



BEAL Appraisal Certificate



Certificate BS1634

EXPIRES 28 February 2024

The Forest Mountain Light Gauge Steel Building System



Product

1.1 The 'Forest Mountain Light Gauge Steel Building System' is based on the use of a range of floor, wall and roof products, using a proprietary light gauge steel design and manufacturing process, incorporating windows and exterior doors, an interior wet area system, for the construction of residential housing, up to three stories in height.

1.2 The FM LGS BS is comprised of light gauge steel framing including insulation, thermal breaks & cavity system for walls, roof truss and suspended floor. The foundations, framing, insulation, linings and any applicable fire rating are to specific design.

1.3 The FM LGS BS is to be constructed under the supervision of an LBP and by persons trained and approved by Forest Mountain Limited or their authorised agents, in conformance with the Forest Mountain **Building Product Quality Plan** and **site checklists**.

NZ Building Regulations

2.1 In the opinion of BEAL, the Forest Mountain Light Gauge Steel Building System, when designed, installed and maintained in accordance with the statements and conditions of this Appraisal Certificate, will meet the following provisions of the New Zealand Building Code:

Clause B1 STRUCTURE

The FM LGS BS meets the requirements of Performance Clauses B1.3.1, B1.3.2, B1.3.3 (a), (b), (f), (g) and (h). Refer paragraph 6.2

Clause B2 DURABILITY

The FM LGS BS meets the requirements of Performance Clauses B2.3.1(a), (b) and (c). Refer paragraphs 6.3

Clause E2 EXTERNAL MOISTURE

The FM LGS BS meets the requirements of Performance Clause E2.3.1 and E2.3.2. Refer paragraphs 6.4

Clause E3 INTERNAL MOISTURE

The FM LGS BS meets the requirements of Performance Clause E3.3.1, E3.3.3, E3.3.4, E3.3.5 and E3.3.6. Refer paragraph 6.5

Clause F2 HAZARDOUS BUILDING MATERIALS

The FM LGS BS meets the requirements of Performance Clause F2.3.1. Refer paragraph 6.6

Clause H1 ENERGY EFFICIENCY

The FM LGS BS contributes to a building meeting the requirements of Clause H1.3.2E. Refer paragraph 6.7.

2.2 The Forest Mountain Light Gauge Steel Building System has been appraised, relying on both Acceptable and Alternative Solutions together with SED for demonstrating compliance, with the New Zealand Building Code.

Applicant:



Forest Mountain NZ Limited

21 Myers Grove
Churton Park, Wellington, 6037
Tel: +64 9 889 1253
E-Mail info@forestmountain.tech
www.forestmountain.tech

Appraiser:

BEAL

2A Plimmerton Drive
Plimmerton, Porirua, NZ
Tel: +64 233 6661
E-Mail: bts@beal.co.nz
www.beal.co.nz

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Scope and Limitations

3.1 The 'Forest Mountain Light Gauge Steel Building System' (FM LGD BS) is based on the use of a range of floor, wall and roof products, using a proprietary light gauge steel design and manufacturing process, incorporating the TAUCO suite of windows and exterior doors and proprietary interior wet area system, for the construction of residential housing, up to three stories in height, subject to:

- constructed with a (seismic) locality factor (Z) of up to 0.42 (Upper Hutt), in a temperate climate, with winds up to and including 55m/sec (extra high);
- the height of buildings shall be up to and including 10m from the finished ground level;
- the system shall use specific designed steel framing and shall incorporate either a SEO concrete foundation to a specific design, or, a proprietary floor system to SEO;
- the system is limited to use for residential housing including Residential 1, Residential 2, Residential 3 and Commercial 1 type of construction within the scope of the National Building Consent Authority Competency Assessment System, dated June 2010. i.e. stand-alone houses, multi-apartment dwellings and light commercial;
- the system shall be constructed in accordance with the technical and quality plan literature supervised by those trained and approved by Forest Mountain NZ Ltd;
- plumbing and other service fixtures and fittings will be sourced from NZ suppliers and site installed in accordance with the NZ Building Code;
- the roofing system and guttering will be sourced from NZ suppliers and installed in accordance with the NZ Building Code and the NZ Metal Roof and Wall Cladding Code of Practice.
- the FM LGS BS system shall be installed only by Forest Mountain NZ Ltd. trained and approved constructors under the supervision of an LBP.

3.2 The design and construction of any new replacement substructure, including control joints, or termination points or the like, are to be specific design and therefore the responsibility of the owner/building designer and are outside the scope of this Appraisal Certificate;

Technical Literature

4.1 The FM LGS BS Technical Literature Ver 3.3 Feb 2023 must be read in conjunction with this Appraisal. All aspects of design, use, installation and maintenance contained within the Technical Literature and scope of this Appraisal Certificate must be followed. For a copy of this Technical Literature and subsequent updates please contact Forest Mountain NZ Ltd.

