor must be completed by tradespersons with an understanding of cavity construction, in accordance with instructions given within the Graphex Insulated Façade System Technical Literature and this Appraisal.

System Installation

Building Underlay and Flexible Sill and Jamb Tape Installation

20.1 The selected building underlay and flexible sill and jamb tape system must be installed by the building contractor in accordance with the underlay and tape manufacturer's instructions prior to the installation of the cavity battens and the rest of the Graphex Insulated Façade System. Flexible building underlay must be installed horizontally and be continuous around corners. Underlay must be lapped 75mm minimum at horizontal joints and 150mm minimum over studs at vertical joints. Generic rigid sheathing materials must be installed in accordance with NZBC Acceptable Solution E2/AS1 and be overlaid with a flexible wall underlay. Proprietary systems shall be installed in accordance with the manufacturer's instructions. Particular attention must be paid to the installation of the building underlay and sill and jamb tapes around window and door openings to ensure a continuous seal is achieved and all exposed wall framing in the opening is protected.

Basis of Appraisal

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

Tests

- 22.1 The following testing has been completed by BRANZ:
- BRANZ expert opinion on NZBC E2 code compliance for the Graphex Insulated Façade System was based on evaluation of all details within the scope and as stated within this Appraisal and testing of the Resene Construction Systems Insulated Façade System to E2/VM1 (as contained within NZBC Clause E2, Amendment 4). The testing assessed the performance of the foundation detail, window head, jamb and sill details, meter box head, jamb and sill details, vertical and horizontal control joints, internal and external corners and balustrade to wall junction with a plastered cap. The Graphex Insulated Façade System follows the same flashing and weathertightness design principles as the Resene Construction Systems Insulated Façade System. In addition to the weathertightness test, the details contained within the Technical Literature have been reviewed, and an opinion has been given by BRANZ technical experts that the system will meet the performance levels of Acceptable Solution E2/AS1 for drained cavity claddings.
 - Wind face load and fastener pull through testing for EIFS cladding systems. BRANZ determined design wind suction pressures, and by comparing these pressures with AS/NZS 1170 pressure coefficients, the fixing requirements were

determined for timber and steel framed walls.

Other Investigations

- 23.1 Structural and durability opinions have been given by BRANZ technical experts.
23.2 Site visits have been carried out by BRANZ to assess the practicability of installation, and to examine completed installations.
23.3 The manufacturer's Technical Literature has been examined by BRANZ and found to be satisfactory.

Quality

- 24.1 The manufacture of the plasters has been examined by BRANZ, including methods adopted for quality control. Details regarding the quality and composition of the materials used were obtained by BRANZ and found to be satisfactory.
24.2 The quality management system of the primer and Resene X200 paint manufacturer, Resene Paints Ltd, has been assessed and registered as meeting the requirements of ISO 9001: 2008.
24.3 The quality of materials, components and accessories supplied by Resene Construction Systems is the responsibility of Resene Construction Systems.
24.4 Quality on site is the responsibility of the Rockcote Resene Ltd approved installers.
24.5 Designers are responsible for the building design, and building contractors are responsible for the quality of installation of framing systems and joinery, building wraps, flashing tapes, air seals and joinery head flashings in accordance with the instructions of Rockcote Resene Ltd.
24.6 Building owners are responsible for the maintenance of the Graphex Insulated Façade System in accordance with the instructions of Rockcote Resene Ltd.

Sources of Information

- AS 1366.3: 1992 Rigid cellular plastic sheets for thermal insulation - Rigid cellular polystyrene - Moulded (RC/PS-M)
- AS 3566: 2002 Self-drilling screws for the building and construction industries.
- AS/NZS 1170: 2002 Structural design action – General principles.
- AS/NZS 3837: 1998 Method of test for heat and smoke release rates for materials and products using an oxygen consumption calorimeter.
- NZS 3602: 2003 Timber and wood-based products for use in building.
- NZS 3603: 1993 Timber Structures Standard.
- NZS 3604: 2011 Timber-framed buildings.
- NZS 4211: 2008 Specification for performance of windows.
- NZS 4214: 2006 Methods of determining the total thermal resistance of parts of buildings.
- Acceptable Solutions and Verification Methods for New Zealand Building Code External Moisture Clause E2, Department of Building and Housing, Third Edition July 2005 (Amendment 6, 14 February 2014).
- Ministry of Business, Innovation and Employment Record of Amendments for Compliance Documents and Handbooks.
- The Building Regulations 1992.

Amendment No. 1, dated 19 April 2010.

This Appraisal has been amended to include expanded polystyrene (EPS) sheet as an alternative substrate to Neopor® board.

Amendment No. 2, dated 31 January 2012.

This Appraisal has been amended to update clause changes as required by the introduction of NZS 3604: 2011 and NZBC Acceptable Solution E2/AS1 Third Edition, Amendment 5.

Amendment No. 3, dated 10 July 2014.

This Appraisal has been amended to change the Appraisal Holder and system name, include EdgeSeal window flashings and the Rockcote Resene Limited finishing system, update fixing requirements, and to update clause changes as required by the introduction of the new NZBC Fire Clauses C1 – C6 Protection from Fire and A3 Building Importance Levels.



BRANZ

In the opinion of BRANZ, the Graphex Insulated Façade 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 Rockcote Resene Limited, and is valid until further notice, subject to the Conditions of Appraisal.

Conditions of Appraisal

- This Appraisal:
 - relates only to the product as described herein;
 - must be read, considered and used in full together with the technical literature;
 - does not address any Legislation, Regulations, Codes or Standards, not specifically named herein;
 - is copyright of BRANZ.
- Rockcote Resene Limited:**
 - continues to have the product reviewed by BRANZ;
 - shall notify BRANZ of any changes in product specification or quality assurance measures prior to the product being marketed;
 - abides by the BRANZ Appraisals Services Terms and Conditions.
- 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.
- BRANZ makes no representation or warranty as to:
 - the nature of individual examples of, batches of, or individual installations of the product, including methods and workmanship;
 - the presence or absence of any patent or similar rights subsisting in the product or any other product;
 - any guarantee or warranty offered by **Rockcote Resene Limited**.
- 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.
- BRANZ provides no certification, guarantee, indemnity or warranty, to **Rockcote Resene Limited** or any third party.

For BRANZ

P Burghout
Chief Executive

Date of issue: 30 October 2009