Magnum Board®
Magnesium oxide board bracing specification manual

MAY 2021

Contents

SYSTEM SUMMARY

Magnum Board® bracing systems – September 2020

Health Based Building™ accepts no liability if Magnum Board® bracing systems are not designed and installed in accordance with details and instructions outlined in this document. This document was prepared for use in design and construction for New Zealand. Bracing values provided are taken from P21 bracing test data provided by Scion Research and engineering advice based on P21 data.

Use the latest specification version

This document may be updated and superseded by a newer version at any time. Health Based Building™ does not accept any liability for the use and reliance on outdated versions of this document. Confirm the most updated version of this document is being referenced at healthbasedbuilding.com before proceeding with design and installation. For clarification on the latest version, call Health Based Building on 0800 611 711 or 03 366 4044.

Substitutions

Magnum Board® bracing is to be designed and installed only with Magnum Board® magnesium oxide board products. Bracing values and test data referenced to Magnum Board® should not be substituted to other products and systems. Follow the specified design details and construction methodology in order to achieve necessary performance and quality on site.

For further information call Health Based Building™ on 0800 611 711 or 03 366 4044.

INTRODUCTION

Scope of Use

This document is intended to inform wall bracing design and construction with the use of Magnum Board® magnesium oxide (MGO) board products in light timber frame (LTF) buildings constructed to meet NZS3604:2011, NZBC B1 or wall framing that has been specific engineer designed (SED) to meet NZBC B1 and B2.

Information in this document is based on NZS3604:2011, BRANZ documentation and other similar products' bracing information and design principles. This is a live document and will be updated continuously in response to feedback from the market and Health Based Building™ developments; as new information becomes available or apparent. This document was prepared by AP Design Ltd at the request of Health Based Building™.

Compliance with the NZ Building Code (NZBC)

NZBC CLAUSE B1 – STRUCTURE

NZBC clause B1 must be met by the design and material specification for timber wall framing when used with respect to this document. Magnum Board® magnesium oxide board bracing complies with NZS3604:2011 -as an acceptable solution to NZBC clause B1, when designed and installed as per this documentation and relevant technical documents.

NZBC CLAUSE B2 – DURABILITY

Magnum Board® magnesium oxide board products have a service life of no less than 50 years and meet the requirements of NZBC clause B2 under normal conditions of dry use.

Magnum Board® magnesium oxide board products should not be used with an unfinished surface where 15 year durability applies and where directly exposed to direct water pressure (e.g. shower cubicles and/or showers over baths). An impervious finish (e.g. acrylic/similar shower liner, waterproof membrane) must be installed over Magnum Board® MGO in these areas to comply with NZBC clause B2 and E3.

NZBC CLAUSE E2 – EXTERNAL MOISTURE

The requirements of NZBC clause E2 are met when Magnum Board® magnesium oxide board is used externally as a rigid air barrier (RAB) in conjunction with ABEP® Blue Barrier Joint Filler and Roller Grade products as per its BEAL appraisal (C1405).

NZBC CLAUSE F2 – HAZARDOUS BUILDING MATERIALS

Under regular conditions and use; handling installation and service life of Magnum Board® magnesium oxide board products do not present a health hazard to users and occupants of the completed building and meet the requirements of NZBC clause F2.

Installers should make sheet cuts only in well ventilated areas, and appropriate personal protection equipment must be used when cutting and handling Magnum Board® MGO board with reference to the product's material safety data sheet (MSDS no. MBGEP-032107-5).

NZBC CLAUSE H1 – ENERGY EFFICIENCY

Sufficient thermal resistance and energy efficiency must be achieved in completed building envelopes. For light timber frame (LTF) walls forming the building envelope and/or thermal envelope, the required thermal resistance (R-value) will depend on the climate zone as per NZBC clause H1 and NZS4218 (Appendix B).

BRACING RESISTANCE & DEMAND

Sheet storage and handling

Magnum Board® magnesium oxide sheet products shall be stored and handled as per the below requirements:
- Sheets must be stacked flat and protected from weather and site elements/hazards
- Sheets must be handled as a finishing material
- Sheets must not be exposed to direct liquids or installed in situations where there is expected and extended exposure to high humidity (90% RH)
- Sheet bracing elements cannot be installed in showers trays -where cut in to lining or behind baths.

