



BRANZ Appraised

Appraisal No.466 [2005]

BRANZ Appraisals

Technical Assessments of products
for building and construction

**BRANZ
APPRAISAL
No. 466 (2005)**

This Appraisal replaces BRANZ
Appraisal No. 466 (2005) issued
2 June 2005.

Amended 30 August 2013

**MONOTEK® SHEET -
CAVITY
CONSTRUCTION**

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Product

1.1 Monotek® Sheet - Cavity Construction is a cavity-based, flush-finished, monolithic plaster wall cladding. It is designed to be used as an external wall cladding system for residential and light commercial type buildings where domestic construction techniques are used.

1.2 Monotek® Sheet - Cavity Construction consists of Monotek® sheet, which is a fibre cement sheet product, fixed over timber battens to form the cavity. The cladding is finished with a jointing and textured finish system.

1.3 The cladding incorporates a primary and secondary means of weather resistance (first and second line of defence) against water penetration by separating the cladding from the external wall framing with a nominal 20 mm cavity.



Scope

2.1 Monotek® Sheet - Cavity Construction has been appraised as an external wall cladding 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'; and,
- detached and located 1 metre or more from the relevant boundary.

2.2 Monotek® Sheet - Cavity Construction 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; 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 Monotek® Sheet - Cavity Construction is appraised for use with jointing and textured finished systems that comply with NZBC Acceptable Solution E2/AS1, Paragraph 9.7.10.2 and are covered by a valid BRANZ Appraisal for use as a jointing and textured finish system for Monotek® Sheet Cavity - Construction.

2.4 Monotek® Sheet - Cavity Construction must only be installed on vertical, flat surfaces (except for tops of balustrades, which must have a minimum 10° slope and be waterproofed in accordance with the Technical Literature).

2.5 Monotek® Sheet - Cavity Construction is appraised for use with aluminium window and door joinery that is installed with vertical jambs and horizontal heads and sills. (*The Appraisal of Monotek® Sheet - Cavity Construction relies on the joinery meeting the requirements of NZS 4211 for the relevant Wind Zone, or pressure.*)

2.6 Installation of components and accessories supplied by the jointing and textured finish system manufacturers must be carried out only by the jointing and textured finish system manufacturer's approved applicators.

(*Note: Monotek® Sheet - Cavity Construction can be used to provide structural bracing and fire resistance rated construction but these aspects have not been assessed by this Appraisal and are outside its scope.*)

Building Regulations

New Zealand Building Code (NZBC)

3.1 In the opinion of BRANZ, Monotek® Sheet- Cavity Construction 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. Monotek® Sheet - Cavity Construction meets the requirements for loads arising from self-weight, earthquake, wind and impact [i.e. B1.3.3 (a), (f), (h) and (j)]. See Paragraphs 10.1 - 10.3.

Clause B2 DURABILITY: Performance B2.3.1 (b), 15 years. Monotek® Sheet - Cavity Construction meets this requirement. See Paragraphs 11.1 and 11.2.

Clause E2 EXTERNAL MOISTURE: Performance E2.3.2. Monotek® Sheet - Cavity Construction meets this requirement. See Paragraphs 15.1 - 15.5.

Clause F2 HAZARDOUS BUILDING MATERIALS: Performance F2.3.1. Monotek® Sheet - Cavity Construction meets this requirement and will not present a health hazard to people.

3.2 This is an Appraisal of an Alternative Solution in terms of New Zealand Building Code compliance.

Technical Specification

4.1 System components and accessories for Monotek® Sheet - Cavity Construction, which are supplied by James Hardie New Zealand Ltd are:

Monotek® Sheet

- Monotek® sheets are manufactured to conform to the requirements of AS/NZS 2908.2 in accordance with NZBC Acceptable Solution E2/AS1, Paragraph 9.7.2.
- Monotek® sheets are 7.5 mm or 9.0 mm thick fibre cement, manufactured from a water resistant cellulose cement formulation. The sheets are formed, cut to length and then cured by high-pressure autoclaving. They are produced in flat, smooth surfaced sheet material form, and are tinted terracotta in colour for identification. Monotek® sheets have a significantly lower permeability to that of standard fibre cements, e.g. Harditex, providing a more stable substrate.
- Monotek® sheets are available as '2 edge' sheets. '2 edge' sheets have both long edges recessed for jointing. 7.5 mm thick sheets are available in sizes of 1200 mm wide and 2450, 2700 and 3000 mm long. 9.0 mm thick sheets are available in sizes of 1200 mm wide and 2450, 2700 and 3000 mm long. The sheets are marked with ink dotting on the face to assist with fixing.

