



BRANZ Appraised

Appraisal No. 772 [2020]

STOARMOUR PANEL FACADE SYSTEM

Appraisal No. 772 [2020]

This Appraisal replaces BRANZ
Appraisal No. 772 [2012]

Amended 10 March 2022



BRANZ Appraisals

Technical Assessments of
products for building and
construction.



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Product

- 1.1 The Sto Armour Panel Facade System is a cavity-based external wall cladding system for residential and light commercial type buildings where domestic construction techniques are used.
- 1.2 The system consists of 50 or 75 mm thick autoclaved aerated concrete [AAC] panels [Sto Armour panels] fixed over high density polystyrene battens to form a 20 or 40 mm cavity, or timber cavity spacers to form a 40 mm cavity. The coating system consists of a nominal 5 mm thick cement-based render applied to the Sto Armour panels, an approximate 2.5 mm thick coat of fibreglass mesh reinforced synthetic resin render [Sto Armat Render System only], and an approximate 1-3 mm thick coat of coloured finishing render. The render system is finished with a Sto coating.
- 1.3 The system incorporates a primary and secondary means of weather resistance [first and second line of defence] against water penetration by separating the facade from the external wall framing with a nominal 20 or 40 mm drained cavity.

Scope

- 2.1 The Sto Armour Panel Facade 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,
 - 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 Sto Armour Panel Facade System has also been appraised for weathertightness and structural wind loading when used as an external wall cladding for buildings within the following scope:
 - the scope limitations of NZBC Acceptable Solution E2/AS1, Paragraph 1.1 with regards to building height and floor plan area; 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 Sto Armour Panel Facade 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].
- 2.4 The system is appraised for use with aluminium window and door joinery that is installed with vertical jambs and horizontal heads and sills. [Note: The Appraisal of the Sto Armour Panel Facade 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 Stoanz Limited and Sto registered contractors must be carried out only by Sto registered contractors.



Building Regulations

New Zealand Building Code (NZBC)

3.1 In the opinion of BRANZ, the StoArmour Panel Facade 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 StoArmour Panel Facade System meets the requirements for loads arising from self-weight, earthquake, wind, impact and creep [i.e. B1.3.3 (a), (f), (h), (j) and (q)]. See Paragraphs 10.1–10.6.

Clause B2 DURABILITY: Performance B2.3.1 (b) 15 years, B2.3.1 (c) 5 years and B2.3.2. The StoArmour Panel Facade System meets these requirements. See Paragraphs 11.1–11.3.

Clause E2 EXTERNAL MOISTURE: Performance E2.3.2. The StoArmour Panel Facade System meets this requirement. See Paragraphs 15.1–15.5.

Clause F2 HAZARDOUS BUILDING MATERIALS: Performance F2.3.1. The StoArmour Panel Facade System meets this requirement.

Technical Specification

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

Cavity battens

- StoTherm expanded polystyrene (EPS) cavity battens for use on timber and steel frame construction are manufactured from high density (Class VH) EPS with an approximate density of 28 kg/m³. The battens are 20 or 40 mm thick by 50 mm wide and are supplied in 1,200 mm lengths.

Cavity spacers

- Timber cavity spacers for use on timber frame construction are minimum 200 mm long x 40 mm thick x 40 mm wide, and are treated to H3.1. Both the top and bottom surfaces are angled on a 22.5° slope. The sloping faces are parallel.

StoArmour panels

- StoArmour panels are 50 or 75 mm thick, manufactured from AAC. The 50 mm thick panels have an approximate density of 31 kg/m³ and are available 2.2 m or 2.4 m long x 600 mm wide. The 75 mm thick panels have an approximate density of 46.5 kg/m³ and are supplied 2.2 m long x 600 mm wide.

Panel adhesive

- StoArmour panel adhesive is a polymer-modified, cement-based adhesive comprising graded sand and additives. The adhesive is supplied in 25 kg bags and is mixed on-site with clean drinking water. It is trowel-applied to the joints of the StoArmour panels.

Primers

- Protectosil WS205 Stay Dry is a milky white, ready-to-use silane sealer available in 20 L containers. It is low pressure spray or brush and roller-applied to dry StoArmour panels once they have been installed, before commencing rendering.
- Stoplex W is a yellow tinted, ready-to-use, acrylic-based primer available in 10 L containers. It is brush and roller-applied to dry Poren and StoLevell Novo render surfaces prior to the application of the StoArmat or finishing render.