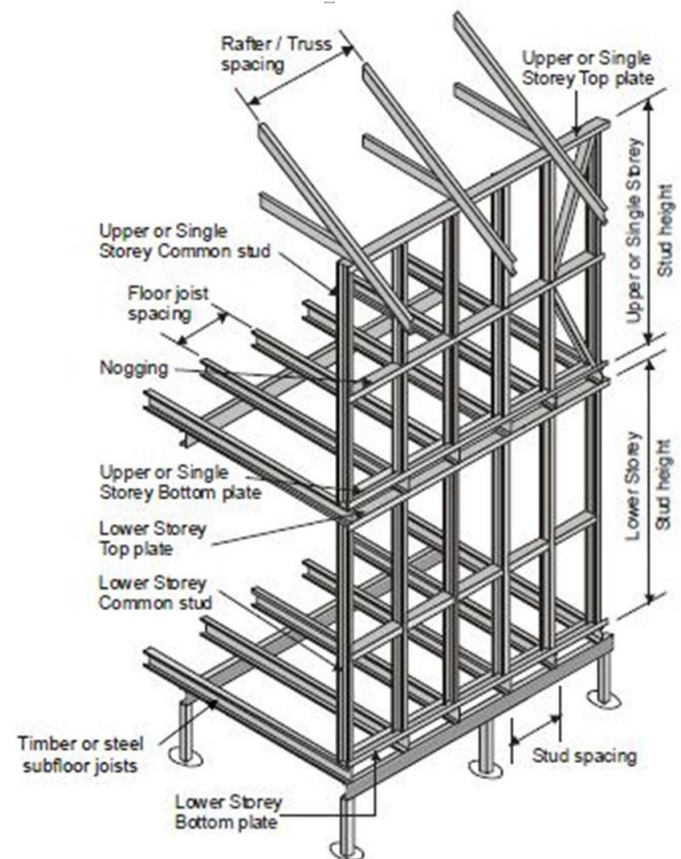
Technical Details

5.1 The Forest Mountain Light Gauge Steel Building System (FM LGS BS), as a system, consists of prefabricated, ready to be assembled building components, for residential buildings up to three storeys high.

5.2 The FM LGS BS complies with NZBC Clauses B1 Structure and B2 Durability for non-specific Design solutions for cold-formed steel-framing used in low-rise residential buildings including houses and low-rise light

commercial buildings. FM LGS BS consists of the following cold formed 'light gauge steel' (LGS) assembled components:

- Sub-floor;
- First-Floor, Mid-floor, Upper-Floor;
- Wall framing - (including prefabricated LGS wall panels with/without pre-installed windows, doors and wall insulation);



5.3 Structural and framing elements are designed using advanced roll-forming manufacturing equipment and software both meeting the NASH Standards with support for training and engineering processes. This will gain efficient design and faster construction with the FM LGS Building System.

Steel coils must meet the requirements of AS 4100 or AS/NZS 4600 in accordance with the NASH Standards. The corresponding light gauge steel (LGS) designs, connection solutions and site jobs must be checked and signed off by a suitably qualified structural engineer.

5.4 The FM LGS BS consists of:

The foundation is either an acceptable solution or SED (Specific Engineered Design) concrete slab and footing, or masonry perimeter, or pole/post footings, or proprietary ground screws.

Flooring material options include 20mm HD enhanced Fibre-cement sheet, or plywood sheet, or particle board/ OSB flooring material laid and screwed to LGS floor joists according to the manufacturer's instructions.

Wall Frames are typically a web of 70 - 100mm, based on wind zone and design specification.

Wall lining panels are constructed with exterior 10mm 20mm thick XPS board, attached to one or both sides of the LGS framing, with interior plasterboard fixed to the interior of the framing.

Insulation material can be either one of, or a mix of the following materials:

- ◆ XPS sheets or XPS Batten Strip / Thermal Break
- ◆ Rock Wool or Glass Wool or Natural Wool blend
- ◆ Sprayed Polyurethane (PU) foam.

Note: XPS sheeting is used on both exterior or interior of the LGS, while Rock Wool, glass/natural wool or PU foam are used only inside the frame cavity.

Roof Truss Framing is typically designed and manufactured the same as for the wall framing.

Exterior wall cladding can be any cladding solution installed over a frame protection system** that is compliant with the NASH Building Envelope Solutions 2019.

Cladding systems other than TAUCO weatherboard cladding system shall be to a specific design.

