



BRANZ Appraised

Appraisal No. 478 [2008]

STOTHERM CAVITY SYSTEM AND STOTHERM INSULATION SYSTEM

Appraisal No. 478 [2008]

This Appraisal replaces Appraisal
No. 478 [2005] issued 6 July
2005.

Amended 11 November 2015



BRANZ Appraisals

Technical Assessments of
products for building and
construction.



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Product

- 1.1 The StoTherm Cavity System and StoTherm Insulation System are cavity-based Exterior Insulation and Finishing System (EIFS) wall claddings. They are designed to be used as external cladding systems for residential and light commercial type buildings where domestic construction techniques are used.
- 1.2 The StoTherm Cavity System consists of 40 or 60 mm thick expanded polystyrene (EPS) sheets fixed over polystyrene battens to form the cavity. The coating system consists of 4-10 mm thickness of fibreglass mesh reinforced mineral plasters (StoTherm plaster system), fibreglass mesh reinforced synthetic resin plasters (StoTherm Classic plaster system) and synthetic resin finishing plasters applied to the polystyrene sheets. The plaster is finished with a mineral silicone resin or 100% acrylic exterior paint system. The top coat plasters can be finished to give different texture appearances.
- 1.3 The StoTherm Insulation System consists of 80 or 100 mm thick EPS StoTherm Panels or StoTherm Sheets fixed over timber battens to form the cavity. The StoTherm Panels and Sheets are coated with the StoTherm Classic plaster system. The plaster system is finished with a 100% acrylic exterior paint system. The top coat plasters can be finished to give different texture appearances.
- 1.4 The systems incorporate 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 wide cavity.

Scope

- 2.1 The StoTherm Cavity System and StoTherm Insulation System have been appraised as external wall cladding systems 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 StoTherm Cavity 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 framing complying with the NZBC; and,
 - situated in specific design wind pressures up to a maximum design differential ultimate limit state (ULS) of 2.5 kPa.

- 2.3 The StoTherm Insulation 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 framing complying with the NZBC; and,
 - situated in specific design wind pressures up to a maximum design differential ultimate limit state (ULS) of 2.5 kPa.
- 2.4 The StoTherm Cavity System and StoTherm Insulation System must only be installed on vertical surfaces *(except for tops of parapets, sills and balustrades, which must have a minimum 10° slope and be waterproofed in accordance with the Technical Literature)*.
- 2.5 The systems are appraised for use with aluminium window and door joinery that is installed with vertical jambs and horizontal heads and sills. *[The Appraisal of the StoTherm Cavity System and StoTherm Insulation System relies on the joinery meeting the requirements of NZS 4211 for the relevant Wind Zone or being specifically designed for use in specifically designed buildings].*
- 2.6 Installation of components and accessories supplied by Stoanz Limited and approved applicators must be carried out only by Stoanz Limited approved applicators.

Building Regulations

New Zealand Building Code [NZBC]

- 3.1 **In the opinion of BRANZ, the StoTherm Cavity System and StoTherm Insulation 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 StoTherm Cavity System and StoTherm Insulation System meet 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 StoTherm Cavity System and StoTherm Insulation System meet these requirements. See Paragraphs 11.1 and 11.2.

Clause E2 EXTERNAL MOISTURE: Performance E2.3.2. The StoTherm Cavity System and StoTherm Insulation System meet this requirement. See Paragraphs 16.1 – 16.5.

Clause F2 HAZARDOUS BUILDING MATERIALS: Performance F2.3.1. The StoTherm Cavity System and StoTherm Insulation System 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.

Technical Specification

- 4.1 System components and accessories supplied by Stoanz Limited are as follows:

Polystyrene [StoTherm Cavity System]

- **Cavity battens** are self-adhesive type manufactured from high density [Class H] expanded polystyrene [EPS] with a nominal density of 24 kg/m³. The battens are 20 mm thick by 50 mm wide and are supplied in 1200 mm lengths. To allow air movement they have a slotted back face, which is also coated with an acrylic adhesive that is protected by a removable film.
- **EPS sheets** are 40 or 60 mm thick Class H with a nominal density of 24 kg/m³. The sheets are supplied in lengths of 2400, 2700 and 3000 mm x 1200 mm wide and must be manufactured to meet the requirements of AS 1366.3.