Unless Magnum Board® magnesium oxide sheet products are installed in accordance with the above requirements, there is great risk of surface defects such as joint peaks and/or cracking. It is also not recommended to use certain wall framing strap fixings where these interfere with sheet installation. These fixings should be limited to wall faces without Magnum Board® magnesium oxide board sheets installed, made to be installed within the wall framing line or chosen to be as thin and unobtrusive to the sheets as possible.

Bracing distribution

In accordance with bracing design under NZS3604:2011 and BRANZ bracing guidance publications, bracing elements are to be evenly distributed throughout the building and as close to external wall corners as practicable.

To achieve required bracing and assist in following best practice during design, a grid along and across the building is to be used to evenly distribute adequate bracing elements throughout it. Bracing lines must coincide with wall bracing elements as much as possible; pairs of bracing elements can be considered on a single bracing line so long as they are parallel; less than or equal to 2 metres apart.

Maximum brace line spacing shall be:
- 6m for typical construction with Magnum Board® magnesium oxide board ceiling
- 7.5m when dragon ties are used as per NZS3604:2011

As per NZS3604:2011, each bracing line shall have the greatest of any of the below options:
- 100 bracing units (BUs)
- 15× the external wall length (metres) for bracing lines located on external walls
- 50% of the total demand, divided by the total number of bracing lines in the respective direction being considered.

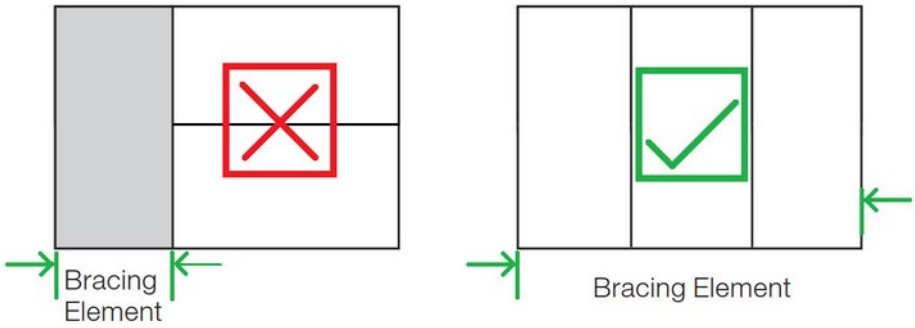
Maximum bracing element values shall not exceed:
- 120BU/m for timber floors
- 150BU/m for concrete floors

When designing with respect to NZS3604:2011 designers must remember they are minimum guidelines; compliance does not guarantee even distribution, they are responsible for confirming distribution. Inadequate distribution can cause torsion and result in local or significant damage in an earthquake.

Bracing layout

In the design process, designers should take in to account completed finish appearances as well as meeting bracing unit requirements; use total wall lengths where it is practical to avoid unnecessary fixings in the middle of walls. Designers are encouraged to use available wall lengths along entire walls to improve bracing achieved and finished appearances.

Figure 1.



Bracing demand

Wind and earthquake bracing demand shall be determined as per NZS3604:2011 section 5. Third party bracing calculator software providing bracing demand values equal to or greater than that of NZS3604:2011 is acceptable for the use of Magnum Board® magnesium oxide board products.

For commercial and public buildings, designers should aim to meet the requirement of 10% probability of exceedance in a 100 or 250 year life expectancy.

Bracing element heights

The typical height of Magnum Board® MGO board bracing elements is 2.4m. As per NZS3604:2011 8.3.1.4, reduce bracing elements greater than 2.4m in height by multiplying bracing units achieved by 2.4/H where H is the height of the bracing element. For walls with varying heights (i.e. sloping/raking top plates), H shall be defined by a mean-average wall height.

For wall bracing element heights less than 2.4m, the bracing element value shall be taken as the typical value for 2.4m in height.