Renders

- **StoLevell Novo** is a polymer-modified, lightweight, cement-based render. The render is supplied in 15 kg bags and is mixed on-site with clean drinking water. It is applied as a base coat in an approximate 4 mm thick layer, followed by the embedment of mesh in the outer surface [StoMiral Render System only]. An additional 1-2 mm layer is applied to fully encase the mesh. StoLevell Novo is applied to a minimum 5 mm thickness when used as the base coat for the StoArmat Render System.
- **Poren render** is a polymer-modified, white cement-based render comprising graded sand and adhesives. The render is supplied in 25 kg bags and mixed on-site with clean drinking water. It is trowel-applied as a base coat in an approximate 4 mm thick layer, followed by the embedment of fibreglass mesh reinforcement in the outer surface [StoMiral Render System only]. An additional 1-2 mm layer is applied to fully encase the mesh. Poren render is applied to a minimum 5 mm thickness when used as the base coat for the StoArmat Render System.
- **StoArmat** is a plasticiser-free, tintable, ready-to-use, polymer-modified, cement-free reinforcement render comprising granulated quartz sands, calibration grain, polypropylene fibre and additives. It is supplied in 23 kg pails, and after diluting with water as necessary and mixing, is ready for use. It is trowel-applied in a 2 mm thick layer followed by the embedment of fibreglass mesh reinforcement in the outer surface. Once dry, a further coat of StoArmat approximately 1 mm thick is applied to cover the mesh and leave a flat, even surface.
- **Stolit K** is a plasticiser-free, tintable, ready-to-use, polymer-modified, cement-free finishing render with a 1, 1.5, 2 or 3 mm grain size. It is supplied in 25 kg pails and is trowel-applied to an approximate thickness of 1-3 mm, gauging to the thickness of the aggregate size.
- **Stolit MP and MP Natural** are plasticiser-free, tintable, ready-to-use, polymer-modified, cement-free finishing renders. They are supplied in 25 kg pails, are trowel-applied in two coats and are either float finished, or lightly sponged to the selected pattern.
- **Stolit Milano** is a smooth, plasticiser-free, tintable, ready-to-use, polymer-modified, cement-free finishing render. It is supplied in 25 kg pails, is trowel-applied in two coats and is either steel troweled, floated, or lightly randomly sponged to the selected pattern.
- **Sto Flexyl** is a cementitious waterproof paste. It is mixed on-site with a 1:1 ratio of fresh cement and is used as a waterproofing membrane over rendered balustrades and fixing blocks. Sto Flexyl is supplied in 18 kg pails.

StoColor Paints and Clear Sealers

- **StoColor Maxicryl** is a ready-to-use, tintable, matt, acrylic exterior paint for application over finishing renders. It is supplied in 15 L pails, and may be brush, roller or spray-applied. The paint colour selected must have a light reflectance value [LRV] of 25% minimum when used with the StoMiral Render System, and an LRV of 20% minimum when used with the StoArmat Render System.
- **StoColor Lotusan** is a ready-to-use, tintable, special dirt and algae resistant mineral silicone resin exterior paint for application over finishing renders. It is supplied in 15 L pails, and may be brush, roller or spray-applied. The paint colour selected must have an LRV of 25% minimum when used with the StoMiral Render System, and an LRV of 20% minimum when used with the StoArmat Render System.
- **StoColor Lastic** is a ready-to-use, tintable, satin matt, acrylic exterior paint for application over finishing renders. It is supplied in 15 L pails, and may be brush, roller or spray-applied. The paint colour selected must have an LRV of 25% minimum when used with the StoMiral Render System, and an LRV of 20% minimum when used with the StoArmat Render System.
- **StoColor X-Black** is a ready-to-use, tintable, matt, heat-reflective, acrylic exterior paint for application over finishing renders. It is supplied in 15 L pails, and may be brush, roller or spray-applied. The paint colour selected must have an LRV of 15% minimum when used with the StoMiral Render System, and an LRV of 10% minimum when used with the StoArmat Render System.

