ENERTREN PTY. LTD. ABN: 75 770 323 635
Ph: (02) 8005 4766
E: info@enertren.com.au
PO Box 312, Bathurst, NSW, 2795

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BEAL (Building Element Assessment Laboratory Limited)
6B Cedric Place
Plimmerton, Porirua 5026
New Zealand

Attn: **Colin Prouse**
By Email: colin@beal.co.nz

Engineering Report

Structural Capacity and NCC 2022 Compliance: 18 mm Magnum Board Flooring Sheet

This Engineering Report provides confirmation of compliance of the 18 mm Magnum Board Flooring Sheet to the nominated Performance Requirements of the National Construction Code (NCC 2022) for structural adequacy.

1. Summary

The Magnum Board flooring system comprises fibre reinforced magnesium oxide (MgO) sheets installed over timber or steel cold-formed steel floor joists spaced at maximum 600 mm ctrs. The sheets are supplied in Australia by Health Based Building Limited from New Zealand.

This report concerns applications in the following building systems:

- Floors for residential buildings (NCC 2022 Volume Two and ABCB Housing Provisions Standard 2022).

Compliance with requirements other than structural adequacy is outside the scope of this report.

2. Product Specification

Magnum Board is supplied in sheets of nominal dimensions as follows:

Length – 2,700 mm
Width – 600 mm
Thickness – 18 mm

The sheets have tongue and groove edge profiles and square ends.

3. Structural Engineering Assessment

The structural engineering assessment is made on the basis of testing carried out under the supervision of a Professional Engineer and calculations in accordance with NCC referenced standards carried out by a Professional Engineer.

3.1 Holmes Testing

Magnum Board was tested by Holmes for flexural strength. Refer to Project: 132262.00

Revision 1.1, 29/11/2017. The test results were assessed by Enertren in accordance with AS/NZS 1170.0 Appendix B and determined that the long and short term capacity of the product is as follows:

ϕM_{LT} = 0.48 kNm/m

ϕM_{ST} = 0.54 kNm/m

3.2 BEAL Testing

Magnum Board was tested by BEAL for point load capacity as per AS/NZS 1170.1 Table 3.1 for Domestic floor imposed action of 1.8 kN applied over an area of 350 mm^2. The test results were assessed by Enertren in accordance with AS/NZS 1170.0 Appendix B and it was determined that Magnum Board has adequate resistance to the effect of this concentrated imposed action for residential applications having floor joist spacing not exceeding 600 mm ctrs.

3.3 Structural Engineering Assessment

The vertical load capacity of Magnum Board floor sheet for a range of floor loading conditions is provided in Table 3.1.

Table 3.1: Load Capacity of Magnum Board Flooring Sheets

Application	Permanent Actions Included in Application	Distributed Imposed Action	Concentrated Imposed Action	Maximum Joist Spacing
Residential Activities – General Areas	G_{sw} = 0.25 kPa G_f = 0.25 kPa G_s = 0.50 kPa	1.5 kPa	1.8 kN (350 mm^2)	600 mm
Residential Activities – Tiled Wet Areas	G_{sw} = 0.25 kPa G_f = 0.50 kPa G_s = 0.50 kPa	1.5 kPa	1.8 kN (350 mm^2)	600 mm
Residential Activities – Balconies and Verandahs	G_{sw} = 0.25 kPa G_f = 0.50 kPa G_s = 0.50 kPa	2.0 kPa	1.8 kN (350 mm^2)	450 mm

Notes:

1. G_{sw} = permanent action due to self-weight.
2. G_f = permanent action of applied floor coverings.
3. G_s = permanent action allowance for superimposed loading of permanent fixtures.

3.4 Exclusions to Structural Engineering Assessment

- Other actions not specified in this section.
- Design of joists and other supporting structural frameworks.

4. National Construction Code Compliance (NCC 2022 +A1,A2)

4.1 Structure

Magnum Board floor sheets specified and installed in accordance with this report comply with NCC 2022 (incorporating Amendment No.1 and No.2):

- Volume Two – H1P1: The system has been designed to resist permanent and imposed actions in accordance with AS/NZS 1170.1 and combinations specified in AS/NZS 1170.0 to the magnitude specified in Table 3.1.

The structural capacity of Magnum Board floor sheet has been determined by engineering calculations using 5 percentile characteristic material property values determined from testing done under the supervision of structural engineers.

