



**BRANZ Appraised**

Appraisal No.607 [2008]

BRANZ Appraisals

Technical Assessments of products  
for building and construction

**BRANZ  
APPRAISAL  
No. 607 (2008)**

## **ELEPHANT PLASTERBOARD BRACING SYSTEMS**

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Limited**

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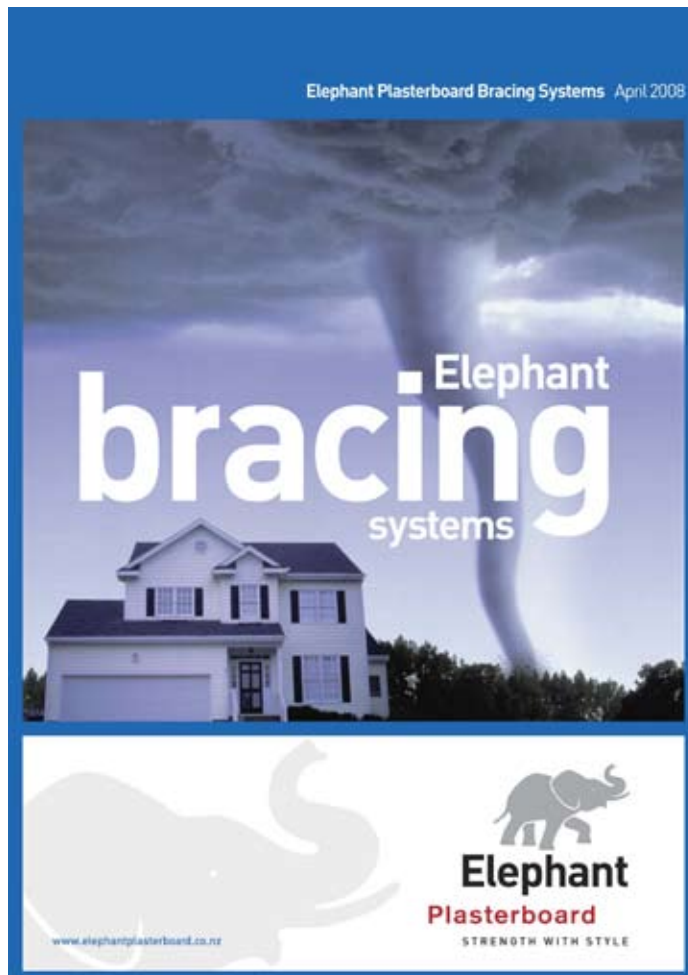
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## Product

1.1 Elephant Plasterboard Bracing Systems are a range of wall and ceiling bracing systems designed to resist earthquake and wind loads on timber frame buildings designed and constructed in accordance with NZS 3604. The systems are based on the use of Elephant Multiboard, Standard and Aquaboard.



## Scope

2.1 Elephant Plasterboard Bracing Systems have been appraised for use as interior wall and ceiling bracing systems in buildings within the scope limitations of NZS 3604.

## Building Regulations

### New Zealand Building Code (NZBC)

3.1 In the opinion of BRANZ, the Elephant Plasterboard Bracing Systems, 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. Elephant Plasterboard Bracing Systems meet the requirements for loads arising from self-weight, earthquake, wind and impact [i.e. B1.3.3 (a), (f), (h) and (j)]. See Paragraphs 8.1 - 8.10.

**Clause B2 DURABILITY:** Performance B2.3.1 (a) not less than 50 years Elephant Plasterboard Bracing Systems meet this requirement. See Paragraph 9.1.

**Clause F2 HAZARDOUS BUILDING MATERIALS:** Performance F2.3.1. Elephant Standard Plasterboard 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.

3.3 Elephant Plasterboard Bracing Systems are for use to satisfy the bracing demand requirements of Section 5 of NZS 3604 which is an NZBC Compliance Document.

