



BRANZ Appraisals

Technical Assessments of
products for building and
construction

**BRANZ
APPRAISAL
CERTIFICATE
No. 03/026**

**TRIBOARD
CONSTRUCTION
SYSTEM**

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Product

- *This Certificate relates to the Triboard Construction System, for single storey and two storey detached housing. The system is based on Triboard wall panels and Triboard ceiling panels. The design and construction of the remainder of the building, comprising foundation, flooring, roof, joinery and claddings is conventional.*
- *The scope of this Appraisal covers internal walls, external walls up to but excluding the cladding and covers ceilings up to the face where roof and ceiling framing are installed.*
- *The Triboard Construction System has been appraised for the construction of Housing within the scope of Clause 1.6 of AS 1684.2 for sites in coastal regions south of the Tropic of Capricorn, in Wind Regions A and B with a Wind Classification of N1, N2 and N3. When reading Clause 1.6, Triboard wall panels should be substituted for timber framing.*
- *The System must be designed, installed and maintained in accordance with the manufacturer's technical information 'The Triboard Manual for Australia', dated August 2002 and referred to as the Triboard Manual.*



Building Regulations

1. Building Code of Australia (BCA96)

In the opinion of BRANZ, housing constructed using the Triboard Construction System in accordance with the statements and conditions of this Certificate, will meet the following BCA96 Performance Requirements:

BCA96 Volume 2 – Class 1 and Class 10 Buildings

Part 2.1 Structure, Performance Requirement P2.1. See Section 5.

Product Information

2. General

2.1 The Triboard Construction System utilizes precut 36 mm thick Triboard wall panels and 18 mm thick Triboard ceiling panels. The wall panels are designed to sit on a conventionally constructed concrete or timber floor. Triboard panels consist of a Strandboard core flanked by two outer layers of nominally 2 mm thick fibreboard. Triboard wall and ceiling panels are manufactured in 2450 mm wide x 4000 mm long sheets.

2.2 Triboard wall panels are chemically treated for termite resistance.

2.3 Wall and ceiling panels are factory cut to shape and size, including window and door openings, by Triboard re-manufacturers. All panel surfaces and exposed edges are pre-painted by the re-manufacturer prior to delivery to site. Vertical battens are attached to the outside face of the exterior Triboard wall panels. Lintels are also constructed from the Triboard wall panels and strengthened as necessary depending on the spans and loading.

2.4 Structural connections are made with nails, screws and various proprietary hardware.

2.5 After erection Triboard wall panels have an internal finish system applied, such as paint or wall paper and on exterior walls conventional wall cladding systems are fixed over a sarking membrane to the battens.

3. Handling and Storage

3.1 Precut panels are trucked to the site and normally lifted into position. To minimise storage and handling on site and to maximise construction efficiency, panel transport from the re-manufacturer's factory should be carefully timed to coincide with the approximate order of erection. Panels must be handled carefully at all times to avoid physical damage and kept dry under cover until ready for construction.

3.2 For long term storage Triboard panels must be kept dry under cover and be stacked horizontally on fillets in between sheets at 1200 mm maximum spacing to allow air circulation. Triboard panels must be protected from direct sunlight whilst in storage.

3.3 The pre-painted surfaces of the panels are to provide adequate protection against occasional rain wetting during construction. To minimise exposure however, roof and wall claddings should be installed as soon as possible. Panels must not be exposed to the weather for more than 2 weeks.

3.4 When prolonged exposure to the weather is anticipated during building construction, waterproof covers such as tarpaulins must be provided to keep the panels dry.

Design Information

4. General

4.1 Buildings not requiring specific design can be built using the information in the Triboard Manual together with AS 1684. The Triboard Construction System has been designed in accordance with AS 1170 to comply with typical design loadings for domestic buildings which come within the scope of AS 1684 (see Section 5. Structure).

4.2 This Appraisal covers single storey and two storey detached buildings, which are buildings in plan view that project a rectangular shape, or a number of rectangular shapes. The maximum roof pitch is 35°.

4.3 Buildings which do not come within this scope can also be built subject to a specific design. This aspect has not been assessed and is outside the scope of this Certificate. For these applications Juken Nissho Ltd should be consulted for design and construction information.

