



CLAY BRICK & PAVER
MANUFACTURER'S ASSOCIATION

Stack Bonded Brick Veneer System



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Midland Brick NZ

PGH



BRANZ Appraised

Appraisal No. 1045 [2019]

CLAY BRICK AND PAVER MANUFACTURERS ASSOCIATION'S STACK BONDED BRICK VENEER SYSTEM

Appraisal No. 1045 [2019]

Amended 30 September 2024



BRANZ Appraisals

Technical Assessments of products for building and construction.



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Product

- 1.1 The Stack Bonded Brick Veneer System is a system for creating clay brick veneer claddings with a stack bond pattern.
- 1.2 The clay brick manufacturers whose bricks are covered by this Appraisal are as follows:
 - Brickworks NZ
 - Canterbury Clay Bricks
 - Clay Bricks Ltd
 - Brick and Stone Imports T/A Midland Brick NZ
 - CSR Building Products

Full contact details are given on page 9.

Scope

- 2.1 The Stack Bonded Brick Veneer System has been appraised for use as a veneer cladding system for buildings within the following scope:
 - the scope limitations of NZBC Acceptable Solution E2/AS1 Paragraph 1.1 in terms of floor area, and with a maximum of one storey; and,
 - with a maximum height of brick veneer of 4 m above the supporting foundation, except that at gable ends and some piers this height may be up to 5.5 m; and,
 - with a minimum panel width of 230 mm; and,
 - with a veneer thickness of 70 mm to 110 mm; and,
 - with a cavity depth of between 40 mm and 60 mm; and,
 - with a risk score of 0 - 20, calculated in accordance with NZBC Acceptable Solution E2/AS1; and,
 - with timber framing constructed on slab-on-ground in accordance with NZS 3604 and/or concrete masonry constructed in accordance with NZS 4229; and,
 - situated in NZS 3604 Wind Zones up to, and including, Extra High; and,
 - with the wall cladding meeting all the requirements of Section 9.2 Masonry Veneer of NZBC Acceptable Solution E2/AS1 or Section 4.6 Masonry Veneer of NZBC Acceptable Solution E2/AS3, except the requirement for running or stretcher bond.
- 2.2 The Stack Bonded Brick Veneer 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 Stack Bonded Brick Veneer System relies on the joinery meeting the requirements of NZS 4211 for the relevant Wind Zone.]*

[Note: The Stack Bonded Brick Veneer System can be used to provide a fire resistance rated construction, but this aspect has not been appraised and is outside the scope of this Appraisal.]



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Building Regulations

New Zealand Building Code (NZBC)

3.1 In the opinion of BRANZ, the Stack Bonded Brick Veneer 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 Stack Bonded Brick Veneer System meets the requirements for loads arising from self-weight, earthquake, wind, impact, creep and shrinkage [i.e. B1.3.3 [a], [f], [h], [j] and [q]]. See Paragraphs 8.1–8.19.

Clause B2 DURABILITY: Performance B2.3.1 [a] not less than 50 years. The structural support elements and reinforcing meet this requirement. Performance B2.3.1 [b] 15 years. The brick veneer wall cladding meets this requirement and B2.3.2. See Paragraphs 9.1–9.5.

Clause E2 EXTERNAL MOISTURE: Performance E2.3.2 The Stack Bonded Brick Veneer System meets this requirement. See Paragraphs 13.1–13.4.

Clause F2 HAZARDOUS BUILDING MATERIALS: Performance F2.3.1. The Stack Bonded Brick Veneer System meets this requirement.

Technical Specification

Clay Bricks

4.1 The Stack Bonded Brick Veneer System uses 70 to 110 mm thick bricks, which are extruded, kiln-fired clay bricks, nominally 230 to 390 mm long and from 40 to 200 mm high. The bricks are smooth, patterned or textured, of varying colour and are manufactured to AS/NZS 4455.