DESIGN AND CONSTRUCTION

Magnum Board® magnesium oxide board linings

When installing part-lengths of Magnum Board® magnesium oxide boards, a minimum of 400mm will apply for bracing elements. *Lengths of bracing elements between 400-600mm require hold-down brackets and values are based on engineering advice of P21 tests for 600mm and 1200mm. If sheet end butt joints cannot be avoided they must be made over dwangs/nogs or studs and fixed at 200mm centres minimum. A preferred alternative is to back-block sheet end butt joints. Boards shall be installed rebated edges to rebated edges; where end to end Joints are required, a rebated edge using a matching profile shall be added in preparation for plastering.

Use of Magnum Board® magnesium oxide board bracing elements in each section of wall cannot be combined with other proprietary bracing elements in the same wall section to increase the total bracing units achieved.

Site conditions

The project site must comply with NZBC clause E1 surface water. Finished adjacent ground to the building must fall away from building footprint to eliminate possible ponding.

Ground Clearances

Bottom edge of Magnum Board® magnesium oxide boards must maintain sufficient clearances to finished ground levels (paved or unpaved) as required to meet NZBC clause E2/AS1.

Managing moisture

Designers must factor in risk of moisture exposure and conditions and in which Magnum Board® magnesium oxide boards will be installed. Consideration to interior and exterior environment must be given to manage moisture exposure; particularly for buildings located with great wind loads and high risk of wind driven rain.

When Magnum Board® MGO board is used externally as part of the RAB system it must be installed in accordance with Magnum Board® MGO RAB Technical Manual (to be read in conjunction with this document) to NZS3604:2011 and NZBC clause E2/AS1. It must not be installed in such a way that it remains in contact with the ground.

Appropriate flashings and waterproofing to be installed at penetrations, openings, joinery openings etc to effectively manage moisture.

Wind loads

Magnum Board® MGO board bracing systems can be used in all wind zones up to and including extra high wind zone as defined in NZS3604:2011. For buildings subject to wind loads and speeds greater than 55m/sec, these require specifically engineer designed (SED).

Magnum Board® MGO board bracing elements in splash areas

15 years durability is required by the NZBC clause B2 in these instances. Magnum Board® MGO boards installed in places that are likely to be liquid exposed frequently must have an impervious product or finish installed. Magnum Board® MGO board bracing elements cannot be installed in shower cubicles/trays or behind baths (where linings are cut above bottom plate); they can be used in splash areas as defined in NZBC clause E3 provided the impervious product or finish is maintained for the service life of the building.

Maintenance

Maintenance of Magnum Board® MGO board bracing elements will be dependant on specific building location and exposure to weather elements. Typical external building maintenance procedures should be followed; in addition but not limited to:

- Maintaining the exterior cladding and envelope of the building. This includes joints, penetrations, flashings and sealants that are potential points of moisture ingress.

- Cleaning and clearing gutters, downpipes, rainwater heads, drains and overflows.

- Maintaining any vegetation that is near or in contact with the building to keep sufficient clearances.

- Keeping sufficient clearances to ground levels (paved or otherwise).

- Maintain integrity of interior/exterior coatings

Openings in Magnum Board® MGO board bracing elements

Small openings

Power outlets, light switches and other similar small openings measuring no greater than 90×90mm may be made on bracing elements provided they are not located within 90mm of the element edge. Blocking may need to be installed next to the perimeter stud where next to the opening. Two such openings/penetrations are recommended per sheet.

Large openings

Switch boards and other large openings greater than 90×90mm must be placed outside of wall bracing elements or located on the opposing side of the wall frame (i.e. exterior). No window and door openings/penetrations are permitted within bracing elements.

Timber wall framing

Timber wall framing must be flush or made flush to the requirements of NZS3604:2011. For best results, use of laminated veneer lumber (LVL) is recommended. As a minimum, kiln dried stress graded timber for all walls, roofs and intermediate floor framing is required. Typical framing grade, spacings and installation requirements must comply with NZS3604:2011, NZS3631 and AS/NZS1748 or specific engineer design (SED) covered under a PS1 to meet NZBC clauses. The minimum framing dimensions required to meet bracing values are 90×45mm for all walls.