Accessories

- Horizontal flashing - uPVC, available in 3000 mm lengths.
- Flashing jointers - uPVC horizontal flashing jointer and corner flashing jointer.
- External corner mould - uPVC, available in 2400, 2700 and 3000 mm lengths.
- Cavity vent strip - uPVC, available in 3000 mm lengths.

4.2 Accessories used with Monotek® Sheet - Cavity Construction which are supplied by the building contractor are:

- Flexible wall underlay – building paper complying with NZBC Acceptable Solution E2/AS1 Table 23, or breather-type membranes covered by a valid BRANZ Appraisal for use as wall underlays.

- Flexible building underlay support – polypropylene strap, 75 mm galvanised mesh, galvanised wire, or additional vertical battens for securing the flexible building underlay in place and preventing bulging of the bulk insulation into the drainage cavity. (Note: mesh and wire galvanising must comply with AS/NZS 4534.)
- Rigid wall underlay – Plywood or fibre cement sheet complying with NZBC Acceptable Solution E2/AS1 Table 23, or rigid sheathing covered by a valid BRANZ Appraisal for use as rigid air barrier systems.
- Flexible sill and jamb flashing tape - 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.
- Inseal® 3259 tape - black, compressible, medium density PVC (Polyvinyl Chloride) closed cell foam. The foam is coated on one side with pressure sensitive acrylic adhesive and the other face is covered by a silicone release paper. The tape is 1.5 mm thick and is supplied in rolls 50 and 80 mm wide and 50 m long.
- Inseal® 3109 tape - black, compressible, low density PVC foam. The foam is coated on one side with pressure sensitive acrylic adhesive and the other face is covered by a silicone release paper. The tape is 19 mm thick and is supplied in rolls 10 mm wide and 12 m long.
- Cavity battens - 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.
- Joinery head flashings - folded from aluminium or galvanised steel to suit the window or door trim opening. Refer to NZS 3604, Section 4 and NZBC Acceptable Solution E2/AS1, Table 20 for durability requirements.
- 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 suitable for use around window, door and other wall penetration openings.
- 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.
- Cavity batten fixings - 40 x 2.8 mm fibre cement hot-dip galvanised Hardiflex nails.
- Monotek® sheet fixings - 60 x 3.15 mm fibre cement hot-dip galvanised Hardiflex nails or stainless steel, ring shank Hardiflex nails.

Jointing and Textured Finish Systems

4.3 Monotek® Sheet - Cavity Construction must be finished with a jointing and textured finish system that has been tested to BRANZ Evaluation Method No. 4 (BRANZ EM4), and is covered by a valid BRANZ Appraisal for use with Monotek® Sheet - Construction.

(Note: Other jointing and textured finish systems that have been tested to BRANZ EM4 with Monotek® Sheet but which are not BRANZ Appraised, may be used to finish Monotek® Sheet - Cavity Construction. These systems have not been assessed by this Appraisal and are outside its scope.)

Handling and Storage

5.1 Handling and storage of all materials supplied by James Hardie New Zealand Ltd or the building contractor, whether on site or off site, is under the control of the building contractor. Monotek® sheets must be stacked flat, off the ground and supported on a level platform. They must be kept dry at all times either by storing under cover or by providing waterproof covers to the stack. Care must be taken to avoid damage to edges, ends and surfaces. The sheets must always be carried on edge. uPVC flashings and profiles must be protected from direct sunlight and physical damage, and should be stored flat and under cover.

5.2 Cavity battens and other accessories must be stored so they are kept clean, dry and undamaged. All accessories must be used within the maximum storage period recommended by the manufacturer.