Accessories

4.2 Accessories and materials used with The Stack Bonded Brick Veneer System that are supplied by the bricklayer or builder are:

- **Mortar** – complying with NZS 4210.
- **Galvanised or stainless-steel brick ties and screw fixings** – complying with AS/NZS 2699.1. Corrosion protection of steel based on the building sites exposure zone from NZS 3604 and NZBC Acceptable Solution E2/AS1, Table 18C.
- **Galvanised or stainless-steel brick joint reinforcing** – reinforcing lattice formed into straight and corner sections used in mortar joints. Brick joint reinforcing consists of two 4 mm wire spaced 36 mm apart with welded wire ties at 160 mm centres. Formed into straight and corner sections. Corrosion protection of steel selected based on the building sites exposure zone from NZS 3604 and NZBC Acceptable Solution E2/AS1, Table 18C.
- **Galvanised or stainless-steel lintels** – complying with AS/NZS 2699.3. Corrosion protection of steel selected based on the building sites exposure zone from NZS 3604 and NZBC Acceptable Solution E2/AS1, Table 18D.
- **Flashings (window and door head and jambs)** – complying with NZBC Acceptable Solution E2/AS1 Paragraph 9.2.4. Refer to NZBC Acceptable Solution E2/AS1, Table 20 for material selection and durability requirements.
- **Wall underlay** – complying with NZBC Acceptable Solution E2/AS1, Table 23, or breather-type membranes covered by a valid BRANZ Appraisal for use around window and door openings.
- **Flexible flashing tape** – complying with NZBC Acceptable Solution E2/AS1, Paragraph 4.3.11.
- **Sill Support Bars and Sill trays** – complying with NZBC Acceptable Solution E2/AS1, Paragraph 9.1.10.5. Refer to NZBC Acceptable Solution E2/AS1, Table 20 for material selection and durability requirements.
- **Air seals (window and door trim cavity)** – air seals complying with either NZBC Acceptable Solution E2/AS1 Paragraph 9.1.6, or self-expanding, moisture cure polyurethane foam air seals covered by a valid BRANZ Appraisal suitable for use around window, door and other wall penetration openings.



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Handling and Storage

- 5.1 Bricks are either packaged in plastic and delivered on pallets or delivered in strapped packs with no pallet. They must be handled with care to avoid physical damage, particularly to corners and edges, and must be stored so that they are protected from the weather.
- 5.2 Components such as brick ties, lintels and shelf angles must be handled so as to avoid damage. They must also be stored in dry locations protected from the weather.
- 5.3 Pre-bagged, pre-mixed mortar and/or bags of cement must be stored in dry locations protected from the weather.

Technical Literature

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

Design Information

General

- 7.1 The Stack Bonded Brick Veneer System allows brick veneer cladding to be erected with the clay brick units in a stack bond pattern rather than a running or stretcher bond as covered by the NZBC Acceptable Solution E2/AS1.
- 7.2 The system and Technical Literature apply for use only with 70 mm to 110 mm thick bricks.
- 7.3 The system is designed for use with a veneer cavity of 40-60 mm.

Structure

General

- 8.1 The Stack Bonded Brick Veneer System can be used with buildings designed to have floor loadings of up to 3 kPa capacity.

Foundations

- 8.2 Foundation systems supporting the veneer must consist of concrete slab-on-ground systems complying with either NZS 3604 or NZS 4229.
- 8.3 Where the building under consideration is to be built on expansive soils as defined by AS 2870, control joints may be necessary, and the advice of a design professional should be obtained.

Framing

- 8.4 The system can be used as a masonry veneer cladding for timber framed buildings complying with NZS 3604 or masonry construction complying with NZS 4229.
- 8.5 All framing timber including; studs, floor joists and lintels must be kiln dried to a maximum of 18% moisture content.
- 8.6 Walls to which the veneer is attached must be constructed from 90 x 45 mm minimum, VSG8 or MSG8, or better, timber framing. Studs must be at maximum 400 mm centres.
- 8.7 The maximum span of any external opening where the veneer is supported over the opening must be in accordance with the Masonry veneer lintel sizes in Table 18E of NZBC Acceptable Solution E2/AS1.

Timber Treatment

- 8.8 All framing timber including studs, floor joists, and lintels must be treated to a minimum of H1.2.



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Veneer Height

- 8.9 The maximum permitted height of veneer for the Stack Bonded Brick Veneer System is 4 m above its foundation support. A gable end or pier may extend to 5.5 m in height above its foundation support. A pier is defined as a brick panel not exceeding 1 m in width. The maximum permitted height of veneer is 7 m above adjacent finished ground level.

Wall Bracing Requirements

- 8.10 Bracing requirements of walls may be calculated by using the prescribed tables in NZS 3604.