## Technical Specification

4.1 Elephant plasterboards and accessories used with the Elephant Bracing Systems and supplied or specified by Elephant Plasterboard (NZ) Limited are as follows:

### Elephant Plasterboards

#### • Elephant Multiboard

4.2 Elephant Multiboard is a high-density 10 mm and 13 mm thick fibreglass reinforced paper-bound gypsum-plaster core sheet lining material. The sheets have a taper on the two long sheet edges. Elephant Multiboard has a sheet width of 1200 mm and is available in lengths of 2400 mm, 2700 mm, 3000 mm and 3600 mm. The nominal weights are 8.5 kg/m<sup>2</sup> for 10 mm and 11.2 kg/m<sup>2</sup> for the 13 mm board. Elephant Multiboard face paper is pink in colour.

#### • Elephant Standard plasterboard

4.3 Elephant Standard Plasterboard is a paper-bound gypsum-plaster core sheet lining material. Elephant Standard Plasterboard is available in 10 mm and 13 mm thicknesses and a sheet width of 1200 mm. The sheets have a taper on the two long sheet edges. The 13 mm and 10 mm board is available in a 1200 mm and 1350 mm wide board with the option of a taper/squared edge sheet. 10 mm and 13 mm boards are available in various lengths from 2400 mm to 6000 mm. The nominal weights are 7.3 kg/m<sup>2</sup> for 10 mm and 9.4 kg/m<sup>2</sup> for the 13 mm board. Elephant plasterboard face paper is a light gray colour.

#### • Elephant Aquaboard

4.4 Elephant Aquaboard is a paper-bound, modified water-resistant gypsum-plaster core sheet lining material. The sheets have a taper on the two long sheet edges. Elephant Aquaboard is available in 10 mm and 13 mm sheet thicknesses, a sheet width of 1200 mm and in lengths of 2400 mm, 2700 mm, 3000 mm and 3600 mm. The nominal weights are 8.5 kg/m<sup>2</sup> for 10 mm and 11.2 kg/m<sup>2</sup> for the 13 mm board. Elephant Aquaboard face paper is green in colour.

#### • Ceiling Diaphragms

4.5 Ceiling diaphragms are constructed using timber, or a 40 mm x 35 mm metal ceiling batten system. The perimeter of the ceiling diaphragm is fixed to an additional 140 mm x 40 mm timber plate fixed to the top plate.

### Fastenings

- **Elephant Bracing Nail (large head nails.)** Elephant plasterboard bracing nails. A smooth shanked 38 mm x 2.8 mm nail with a 16 mm washer fused to the head of the nail.
- **Small head nails** Annular grooved plasterboard nail 30 mm x 2.8 mm with a 8 mm head
- **Elephant Bracing Screw (Large head screw)** A gold passivated double bugle head coarse thread screw 35 mm x 3.8 mm with a 10.5 mm head.
- **Small head screw** A 32 mm x 6g, drywall, gold passivated, bugle head coarse thread screw with a 8 mm head.

### Adhesive

- Adhesive must comply with AS 2753 for bonding gypsum plaster linings to wood and metal framing members.

### Jointing Compounds

- Jointing Compounds and Jointing Tapes must comply with ASTM C475 as set out in AS/NZS 2589.1

### Plywood

- Plywood must be a minimum of 7 mm thick complying with AS/NZS 2269 D-D Grade Structural.
- Plywood fixings are 30 mm x 2.8 mm hot-dipped galvanised flat-head nails.

### Fasteners, braces and connections

- Coach screws 12 mm x 150 mm (minimum) or 200 mm and 50 x 50 x 3 mm washer hot-dipped galvanised for fixing to timber floors.
- Bolts M12 x 150 mm (minimum) and 50 mm x 50 mm x 3 mm washers for fixing to concrete floors. Proprietary fixings with a minimum characteristic strength of 15kN may be used.
- Shot fired fasteners minimum 75 mm x 3.8 mm with 16 mm discs for fixing ES and ESS internal bracing elements to concrete slabs.
- Galvanised or stainless steel strap 25 mm x 0.9 mm top and bottom plate connections.
- Strap fixings 30 mm x 2.5 mm hot-dipped galvanised flat-head nails.

*Note: For corrosion protection requirements refer to NZS 3604 Section 4.*

### Handling and Storage

5.1 Elephant plasterboards are to be kept dry at all times. For the best results treat boards as a finishing material, protect from damage and store flat. Carry sheets on edge to prevent sheet breakage.