Roofing can be any roofing compliant roofing solution that is compliant with the NASH Building Envelope Solutions 2019. Other roofing systems shall be to a specific design.

Wet Area Linings will be a NZBC compliant membrane or acrylic liner applied over the selected wall panel with tiles over all waterproofed areas.

All building work shall be in accordance with the Forest Mountain Light Gauge Steel Building System Design Manual New Zealand V3.1 Feb 2021.

Handling and Storage

5.4 Before arrival of components, a flat, solid dry area shall be made ready. On arrival, components must be stored on the flat, solid dry area, out of the weather and ensure no damage prior to construction.

**NOTE: A frame protection system is comprised of either a proprietary rigid air barrier or a flexible air barrier system, incorporating sealing tapes and gaskets that prevents air and moisture penetrating the framing.



Advice for designers

6.1 General

As mentioned, the Forest Mountain Light Gauge Steel Building System (FM LGS BS), as a system, consists of prefabricated, ready to be assembled building components, for buildings up to three storeys high in accordance with the site-specific conditions and specifications. Information about the design and manufacture of the FM LGS BS is described in summary under the heading Technical Details. Before any design work can be carried out, it is essential that the designer has a good understanding of the system, described in detail in the FM LGS BS Technical Literature. Below is information to assist with the application of a building consent:

Clause B1 - Structure

6.2 The FM LGS BS meets the requirements of performance clause B1 through the use of proprietary design software that is in conformance with the NASH Standards Part 1 and Part 2.

Clause B2 - Durability

6.3 The FM LGS BS meets the requirements of performance clause B2 through the use of materials and construction processes that are in conformance with the NASH Standards Part 1 and Part 2.

Clause E2 - External Moisture

6.4 The FM LGS BS will comply with the requirements of this clause when the system is designed and constructed in accordance with the NASH Building Envelope Solutions 2019.

Clause E3 - Internal Moisture

6.5 The FM LGS BS will comply with the requirements of this clause when a NZBC compliant waterproofing membrane system is applied to walls and floors in wet areas, and tiled over.

Clause F2 - Hazardous Building Materials

6.6 The FM LGS BS, when designed and constructed according to the requirements of this appraisal meets this requirement and will not present a health hazard to people using the building.

Clause H1 - Energy Efficiency

6.7 The FM LGS BS, when designed and constructed according to the requirements of this appraisal contributes to a building performance index described in the NZBC.

Installation Requirements

7.1 Installation Skill Requirement

The FM LGS BS must be carried out by suitably experienced applicators under the supervision of a LBP and a person who has been trained and approved by Forest Mountain NZ Ltd.

7.2 Health and Safety

The safe use and handling of the many components of the FM LGS BS must be used in conjunction with the relevant materials safety data sheet from suppliers and manufacturers.

Basis of this Appraisal

BEAL use the compliance verification procedure to demonstrate compliance with the relevant clauses of the NZBC based on a risk analysis procedure. The following is a summary of the technical investigations carried out:

Assessments

8.1 The following assessments of the FM LGS BS have been undertaken by BEAL:

A review of testing, safety and technical literature supplied by Forest Mountain NZ Ltd.

In-Service History

8.2 The light gauge steel constructions have extensive in-service history as being in conformance with the NASH Standards and demonstrating compliance with the relevant performance clauses of the NZBC.

The proprietary design, manufacturing software solutions used by Forest Mountain NZ Ltd must be checked and signed off by a suitably qualified structural engineer. This has been reviewed and considered acceptable by BEAL.

Testing

8.3 Testing of the FM LGS BS has been undertaken by BEAL to verify compliance of the use of the foam rubber DPC, 20mm thick XPS sheet and the TAUCO Structural Cavity Batten to verify the material as a thermal break and fixing point for the TAUCO Insulating Weatherboard System, together with testing of the fluted Polypropylene board material used for flooring.

Testing of the TAUCO weatherboard cladding on cavity battens in a horizontal and vertical configuration was undertaken by Façade Lab in Auckland – an IANZ accredited laboratory.

Testing of the TAUCO Al-Mg Roof System (with secret thermal fixing clips) in accordance with AS 4040.1 Methods of testing sheet roof and wall cladding Method 1: Resistance to concentrated loads and AS 1562:1 Design and Installation of sheet roof and wall cladding Part 1: Metal, has been undertaken by Inspection and Certification Co. Ltd. (a CNAS accredited laboratory) to verify conformance with the Standard.

Testing of the TAUCO Al-Mg Roof System (with secret thermal fixing clips) in accordance with AS 4040.2 Methods of testing sheet roof and wall cladding Method 2: Resistance to wind pressures for non-cyclonic regions, has been undertaken by Inspection and Certification Co. Ltd. (a CNAS accredited laboratory) to verify conformance with the Standard.