Mass

- 8.11 The Stack Bonded Brick Veneer System mass gives it a Heavy wall cladding classification as per NZS 3604. For specific structural design purposes, 70 mm wide bricks have a mass of approximately 140 kg/m², and 90 mm wide bricks have a mass of approximately 180 kg/m². For other widths interpolation may be used.

Steel Lintel Angles

- 8.12 Lintel angle sizes and details based on in Table 18E of NZBC Acceptable Solution E2/AS1 for spans up to 4,800 mm are given in the Technical Literature.

BrickTies

- 8.13 Brick ties are to conform to the requirements of NZS 2699.1.
8.14 Brick ties are to be fixed to studs spaced at a maximum 400 mm centres and at maximum vertical spacing of 400 mm.

Brick joint reinforcing

- 8.15 Brick joint reinforcing steel consists of two 4 mm wire spaced 36 mm apart joined by welded wire ties at 160 mm centres and formed into straight and corner sections.
8.16 Straight and corner sections of brick joint reinforcing must be lapped a minimum of 200 mm to form a continuous reinforcement in the brick course.
8.17 Brick joint reinforcement is to be bedded into horizontal mortar joints at maximum 400 mm centres vertically.
8.18 Brick joint reinforcement is to be located in the mortar joint halfway between the courses above and below where brick ties are located.

Concrete Masonry Buildings

- 8.19 The Stack Bonded Brick Veneer System may also be used with concrete masonry buildings constructed in accordance with NZS 4229. A cavity, with a minimum width of 40 mm and maximum 60 mm, must be formed between the veneer and masonry structural wall, with the veneer attached to the concrete masonry by veneer ties mechanically fixed to the face of the masonry. The fixing of brick ties to masonry must be in accordance with NZS 4229, Appendix E.

Durability

Serviceable Life

- 9.1 Kiln-fired clay bricks produced and marketed by the manufacturers listed at the end of this Appraisal will have a serviceable life of at least the life of the building, and in excess of 50 years.
9.2 Brick veneer ties and their fixings must meet the durability requirements of NZBC E2/AS1, Paragraph 9.2.7.
9.3 Brick joint reinforcing steel must meet the durability requirements for brick ties of NZBC Acceptable Solution E2/AS1, Paragraph 9.2.7.
9.4 Flashings must comply with NZBC Acceptable Solution E2/AS1 Paragraph 9.2.4.
9.5 Lintels must meet the durability requirements of NZBC Acceptable Solution E2/AS1, Paragraph 9.2.9.



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Maintenance

- 10.1 An inspection of the brick veneer must be carried out at least annually. Weep holes must be kept clear of dust, dirt, spider webs and the like to ensure that moisture can continue to drain from the cavity.
- 10.2 Where bricks or mortar are cracked, the cause must be determined (this may require a structural engineer's assessment) and repairs must be carried out to restore the cladding.

Prevention of Fire Occurring

- 11.1 The Stack Bonded Brick Veneer System is considered a non-combustible material and need not be separated from heat sources such as 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 fireplaces, heating appliances, flues and chimneys in accordance with the requirements of Part 7 of NZBC Acceptable Solution C/AS1 and NZBC Acceptable Solution C/AS2.

Control of External Fire Spread

- 12.1 Clay bricks and mortar are non-combustible materials. When the Stack Bonded Brick Veneer System is uncoated or is finished with a paint coating of not more than 1 mm in thickness, the exterior surface finishes requirements of NZBC Acceptable Solution C/AS1, Paragraph 5.4 and Acceptable Solution C/AS2, Paragraph 5.8.1 do not apply in accordance with NZBC Acceptable Solution C/AS1, Paragraph 5.4 and Acceptable Solution C/AS2, Paragraph 5.8.2 (a), respectively.

External Moisture

- 13.1 The Stack Bonded Brick Veneer System must be detailed for weathertightness in accordance with NZBC Acceptable Solution E2/AS1, Section 9.2 Masonry veneer or NZBC Acceptable Solution E2/AS3, Section 4.6 Masonry veneer and the Technical Literature.
- 13.2 The Stack Bonded Brick Veneer System, when installed in accordance with this Appraisal and the Technical Literature on buildings with a risk score of 0-20, calculated in accordance with NZBC Acceptable Solution E2/AS1, Table 2, prevents the penetration of moisture that could cause undue dampness or damage to building elements.
- 13.3 The cavity must be sealed off from the roof and sub-floor space to meet code compliance with Clause E2.3.5.
- 13.4 The Stack Bonded Brick Veneer System allows excess moisture present at the completion of construction to be dissipated without permanent damage to building elements in compliance with Clause E2.3.6.