5.2 All accessories must be kept dry.

## Technical Literature

6.1 Refer to the Appraisals listing on the BRANZ website for details of the current Technical Literature for the Elephant Bracing Systems. 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

### General

7.1 The Elephant Plasterboard Bracing Manual contains design procedures to calculate the bracing demand required to resist wind and earthquake forces that will act on a building according to NZS 3604. The design procedures take into account the building type and size, building construction, earthquake and wind zones, topography and environmental conditions of the building site. The manual provides methods to distribute the bracing units in walls to resist these forces in order to meet the requirements of NZS 3604 and a method for modifying the wall bracing demand for alternative wall heights. The use of ceiling diaphragms is also defined in the Technical Literature.

7.2 Bracing demand calculations made using the Elephant Bracing Manual Technical Literature may occasionally produce different values than if using NZS 3604. Either bracing demand calculation method may be used with Elephant Plasterboard Bracing Systems.

7.3 Elephant Plasterboard Bracing Systems are for use in dry, internal situations only.

7.4 Elephant plasterboards must not be exposed to temperatures of 52°C or greater for prolonged periods. Refer to appliance and fitting manufacturers for installation details.

### Framing

7.5 Timber framing grade, spacing and construction must comply with NZS 3604. Timber treatment must comply with NZS 3602.

7.6 Elephant Plasterboard Bracing Systems Technical Literature recommends the use of kiln-dried machine stress-

grade framing timber. The minimum actual framing dimensions are 90 mm x 35 mm for external walls and 75 mm x 35 mm for internal walls.

7.8 Joints in the top plates of bracing panels must be tied together with 3kN and 6 kN top plate connectors using 2.5 mm x 0.9 mm galvanised mild steel strap, 3 nails each side of joint for 3kN and 6 nails each side of joint for 6kN.

## Structure

### Bracing

8.1 Elephant Bracing Systems have achieved wind and earthquake bracing ratings as set out in Tables 1-5.

8.2 Elephant Bracing Systems are fixed using a combination of two different fixing patterns, fixing types and panel hold downs as detailed in Tables 1-5. For comprehensive installation details refer to the Elephant Plasterboard Bracing Systems Manual.

8.3 Where Elephant Multiboard is substituted by Elephant Aquaboard fixing centres may need to be decreased. Refer to the Elephant Plasterboard Bracing Systems Manual for details.

8.4 The bracing units are derived from BRANZ P21 test method based on a wall height of 2.4 m. For any other wall height the bracing rating can be calculated by multiplying the appropriate value shown in Tables 1- 5 by 2.4 and dividing by the wall height in metres, except that panels less than 1.8 m high shall be rated as if they were 1.8 m high.

**Table 1: Special Enhanced System 10 mm Elephant Standard Plasterboard or any Plasterboard listed in Paragraphs 4.2 to 4.4**

System Number	Plasterboard Requirement Vertical or Horizontal	Minimum Element Length (m)	Bracing Units Per Metre		Angle Brace	Panel Hold Downs	Fixing Type	Fixing Pattern Type
			Wind	Earthquake				
EXS	10 mm Elephant Standard Plasterboard one side	0.4	95	85	No	Yes	32 mm x 6g Drywall screws	Pattern 2
EXSa	10 mm Elephant Standard Plasterboard one side	1.8	120	100	Yes			
EXSP	10 mm Elephant Standard Plasterboard one side, 7 mm D-D Plywood on the other	0.6	130	135	No			
EXSS	10 mm Elephant Standard Plasterboard both sides	0.6	145	135				
		1.2	150	140				