- **S-Protect SC** is an invisible, silane-based, hydrophobic sealer for application over Stolit MP, MP Natural and Milano finishing renders. It is supplied in 10 and 20 L pails and is applied in a flood coat using a low pressure sprayer and Sto block brush.
- **StoPur WV200** is a two-component PUR, water-based, matt transparent sealer for application over Stolit Milano finishing render. It is applied by brush and Sto Micro roller.

Accessories

- **Construction adhesive** - an AAC compatible polyurethane-based construction adhesive for temporarily bonding StoArmour panel joints during construction and for temporarily adhering uPVC trims to StoArmour panels until rendering is completed.
 - **Reinforcing mesh** - alkali-resistant fibreglass mesh with a nominal mesh size of approximately 7 x 7 mm or 4 x 4 mm and an approximate weight of 165 g/m².
 - **uPVC components** - Sto vented base cap, Sto sill and jamb flashings, Sto vented adjustable foot tray and control joint flashing.
 - **Sto pre-meshed corner beads and finishing edges** - uPVC and fibreglass mesh corner and finishing mouldings.
- 4.2 Accessories used with the system which are supplied by the Sto registered contractor are:
- **Cavity spacer fixings (timber frame only)** - 75 x 3.06 mm hot-dip galvanised D-head, ring shank gun nails in NZS 3604 defined Exposure Zones B, C and D. *[Note: The hot-dip galvanising must comply with AS/NZS 4680.]*
 - **StoArmour fixings (timber frame - 50 mm panel)** - 100 mm long [for 20 mm cavity battens] or 120 mm long [for 40 mm cavity battens] Grade 304 stainless steel wood screws or AS 3566 Corrosion Class 4 hot-dip galvanised wood screws with a head diameter of 14 mm and a shank diameter of 5.1 mm; 10 g x 75 mm long [for 40 mm timber cavity spacers], Grade 304 stainless steel wood screws or AS 3566 Corrosion Class 4 hot-dip galvanised wood screws with a head diameter of 14 mm.
 - **StoArmour fixings (timber frame - 75 mm panel)** - 125 mm long [for 20 mm cavity battens], Grade 304 stainless steel wood screws or AS 3566 Corrosion Class 4 hot-dip galvanised wood screws with a head diameter of 14 mm and a shank diameter of 5.1 mm; 10 g x 100 mm long [for 40 mm timber cavity spacers] Grade 304 stainless steel wood screws or AS 3566 Corrosion Class 4 hot-dip galvanised wood screws with a head diameter of 14 mm.
 - **StoArmour fixings (steel frame)** - 100 mm long [for 50 mm panel with 20 mm cavity battens], 125 mm long [for 75 mm panel with 20 mm cavity battens], or 120 mm long [for 50 mm panel with 40 mm cavity battens], Type 17, AS 3566 Corrosion Class 4 self-drilling screws with a head diameter of 14 mm and a shank diameter of 5.1 mm in NZS 3604 defined Exposure Zones B and C and Grade 304 stainless steel in Exposure Zone D.
 - **uPVC component fixings** - 30 x 2.5 mm hot-dip galvanised steel flat head nails to timber frame and AS 3566 Corrosion Class 3, 20 mm screws to steel frame.
 - **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.
 - **Sto steel primer** - a rust-inhibiting primer applied to the exposed cut ends of StoArmour panel reinforcing.
- 4.3 Accessories used with the system which are supplied by the building contractor are:
- **Flexible wall underlay** - paper or underlay complying with NZBC Acceptable Solution E2/AS1, Table 23, or breather-type flexible underlays covered by a valid BRANZ Appraisal for use as wall underlays.
 - **Flexible wall underlay support** - polypropylene strap, 75 mm galvanised mesh, galvanised wire, or additional vertical battens for securing the flexible wall 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 (where StoTherm cavity battens or cavity spacers are not used)** – 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, or cavity battens covered by a valid BRANZ Appraisal for use as a cavity batten system behind wall claddings.
- **Cavity batten fixings** – 40 x 2.5 mm hot-dip galvanised steel flat head nails to timber frame and AS 3566 Corrosion Class 3, 30 mm screws to steel frame.
- **Thermal break (steel frame)** – EPS in accordance with the requirements of NZBC Acceptable Solution E3/AS1, Paragraph 1.1.4 d), or thermal break products covered by a valid BRANZ Appraisal for use as thermal breaks behind wall claddings.
- **Joinery head flashings** – as supplied by the joinery manufacturer or contractor.
- **Window and door trim cavity air seal** – 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 Sto registered contractor, whether on-site or off-site, is under the control of the Sto registered contractor. Dry storage must be provided on-site for the Sto Armour panels, fibreglass mesh and bags of render. EPS 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-site 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 Sto Armour Panel Facade 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 Sto Armour Panel Facade System must be treated as required by NZBC Acceptable Solution B2/AS1.