Top plate connections

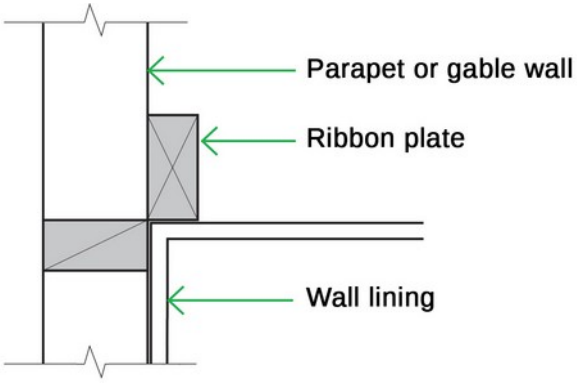
Top plate connections to be installed as per NZS3604:2011 section 8.7.3.

Parapet & gable end walls; bracing elements terminated below top plate

Magnum Board® MGO board bracing elements must be fixed to the top and bottom plates.

If a bracing element stops below the wall top plate, a continuous ribbon plate (e.g. 90×45mm) is to be fixed across studs above above an additional row of dwangs/nogs to fix the Magnum Board® MGO board bracing sheet. In these instances the minimum height for bracing elements is 1.8m.

Figure 2.



Bottom plate connections

Timber floor

*Bracing elements equal to or greater than 400mm but less than 600mm require hold down brackets to studs at each end of the element. Bracing elements greater than 600mm do not require hold down brackets; fix as per NZS3604:2011 table 8.19, 2/100 × 3.75mm hand nails or 3/90 × 3.15mm power-driven nails at 600mm centres minimum.

For elements requiring hold-down brackets outlined above, fixings required are as per MiTek® HandiBrac® specifications. As part of the HandiBrac® fix in to timber floors with BOWMAC® screw bolt or 150mm x 12mm diameter galvanised coach screw with uplift strength rated of 12kN minimum; for external walls locate the bracket on the ***exterior face*** of the wall frame; internal walls locate centrally and solid block between joists as required. Install all Tek screws supplied with HandiBrac® pack.

Concrete floor

*Bracing elements equal to or greater than 400mm but less than 600mm require hold down brackets to studs at each end of the element. Bracing elements greater than 600mm do not require hold down brackets; fix as per NZS3604:2011 section 7.5.12 – 7.5.12.4.

For elements requiring hold-down brackets outlined above, fixings required are as per MiTek® HandiBrac® specifications. As part of the HandiBrac® fix in to concrete floors with BOWMAC® screw bolt or 150mm x 12mm diameter galvanised coach screw with uplift strength rated of 15kN minimum; for external walls locate the bracket on the ***interior face*** of the wall frame; internal walls locate centrally. Take care to clear debris prior to installing bolt; do not exceed maximum clamping torque of 80Nm. Install all Tek screws supplied with HandiBrac® pack.

Length of bracing elements

Magnum Board® MGO board bracing elements lengths shall be determined as illustrated below.
*Bracing elements equal to or greater than 400mm but less than 600mm require hold down brackets to studs at each end of the element. Length of bracing elements (L) cannot be less than 400mm. Bracing fixings outlined further below in this document.

Refer to figures 3-6 illustrating bracing element length (L).

Figure 3.

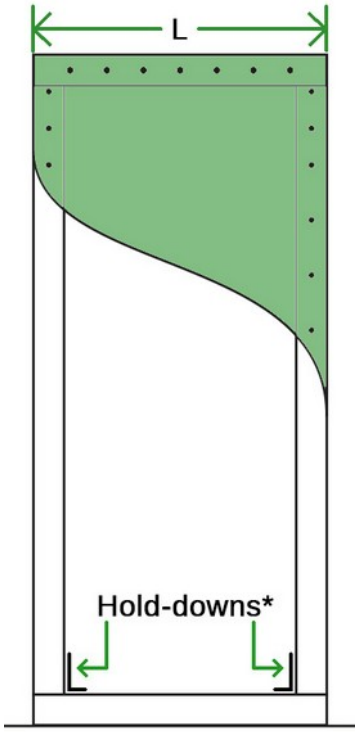


Figure 4.