Technical Literature

6.1 Refer to the Appraisals listing on the BRANZ website for details of the current Technical Literature for Monotek® Sheet - Cavity Construction. 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 Monotek® Sheet - Cavity Construction must be treated as required by Acceptable Solution B2/AS1.

Timber Framing

7.2 Timber framing must comply with NZS 3604 for buildings or parts of buildings within the scope limitations of NZS 3604. Buildings or parts of buildings outside the scope of NZS 3604 must be to a specific design in accordance with NZS 3603 and AS/NZS 1170. Where specific design is required, the framing must be of at least equivalent stiffness to the framing provisions of NZS 3604. In all cases studs must be at maximum 600 mm centres for buildings designed to NZS 3604 and at maximum 400 mm centres for specifically designed buildings. Dwaags must be fitted flush between the studs at maximum 800 mm centres (for studs at maximum 600 mm centres) or 1200 mm maximum centres (for studs at maximum 400 mm centres).

7.3 Timber wall framing behind cavity battens where sheets are joined must be nominal 50 mm thickness (i.e. 45 mm minimum finished thickness).

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

7.5 Timber wall framing and cavity battens must have a moisture content of 20% or less at the time of commencement of the jointing and textured finish system.

Monotek® Sheet Set Out

7.6 Monotek® sheets must be installed vertically. All vertical Monotek® sheet edges must be supported and fixed through the cavity battens to the wall framing. Horizontal sheet edges must be supported at fixing locations with cavity spacers 100 mm long maximum in accordance with NZBC Acceptable Solution E2/AS1, Paragraph 9.1.8.2(f). At the base of the wall, the sheets must hang 50 mm below the supporting framing.

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

General

8.1 When Monotek® Sheet - Cavity Construction 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 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 cavity vent strip provide a minimum 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 At ground level the bottom edge of the Monotek® sheets must be kept clear of paved surfaces, for example footpaths, by a minimum of 100 mm and unpaved surfaces by 175 mm in accordance with NZBC Acceptable Solution E2/AS1, Table 18. The ground clearances to finished floor levels as set out in NZS 3604 must be adhered to.

8.4 At balcony, deck or low pitch roof/wall junctions, the bottom edge of the Monotek® sheets 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 Monotek® Sheet - Cavity Construction abuts other cladding systems, designers must detail the junction to meet their own requirements and the performance requirements of the NZBC. These details are outside the scope of this Appraisal.

Control Joints

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

- Vertical control joints - at maximum 5.4 m centres; aligned with any control joint in the structural framing, or where the system abuts different cladding types.
- Horizontal control joints - at maximum 5.4 m centres and at inter-storey floor levels.

(Note: Horizontal and vertical control joints must be located over structural supports. The design of vertical junctions where the system abuts different cladding types is outside the scope of this Appraisal and is the responsibility of the designer - see Paragraph 8.6.)

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).

Structure

Mass

10.1 The mass of Monotek® Sheet - Cavity Construction using 7.5 mm sheet is approximately 13 kg/m² at equilibrium moisture content (EMC) and the mass of Monotek® Sheet - Cavity Construction using 9.0 mm sheet is approximately 15 kg/m² at EMC, therefore Monotek® Sheet - Cavity Construction is considered a light wall cladding in terms of NZS 3604.

Impact Resistance

10.2 Monotek® Sheet - Cavity Construction 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. Monotek® 9.0mm sheet should be used in these applications and appropriate protection such as the installation of bollards and barriers provided for vulnerable areas.

Wind Zones

10.3 Monotek® Sheet - Cavity Construction is suitable for use in all Wind Zones of NZS 3604, up to, and including Extra High where buildings are designed to meet the requirements of NZBC Acceptable Solution E2/AS1, Paragraph 1.1, or up to 2.5 kPa ULS wind pressure where buildings are specifically designed.