StoTherm Panels and Sheets [StoTherm Insulation System]

- **StoTherm Panels and Sheets** are 80 or 100 mm thick Class S EPS with a nominal density of 16 kg/m³. StoTherm Panels are supplied 1200 mm wide x 600 mm high. StoTherm Sheets are supplied in lengths of 2400, 2700 and 3000 mm x 1200 mm wide. The Panels and Sheets must be manufactured to meet the requirements of AS 1366.3.

Plasters (StoTherm Plaster System)

- **StoLevell Uni** is a dry mix, cement-based mineral plaster supplied in 25 kg bags and mixed on site with clean water. It is used as a base coat for bonding and bedding the fibreglass mesh and is trowel applied to an approximate thickness of 3-4 mm.
- **Stolit MP/K** is a plasticiser free, tintable, ready-to-use, polymer-modified cement free finishing plaster with a 1.0, 1.5, 2.0 or 3.0 mm grain size. It is supplied in 25 kg pails and is trowel-applied to an approximate thickness of 1.0-3.0 mm.
- **Sto Flexyl** is a cementitious waterproof paste. It is used as a waterproofing membrane over plastered balustrades and fixing blocks. Sto Flexyl is supplied in 18 kg pails.

Plasters (StoTherm Classic Plaster System)

- **LevelLite** is a polymer-modified, cement-based plaster comprising coarse sand, polypropylene fibres, polystyrene beads and adhesives. The plaster is supplied in 20 kg bags and mixed on site with clean water. It is used as a levelling base coat to fill all washers and straighten the EPS sheets, and is trowel-applied in a 5-7 mm thick layer.
- **StoArmat RFP** is a plasticiser free, tintable, ready-to-use, polymer-modified, cement-free reinforcement plaster comprising granulated quartz sands, calibration grain, polypropylene fibre and additives. It is trowel applied to the LevelLite base coat in a 1.5-2.0 mm thick layer followed by the embedment of fibreglass mesh reinforcement in the outer surface. An additional 1.0-1.5 mm layer is applied to fully encase the mesh. Sto RFP Armat is supplied in 23 kg pails.
- **Stolit MP/K** is a plasticiser free, tintable, ready-to-use, polymer-modified cement free finishing plaster with a 1.0, 1.5, 2.0 or 3.0 mm grain size. It is supplied in 25 kg pails and is trowel-applied to an approximate thickness of 1.0-3.0 mm.
- **Sto Flexyl** is a cementitious waterproof paste. It is used as a waterproofing membrane over plastered balustrades and fixing blocks. Sto Flexyl is supplied in 18 kg pails.

Paint and Primers

- **StoSilco Color G** is a ready-to-use, tintable, special dirt and algae resistant mineral silicone resin exterior paint system for application over finishing plasters. It is supplied in 15 litre pails, and may be brush, roller or spray applied. The paint colour selected must have a light reflectance value [LRV] of 40% minimum regardless of gloss value.
- **StoMaxicryl** is a ready-to-use, tintable, acrylic exterior paint system for application over finishing plasters. It is supplied in 15 litre pails, and may be brush, roller or spray applied. The paint colour selected must have an LRV of 40% minimum regardless of gloss value.
- **StoLastic Color** is a ready-to-use, tintable, satin matt, acrylic exterior paint system paint for application over finishing plasters. It is supplied in 15 litre pails, and may be brush, roller or spray applied. The paint colour selected must have an LRV of 40% minimum regardless of gloss value.
- **Stoplex W** is a yellow tinted, ready to use, acrylic-based primer available in 10 litre containers.
- **Sto Putzgrund** is a pigmented, gritty, ready-to-use, acrylic based primer available in 25 kg pails.