4.4 Foundations and floor are conventional and may be either a concrete slab-on-ground in accordance with AS 2870 or a suspended timber framed floor designed and constructed in accordance with AS 1684 or BCA96 "Acceptable construction practice" as appropriate. Suspended floors must meet the provisions of AS 1684, Clause 3.9, or BCA96 Volume 2, Part 3.4.3.

4.5 External Triboard wall panel requirements for various applications are selected directly from Tables in the Triboard

Manual.

4.6 External wall panel battens must be either F7 stress grade radiata pine or MGP10 Grade timber. The maximum batten spacing is 600 mm.

4.7 Exterior windows and doors are conventional. They are fitted and fastened into openings with all required reveals, seals and flashings which must protect the Triboard panel edges from exposure to moisture.

4.8 Openings in Triboard walls are completely trimmed by timber battens such that the openings are similar to those in conventional framed walls. Weathertightness details which apply to conventional framed walls therefore apply to Triboard walls, e.g. BCA96 Volume 2, Acceptable construction practice, Clause 3.5.3.6.

4.9 Triboard wall panels may be battened out for internal linings, such as where the walls are to be waterproofed in wet areas or to accommodate services.

4.10 Roof trusses must be designed in accordance with AS 1720.1. Purlins and other roof framing must be in accordance with AS 1684 or other Acceptable construction manual called up in BCA96, Volume 2, Clause 3.4.3.0. Alternatively they may be subject to a specific design. Roof truss hold-down connections for sites with a Wind Classification up to N3 are shown in the Triboard Manual.

4.11 Roof claddings are conventional. Acceptable roof claddings are given in BCA96, Volume 2, Part 3.5.1.

4.12 Triboard ceilings provide an effective ceiling diaphragm. Bracing walls associated with the ends of Triboard ceiling diaphragms may be spaced up to a maximum of 8 m.

5. Structure

5.1 The structural design of the system is based on the action of a configuration of connected Triboard wall and ceiling panels. External wall Triboard panels are stiffened by face fixed timber battens.

5.2 Triboard wall panels have a nominal mass of 20kg/m². Triboard ceiling panels have a nominal mass of 12kg/m².

Triboard Walls and Lintels

5.3 Triboard wall panels are loadbearing. The stiffness and strength of the walls and the lintels are adequate to resist gravity and wind loads to at least the same level as conventional timber framing.

Live loads

5.4 Upper floor live loads must not exceed a uniformly distributed load of 1.5kPa or a concentrated load of 1.8kN.

5.5 Roofs are non-trafficable with a live load limit of 0.25kPa. The snow load limit for light roofs is 0.5kPa. Snow load associated with heavy roofs must be subject to a specific design.

Wall Bracing Resistance

5.6 The external walls and designated internal walls provide bracing to resist lateral wind and earthquake loads. Bracing demand forces in kN are determined from AS 1684 for specific house designs within the scope of application. The Triboard Manual is then used to ensure that the array of wall bracing elements satisfy this demand. This is achieved by summing the bracing resistance for suitable lengths of the various available Triboard wall panel configurations given in the Triboard Manual.

5.7 Triboard wall panels have a very high in-plane (bracing) rigidity such that bracing resistance is limited by the connections to the floor and ceiling. Overturning is prevented by connections to the floor and abutting walls, and for external walls, by connections to the floor.

Connections

5.8 The connections have been designed to resist design level face and racking loads associated with wind, earthquake and

impact, and also loads associated with wind uplift. The connections of wall panels to other wall panels and the ceiling panels is by nails or screws. Adhesive used at panel joints is ignored in terms of structural resistance. Wall connections to the floor are made via wall battens, steel angles, nails, screws, and cast-in floor framing anchors. Wall connections to roof trusses are made using standard proprietary hardware such as cyclone ties.

Wind

5.9 Buildings meeting the scope of AS 4055 and constructed in accordance with the Triboard Manual are suitable for sites in Wind Regions A and B with a Wind Classification up to and including N3.

Impact

5.10 Triboard wall and ceiling panels are robust and have a high resistance to soft body impacts, and most hard body impacts associated with normal domestic use situations.

Service Penetrations

5.11 Typical penetration details for piping and electrical cabling and fittings are provided in the Triboard Manual.

6. Durability

6.1 Triboard walls and ceilings will have a similar serviceable life to that of conventional dry wall construction.

6.2 The long term durability is dependant on the Triboard wall and ceiling panels and the connections remaining dry in service. In particular the wall and ceiling panels must not be exposed to sustained high humidities (greater than 95% RH), liquid water, or temperatures in excess of 40°C over large areas for prolonged periods (e.g. by climate conditions or by ceiling heating installations), or 50°C in localised areas (e.g. the area surrounding a heating flue penetration).