Other investigations

8.4 BEAL have carried out an extensive review of the performance of 'light gauge steel framing systems used throughout the world. Though there has been little use in New Zealand compared with timber framing, overseas and local research indicates excellent long-term performance, especially in seismic prone environments.

8.5 The installation of the FM LGS BS was also evaluated through an assessment of 'constructability', potential risks of non-performance when being installed, any external factors that could affect the quality of the installed product.

Installation Information

8.6 The Technical and Installation literature has been

examined by BEAL and found to be satisfactory.

Quality Management

8.7 The design and supply of the framing is the responsibility of the designer and manufacturer of the Light Gauge Steel Framing.

8.8 The supply and construction of other components of the FM LGS BS is managed through the use of a Building Product Quality Plan.

8.9 Forest Mountain NZ Ltd.'s Building Product Quality Plan is reviewed and audited at least annually by BEAL or their appointed agent.

8.10 Building owners are responsible for the maintenance of those elements of the FM LGS BS which require periodic maintenance in accordance with the product manufacturer's instructions and this Appraisal Certificate.

Sources of Information

- The Building Regulations 1992, reprinted 1 January 2017
- AS/NZS2269 Plywood - Structural
- NASH Standards 1 & 2
- the NASH Building Envelope Solutions 2019
- NZS3109 Concrete Construction
- (NZ) Code of Practice for Internal Wet-area Membrane Systems
- FM LGS BS Technical Literature Ver 3.1 Feb 2021
- FM Product Quality Plan document dated May 2021
- Summary of testing carried out by BEAL Testing Services:
- Testing of bottom plate foam rubber DPC
- Thermal testing of the XPS sheet used as a thermal break
- Fixing pullout from the LGS framing
- Mechanical and structural testing of the TAUCO Cavity Batten (fluted PP sheet)
- Testing of tape adhesion and durability onto the XPS sheet
- Testing of a special wet area sealant/glue for use with TAUCO PP Board substrates
- Testing of TAUCO enhanced fibre-cement sheet used as a rigid air barrier and flooring substrate
- Buildability assessment of a scaled-down example of a floor, wall and roof truss including specified cladding system with window system.
- Structural report covering use of the TAUCO Cavity Batten material from engineers King & Dawson, dated 21 November 2019
- Weathertightness test report of the TAUCO Weatherboard cladding from Façade lab dated 18 August 2022
- Roofing resistance to concentrated loads test report from CMC dated 10th November 2022
- Roofing resistance to wind pressures loads for non-cyclonic regions test report from CMC dated 10th November 2022.

Concluding statement

9.1 In the opinion of BEAL, the FM LGS BS is fit for purpose and will comply with the NZBC to the extent specified provided that it is used, designed, installed and maintained as set out in this Appraisal Certificate.

9.2 The Appraisal Certificate is issued only to Forest Mountain NZ Ltd., and is valid until further notification, subject to the conditions of this Appraisal.

Conditions of Appraisal

10.1 This appraisal Certificate :

a) This appraisal Certificate:

Relates only to the Forest Mountain Light Gauge Steel Framing System as described herein;

Must be read, considered and used in full, together with the current version of the Technical Literature;

Does not address any legislation, regulations, codes or standards, not specifically named herein;

Is copyright of BEAL.

10.2 The Appraisal Certificate holder continues to meet the quality requirements of the Forest Mountain NZ Ltd. Building Product Quality Plan and has the plan audited and Appraisal certificate revalidated by BEAL on an annual basis.

10.3 Forest Mountain NZ Ltd. shall notify BEAL and obtain approval of any changes of the product specification or quality assurance prior to product being marketed including any trade literature, web site info or the like.

10.4 BEAL makes no representation as to:

- The nature of individual examples of, batches of, or individual installations of the product, including methods and workmanship.

- The presence or absence of any patent or similar rights subsisting in the product or any other product;

- Any guarantee or warranty offered by the Appraisal Certificate holder.

10.5 BEAL's verification of the building product or system complying with one or more of the above- mentioned criteria is given on the basis that the criteria used were those that were appropriate to demonstrate compliance with the NZBC at the date of this Appraisal Certificate. In the event that the criteria is withdrawn or amended at a later date, this Appraisal may no longer remain valid.

10.6 Any reference in this Appraisal Certificate to any other publication shall be read as a reference to the version of publication specified in this Appraisal Certificate.

Authorised Signatory



C R Prouse - Director

BEAL (Building Element Assessment Laboratory Limited)

[Updated February 2023]