Timber Framing

- 7.2 Timber framing must comply with NZS 3604, or 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. Dwargs must be fitted flush between the studs as required for the fixing of internal linings.
- 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 Timber framing must have a maximum moisture content of 24% at the time of the cladding application. *[Note: If Sto Armour 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

- 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 0.75 mm.
- 7.7 In all cases, studs must be at maximum 600 mm centres. Dwgangs must be fitted flush between the studs as required for the fixing of internal linings.

StoArmour Setout

- 7.8 StoArmour panels are installed horizontally. Vertical panel edges may be jointed on-stud or off-stud. Horizontal StoArmour panel edges do not require edge fixing, except at soffits and window and door openings where additional framing will be required for the support and fixing of panel edges. Vertical panel joints must be staggered for each row. StoArmour panels must be supported at fixing locations with vertical cavity battens or 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 StoArmour panels must hang 50 mm below the supporting framing.
- 7.9 When a 75 mm thick StoArmour panel is used, the panel must be fully supported on a rebate in the foundation.

General

- 8.1 When the StoArmour Panel Facade System is used for specifically designed buildings up to design differential 2.5 kPa ULS wind pressure, only the weathertightness aspects of the cladding and maximum framing centres and StoArmour 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 Punchings in the base cap provide a minimum ventilation opening area of 1,000 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 StoArmour Panel Facade 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 wall underlays for buildings in the Extra High Wind Zone and specifically designed buildings up to design differential 2.5 kPa ULS wind pressure. Unlined gables and walls must incorporate a rigid wall underlay 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, or the StoArmour fixings are to be embedded up to a maximum of 12 mm below the panel surface to maintain a minimum 30 mm penetration into the wall frame.
- 8.6 Where penetrations through the StoArmour Panel Facade 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 EPS cavity battens. When cables must penetrate the EPS for exterior electrical connections, the cable must be directly supported by passing through an electrical conduit. There is no separation requirement for PVC sheathed electrical cables passing through StoArmour panels.

Control Joints

- 9.1 Control joints where StoArmour panels are used must be constructed in accordance with the Technical Literature and be provided as follows:

- **Horizontal control joints** – at maximum 7 m centres and at inter-storey floor levels where unseasoned timber floor joists are used.
- **Vertical control joints** – at maximum 8 m centres; aligned with any control joint in the structural framing, or where the system abuts different cladding types.

[Note: Horizontal and vertical control joints must be located to ensure the panel is adequately supported on both sides of the control joint. The Technical Literature provides some guidance for the design of vertical control joints where the system abuts different cladding types. Details not included within the Technical Literature are outside the scope of this Appraisal and are the responsibility of the designer – refer to 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 m in height, in accordance with the requirements of NZBC Acceptable Solution E2/AS1, Paragraph 9.1.9.4 b).

Structure

Mass

- 10.1 The mass of the StoArmour Panel Facade System is approximately 34.5 kg/m² when 50 mm thick panel is used, and 50 kg/m² when 75 mm thick panel is used. It is therefore considered a medium wall cladding in terms of NZS 3604.

Impact Resistance

- 10.2 The system has adequate resistance to impact loads likely to be encountered in normal residential use. 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 StoArmour Panel Facade 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 design differential 2.5 kPa ULS wind pressure when the buildings are specifically designed.