6.3 The use of Triboard wall and ceiling panels in Sauna rooms and the like, or the use of Triboard ceiling panels in skillion roofs or flat roofs (less than 10° pitch) has not been assessed and is outside the scope of this Certificate.

7. Maintenance

7.1 Maintenance must be carried out to ensure that the Triboard panels remain in a dry condition.

7.2 Regular inspections (at least yearly) of the external cladding system, the internal linings and finishes, and floor coverings must be made, and any damage or deterioration of seals at joints and openings repaired. External cladding protective coating systems must be cleaned and reapplied as necessary to maintain a weathertight surface. All this work must be carried out in accordance with the relevant coating manufacturer's instructions. The internal linings, floor coverings and finishing, including joints, openings and at the perimeters must be maintained to provide protection from internal moisture. The cladding and lining installation and maintenance instructions, together with the details in the Triboard Manual must be followed.

7.3 If swelling of the panels results from water damage, contact Juken Nissho for advice on repair methods.

7.4 Subfloor, above floor and ceiling space ventilation openings, and the subfloor space must be kept clear of debris. Drainage paths must be maintained in compliance with BCA 96, Clause P2.2.1 Surface Water.

Termite Risk

7.5 Triboard wall panels are H2 preservative treated in accordance with Appendix D of AS 3660.1. Refer to Juken Nissho Ltd for details. Other primary building elements may not have this protection and so the building as a whole may need to be subject to termite risk management. The extent of this will depend on the treatment of other building components used. The "deemed to satisfy" provisions of BCA96 Volume 2, Part 3.1.3 may be used to provide termite risk management.

8. Fire Resistance and Stability

Housing constructed with Triboard wall and ceiling panels shall be considered as combustible and equivalent to timber wall framing when addressing the Class 1 provisions of BCA96, Part 3.7 Fire Safety.

9. Fire Safety

Housing constructed using The Triboard Construction System contains combustible components which must be protected from heat sources such as chimneys, solid fuel heaters and flues. The serviceable life of Triboard wall and ceiling panels may be affected if surface temperatures exceed 50°C. Clearances from heat sources specified in BCA96, Volume 2, Part 3.7.3 may not be sufficient for some appliances and additional heat shielding or separation may therefore be required to ensure 50°C is not exceeded.

10. Damp and Weatherproofing

10.1 Triboard wall and ceiling panels must be protected against the effects of external moisture by the building's external envelope.

10.2 The external wall and roof cladding system, including all joints and details at openings such as for windows, must be maintained in a weathertight condition to ensure the performance requirements of BCA96 Volume 2, Clause P2.2.2 continue to be met.

10.3 Sub-floors must be maintained weathertight and ventilated in accordance with BCA96, Volume 2, Part 3.4.1.

10.4 Concrete slab-on-ground floors must be protected by a damp proof membrane (DPM) and minimum height clearances to damp proof course (DPC) and floor level must be maintained from the adjacent ground or paving level. For masonry veneer refer to BCA96, Volume 2, Clauses 3.3.4.5(c) and 3.2.2.7.

10.5 Masonry veneer wall cavities must not vent into the roof space.

11. Health and Amenity

Wet Areas

11.1 To meet the BCA96, Clause P2.4 performance requirements for wet areas, floors, walls and joints must be protected in accordance with BCA96 Volume 2, Part 3.8.1, and in South Australia, by South Australian Variation SA F1.7 (Minister's specification SA F1.7).

11.2 Wall and floor junctions must be protected by extending waterproof floor membranes up the wall and/or by sealing in accordance with of BCA96, Volume 2, Clause 3.8.1.6 as appropriate.

11.3 Some permanent ventilation, not reliant on window openings, must be provided in wet areas, such as bathrooms and laundries. To supplement this, vented windows, wall or ceiling mounted extract fans, or similar fittings are recommended in all building wet areas. Extract fans for moisture laden air must be vented externally.

11.4 The incorporation of vented windows and other forms of permanent ventilation are recommended in all rooms to ensure adequate air circulation and to prevent the build up of high moisture levels.