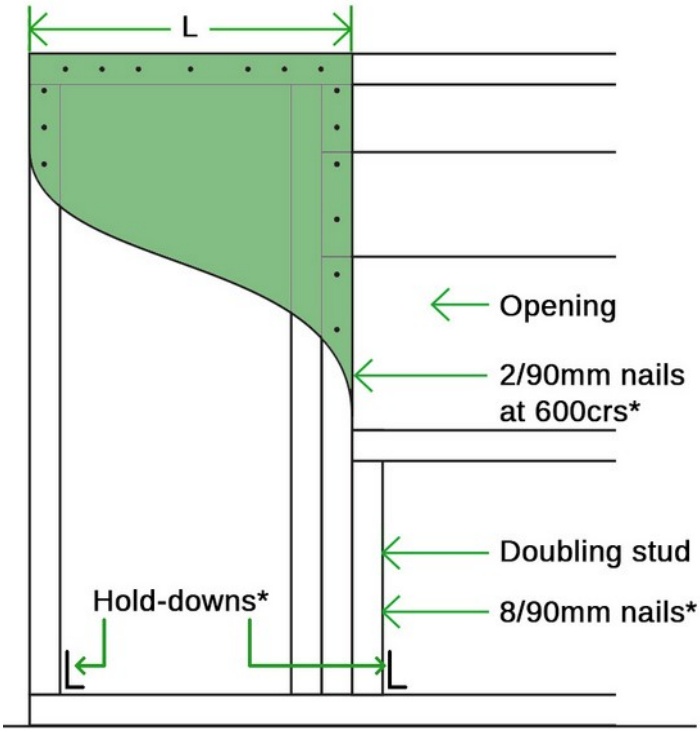


Figure 5.

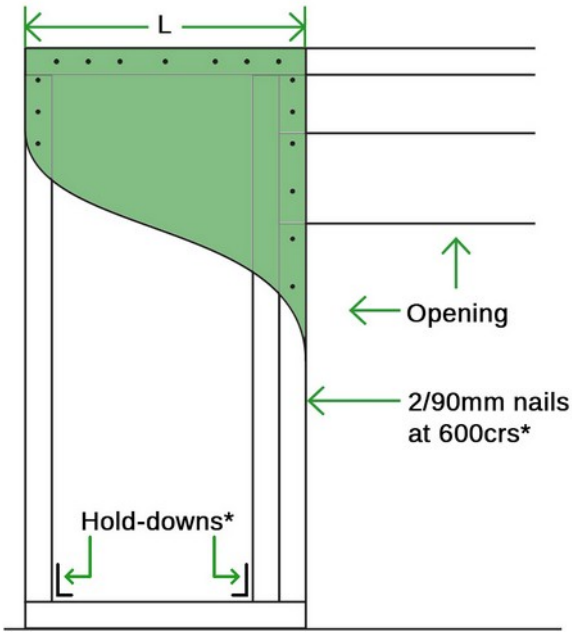
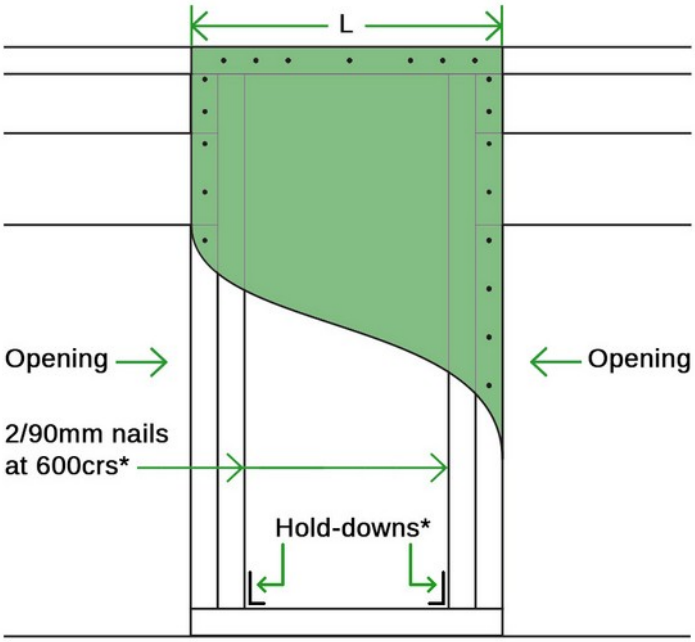


Figure 6.