StoArmour Panel Fixing – Timber Frame with 20 and 40 mm Cavity Battens

- 10.4 For installations in NZS 3604 Wind Zones up to, and including, Extra High and specific design wind pressures up to, and including, design differential 2.5 kPa ULS, StoArmour panels must be fixed through the 20 or 40 mm cavity battens to the wall framing at maximum 600 mm horizontal centres with 100 mm long [for 50 mm panel with 20 mm cavity battens], 125 mm long [for 75 mm panel with 20 mm cavity battens] or 120 mm long [for 50 mm panel with 40 mm cavity battens] Grade 304 stainless steel or AS 3566 Corrosion Class 4 hot-dip galvanised wood screws with a head diameter of 14 mm and a shank diameter of 5.1 mm. The fixings must be positioned 150 mm up from the bottom edge and 150 mm down from the top edge of the panel giving an overall fixing layout of 300 mm centres vertically.

StoArmour Panel Fixing – Timber Frame with 40 mm Cavity Spacers

- 10.5 For installations in NZS 3604 Wind Zones up to, and including, Extra High and specific design wind pressures up to and including design differential 2.5 kPa ULS, cavity spacers must be fixed to the timber framing [studs] with two 75 x 3.06 mm hot-dip galvanised D-head, ring shank gun nails in accordance with the Technical Literature. The cavity spacers must be installed at maximum 600 mm horizontal centres along all horizontal panel joints. Additional cavity spacers may be required at corners and around openings in accordance with the Technical Literature. The StoArmour panels are fixed to the cavity spacers with 10 g x 75 mm long [for 50 mm panel] or 10 g x 100 mm long [for 75 mm panel] Grade 304 stainless steel or AS 3566 Class 4 hot-dip galvanised wood screws with a head diameter of 14 mm. The fixings must be positioned 50 mm up from the bottom edge and 50 mm down from the top edge of the panel and the fixing heads must finish 5 mm below the panel surface.

StoArmour Panel Fixing – Steel Frame with 20 and 40 mm Cavity Battens

- 10.6 For installations in NZS 3604 Wind Zones up to, and including, Extra High and specific design wind pressures up to, and including, design differential 2.5 kPa ULS, StoArmour panels must be fixed through the 20 or 40 mm cavity battens to the wall framing at maximum 600 mm horizontal centres with 100 mm long [for 50 mm panel with 20 mm cavity battens] or 120 mm long [for 50 mm panel with 40 mm cavity battens] Type 17, AS 3566 Corrosion Class 4 self-drilling screws with a head diameter of 14 mm and a shank diameter of 5.1 mm in NZS 3604 defined Exposure Zones B and C and Grade 304 stainless steel in Exposure Zone D. The fixings must be positioned 150 mm up from the bottom edge and 150 mm down from the top edge of the panel giving an overall fixing layout of 300 mm centres vertically.

Durability

- 11.1 The StoArmour Panel Facade System meets the performance requirements of NZBC Clause B2.3.1 [b] 15 years for the facade system and render finish, and the performance requirements of NZBC Clause B2.3.1 [c] 5 years for the exterior paint system.

Serviceable Life

- 11.2 The StoArmour Panel Facade 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 StoArmour panels, fixings and render 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 StoArmour 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 facade system, including the Sto coating system, renders, flashings and any sealed joints remain in a weatherproof condition. Any cracks, damaged areas or areas showing signs of deterioration which could allow water ingress, must be repaired immediately. The StoArmour Panel Facade System must be repaired in accordance with the instructions of Stoanz Limited.
- 12.3 Although the paint system is designed as a special dirt and algae resistant type, 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. The paint system must be recoated at approximately 8-10 yearly intervals in accordance with the instructions of Stoanz Limited. Clear sealer systems require recoating at 5-7 yearly intervals.

- 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. *[Note: Failure to adhere to the minimum ground clearances given in this Appraisal and the Technical Literature will adversely affect the long term durability of the StoArmour Panel Facade System.]*

Control of External Fire Spread

Vertical Fire Spread

- 13.1 This Appraisal only covers buildings 10 m or less in height. NZBC Functional Requirements C3.2 identifies that external vertical fire spread to upper floors only needs to be considered for buildings with a building height greater than 10 m. Control of external vertical fire spread is therefore outside the scope of this Appraisal.