Accessories

- **Reinforcing mesh** - alkali-resistant fibreglass mesh with a nominal mesh size of approximately 6.0 x 6.0 mm and an approximate weight of 165 g/m², or with a nominal mesh size of approximately 4.0 x 4.0 mm and an approximate weight of 165 g/m².
- **uPVC components** - sill and jamb flashings, head flashing, control joint and foot tray flashing.
- **StoTherm Cavity System EPS sheet fixings** - 90 x 3.55 (for 40 mm thick) and 110 x 4.0 mm (for 60 mm thick) galvanised steel flat-head nails. [Note: Hot-dipped galvanising must comply with AS/NZS 4680.] All nails must be used with 42 mm diameter Sto washers.
- **Washers** - 42 mm diameter, yellow high density polyethylene [HDPE].
- **StoTherm Anchors** - 120 mm (for 80 mm thick StoTherm Panels or Sheets) or 140 mm (for 100 mm thick StoTherm Panels or sheets) screw applied anchors with a 60 mm diameter HDPE washer and an electroplated galvanised steel screw for use in NZS 3604 defined Corrosion Zones B and C or stainless steel screw for use in Corrosion Zone D or where the cavity batten or wall framing timber has been treated with a copper based treatment.

- **ST Insulation Caps** – 60 mm diameter polystyrene caps for StoTherm Anchors.
 - **Sto Pageris foam** – polyurethane foam for joining the polystyrene sheets and Panels.
 - **Sto pre-meshed corner beads** – uPVC and fibreglass mesh corner mouldings.
 - **Sto Joint Sealing Tape 2D** – black, compressed polyurethane foam. The foam is coated on one side with a pressure sensitive adhesive, which is covered by a release paper. The tape is available 2 and 5 mm thick, expanding to maximum 6 and 12 mm thick after installation, and is supplied in rolls 15 mm wide and 18 and 9 m long respectively.
- 4.2 Accessories used with the systems which are supplied by the Stoanz Limited approved applicator are:
- **EPS sheet fixings [StoTherm Cavity System - steel frame]** – 6-gauge self-drilling AS 3566 Corrosion Class 4 screws in NZS 3604 defined Corrosion Zones B and C and Grade 304 Stainless Steel 6-gauge screws in Corrosion Zone D, used with 42 mm diameter washers. The screw length must allow a minimum 10 mm penetration through the steel frame.
 - **Waterproof membrane tapes** – tapes covered by a valid BRANZ Appraisal for use as waterproof membranes over the tops of plastered 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** – polystyrene compatible adhesive for adhering uPVC components to the EPS sheets, StoTherm Panels and StoTherm 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 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.
 - **Cavity battens [StoTherm Insulation System]** – nominal 50 mm wide by 25 mm thick [minimum finished size of 45 mm wide by 18 mm thick] timber treated to Hazard Class H3.1.
 - **Cavity batten fixings [StoTherm Insulation System]** – 40 x 2.5 mm flat head hot-dipped galvanised nails.
 - **Joinery head flashings** – as supplied by the joinery manufacturer or contractor.
 - **Window and door trim cavity air seals** – 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 Stoanz Limited or the approved applicators, whether on or off site is under the control of Stoanz Limited approved applicators. Dry storage must be provided for the fibreglass mesh and bags and pails of plaster mix. EPS sheets, StoTherm Panels, StoTherm Sheets and 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 the site is 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 StoTherm Cavity System and StoTherm Insulation 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

Framing

Timber Treatment

- 7.1 Timber wall framing behind the StoTherm Cavity System and StoTherm Insulation System must be treated as required by NZS 3602.

Timber Framing

- 7.2 Timber framing must comply with NZS 3604 for buildings or parts of a building within the scope limitations of NZS 3604. Buildings or parts of a building outside the scope of NZS 3604 must be to a specific design in accordance with NZS 3603 and AS/NZS 1170. Studs must be at maximum 600 mm centres in Low, Medium, High and Very High Wind Zones and maximum 400 mm centres for the NZS 3604 Extra High Wind Zone and specifically designed buildings. Dwargs must be fitted flush between the studs at maximum 800 mm centres.
- 7.3 For specifically designed timber framed buildings situated in Wind Zones above NZS 3604 defined Extra High, there must be a minimum timber framing size of 90 x 45 mm, and a minimum timber grade of MSG8.
- 7.4 The framing must have a maximum moisture content of 24% at the time of the cladding installation. *[If EPS sheets, StoTherm Sheets or StoTherm Panels 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 [StoTherm Cavity System]

- 7.5 Steel framing must be to a specific design meeting the requirements of the NZBC.
- 7.6 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 a minimum 0.55 mm.
- 7.7 For steel framed buildings situated in 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.