This engineering report providing interpretation of the test results to the applications specified in this report constitutes evidence of suitability as per NCC Volume Two A5G4(1)(e).

4.2 Fire Safety

The fire resistance performance of floor systems comprising Magnum Board floor sheet has not been assessed and is outside the scope of this report. Advice must be sought from a fire engineer.

4.3 Waterproofing

Magnum Board floor sheet and framing members must be constructed above the DPC, and exposed floor areas on verandahs and balconies must be fully sealed with a waterproof tanking membrane to all exposed Magnum Board surfaces in accordance with the requirements provided in the supporting technical documentation, prior to installation of tiling or other floor surface finishing. The tanking membrane shall not be penetrated by fixings. Waterproofing of verandahs and balconies shall be carried out in accordance with AS 4654.2 using membranes that comply with AS 4654.1.

Internal wet areas shall be waterproofed in accordance with AS 3740 using membranes that comply with AS/NZS 4858. Refer also to ABCB Housing Provisions Part 10.2 Wet area waterproofing.

4.4 Sound Transmission and Insulation

The acoustic performance of floor systems comprising Magnum Board floor sheet has not been assessed and is outside the scope of this report. Advice must be sought from an acoustic engineer.

4.5 Energy Efficiency

The thermal performance of floor systems comprising Magnum Board floor sheet has not been assessed and is outside the scope of this report. Advice must be sought from an energy efficiency consultant.

4.6 Durability

In the context of the NCC, durability is the capability of a building or its components to remain serviceable over a specified time period. While there is not a specific major section in the BCA concerning durability, it is implied that the materials and components used and the construction and finishing of a building is done such that the design life can be reliably achieved.

The durability of Magnum Board floor sheet has been determined by testing and evaluation carried out by BEAL. Refer to BEAL Appraisal Certificate No. I-2440.

Design for durability involves selection of an appropriate strategy for reliability. The specified minimum performance at the target design life can be achieved by adopting one of a number of strategies as follows:

1. No maintenance or repair
2. With repair
3. With maintenance
4. With maintenance and repair

The location of elements within a building structure influences the strategy decision. For example, it’s impractical to inspect, let alone maintain or repair components that are embedded within floor cavities, so the design for durability should be focussed on Strategy 1 from above – ie. design life met through the properties of the component initially.

Cold-formed steel shall have a minimum coating class of Z275 or AZ150 in accordance with AS 1397. This is considered acceptable for applications within the building envelope in areas up to 300 m from breaking surf. Balconies would not typically be considered to be within the building envelope, so the floor framing members and connectors and fasteners should be selected accordingly for the degree of exposure and site location. For coastal locations and balcony areas, refer to the cold-formed steel manufacturer's specifications for suitability of the specified product for the application at the project site. Refer to AS 4312 for information about corrosivity zones in Australia.

Timber framing and connectors and fasteners used in verandahs and balconies should likewise be selected according to the degree of exposure and site location for the required durability.

Balcony and verandah areas must have a waterproof tanking membrane applied to the surface. Waterproofing solutions that meet the requirements of AS 4654.1 shall be specified and installed in accordance with AS 4654.2. Ensure the specified tanking membrane is compatible with and carries a specification for application on MgO board materials.

The possibility of condensation occurring within building elements must be considered in the detailing and specification of the building fabric. The mechanism of condensation is through the behaviour of water vapour in air. Water vapour condenses out of air on material surfaces that are below the dew point temperature. The presence of condensation within the building envelope can lead to a degradation of materials, therefore careful design through use of insulation and vapour barriers to prevent condensation, or the active control of the effects, must be undertaken specific to the site conditions. Refer to ABCB Guideline Document – Condensation in Buildings. Magnum Board floors constructed at ground level must have sub-floor ventilation in accordance with the Deemed-to-Satisfy Provisions of the ABCB Housing Provisions 2022 Part 6.2.

5. Specifications

The NCC 2022 Volume Two Deemed-to-Satisfy Provisions of H1D6 may be used as a reference for an acceptable construction method for the floor framing to support the Magnum Board floor sheet as applicable.