Monotek® Sheet Fixings

10.4 For installations in up to, and including, 'Very High' Wind Zones, Monotek® sheets must be fixed through the cavity battens to the wall framing at maximum 200 mm vertical centres along sheet edges and in the body of the sheet where the cavity batten is fully supported over framing. The sheets must be fixed at maximum 200 mm centres at horizontal sheet edges, and where the cavity batten or packer is supported by the horizontal framing members in the body of the sheet. The fixings must be positioned a minimum of 12 mm from all sheet edges, and a minimum of 75 mm vertically and 150 mm horizontally from sheet corners edges. The fastener heads must finish flush with the sheet surface.

10.5 For installations in the 'Extra High' Wind Zone and specifically designed buildings up to 2.5 kPa ULS wind pressure must have sheet fixings at maximum 150 mm centres along sheet edges and in the body of the sheet. Fixings along horizontal framing members must be at maximum 200 mm centres.

Durability

Serviceable Life

11.1 Monotek® Sheet - Cavity Construction installations are expected to have a serviceable life of at least 50 years provided the jointing and textured finish system is maintained in accordance with this Appraisal and any other relevant Appraisal to ensure the Monotek® sheets and fixings remain dry in service. For Monotek® Sheet - Cavity Construction to meet the durability requirements of the NZBC, Monotek® sheets must be finished with an Appraised jointing and textured finish system within 3 months of fixing.

11.2 Coastal locations can be very corrosive to fasteners, especially locations within distances of up to 500 m from the sea including harbours, or 100 metres from tidal estuaries and sheltered inlets, and otherwise as shown in NZS 3604 Figure 4.2. These coastal locations are defined in NZS 3604 as Zone D. To achieve a 50 year serviceable life in Zone D, Monotek® sheets must be fixed with stainless steel fasteners. Fasteners outside Zone D may be hot-dip galvanised steel.

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 Monotek® sheets in areas subject to microclimatic conditions requires specific design in accordance with NZS 3604 Paragraph 4.2.4, and is outside the scope of this Appraisal.

Maintenance

12.1 Regular maintenance is essential for Monotek® Sheet - Cavity Construction installations to continue to meet the NZBC durability performance provision and to maximise their serviceable life.

12.2 Annual inspections must be made to ensure that all aspects of the cladding system, including the textured finish system, flashings and any sealed joints remain in a weatherproof condition. Any damaged areas or areas showing signs of deterioration which would allow water ingress, must be repaired immediately. Sealant, paint coatings, textured finish systems, flashings or the fibre cement sheets must be repaired in accordance with the relevant manufacturer's instructions.

12.3 Regular cleaning (at least annually) of the textured finish system is recommended to remove grime, dirt and organic growth, 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 finishing system will be necessary throughout the life of the cladding system. The interval between recoats depends on the finish colour, orientation and quality of the application, and will be at approximately 5-10 yearly intervals in accordance with the paint manufacturer's instructions.

12.5 Minimum ground clearances as set out in this Appraisal must be maintained at all times during the life of the cladding. *(Failure to adhere to the minimum ground clearances given in this Appraisal and the Technical Literature will adversely affect the long term durability of Monotek® Sheet - Cavity Construction.)*

Control of External Fire Spread

13.1 Refer to the selected jointing and finishing system supplier for confirmation of the peak rate of heat release and total heat released values for the system. Where no information is available, Monotek® Sheet - Cavity Construction is suitable for use on buildings with an SH Risk Group classification, a building height of ≤ 10 m and at a distance of ≥ 1.0 m to the relevant boundary. Refer to NZBC Acceptable Solutions C/AS2 – C/AS6 Paragraph 5.8.1 for the specific exterior surface finishes requirements for other building Risk Groups.

(Note: The scope of this Appraisal limits building heights to 10 m in accordance with the limitations of NZBC Acceptable Solution E2/AS1, Paragraph 1.1(a). The building heights referenced in Paragraph 12.1 above are as defined in the Definitions Sections of NZBC Clauses C1 - C6 Protection from Fire.)

Prevention of Fire Occurring

14.1 Separation or protection must be provided to Monotek® Sheet - Cavity Construction from heat sources such as fire places, heating appliances, flues and chimneys. Part 7 of NZBC Acceptable Solutions C/AS1 – C/AS6 and NZBC Verification Method C/VM1 provide methods for separation and protection of combustible materials from heat sources.