EPS Sheet, StoTherm Sheet and StoTherm Panel Set-out

- 7.8 All vertical EPS sheet, StoTherm Sheet and StoTherm Panel edges must be supported and fixed through the cavity battens to framing. Horizontal sheet and panel edges must be supported at fixing locations with cavity spacers in accordance with NZBC Acceptable Solution E2 /AS1, Paragraph 9.1.8.2 [f]. At the base of the wall, the EPS sheet, StoTherm Sheet and StoTherm Panel must hang 50 mm below the supporting framing.
- 7.9 Additional battens and framing will be required at soffits, internal and external corners and window and door for the support and fixing of sheet and panel edges.

General

- 8.1 When the StoTherm Cavity System and StoTherm Insulation System is used for specifically designed buildings up to 2.5 kPa ULS wind pressure, only the weathertightness aspects of the cladding and maximum framing centres and sheet and panel 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 Holes in the foot tray flashing provide a ventilation opening area of 1000 mm² per lineal metre of wall in accordance with 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 cladding 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 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 cavity batten fixing lengths must be increased by a minimum of the thickness of the underlay.
- 8.6 Where penetrations through the StoTherm Cavity System and StoTherm Insulation 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 systems abut other cladding systems, designers must detail the junction to meet their own requirements and the performance requirements of the NZBC. 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 polystyrene. When cables must penetrate the EPS sheet, StoTherm Sheet or StoTherm Panels 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 structural framing; where the system abuts different cladding types; or where the system covers different construction materials.

[Note: Horizontal and Vertical control joints must be located over structural supports. The design of vertical control joints where the systems abut 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 junctions 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 StoTherm Cavity System is approximately 9 kg/m² at equilibrium moisture content. The mass of the StoTherm Insulation System is approximately 10 kg/m² at equilibrium moisture content, therefore they are considered light wall cladding in terms of NZS 3604.

Impact Resistance

10.2 The systems have adequate resistance to impact loads likely to be encountered in normal residential use. The likelihood of impact damage to the systems when used in light commercial type situations should be considered at the design stage, and appropriate protection such as the installation of barriers or bollards should be provided for vulnerable areas.

[Note: Additional coats of reinforced plaster or a heavier grade mesh can be used to increase impact resistance. This has not been assessed and is outside the scope of this Appraisal.]

Wind Zones

10.3 The systems are 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 ULS wind pressure where buildings are specifically designed.

StoTherm Cavity System EPS Sheet Fixing

10.4 EPS sheets must be fixed through the cavity battens and cavity spacers to the wall framing at the maximum centres specified in Table 1.

Table 1: EPS Sheet Fixing Centres for Edges and Intermediate Studs

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-dwang length.
2. Fixings are also required into 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 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 noggs
150	200	150

StoTherm Sheet and StoTherm Panel Fixing

10.5 StoTherm Sheets and StoTherm Panels must be fixed through the cavity battens and cavity spacers to the wall framing at the maximum centres specified in Table 2.

Table 2: StoTherm Sheet and StoTherm Panel Fixing Centres for Edges and Intermediate Studs

NZS 3604 Wind Zone with studs at maximum 600 mm centres	Maximum Vertical Fixing Centres [mm]
Low, Medium, High and Very High ¹	300

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

NZS 3604 Wind Zone Extra High and specifically designed buildings up to a differential design ULS wind pressure of 2.5 kPa with studs at maximum 400 mm centres	
Maximum vertical fixing centres [mm] along studs	Maximum horizontal fixing centres [mm] along top and bottom plates
400	400