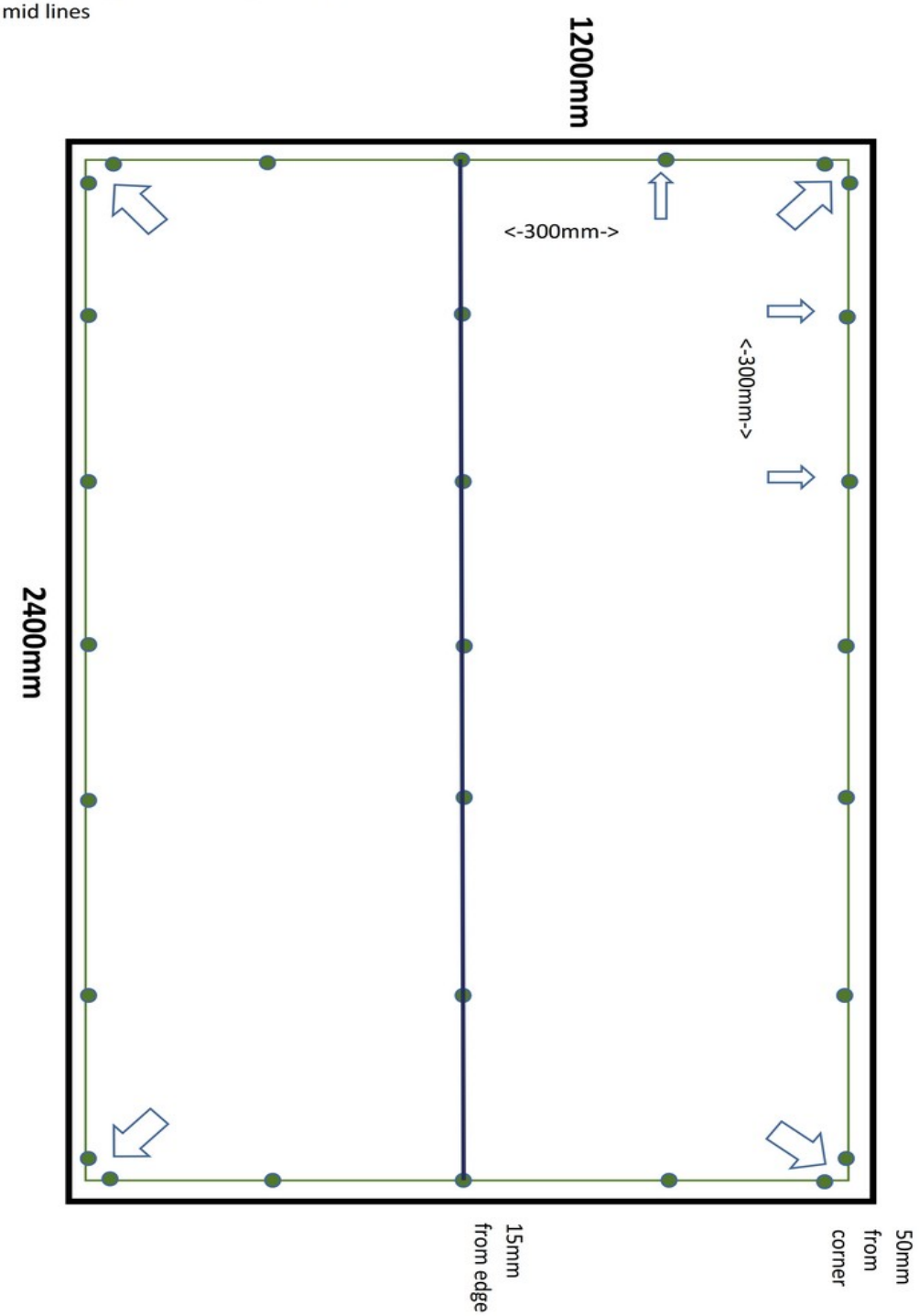
Note: For Magnum Board® MGO board bracing elements to perform adequately, they must be installed as prescribed in this documentation. Substitutions and variations may result in inadequate performance of bracing elements; leading to overall building performance compromises. For clarification and further guidance contact Health Based Building.

Magnum Board® MGO board sheet fixing

Typical fixing illustrated in figure 7 below; to be read in conjunction with specific bracing system specifications outlined in this document.