5.1 Component Specifications

Framing –	Timber floor framing in accordance with AS 1684 series having a width of min. 45 mm; or, Cold-formed steel floor framing in accordance with NASH Standard having a width of min. 50 mm and thickness (BMT) of min. 0.75 mm.
Screws –	In accordance with AS 3566.1: Timber – Simpson Strong Tie SSDHSD50TSA, 12-guage x 50 mm #2 square drive pre-bore tip screw. Steel – Simpson Strong Tie SSBFHSD2SA, 10-guage x 50 mm #2 square drive self-drilling wing tip screw. Screw spacing – 300 mm max. ctrs along joists Edge distance – 25 mm min., either tongue or groove edge End distance – 15 mm min., end of panel Screw corner distance – 50 mm Corrosion protection of screws in accordance with AS 3566.2 – Grade 316 stainless steel. Consideration shall be given to potential for galvanic corrosion to ensure it cannot occur – refer to manufacturer's specifications.
Flashings and DPC –	In accordance with AS/NZS 2904.
Construction adhesive –	Compatible with MgO material and the joist material, applied in a min.

	10 mm continuous bead along every joist and in tongue and groove edge joints. Two beads shall be applied at the junction of the ends of sheets.
Sealants –	Polyurethane, external grade and fire rated as required, prepared and installed in accordance with the manufacturer's instructions for MgO material, eg. MAPEI PU35 or MAPEI PU45.

5.2 Footings and Supporting Structures

Footings supporting residential floors shall be designed, specified and constructed in accordance with AS 2870 with due consideration made for the permanent load of the Magnum Board sheets and applied flooring. Sub-floor spaces must be provided with adequate ventilation. Refer to the ABCB Housing Provisions 2022 Part 6.2 for requirements.

Supporting structures including joists, bearers, beams, columns and support walls shall be designed to resist the permanent action of the Magnum Board sheets and applied flooring together with relevant superimposed permanent, imposed and other actions as appropriate for the application, within the limitations of Table 3.1.

5.3 Construction Detailing

Standard construction detailing shall follow the principles of AS 1860.2 Particleboard flooring. The specifications in this report shall govern in the case of any discrepancies.

5.4 Construction Notes

The Installer is to refer to the project drawings and specifications and shall perform work to the quality standards agreed with the builder. The notes below are important from a structural engineering and compliance perspective.

1. Framing shall be in accordance with the required standards for timber or cold-formed steel as per Section 5.1, designed to support the permanent action of the Magnum Board floor sheets and other linings or permanent fixtures plus required project imposed actions, and any other actions as applicable. Consult the project engineer.
2. Verandah and balcony framing shall be constructed so as to provide the necessary fall away from the external wall of the building, and shall be protected from moisture by flashings and DPC as required.
3. Timber joists shall be min. 35 mm wide. Steel joists shall be min. 40 mm wide.
4. Joist spacing (centre to centre distance) shall not exceed the max. spacing specified in Table 3.1 for the relevant floor type.
5. Line loads and concentrated point loads shall have a structural support pathway directly under the Magnum Board sheet.
6. Structural bracing and hold-down of wall frames shall be carried through to the floor framing members.
7. Where the structure contains any structural framing members that are timber, the requirements of AS 3660.1 shall be followed to protect against termite attack.
8. DPC shall be installed below the floor framing.
9. All joists shall be level and flat to provide even bearing for support of the Magnum Board floor sheets.
10. Magnum Board sheets shall be installed spanning a minimum of 2 joist spacings.
11. Magnum Board sheets shall be continuously supported at free edges as follows:
    11.1. Minimum 35 mm end bearing.
    11.2. Minimum 35 mm edge bearing.
12. Magnum Board sheet ends in the field of the floor shall be evenly supported on a joist with 15 mm minimum bearing. Ensure construction adhesive bonds both sheets to the joist.
13. Min. sheet width when trimmed shall be 200 mm. Trim and install in a manner to maintain tongue and groove edge profiles. Reinstate as required.