Durability

Serviceable Life

- 11.1 The StoTherm Cavity System and StoTherm Insulation System meet the performance requirements of NZBC Clause B2.3.1 [b], 15 years for the cavity system and plaster finish, and the performance requirements of NZBC Clause B2.3.1 [c], 5 years for the exterior paint system.
- 11.2 The StoTherm Cavity System and StoTherm Insulation System are expected to have a serviceable life of at least 30 years provided they are maintained in accordance with this Appraisal, and the EPS sheets, StoTherm Sheets, StoTherm Panels, fixings and plasters are continuously protected by a weathertight paint system 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 StoTherm Sheets and StoTherm Panels 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 Annual inspections must be made to ensure that all aspects of the cladding system, including the paint 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, paint coatings and the like must be repaired in accordance with the sealant or Stoanz Limited's instructions.
- 12.3 Although the paint system is designed as a special dirt and algae resistant type, regular cleaning [at least annually] is still recommended to remove any grime, dirt and organic growth that may have accumulated, and to maximise the life and appearance of the coating. Grime may be removed by brushing with a soft brush, warm water and detergent.
- 12.4 Recoating of the paint system will be necessary throughout the life of the plaster system. The interval between recoats depends on the paint colour, orientation and quality of the application, and will be at approximately 5-10 yearly intervals in accordance with the instructions of Stoanz Limited.
- 12.5 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. *[Failure to adhere to the ground clearances given in this Appraisal and the Technical Literature will adversely affect the long term durability of the systems.]*

Control of Internal Fire and Smoke Spread

- 13.1 Polystyrene used with the system must meet 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.
- 13.2 The completed wall system, including the surface lining product enclosing the polystyrene 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

StoTherm Plaster System

- 14.1 The StoTherm Cavity System and StoTherm Insulation System has a peak heat release rate of less than 100 kW/m² and a total heat released of less than 25 MJ/m². In accordance with NZBC Acceptable Solution C/AS1, Table 5.1 the system is suitable for use on buildings with a SH Risk Group classification, at any distance to the relevant boundary. Refer to NZBC Acceptable Solutions C/AS2 to 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 to 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 StoTherm Cavity System from heat sources such as fire places, heating appliances, flues and chimneys. Part 7 of NZBC Acceptable Solutions C/AS1 to 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 StoTherm Cavity System and StoTherm Insulation System, when installed in accordance with this Appraisal and the Technical Literature, prevent 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 compliance with NZBC clause E2.3.5.
- 16.3 The StoTherm Cavity System and StoTherm Insulation System allow excess moisture present at the completion of construction to be dissipated without permanent damage to building elements to meet compliance with NZBC 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 StoTherm Cavity System and StoTherm Insulation 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 StoTherm Cavity System and StoTherm Insulation System alone do 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 StoTherm Cavity System and StoTherm Insulation System are 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 StoTherm Cavity 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 StoTherm Cavity System, unless better information is available for a specific case, the R-value of the polystyrene layers must be taken as R0.58 [40 mm thick] and R0.87 [60 mm thick] based on a thermal conductivity [k-value] of 0.038 W/m °C; and in the StoTherm Insulation System, the R-value of the StoTherm Sheet and StoTherm Panel layers must be taken as R1.07 [80 mm thick] and R1.34 [100 mm thick] based on a thermal conductivity of 0.041 W/m °C.

Installation Information

Installation Skill Level Requirement

- 19.1 Installation and finishing of components and accessories supplied by Stoanz Limited and its approved applicators must be completed by trained applicators, approved by Stoanz Limited.
- 19.2 Installation of the accessories supplied by the building contractor must be completed by tradespersons with an understanding of cavity wall construction and EIFS installation, in accordance with the instructions given within the StoTherm Cavity System and StoTherm Insulation 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 StoTherm Cavity System or StoTherm Insulation System. Flexible building underlay must be installed horizontally and be continuous around corners. Underlay must be lapped 75 mm minimum at horizontal joints and 150 mm 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.
- 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.

StoTherm Cavity System and StoTherm Insulation System

- 20.4 The systems must be installed in accordance with the Technical Literature by a Stoanz Limited approved applicator.
- 20.5 The StoTherm plaster systems 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 StoTherm Cavity System and StoTherm Insulation System installations.

Health and Safety

- 21.1 Safe use and handling procedures for the components that make up the StoTherm Cavity System and StoTherm Insulation System are provided in the relevant manufacturer's Technical Literature.