External Moisture

15.1 Monotek® Sheet - Cavity Construction, when installed and maintained 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 sub-floor space to meet compliance with NZBC Clause E2.3.5.

15.3 Monotek® Sheet - Cavity Construction allows 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.

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 Monotek® Sheet - Cavity Construction where there is a designed cavity drainage path for moisture that penetrates the cladding, does not reduce the requirement for joints, penetrations and junctions to remain weather resistant.

Internal Moisture

16.1 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 Monotek® Sheet - Cavity Construction is not a barrier to the passage of water vapour, and when installed in accordance with this Appraisal will not create or increase the risk of moisture damage resulting from condensation.

Installation Information

Installation Skill Level Requirements

17.1 Installation of Monotek® sheets and accessories supplied by James Hardie New Zealand Ltd and the building contractor must be completed by tradespersons with an understanding of cavity construction and fibre cement sheet installation, in accordance with instructions given within the Monotek® Sheet - Cavity Construction Technical Literature and this Appraisal.

17.2 Installation of components and accessories supplied by the textured finish system manufacturers must be completed by trained applicators, approved by the textured finish system manufacturer.

System Installation

Building Underlay and Flexible Sill and Jamb Tape Installation

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

Cavity Battens

18.2 Cavity battens must be installed over the building wrap to the wall framing at maximum 300 mm centres where the studs are at maximum 600 mm centres or at 400 mm centres where the studs are at 400 mm centres. The battens must be fixed in place with 40 x 2.8 mm hot-dipped galvanised Hardiflex nails at maximum 800 mm centres.

Aluminium Joinery Installation

18.3 Aluminium joinery and associated head flashings must be installed by the building contractor in accordance with the Technical Literature. A 7.5 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.

Monotek® Sheet Installation

18.4 Monotek® sheets may be cut by scoring and snapping, hand guillotine, hand or power saw. Site edge recessing of cut sheets may be carried out using a tool specifically designed for that use, or by running an angle grinder run down the edge of the sheet at an acute angle to the face. A minimum sheet edge thickness of 5.5 mm must be maintained. Holes and cut-outs may be formed by drilling a number of holes around the perimeter of the opening required and tapping out the centre with a hammer, or by using a hole saw.

18.5 Sheets must be dry prior to installation. There is no requirement for sheet edges to be pre-painted with a seal coat prior to fixing as required by NZBC Acceptable Solution E2/AS1, Paragraph 9.7.3. Cut sheet edges must however be pre-painted around cut-outs for windows, doors and other penetrations, e.g. meter boxes.

18.6 Prior to fixing sheets, a check must be made to ensure all sheet joints will be supported by framing. Sheets must be fixed through the cavity battens and cavity spacers to the timber framing with either 60 x 3.15 mm flat head hot-dip galvanised Hardiflex nails or stainless steel, ring shank Hardiflex nails depending on the location - see Paragraph 11.2.

18.7 Sheets at flush finished vertical and horizontal joints must be installed with a 1-2 mm gap between the sheet edges. Internal corners and vertical control joints must be fixed so that an 8 mm gap is left between the sheets for filling with a flexible sealant. Inseal® 3259 tape must be used behind vertical control joints and internal corners. External corner sheets must be fixed flush.

18.8 Sheets must not be fixed to inter-storey joists or blocking, and must have a 15 mm gap between sheet edges at this point to allow for shrinkage of the framing. This gap must be flashed with a horizontal control joint flashing to prevent moisture entry, and may be covered with an architectural shape fixed to the upper sheet only.

18.9 Horizontal or vertical sheet joints, with the exception of vertical control joints, must not occur at the edge of window and door openings. Vertical sheet joints adjacent to openings must be a minimum of 200 mm inside the jamb line of the opening.

Jointing and Textured Finish System

18.10 Components and accessories supplied by the jointing and textured finish system manufacturer and the approved applicator must be installed in accordance with the jointing and textured finish system manufacturer's Technical Literature and the relevant Appraisal by the approved applicator.

Inspections

18.11 The Technical Literature must be referred to during the inspection of Monotek® Sheet - Cavity Construction installations.