14. Floor widths less than a full Magnum Board sheet width of 600 mm shall have full edge support of the Magnum Board sheet.
15. Apply a continuous bead of construction adhesive (min. 10 mm wide) to every joist in accordance with the manufacturer's instructions. Provide 2 x beads at locations of sheet end joints in the field of the floor.
16. Fix Magnum Board sheets to joists with screws as follows:
    16.1. Timber joists – Simpson Strong Tie SSDHSD50TSA, 12-guage x 50 mm #2 square drive pre-bore tip screw
    16.2. Metal joists – Simpson Strong Tie SSBFHSD2SA, 10-guage x 50 mm #2 square drive self-drilling wing tip screw
    16.3. Screw spacing – 300 mm max. ctrs along joists
    16.4. Edge distance – 25 mm min., either tongue or groove edge
    16.5. End distance – 15 mm min., end of panel
    16.6. Screw corner distance – 50 mm
    16.7. Screw heads are to be embedded below the surface and finished by filling with a suitable patching compound.
17. Magnum Board sheets are to be laid out over the floor in a stretcher bond manner. Minimum 2 x normal joist spacing overlap shall be achieved.
18. Magnum Board sheets are to be joined as follows:
    18.1. Construction adhesive applied in the tongue and groove edge joints.
    18.2. End joints generally butted with construction adhesive and with 2 mm gap and MAPEI PU35 or MAPEI PU45 sealant in areas requiring a waterproof membrane.
19. Provide control joints (min. 5 mm wide) in Magnum Board flooring at the following locations:
    19.1. Max. 9,000 mm x 9,000 mm spacing for internal floors.
    19.2. Max. 4,800 mm x 4,800 mm spacing in for external floors.
    19.3. A change in floor thickness.
    19.4. Corresponding to supporting structure steps or control joints.
    19.5. Junctions of different floor system types.
    19.6. Over structural beams supporting the floor framing members.
20. Control joints perpendicular to the sheet span direction shall have 2 x joists, one under each sheet.
21. Seal control joints with backing rod and compatible sealant, minimum 5 mm width x 2.5 mm depth (at narrowest point).
22. Sealants shall be approved for the application by the manufacturer. The contractor must follow the manufacturer's specifications and ensure surfaces to be bonded are clean, free of dust and debris, and prepared and primed as required.
23. Optionally, provide a light gauge aluminium angle trim (min. 30 x 30 x 1.0 mm) to the leading edge of the Magnum Board sheets at exposed edges, eg. top of stairs, for improved robustness.
24. Waterproofing of finished Magnum Board floors for wet areas shall be done in accordance with the ABCB Housing Provisions 2022 Part 10.2 and AS 3740 using products compatible with MgO material. Provide a bond breaker tape over sealant joints in the floor and at wall junctions. A proprietary impervious waterproofing barrier assessed and classified in accordance with AS/NZS 4858 shall be specified. Refer to separate data sheet from MAPEI.
25. Waterproofing of finished Magnum Board external floors shall be done using membranes complying with AS 4654 Part 1 that are compatible with MgO material, and installed in accordance with AS 4654 Part 2. Provide a bond breaker tape over sealant joints in the floor and at wall junctions.
26. Control joints in the Magnum Board floor systems shall be expressed through floor tile systems.

6. Safety Considerations

Refer to Magnum Board Material Safety Data Sheet, MSDS No.: MBGEP-032107 for general information.

Cutting of Magnum Board sheets shall be carried out in accordance with accepted current industry safe work practice using appropriate tools and personal protective equipment.

Prior to commencing work, ensure floor framing has been designed and installed in accordance with the project specifications including any referenced Australian Standards and the NCC.

During installation, ensure Magnum Board sheets are secured to the framing promptly. Protect the surface from damage and ensure loading does not exceed specified capacity, particularly for point loading. Ensure point loads during construction are located above framing members and that the framing members are safe to support the load. Consult the project structural engineer as required.

Follow manufacturers specifications for safe use of adhesives, sealants and waterproofing membranes.

7. Limitations, Exclusions and Responsibilities

This report provides a general design specification for applications within the scope. It is valid for the 2022(+A1,A2) edition of the National Construction Code and remains valid while the referenced clauses and standards remain unchanged, or until four years from the date of issue.

Any deviations from, changes to, or substitution of, any material or component specified in this report is outside the scope. It is the product supplier's responsibility to maintain compliance of the products within an acceptable quality range consistent with the tested products and the specifications and engineering properties declared in this report. This includes ensuring all referenced appraisals and certification documents are valid and up to date. It also includes establishing an effective quality control plan that includes batch testing of incoming stock.

Certification of project design and installation is outside the scope of this report. That is the responsibility of the building contractor, the appropriate project consultants and floor installers.