Installation Information

Installation Skill Level Requirement

- 14.1 All design and building work must be carried out in accordance with the Stack Bonded Brick Veneer System Technical Literature and this Appraisal by competent and experienced tradespeople conversant with the Stack Bonded Brick Veneer System. Where the work involves Restricted Building Work (RBW), this must be completed by, or under the supervision of, a Licensed Building Practitioner (LBP) with the relevant Licence Class.
- 14.2 The materials and workmanship of the Stack Bonded Brick Veneer System shall be in accordance with the SNZ HB 4236 for Masonry veneer wall cladding.



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System Installation

Wall Underlay and Tape Installation

- 15.1 The selected wall underlay and flashing tape system must be installed by the building contractor in accordance with the underlay and tape manufacturers' instructions and in accordance with NZBC Acceptable Solution E2/AS1 Paragraph 9.1.5 prior to the installation of the clay bricks. Particular attention must be paid to the installation of the building underlay and sill/jamb junction and head/jamb junction tapes at window and door openings to ensure a continuous seal is achieved and all exposed timber in the opening is protected.

Aluminium Joinery Installation

- 15.2 Aluminium joinery must be installed as per E2/AS1 Paragraph 9.2.10 with flashings installed as per Figures 73C and 73D.
- 15.3 A continuous air seal must be provided in accordance with NZBC Acceptable Solution E2/AS1 Paragraph 9.1.6.

Clay Brick Installation

- 15.4 If at all possible, bricks should be of one single batch. If this is not possible, bricks from two batches should be thoroughly mixed to avoid obvious colour variations. It is recommended that bricks be selected from at least 3 different pallets or packs simultaneously.
- 15.5 Pallets or packs of bricks should always be kept covered so that they are laid dry. If rain is likely during construction, the top course and cavity should be covered to reduce the likelihood of efflorescence occurring on the surface of the bricks.
- 15.6 Brickwork should be cleaned thoroughly as construction progresses, as mortar stains can be difficult to remove later. If acid is used for cleaning, industry guidelines must be followed with respect to methods of use and disposal.
- 15.7 Mortar Joints shall be ± 2 mm from the specified mortar joint thickness. The minimum mortar joint thickness permitted is 8 mm and the maximum 18 mm. Joints may be raked to a maximum depth of 6 mm and should be tooled to provide a hard, smooth surface to reduce water absorption.
- 15.8 If mortar is site-batched, it must be carefully mixed (in the volumes described in NZS 4210, Table 2.1 for the required durability requirement) to ensure consistent colour and bond strength. Pre-mixed mortar is recommended for its consistency in both strength and colour, as well as its low level of chloride salts.

Brick Tie Installation

- 15.9 Brick ties must be screw fixed at a maximum of 400 mm centres horizontally and spaced vertically as per the technical literature and must angle down from the framing toward the brick veneer at a 5° slope.
- 15.10 Brick ties may be dry bedded, i.e. the tie is fixed so that it lies on the top surface of the brick and the mortar bed placed on top of it, rather than bedding the tie within the mortar bed.

Brick Joint Reinforcing Installation

- 15.11 Brick joint reinforcing is to be bedded into horizontal mortar joints at maximum 400 mm centres vertically.
- 15.12 Brick joint reinforcing is to be located in the mortar joint halfway between the courses above and below where brick ties are located.
- 15.13 Straight and corner sections of brick joint reinforcing must be lapped a minimum of 200 mm to form a continuous reinforcement in the brick course.



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General

- 16.1 During and after brick veneer installation, it is recommended that, if possible, internal linings be attached to timber frames by screwing rather than nailing in order to avoid vibration to the cladding that could produce hairline cracks in the mortar.
- 16.2 Any brick veneer covered by this Appraisal may be painted, bagged or plastered as long as the weight limitations of Table 2.3 of NZS 4210 are not exceeded for the type of brick tie used. Painting, bagging or plastering is outside the scope of this Appraisal.

Inspections

- 17.1 The Technical Literature must be referred to during the inspection of the Stack Bonded Brick Veneer System installations by building consent authorities and territorial authorities. Flashing installation is a critical point for inspection.