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 clause E2 code compliance for the StoTherm Cavity System and StoTherm Insulation System was based on testing and evaluation of all details within the scope as stated within this Appraisal. The StoTherm Cavity System and balustrade to wall junction details were tested to NZBC 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. 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 NZBC Acceptable Solution E2/AS1 for EIFS 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 the NZS 3604 design wind speeds and AS/NZS 1170 pressure coefficients, the fixing requirements were determined for timber and steel framed walls.
 - Fastener pull through testing of StoTherm Anchors to determine the characteristic pull through strength.
 - Cone Calorimeter testing of the StoTherm Plaster System and StoTherm Classic Plaster System over EPS. The testing was carried out in accordance with AS/NZS 3837.
- 22.2 Testing has been undertaken by the British Board of Agrément [BBA] on Sto External Wall Insulation Systems covering thermal cycling [heat and moisture cycles], freeze-thaw, resistance to hard body impact, indentation test, water vapour permeability, ash content, sieve grading, density, mass per unit volume and pyrolysis – gas chromatography [liquid component]. The test methods and results have been reviewed by BRANZ and found to be satisfactory.
- 22.2 The Centre Scientifique et Technique du Batiment [CSTB] has undertaken a European Technical Approval of the StoTherm Classic External Thermal Insulation Composite System [Approval No. ETA-03/0027]. Testing undertaken includes water absorption, hygrothermal behaviour, freeze/thaw, impact resistance, water vapour permeability and bond strength. The test methods and results have been reviewed by BRANZ and found to be satisfactory.

Other Investigations

- 23.1 Structural and durability opinions have been provided 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 Technical Literature for the StoTherm Cavity System and StoTherm Insulation System has been examined by BRANZ and found to be satisfactory.

Quality

- 24.1 The manufacture of the plasters and paints 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.
- 24.2 The quality management system of the plaster and paint manufacturer, Sto AG, has been assessed and registered as meeting the requirements of ISO 9001: 2008.
- 24.3 Sto External Wall Insulation Systems are the subject of a current British Board of Agrément (BBA) Certificate No 95/3132 Sto External Wall Insulation Systems, and the manufacture of the systems continues to be checked by the BBA during the validity period of the Certificate. Plasters and paints used within the StoTherm Cavity System and imported by Stoanz Limited are covered by the BBA Certificate.
- 24.4 Sto External Wall Insulation Systems are the subject of Certifications and Evaluations in countries such as Canada, Austria, Germany, United Kingdom, Sweden, France, Switzerland, Netherlands and Czech Republic.
- 24.5 The quality control system of the Sto Levellite plaster manufacturer has been assessed and registered as meeting the requirements of the Telarc Q-Based Code by Telarc Limited.
- 24.6 The quality of materials, components and accessories supplied by Stoanz Limited are the responsibility of Stoanz Limited.
- 24.7 Quality on site is the responsibility of the Stoanz Limited approved applicators.
- 24.8 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 Stoanz Limited's instructions.
- 24.9 Building owners are responsible for the maintenance of the StoTherm Cavity System and StoTherm Insulation System in accordance with Stoanz Limited's instructions.

Sources of Information

- AS 1366.3 - 1992 Rigid cellular plastic sheets for thermal insulation - Rigid cellular polystyrene - Moulded [RC/PS-M].
- AS/NZS 1170: 2002 Structural design actions.
- AS/NZS 4680: 2006 Hot-dip galvanised [zinc] coatings on fabricated ferrous articles.
- 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 the performance of windows.
- NZS 4214: 2006 Methods of determining the total thermal resistance of parts of buildings.
- Compliance Document for New Zealand Building Code External Moisture Clause E2, Department of Building and Housing, Third Edition July 2005 [Amendment 5, 1 August 2011].
- Ministry of Business, Innovation and Employment Record of Amendments for Compliance Documents and Handbooks.
- The Building Regulations 1992.



Amendments

Amendment No. 1, dated 22 December 2008.

This Appraisal has been amended to include the StoTherm Insulation System and to include current cone calorimeter test results for the StoTherm Classic Plaster System.

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 30 August 2013.

This Appraisal has been amended to update clause changes as required by the introduction of NZBC Fire Clauses C1 – C6 Protection from Fire and A3 Building Importance Levels.

Amendment No. 4, dated 11 November 2015.

This Appraisal has been amended to update the Appraisal Holders contact details.



In the opinion of BRANZ, **StoTherm Cavity System And StoTherm Insulation 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 **Stoanz Limited**, 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. **Stoanz Limited**:
 - 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 **Stoanz Limited**.
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 **Stoanz Limited** or any third party.

For BRANZ



Chris Preston
Chief Executive

Date of Issue:
17 March 2008