Formaldehyde

11.5 Triboard wall and ceiling panels are manufactured using melamine fortified urea formaldehyde adhesive. Vapour emissions are minimal because the panels are made using a low formaldehyde resin and because they are encapsulated by a paint coating system. Formaldehyde emission meets the E1 Class when tested in accordance with AS/NZS 4266.15.

11.6 The degree of health hazard caused by vapour release will depend on the ventilation rate and the total amount of vapour released from all sources in the building, including flooring and furniture, and also the degree of encapsulation provided by surface finishes, such as coatings and carpets. The permanent ventilation required and recommended to control moisture levels, (see Health and Amenity, 11.3, 11.4) will also avoid any accumulation of formaldehyde gas.

Health and Safety

11.7 Suitable protective masks must be worn to prevent the inhalation of dust resulting from cutting or working with the Triboard panels.

11.8 The safe work practices and health and safety precautions which apply to working with and handling of Triboard panels are detailed in the Triboard Manual.

12. Energy Efficiency

The Triboard Manual provides thermal insulation options that meet the energy efficiency performance requirements of BCA96 Volume 2, Part 2.6.

Installation Information

13. General

13.1 Triboard Housing must be constructed in accordance with the non-specific design information contained within the Triboard Manual. The following is a summary of important aspects.

13.2 Particular care must be taken that the foundations and building platform are level and square and that perimeter dimensions are accurate. This is important as the panels are accurately factory-cut to size.

13.3 All timber framing including battens must have a moisture content of 18% or less before fixing claddings in place.

13.4 To minimise the use of temporary braces, the erection sequence for wall panels is best planned so that, during construction, panels at right angles support each other. Checks for final location should be made before fixing the panels into position.

13.5 Battens must be screw or nail-fixed in place in accordance with the details in the Triboard Manual. Sometimes battens can be fitted at the factory.

13.6 External walls must be connected to concrete floors by means of a galvanised steel angle, and by galvanised steel anchors fixed to the battens with galvanised nails. Wall anchors, straps and fixings must be minimum Grade 304 stainless steel in the Sea Spray Zone, which is within 500 m of the coast or within 100 m from a harbour or estuary. The steel angle is screw fixed to the wall panel, and fixed to concrete floors using concrete nails. Battens are fixed to concrete floors using proprietary bottom plate anchors which are cast into the concrete slab. With timber floor framing, wall panels and battens are nail fixed to floor framing.

13.7 Internal wall panels are fixed to timber floors by skew nailing from both sides and to concrete floors via the galvanised steel angle using screws and concrete nails as for external Triboard Wall Panels.

13.8 All exposed pre-cut wall panel edges are protected by a factory paint coating. It is important that any site cut, or site exposed edges are similarly protected, using the paint supplied with the wall panels.

13.9 Lintel options utilising integral and separate Triboard panels are detailed in the Manual. Lintels are strengthened either by the installation of an additional Triboard lintel panel section or by installing mild steel plates between Triboard lintel panels to make flitch beams. Details are shown in the Triboard Manual.

13.10 Triboard ceiling panels are temporarily supported on purpose built ceiling support frames and then nail or screw fixed to the top of walls. The roof/ceiling framing or the first floor framing is placed in position and the ceiling panels fixed to it via an angle cleat. The ceiling support frames are then removed.

13.11 Ceiling panels are fixed together by a continuous screw-fixed galvanised steel strap or board cleat running parallel with and centered on the joint. Where the joint is parallel to a framing member and more than 150 mm from it, the joint is supported by noggings between the framing members and by using a ceiling cleat near the joint. Trusses may be moved to clear joints if required.

13.12 Where heavy roof cladding is specified (e.g concrete tiles) the fixing of ceiling panels to roof framing should be left a few days after the roof cladding is installed when most of the roof framing creep deflection will have occurred. The Triboard ceiling will span up to 900 mm between trusses without unacceptable deflection.

13.13 First floor joists, roof trusses and ceiling panels must be supported by Triboard wall panels. Floor joists must be blocked at all wall supports. Blocking must be the same size as the joists. Blocking and joists at supports must be skew nailed to the walls or lintels below.

13.14 Roof trusses must be restrained against wind uplift by using one of the hardware fixing options shown in the Triboard Manual. Connections must be minimum grade 304 stainless steel within the Sea Spray Zone.