Horizontal Fire Spread

- 13.2 The StoArmour Panel Facade System has a peak heat release rate of less than 100 kW/m² and a total heat released of less than 25 MJ/m². Testing was carried out in accordance with Paragraph 5.4 of NZBC Acceptable Solution C/AS1 and Paragraph 5.8.1 of NZBC Acceptable Solution C/AS2, achieving a Type A performance. The StoArmour Panel Facade System can therefore be used within 1 m of the boundary.
- 13.3 Refer to NZBC Acceptable Solutions C/AS1 and C/AS2 and Verification Method C/VM2 for fire resistance rating and control of external fire spread requirements for external walls.

Prevention of Fire Occurring

- 14.1 StoArmour panels are non-combustible and need not be separated from fireplaces, heating appliances, flues and chimneys. However, when used in conjunction with, or attached to heat sensitive materials, the heat sensitive material must be separated from heat sources such as fireplaces, heating appliances and chimneys. Part 7 of NZBC Verification Method C/VM1 and Acceptable Solution C/AS1, and NZBC Acceptable Solution C/AS2 provide methods for separation and protection of combustible materials from heat sources.

External Moisture

- 15.1 The StoArmour Panel Facade 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.
- 15.2 The cavity must be sealed off from the roof and subfloor space to meet the performance requirements of NZBC Clause E2.3.5.
- 15.3 The StoArmour Panel Facade System allows excess moisture present at the completion of construction to be dissipated without permanent damage to building elements to meet the performance requirements of NZBC Clause E2.3.6.
- 15.4 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.
- 15.5 The use of the StoArmour Panel Facade 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

- 16.1 The StoArmour Panel Facade 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

- 16.2 The StoArmour Panel Facade 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. Refer to Paragraph 16.3 below for specific requirements for steel-framed buildings.
- 16.3 When the StoArmour Panel Facade System is installed over a steel frame, a thermal break must be installed over each steel member in accordance with the requirements of NZBC Acceptable Solution E3/AS1, Paragraph 1.1.4 d). When StoTherm EPS cavity battens are used, a 10 mm thick Class H EPS thermal break must be installed over the wall underlay over each steel member not covered by a cavity batten. StoTherm cavity battens must not be used horizontally. When timber cavity battens are used, an EPS thermal break must be installed over each steel member. The rest of the StoArmour Panel Facade System is then installed over top of the thermal break in accordance with the Technical Literature and this Appraisal. Where thermal breaks are used in conjunction with timber cavity battens, the StoArmour panel fixing length must be increased by a minimum of the thickness of the thermal break.

Installation Information

Installation Skill Level Requirements

- 17.1 Installation and finishing of components and accessories supplied by Stoanz Limited and its Sto registered contractors must be completed by trained applicators, approved by Stoanz Limited.
- 17.2 Installation must always be carried out in accordance with the StoArmour Panel Facade System Technical Literature and this Appraisal by, or under the supervision of, a Licensed Building Practitioner [LBP] with the relevant Licence Class.

System Installation

Wall Underlay and Flexible Sill and Jamb Tape Installation

- 18.1 The selected wall 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 spacers or cavity battens and the rest of the StoArmour Panel Facade System. Flexible wall 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 wall underlay 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 wall 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.
- 18.2 Where studs are at greater than 450 mm centres and a flexible wall underlay is being used, a wall underlay support must be installed over the underlay at maximum 300 mm centres horizontally.

Aluminium Joinery Installation

- 18.3 Aluminium joinery 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. The joinery must be spaced 22–23 mm off of the wall frame or the face of the rigid wall underlay to allow the StoArmour Panel Facade System flashings to be installed.

StoArmour Panel Facade System

- 18.4 The system must be installed in accordance with the Technical Literature by a Sto registered contractor.
- 18.5 The StoArmour Panel Facade System renders must only be applied when the air and substrate temperature is within the range of 5–30°C.

Inspections

- 18.6 The Technical Literature must be referred to during the inspection of StoArmour Panel Facade System installations.