2400x1200x09mm, 2700x1200x09mm and 3000x1200x09mm wall and ceiling board sizes

Fixing Pattern
15mm in from perimeter edges
50mm in from corners
300mm apart along perimeter edges and
600mm mid lines



SYSTEM SPECIFICATIONS

Magnum Board® MGO board bracing 400mm – MG 0.4*

Code	Minimum length (mm)	Lining	Hold-downs
MG 0.4*	400*	9mm MGO board one side	Required*

	Wind	Earthquake
Total bracing units (BUs) achieved	30.8BUs	27.2BUs
Bracing units (BUs) achieved per meter	77BUs/m	68BUs/m

Wall Framing

Framing must comply with:
- NZBC B1/AS1, Structure clause 3 timber (NZS3604:2011)
- NZBC B2/AS1, Durability clause 3.2 timber (NZS3602)

All wall frames to be:
- 90 × 45mm minimum
- Studs at 600mm centres maximum
- 2x rows of dwangs/nogs minimum

In addition to the above requirements, wall frames (load bearing and non-load bearing) heights and dimensions to be designed as per NZS3604:2011. Laminated veneer lumber (LVL) is recommended; as a minimum, kiln dried stress graded timber is required.

Bottom Plate Fixing

Timber floor (Maximum bracing element limit: 120BUs/m)

- 2/100 × 3.75mm hand driven nails at 600mm centres maximum; or
- 3/90 × 3.15mm power driven nails at 600mm centres maximum.

Concrete Floor (Maximum bracing element limit: 150BUs/m)

Walls containing bracing elements fix as per NZS3604:2011 requirements for bottom plate fixing.

Wall Lining

- 9mm Magnum Board® MGO board lining
- Sheets to be fixed vertically, rebated edge to rebated edge.
- Full length sheets to be used as much as possible
- Sheet joints to be touch fitted

Alternatives/substitutions

There are no permitted alternatives or substitutions to Magnum Board® MGO board.

Jointing

Fastener heads to be stopped and sheet joints tape reinforced and stopped to achieve adequate strength as part of the specified bracing system.

Adhesive

Ultrabond S9771K construction adhesive

Fastening

Fasteners

Fortress Fasteners 6g x 32mm C3 Galvanised Collated Screws

Fastener centres

50, 250 then 300mm centres to studs, and 50, 250 to plates plus spot glued at 300mm centres around sheet perimeter. Install fasteners 15-20mm from sheet edges.

Note: For Magnum Board® MGO board bracing elements to perform adequately, they must be installed as prescribed in this documentation. Substitutions and variations may result in inadequate performance of bracing elements; leading to overall building performance compromises. For clarification and further guidance contact Health Based Building.

Magnum Board® MGO board bracing 600mm – MG 0.6

Code	Minimum length (mm)	Lining	Hold-downs
MG 0.6	600	9mm MGO board one side	Not required

	Wind	Earthquake
Total bracing units (BUs) achieved	46BUs	41BUs
Bracing units (BUs) achieved per meter	77BUs/m	68BUs/m

Wall Framing

Framing must comply with:
- NZBC B1/AS1, Structure clause 3 timber (NZS3604:2011)
- NZBC B2/AS1, Durability clause 3.2 timber (NZS3602)

All wall frames to be:
- 90 × 45mm minimum
- Studs at 600mm centres maximum
- 2x rows of dwangs/nogs minimum

In addition to the above requirements, wall frames (load bearing and non-load bearing) heights and dimensions to be designed as per NZS3604:2011. Laminated veneer lumber (LVL) is recommended; as a minimum, kiln dried stress graded timber is required.

Bottom Plate Fixing

Timber floor (Maximum bracing element limit: 120BUs/m)

- 2/100 × 3.75mm hand driven nails at 600mm centres maximum; or
- 3/90 × 3.15mm power driven nails at 600mm centres maximum.

Concrete Floor (Maximum bracing element limit: 150BUs/m)

Walls containing bracing elements fix as per NZS3604:2011 requirements for bottom plate fixing.

Wall Lining

- 9mm Magnum Board® MGO board lining
- Sheets to be fixed vertically
- Full length sheets to be used as much as possible
- Sheet joints to be touch fitted

Alternatives/substitutions

There are no permitted alternatives or substitutions to Magnum Board® MGO board.