13.15 Roof and wall cladding shall be constructed in accordance with their manufacturer's specification and/or with the provisions of BCA96 Volume 2, Parts 3.5.1 and 3.5.3 respectively. Masonry veneer shall be in accordance with the "Acceptable construction" provisions of BCA96 Volume 2, Part 3.3, with the exception that a sarking

membrane must be installed over the battens.

13.16 Roof and wall cladding should be installed as soon as practicable to provide weather protection to the wall and ceiling panels. See Section 3.4 of this Certificate where this is not possible.

Services

13.17 Electrical flush box holes are hole sawn or routed into the wall panels, and ducts are drilled to them from the appropriate panel edge. Wiring may be fed through the ducts, or fixed to the outside surface of external wall panels. PVC sheathed electrical cables must not come into contact with EPS or XPS insulation. Where electrical cabling is located in recesses cut into the face of the wall panels, vertical routing is recommended. Horizontal or diagonal recesses, particularly through the middle third height of the Triboard Wall Panels, should be avoided as this weakens the walls.

13.18 Plumbing and pipework is run through the foundation platform, where possible up behind wall panels, within the fixtures themselves, in fitted joinery, or through ducts mounted on the wall panel face.

Joinery

13.19 Exterior windows and doors must be installed in accordance with their manufacturer's instructions.

Finishing

13.20 Where a fine surface finish is required, surface sanding of the Triboard panels is recommended.

13.21 All dust should be removed from the surface of Triboard panels prior to applying a paint or paper finish.



Basis of Appraisal

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

14. Tests

14.1 Tests have been carried out by Juken Nissho at their Kaitaia Mill and at Gangnail New Zealand Ltd to establish characteristic strengths and stiffnesses of the wall and ceiling panels, the panel to panel connections, the batten to wall panel connection and the Triboard wall panel to floor connections. This work has been reviewed by BRANZ and found to be satisfactory.

14.2 Cyclic humidity tests were carried out by BRANZ to establish the durability of Triboard wall and ceiling panels.

15. Calculations

Calculations to justify the structural adequacy of Triboard housing in New Zealand have been updated for Australia by R F Gale and Associates Ltd. These calculations have been examined by BRANZ and found to be satisfactory.

16. Investigations

16.1 The satisfactory performance of Triboard panel housing systems in New Zealand since 1987, is recognised by BRANZ. BRANZ have inspected a number of Triboard panel houses up to 15 years old.

16.2 Site inspections at various stages of construction, to assess installation methods and to examine completed installations, have been made by BRANZ.

16.3 Details of materials used and methods adopted for quality control have been obtained.

16.4 The manufacture of Triboard wall and ceiling panels by Juken Nissho Ltd, Kaitaia has been assessed by BRANZ. Manufacture is subject to an ISO 9001 quality system, certified by SGS International Certification Services Pty Ltd, Certificate number QS444.02, dated 16 January 2002.

16.5 A re-manufacturer's factory operation for pre-cut house panels has been assessed by BRANZ and found to be satisfactory.

16.6 Results of a formaldehyde monitoring investigation carried out by Paragon Health and Safety have been obtained. The results show that the air concentration of formaldehyde in a number of finished (closed up) houses was acceptable being within the generally accepted indoor Air Quality Guidelines of 0.05 - 0.1ppm.

16.7 The Triboard Manual for Australia, dated 2002, has been examined by BRANZ and found to be satisfactory.

17. Sources of Information

- AS 1170.1:1989, Dead and live loads and load combinations.
- AS 1170.4:1993, Minimum design loads on structures, Part 4 Earthquake loads.
- AS 1684: 1999, National timber framing code.
- AS 1720.1: 1997, Timber structures - Part 1: Design methods.
- AS 2870: 1996 Residential slabs and footings.
- AS/NZS 2904: 1995, Damp-proof courses and flashings.
- AS 3660.1: 2000, Termite management - Part 1 New building work.
- AS 3700: 1998, Masonry structures.
- AS 4055: 1992, Wind loads for housing.
- AS/NZS 4266.15: 1995, Reconstituted wood-based panels - methods of test - Method 15: Determination of formaldehyde (Perforator method).
- Building Code of Australia, Volume 2 Class 1 and 10 Buildings, Australian Building Codes Board, 1996. (Including Amendment 12, January 2003).
- World Health Organisation (WHO) Working Group Consensus of Concern about Indoor Air Pollution, 1984.



In the opinion of BRANZ, The Triboard Construction System 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, Juken Nissho Ltd, 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

G M Lawrance

M E Reed

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