Health and Safety

- 19.1 Cutting of StoArmour panels must be carried out in well ventilated areas, and a dust mask and eye protection must be worn.
- 19.2 When power tools are used for cutting, grinding or forming holes, health and safety measures must be observed because of the amount of dust generated.
- 19.3 Safe use and handling procedures for the components that make up the StoArmour Panel Facade 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

- 20.1 The following testing has been undertaken by BRANZ:
- BRANZ expert opinion on NZBC Clause E2 code compliance for the StoArmour Panel Facade System was based on testing and evaluation of all details within the scope and as stated within this Appraisal. The StoArmour Panel Facade System was tested to E2/VM1. 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 joints, internal and external corners. 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 drained cavity claddings.
 - Wind face load and small-scale fastener withdrawal testing for the StoArmour Panel Facade System was completed by BRANZ. BRANZ determined design wind suction pressures, and by comparing these with the NZS 3604 design wind speeds and AS/NZS 1170 pressure coefficients, the fixing requirements were determined for timber and steel-framed walls.
 - In-plane shear testing of the StoArmour Panel Facade System to determine the system's ability to resist its self-weight.
 - A racking test was completed to examine the performance of the StoArmour Panel Facade System when the system was subjected to both serviceability level and ultimate level seismic racking deflections, taken to be ± 8 mm and ± 36 mm respectively. The render system did not crack or show signs of damage for the entire test program.
 - Durability testing of the StoArmour panels to verify the durability of the system. The testing included compressive strength, length change during moisture movement, corrosion protection of steel reinforcement and mineralogy by x-ray diffraction crystallography.
 - Cone calorimeter testing of the StoArmour renders on the StoArmour Panel were undertaken in accordance with ISO 5660 to determine the exterior surface finishes performance.

Other Investigations

- 21.1 Structural and durability opinions have been provided by BRANZ technical experts.
- 21.2 Site inspections of StoArmour Panel Facade System installations have been carried out by BRANZ to assess the practicability of installation, and to examine completed installations.
- 21.3 The Technical Literature for the StoArmour Panel Facade System has been examined by BRANZ and found to be satisfactory.

Quality

- 22.1 The manufacture of the StoArmour base render 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. The quality control system of the StoArmour render manufacturer has been assessed and registered as meeting the requirements of the Telarc Q-Based Code.
- 22.2 The manufacture of the Sto renders and finishes 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. The quality management system of the manufacturer, Sto SE & Co. KGaA, has been assessed and registered as meeting the requirements of ISO 9001.
- 22.3 The environmental management system of Sto SE & Co. KGaA has been assessed and registered as meeting the requirements of ISO 14001.
- 22.4 Sto External Wall Insulation Systems are the subject of a current British Board of Agrément (BBA) Certificate No 95/3132 and the manufacture of the systems continues to be checked by the BBA during the validity period of the Certificate. Renders and paints used within the StoArmour Panel Facade System and imported by Stoanz Limited are covered by the BBA Certificate.
- 22.5 The manufacture of the StoArmour panels 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.
- 22.6 The quality of materials, components and accessories supplied by Stoanz Limited are the responsibility of Stoanz Limited.
- 22.7 Quality on-site is the responsibility of the Sto registered contractor.
- 22.8 Designers are responsible for the building design, and building contractors are responsible for the quality of installation of framing systems and joinery, wall underlays, flashing tapes, air seals and joinery head flashings in accordance with Stoanz Limited's instructions.
- 22.9 Building owners are responsible for the maintenance of the StoArmour Panel Facade System in accordance with the instructions of Stoanz Limited.

Sources of Information

- AS 3566:2002 Self-drilling screws for the building and construction industries.
- AS/NZS 1170:2002 Structural design actions.
- ISO 5660:2002 Reaction-to-fire tests - Heat release, smoke production and mass loss rate.
- NZS 3603:1993 Timber structures standard.
- NZS 3604:2011 Timber-framed buildings.
- NZS 4211:2008 Specification for performance of windows.
- Ministry of Business, Innovation and Employment Record of amendments - Acceptable Solutions, Verification Methods and handbooks.
- The Building Regulations 1992.

Amendments

Amendment No.1, dated 10 March 2022

This appraisal has been amended to change the system name.



BRANZ Appraised
Appraisal No. 772 [2020]

BRANZ Appraisal
Appraisal No. 772 [2020]
17 December 2020

STOARMOUR PANEL FACADE
SYSTEM



In the opinion of BRANZ, the **StoArmour Panel Facade 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

Chelydra Percy

Chief Executive

Date of Issue:

17 December 2020