Jointing

Fastener heads to be stopped and sheet joints tape reinforced and stopped to achieve adequate strength as part of the specified bracing system.

Adhesive

Ultrabond S9771K construction adhesive

Fastening

Fasteners

Fortress Fasteners 6g x 32mm C3 Galvanised Collated Screws

Fastener centres

50, 250 then 300mm centres to studs, and 50, 250 to plates plus spot glued at 300mm centres around sheet perimeter. Install fasteners 15-20mm from sheet edges.

Note: For Magnum Board® MGO board bracing elements to perform adequately, they must be installed as prescribed in this documentation. Substitutions and variations may result in inadequate performance of bracing elements; leading to overall building performance compromises. For clarification and further guidance contact Health Based Building.

Magnum Board® MGO board bracing 1200mm – MG 1.2

Code	Minimum length (mm)	Lining	Hold-downs
MG 1.2	1200	9mm MGO board one side	Not required

	Wind	Earthquake
Total bracing units (BUs) achieved	136BUs	121BUs
Bracing units (BUs) achieved per meter	113BUs/m	101BUs/m

Wall Framing

Framing must comply with:
- NZBC B1/AS1, Structure clause 3 timber (NZS3604:2011)
- NZBC B2/AS1, Durability clause 3.2 timber (NZS3602)

All wall frames to be:
- 90 × 45mm minimum
- Studs at 600mm centres maximum
- 2x rows of dwangs/nogs minimum

In addition to the above requirements, wall frames (load bearing and non-load bearing) heights and dimensions to be designed as per NZS3604:2011. Laminated veneer lumber (LVL) is recommended; as a minimum, kiln dried stress graded timber is required.

Bottom Plate Fixing

Timber floor (Maximum bracing element limit: 120BUs/m)

- 2/100 × 3.75mm hand driven nails at 600mm centres maximum; or
- 3/90 × 3.15mm power driven nails at 600mm centres maximum.

Concrete Floor (Maximum bracing element limit: 150BUs/m)

Walls containing bracing elements fix as per NZS3604:2011 requirements for bottom plate fixing.

Wall Lining

- 9mm Magnum Board® MGO board lining
- Sheets to be fixed vertically
- Full length sheets to be used as much as possible
- Sheet joints to be touch fitted

Alternatives/substitutions

There are no permitted alternatives or substitutions to Magnum Board® MGO board.

Jointing

Fastener heads to be stopped and sheet joints tape reinforced and stopped to achieve adequate strength as part of the specified bracing system.

Adhesive

Ultrabond S9771K construction adhesive

Fastening

Fasteners

Fortress Fasteners 6g x 32mm C3 Galvanised Collated Screws

Fastener centres

300mm centres to plates, end studs and centre studs. Install fasteners 15-20mm from sheet edges.

Note: For Magnum Board® MGO board bracing elements to perform adequately, they must be installed as prescribed in this documentation. Substitutions and variations may result in inadequate performance of bracing elements; leading to overall building performance compromises. For clarification and further guidance contact Health Based Building.

History

Health Based Building™ was formed in a joint venture with Hardie & Thomson in 2012. Hardie & Thomson have been resident on the Colombo Street site as timber and joinery suppliers since 1908.

HEALTH BASED BUILDING™

The brand that champions healthy and sustainable life spaces. Spaces where we live, work, sleep, eat, play. A healthy living environment that achieves human development goals whilst sustaining the ability of natural systems to continue the provision of natural resources and ecosystem services upon which the economy and society depends – sustainable development in the truest sense.

Everyone talks of the great, healthy outdoors. Yet, nearly all of us spend up to 90% of our time enclosed in buildings – indoors in some way or another. The problem is, as human beings, we don't ensure our well-being within any space. It's the external objects within the space around us that shape our health. The walls, floors, doors, paint, soft furnishings, fittings, substructure – everything and anything that is chemically advanced, synthetic, processed, or treated.

Health Based Building can help you, reassess what makes up your space by taking the search out of your equation. We have done it all for you. Whether you are building, renovating, or simply changing around a few things, Health Based Building is here to provide information and products for you to **make your space a healthy place.**

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TRADEMARKS

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