**Table 2: 10 mm Elephant Standard Plasterboard or any Plasterboard listed in Paragraphs 4.2 to 4.4**

System Number	Plasterboard Requirement Vertical or Horizontal	Minimum Element Length (m)	Bracing Units Per Metre		Angle Brace	Fixing Type	Fixing Pattern Type
			Wind	Earthquake			
ES	10 mm Elephant Standard Plasterboard one side	1.2	70	65	No	32 mm x 6g Drywall screws	Pattern 1
		1.8	85	70			
ESa	10 mm Elephant Standard Plasterboard one side	1.8	95	75	Yes		
ESP	10 mm Elephant Standard Plasterboard one side 7 mm D-D plywood on the other	0.6	100	90	No		
ESS	10 mm Elephant Standard Plasterboard both sides	1.2	85	75			
		1.8	95	80			
		2.4	100	80			

**Table 3: 10 mm Elephant Multiboard (or 10 mm Elephant Aquaboard, with fixing pattern 2 perimeter fixings at 100 mm centres, minimum length 600 mm)**

System Number	Plasterboard Requirement Vertical or Horizontal	Minimum Element Length (m)	Bracing Units Per Metre		Angle Brace	Panel Hold Downs	Fixing Type	Fixing Pattern Type
			Wind	Earthquake				
EM	10 mm Elephant Multiboard one side	0.4	100	95	No	Yes	38 mm Elephant Bracing Nail or 35 mm Elephant Bracing Screw	Pattern 2
		0.6	130	115				
EMa	10 mm Elephant Multiboard one side	1.8	150	140	Yes			
EMP	10 mm Elephant Multiboard one side, 7 mm D-D plywood on the other	0.6	150	150	No			
EMS	10 mm Elephant Multiboard one side, 10 mm Elephant Standard on the other	0.6	150	150				
EMd	10 mm Elephant Multiboard one side	0.4	125	125				

**Table 4: 13 mm Elephant Standard Plasterboard or 13 mm Elephant Multiboard or 13 mm Elephant Aquaboard**

System Number	Plasterboard Requirement Vertical or Horizontal	Minimum Element Length (m)	Bracing Units Per Metre		Angle Brace	Panel Hold Downs	Fixing Type	Fixing Pattern Type
			Wind	Earthquake				
E13S	13 mm Elephant Standard Plasterboard one side	0.4	90	85	No	Yes	32 mm x 6g Drywall screws	Pattern 2
		0.6	100	85				
		1.2	110	90				
		1.8	115	95				
E13Sa	13 mm Elephant Standard Plasterboard one side	1.8	135	115	Yes			
E13SP	13 mm Elephant Standard Plasterboard one side, 7 mm D-D plywood on other side	0.6	145	150	No			
		0.9	150	150				
E13SS	13 mm Elephant Standard Plasterboard both sides	0.6	135	135				
		1.2	150	150				

**Table 5: 13 mm Elephant Multiboard (or 13 mm Elephant Aquaboard, with fixing pattern 2 perimeter fixings at 100 mm centres, minimum length 600 mm)**

System Number	Plasterboard Requirement Vertical or Horizontal	Minimum Element Length (m)	Bracing Units Per Metre		Angle Brace	Panel Hold Downs	Fixing Type	Fixing Pattern Type
			Wind	Earthquake				
E13M	13 mm Elephamt Multiboard one side	0.4	100	95	No	Yes	38 mm Elephant Bracing Nail or 35 mm Elephant Bracing Screw	Pattern 2
		0.6	130	115				
E13Ma	13 mm Elephant Multiboard one side	0.6	150	140	Yes			
E13MP	13 mm Elephant Multiboard one side, 7 mm D-D Plywood on the other	0.6	150	150	No			
E13MS	13 mm Elephant Multiboard one side, 13 mm Elephant standard on the other	0.6	150	150				

**Note:** 1) 13 mm Elephant Standard, 10 mm and 13 mm Multiboard and 10 mm and 13 mm Elephant Aquaboard may be substituted for Elephant Standard Plasterboard in Tables 1 and 2.

2) 13 mm Elephant Multiboard, 10 mm and 13 mm Elephant Aquaboard may be substituted for Elephant Multiboard in Table 3.

3) Bracing unit ratings are for Timber and Concrete floors.

### Ceiling Diaphragms

8.5 Elephant plasterboard ceiling diaphragms are required when spacings between bracing lines exceed 5m with a single top plate and 6 m when double plates are used. Dragon ties used as per NZS 3604 can increase this distance to 7.5 m. The length of the ceiling diaphragms shall not exceed twice the width and plasterboard is required to cover the entire area of the ceiling diaphragm.