8. References

NCC 2022 National Construction Code, Volume Two Building Code of Australia, Australian Building Codes Board, 2023

ABCB Housing Provisions Standard 2022, Australian Building Codes Board, 2023

AS/NZS 1170.0:2002(+A1,A3,A4) Structural design actions – Part 0: General principles

AS/NZS 1170.1:2002(+A1,A2) Structural design actions – Part 1: Permanent, imposed and other actions

AS 1684.2:2021 Residential timber-framed construction – Part 2: Non-cyclonic areas

AS 1684.3:2021 Residential timber-framed construction – Part 3: Cyclonic areas

AS 1684.4:2010(+A1) Residential timber-framed construction – Part 4: Simplified – Non-cyclonic areas

AS 1720.1:2010(+A1,A2,A3) Timber structures – Part 1: Design methods

AS 1860.2–2006(+A1) Particleboard flooring

AS 2870:2011 Residential slabs and footings

AS/NZS 2904:1995(+A1,A2) Damp proof courses and flashings

AS 3566.1:2002(R2015) Self-drilling screws for the building and construction industries – Part 1: General requirements and mechanical properties

AS 3566.2:2025 Self-drilling screws for the building and construction industries – Part 2: Corrosion resistance requirements

AS 3740:2021 Waterproofing of domestic wet areas

AS 3958.1–2007(+A1) Ceramic tiles – Part 1: Guide to the installation of ceramic tiles

AS 4312:2019 Atmospheric corrosivity zones in Australia

AS/NZS 4600:2018 Cold-formed steel structures

AS 4654.1–2012 Waterproofing membranes for external above-ground use – Part 1: Materials

AS 4654.2–2012 Waterproofing membranes for external above-ground use – Part 2: Design and installation

AS/NZS 4858:2004 (R2020) Wet area membranes

NASH — Handbook — Design of Residential and Low-Rise Steel Framing

NASH Standard Part 1 — Residential and Low-Rise Steel Framing — Design criteria

NASH Standard Part 2 — Residential and Low-Rise Steel Framing — Design solutions

BEAL Appraisal Certificate Appraisal #: I-2440, "The Magnum Board Flooring Underlay", expiry date 30 September 2025

BEAL BTS2440 Certificate of Test: TR250905-1, "Measurement of the Point Load Resistance of a Floor", 5/09/2025

BEAL BTS2440 Certificate of Test: TR250908-1, "Measurement of the Point Load Resistance of a Floor", 5/09/2025

Magnum Board 18 mm Flooring Underlay Technical Information & Installation Guide, Ref.: 043AU V3.1, Date of Issue: 01/10/2025

Holmes Solutions Project: 132262.00 Revision No. 1.1, "Health Based Building Limited MgO Magnum Board – Flexural Testing", 29/11/2017

MAPEI Product Specification, "Installation of Carpet Flooring to a Magnum Board Substrate", Version 1, 21/09/2018

MAPEI Product Specification, "Installation of Vinyl Flooring to a Magnum Board Substrate", Version 1, 21/09/2018

MAPEI Product Specification, "Generic Specification for the Installation of Timber Floor Coverings to a Magnum Board Substrate, Health Based Building, Christchurch", Version 1, 08/27/2018

MAPEI Product Specification, "Specification for the Installation of Ceramic and Porcelain Tiles Magnum Board including Waterproofing – External Walls", Version V 1.0, 19/10/2018

MAPEI Product Specification, "Specification for the Installation of Ceramic and Porcelain Tiles Magnum Board including Waterproofing – Internal Walls", Version V 1.0, 19/10/2018

Please contact the undersigned if you have any queries regarding this document.
Yours sincerely,

For and on behalf of Enertren Pty Ltd

John Trenerry BE MEM MIEAust CPEng NER (471275)
RPEng (Structural): NSW – PRE0000453; Queensland – 21047; Victoria – PE0005235
Design Practitioner Registration NSW (Façade, Structural Engineering) – DEP0000453

Document Control

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12/09/2025	V.1	BEA-003 Magnum Board Flooring Engineering Report 250912 V.1	Final version.
17/09/2025	V.2	BEA-003 Magnum Board Flooring Engineering Report 250917 V.2	Update per client comments on marked up draft version.
14/10/2025	V.3	BEA-003 Magnum Board Flooring Engineering Report 251014 V.3	Update reference to latest Magnum Board technical document, screw product reference numbers added.
17/10/2025	V.4	BEA-003 Magnum Board Flooring Engineering Report 251017 V.4	Update per client feedback, email 16/10/2025.