Health and Safety

19.1 Safe use and handling procedures for the components that make up Monotek® Sheet - Cavity Construction are provided in the relevant manufacturer's Technical Literature.

19.2 Cutting of Monotek® sheets must be carried out in well ventilated areas, and a dust mask and eye protection must be worn. When power tools are used for cutting, grinding or forming holes, safety measures as set out in the Technical Literature must be undertaken because of the amount of dust generated.

Basis of Appraisal

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

Tests

20.1 The following testing has been completed by BRANZ:

- BRANZ expert opinion on NZBC E2 code compliance for Monotek® Sheet - Cavity Construction was based on testing and evaluation of all details within the scope and as stated within this Appraisal. Monotek® Sheet - Cavity Construction was tested to E2/VM1 (as contained within NZBC Clause E2, Third Edition, 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 Acceptable Solution E2/AS1 for drained cavity claddings.

20.2 Testing has been carried out by James Hardie Building Products to determine the face load pressure resistance of Monotek® Sheet - Cavity Construction. The test method and results have been reviewed by BRANZ and found to be satisfactory.

Other Investigations

21.1 Structural and durability opinions have been given by BRANZ technical experts.

21.2 An opinion on the equivalence of Monotek® and Harditex has been completed by Pether & Associates Pty. Limited. The opinion has been reviewed by BRANZ and found to be satisfactory.

21.3 Site visits have been carried out by BRANZ to assess the practicability of installation, and to examine completed installations.

21.4 The Technical Literature for Monotek® Sheet - Cavity Construction has been examined by BRANZ and found to be satisfactory.

Quality

22.1 The manufacture of Monotek® sheet 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.

22.2 The quality of materials, components and accessories supplied by James Hardie New Zealand Ltd is the responsibility of James Hardie New Zealand Ltd. The quality control system of James Hardie New Zealand Ltd has been assessed and registered as meeting the requirements of ISO 9001: 2008.

22.3 Quality of installation on site of components and accessories supplied by James Hardie New Zealand Ltd and the building contractor is the responsibility of the installer.

22.4 Designers are responsible for the building design, and building contractors are responsible for the quality of installation of framing systems and joinery, building underlay, flashing tapes, air seals, joinery head flashings, cavity battens and Monotek® sheets in accordance with the instructions of James Hardie New Zealand Ltd.

22.5 Building owners are responsible for the maintenance of Monotek® Sheet - Cavity Construction in accordance with the instructions of James Hardie New Zealand Ltd.

Sources of Information

- AS/NZS 1170: 2002 Structural design actions.
- AS/NZS 2908.2:2000 Cellulose-cement products - Flat Sheet.
- NZS 3602: 2003 Timber and wood-based products for use in building.
- NZS 3603: 1993 Timber Structures Standard.
- NZS 3604: 2011 Timber-framed buildings.
- NZS 4211: 2008 Specification for performance of windows.
- BRANZ Evaluation Method No. 4 (2004) Test procedure for coating and jointing systems for flush finished fibre cement Sheet cladding, June 2005.
- 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.



BRANZ

In the opinion of BRANZ, Monotek® Sheet - Cavity Construction is fit for purpose and will comply with the Building Code to the extent specified in this Certificate provided it is used, designed, installed and maintained as set out in this Certificate.

The Appraisal Certificate is issued only to the Certificate Holder, James Hardie New Zealand, and is valid until further notice, subject to the Conditions of Certification.

Conditions of Certification

1. This Certificate:
 - 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. The Certificate Holder:
 - a) continues to have the product reviewed by BRANZ;
 - b) shall notify BRANZ of any changes in product specification or quality assurance measures prior to the product being marketed;
 - c) abides by the BRANZ Appraisals Services Terms and Conditions.
3. The product and the manufacture are maintained at or above the standards, levels and quality assessed and found satisfactory by BRANZ.
4. BRANZ makes no representation 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 the Certificate Holder.
5. Any reference in this Certificate to any other publication shall be read as a reference to the version of the publication specified in this Certificate.

For BRANZ

P Robertson
Chief Executive

Date of issue: 15 August 2005

Amendment No. 1, 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. 2, 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 and to change the name of the Appraisal Holder.