Health and Safety

- 18.1 Cutting of clay bricks with power tools should be carried out in well ventilated areas, and a dust mask, eye and hearing protection should be worn.

Basis of Appraisal

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

Tests

- 19.1 The following testing has been completed by BRANZ:
- Testing of stack bonded brick veneer with mortar joint reinforcing and running/stretcher bond veneer without reinforcing was undertaken and the results compared.

Other Investigations

- 20.1 Assessment has been made of the structural aspects and durability of the system and opinions given by BRANZ technical experts.
- 20.2 The manufacturer's Technical Literature has been examined by BRANZ and found to be satisfactory.
- 20.3 Site inspections were carried out by BRANZ to assess methods used for construction of The Stack Bonded Brick Veneer System and to inspect completed systems.

Quality

- 21.1 The manufacture of clay bricks by the companies listed at the end of the Appraisal has been examined by BRANZ, and details of the quality and composition of the materials used were obtained and found to be satisfactory.
- 21.2 The manufacturers listed at the end of this Appraisal are responsible for the quality of bricks supplied.
- 21.3 Various component suppliers are responsible for the supply of components used with the system.
- 21.4 Designers are responsible for the design of the building and incorporating the wall cladding system in accordance with the Technical Literature and NZBC Acceptable Solution E2/AS1.
- 21.5 Quality on-site for construction of the Stack Bonded Brick Veneer System is the responsibility of the building contractor and the bricklayer in accordance with the instructions of the brick manufacturers that are the current members of the Clay Brick and Paver Manufacturers Association.
- 21.6 Building owners are responsible for the maintenance of the Stack Bonded Brick Veneer System in accordance with the instructions of the brick manufacturer.



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Sources of Information

- AS 2870:2011 Residential slabs and footings – Construction.
- AS/NZS 1170:2002 Structural design actions.
- AS/NZS 2699.1:2000 Built-in components for masonry construction – Wall ties.
- AS/NZS 2699.3:2002 Built-in components for masonry construction – Lintels and shelf angles [durability requirements].
- AS/NZS 4455:2008 Masonry units, pavers, flags and segmental retaining wall units.
- NZS 3603:1993 Timber structures standard.
- NZS 3604:2011 Timber-framed buildings.
- NZS 4210:2001 Masonry construction: Materials and workmanship.
- NZS 4211:2008 Specification for performance of windows.
- NZS 4229:2013 Concrete masonry buildings not requiring specific engineering design.
- SNZ HB 4236:2002 Masonry veneer wall cladding.
- Ministry of Business, Innovation and Employment Record of amendments – Acceptable Solutions, Verification Methods and handbooks.
- The Building Regulations 1992.

Amendments

Amendment No. 1, dated 30 September 2024

This Appraisal has been amended to update the list of manufacturers.



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Contact Details

The contact details for the clay brick manufacturers covered by this Appraisal are:

	<p>Brickworks 956 Great South Road Auckland 1061 Tel: 09 579 0166 Web: www.brickworks.co.nz</p>
	<p>Canterbury Clay Bricks 1 Horndon St Darfield Tel: 03 318 8203 Fax: 03 318 8171 Web: www.clay-bricks.co.nz</p>
	<p>Clay Bricks Ltd 50 Tregoweth Lane Huntly Tel: 07 828 9919 Fax: 07 828 9913 Web: www.claybricks.co.nz</p>
	<p>Brick and Stone Imports T/A Midland Brick NZ 8 Cowley Place Albany Auckland Tel: 09 414 1075 Fax: 09 414 1073 Web: www.midlandbrick.co.nz</p>
	<p>CSR Building products 14 The Furlong Takanini Auckland 2112 Tel: 0800 999 277 Web: www.csr.co.nz</p>



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In the opinion of BRANZ, **Clay Brick And Paver Manufacturers Association's Stack Bonded Brick Veneer 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 **Clay Brick and Paver Manufacturers Association**, 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. **Clay Brick and Paver Manufacturers Association:**
 - 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 **Clay Brick and Paver Manufacturers Association**.
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 **Clay Brick and Paver Manufacturers Association** or any third party.

For BRANZ

A handwritten signature in blue ink, reading "Chelydra Percy".

Chelydra Percy

Chief Executive

Date of Issue:

23 October 2019



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