8.6 Elephant ceiling diaphragms are limited to not being steeper than 25° to the horizontal and not exceeding 15 m in length, or not being steeper than 45° to the horizontal and not exceeding 7.5 m in length.

8.7 Elephant 10 mm Standard Plasterboard or any other Elephant plasterboard can be used.

8.8 Elephant plasterboard ceiling diaphragms have three unique corner fastening detail patterns C1, C2 and C3.

### Openings in Bracing Elements

8.9 Openings are allowed within the middle third of the length and width of ceiling diaphragms and length and height of wall bracing elements. The dimensions of the opening are not to exceed one third of the element's height or width. Small openings of 90 mm x 90 mm or less may be placed anywhere except within 90 mm of the edge of the bracing element.

### Water-Splash Areas

8.10 Elephant Plasterboard Bracing Systems must not be used in shower cubicles or behind baths and the like. Elephant Bracing Systems may be used in water splash areas provided they are protected as required by NZBC Clause E3.

### Impact Resistance

8.11 Elephant plasterboards provide adequate resistance to soft body impact, based upon compliance with the property requirements of AS/NZS 2588 and upon experience and history of use.

### Durability

9.1 Elephant Plasterboard Bracing Systems, including linings and their fixings have a serviceable life of at least 50 years. The ability of the systems to remain durable is dependent on them remaining dry in service, and being maintained in accordance with this Appraisal.

### Maintenance

10.1 The building must be maintained weatherproof and Elephant Plasterboard Bracing Systems must be protected from external and internal moisture in accordance with NZBC Clauses E2 and E3.

10.2 Holes resulting from damage to the lining, up to 100 x 100 mm<sup>2</sup>, will have no significant effect on the performance of the bracing panel. Such holes may be repaired by patching. In areas of substantial damage remove and replace the sheet, stopping and finishing the affected area as appropriate.

10.3 Bracing elements require no ongoing maintenance, apart from decoration and the repair of any damage.

### Outbreak of Fire

11.1 Separation or protection must be provided to Elephant Plasterboard Bracing Systems from heat sources such as stoves, heaters, flues and chimneys.

11.2 Elephant plasterboard must be separated from fireplaces, heating appliances, flues and chimneys in accordance with the requirements of NZBC Acceptable Solution E2/AS1 part 9 of the protection of combustible materials.

## Internal Moisture

12.1 Elephant Plasterboard Bracing Systems must be used in dry internal situations, and must not be used where it is likely to be exposed to liquid water, or where extended exposure to humidity above 90% RH is expected e.g., such as may be expected in sauna rooms, commercial kitchens and the like.

## Installation Information

### Installation Skill Level Requirement

13.1 Installation of Elephant Plasterboard Bracing Systems can be carried out by any competent building contractor.

### General

14.1 Elephant Plasterboard Bracing Systems must be installed in accordance with the Technical Literature.

### Cutting

14.2 Elephant plasterboard is easily cut by scoring the face paper with a sharp short-bladed trimming knife, and then snapping the plasterboard away from the cut face and cutting the back paper or by sawing. Use of a metal straightedge facilitates clean straight cuts. Cut edges can be tidied up by using a knife. Paper dags should be removed.

### Health and Safety

14.3 Dust resulting from the sanding of stopping and finishing compounds may be a respiratory irritant, and the use of a suitable facemask is recommended.

### Framing

14.4 To achieve an acceptable decorative finish, Elephant installation instructions specify that walls must not be lined unless the moisture content of timber framing is less than or equal to 18%.

### Sheet Fixing

14.5 Elephant Plasterboard Bracing Systems must be installed in accordance with Elephant Plasterboard Bracing Systems Manual. Particular attention must be paid to the corner and perimeter fixing details and panel hold down requirements of each system.

14.6 Elephant Plasterboard Bracing Systems are screwed or nailed around the perimeter of the bracing elements using 32 mm x 6g Drywall Screws, 35 mm Elephant bracing screws or a 38 mm Elephant bracing nails depending on the selected bracing system. Fixings must be no closer than 12 mm from the vertical edge, and no closer than 18 mm from the horizontal edge, and driven at right angles to the sheet until the head is seated in a slight dimple just below the surface of the paper liner. Fixings must not be over-driven. Centres of the sheets are fixed conventionally using adhesive or mechanical fixing. Mechanical fixings must be spaced between the daubs of adhesive.

14.7 When using Elephant Aquaboard to substitute Multiboard, fixing centres may need to be decreased. Refer to the Elephant Bracing Manual for details.

14.8 Plywood is fixed at 150 mm centres around the perimeter of each sheet using 30 mm x 2.8 mm flat head galvanised nails.

### Jointing and Finishing

14.9 All bracing element joints must be reinforced with paper tape and finished in accordance with Elephant Plasterboard Installation Manual.

### Inspection

14.10 For inspection, reference must be made to Elephant Plasterboard Bracing Systems Manual and Installation Manual.

## Basis of Appraisal

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

### Tests

15.1 Bracing tests were carried out by BRANZ in accordance with BRANZ Technical Paper P21 to determine the performance of Elephant Plasterboard Bracing Systems when the building is subjected to lateral wind or earthquake loading. Nail and screw slip tests were carried out by BRANZ.

15.2 Elephant plasterboards have been tested against the requirements of AS/NZS2588 to establish fitness for purpose. Testing completed includes, Bending Strength, Edge Hardness, Nail pull Resistance Bond Strength in Tension, Humidified Deflection, Edge Hardness, Thickness and for Elephant Aquaboard Water Resistance and Surface Water Resistance

### Other Investigations

16.1 The Elephant Plasterboard Bracing Systems Manual and Installation Manual have been examined by BRANZ and found to be satisfactory.

16.2 Site visits were carried out by BRANZ to assess the practicability of the installation of the systems, and to view completed installations.

16.3 An assessment was made of the durability of the systems by BRANZ technical experts and found to be satisfactory.

### Quality

17.1 The manufacture of Elephant plasterboard has been examined by BRANZ and found to be satisfactory.

17.3 Elephant Plasterboard (NZ) Limited is responsible for the quality of the product supplied.

17.4 The quality of the application and finish on site is the responsibility of the installation and stopping contractors.

17.5 Designers are responsible for the design of buildings.

17.6 Building owners are responsible for the maintenance in accordance with the instructions of Elephant Plasterboard (NZ) Limited.

### Sources of Information

- AS/NZS 2269 Structural Plywood.
- AS/NZS 2588: 1998 Gypsum Plasterboard.
- AS/NZS 2589: 2007 Gypsum linings - Application and finishing.
- AS/NZS2753: 1985 adhesives – Mastic – for bonding gypsum plaster linings to wood and metal framing members.
- BRANZ Technical Paper P21:1979 (revised 1982, 1987, 1988) A wall bracing test and evaluation procedure.
- BRANZ Technical Recommendation No. 10 - December 1991, Supplement to P21: An evaluation method of P21 test results for use with NZS 3604: 1990.
- NZS 3602: 2003 Timber and wood-based products for use in building.
- NZS 3604: 1999 Timber framed buildings.
- New Zealand Building Code Handbook Department of Building and Housing, Third Edition May 2007
- The Building Regulations 1992, up to, and including May 2007 Amendment.



**BRANZ**

In the opinion of BRANZ, **Elephant Plasterboard Bracing Systems** are fit for purpose and will comply with the Building Code to the extent specified in this Appraisal provided they are used, designed, installed and maintained as set out in this Appraisal.

The Appraisal is issued only to **Elephant Plasterboard (NZ) 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. **Elephant Plasterboard (NZ) 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.
3. 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.
4. 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 **Elephant Plasterboard (NZ) Limited**.
5. 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.
6. BRANZ provides no certification, guarantee, indemnity or warranty, to **Elephant Plasterboard (NZ) Limited** or any third party.

For BRANZ

C Preston  
Chief Executive

Date of issue: 18 April 2008