

LiteSteel beam Part 1 Introduction

Residential Construction Manual For LiteSteel® beam

LiteSteel Technologies

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1.1 Scope

This publication provides span tables for using the LSB in common structural applications in typical timber-framed or steel-framed residential construction within the limitations given in Section 1.2. It is also limited to Class 1 and Class 10 buildings as defined by the Building Code of Australia. The span tables for floor members, wall members and roof members are contained in Sections 6, 7 and 8 respectively, together with the specific design criteria used to calculate the values in the tables.

Section 2 contains a full specification of the LSB, and Sections 3 and 4 provide all of the general loading and design criteria which have been used in this publication for the preparation of the tables. Section 5 gives guidance on various construction details relating to the use of the LSB in residential construction and typical connection details with capacities are provided in Section 9.

The span tables in this publication may also be applicable to the use of the LSB in other classes of buildings where the design criteria, loads and other parameters applicable to those classes of building are within the limitations of this publication.

1.2 Limitations

1.2.1 General

The information contained in this document is provided specifically for the use of the LSB in conventional timber-framed or steel-framed buildings in residential construction, and is applicable to single and two storey construction built within the limits and parameters given in Sections 1.2.2 to 1.2.10 and Figure 1.1.

1.2.2 Wind Classification

For wind loads, the simplified wind classifications from AS 4055 have been adopted. The wind classifications included in this publication are:

- **Non-cyclonic areas: N2 to N5**
- **Cyclonic areas: C1 and C2**

If AS/NZS 1170.2 is used to determine the design wind loads, the ultimate limit state design wind pressures calculated in accordance with this standard must be equal to or less than that for the AS 4055 wind classification used in this document.

Note that while span tables are not provided specifically for wind classification N1, it is appropriate to use the tables for wind classification N2 instead.

1.2.3 Plan

Building shapes shall be essentially rectangular, square, L-shaped or a combination of essentially rectangular elements including splayed-end and boomerang-shaped buildings.

1.2.4 Number of Storeys

The number of storeys of timber or steel framing must not exceed two.

1.2.5 Width and Length

The width (W) of a building (including roofed verandahs but excluding eaves) must not exceed 16.0 m, and the length (L) must not exceed five times the width (see Figure 1.1).

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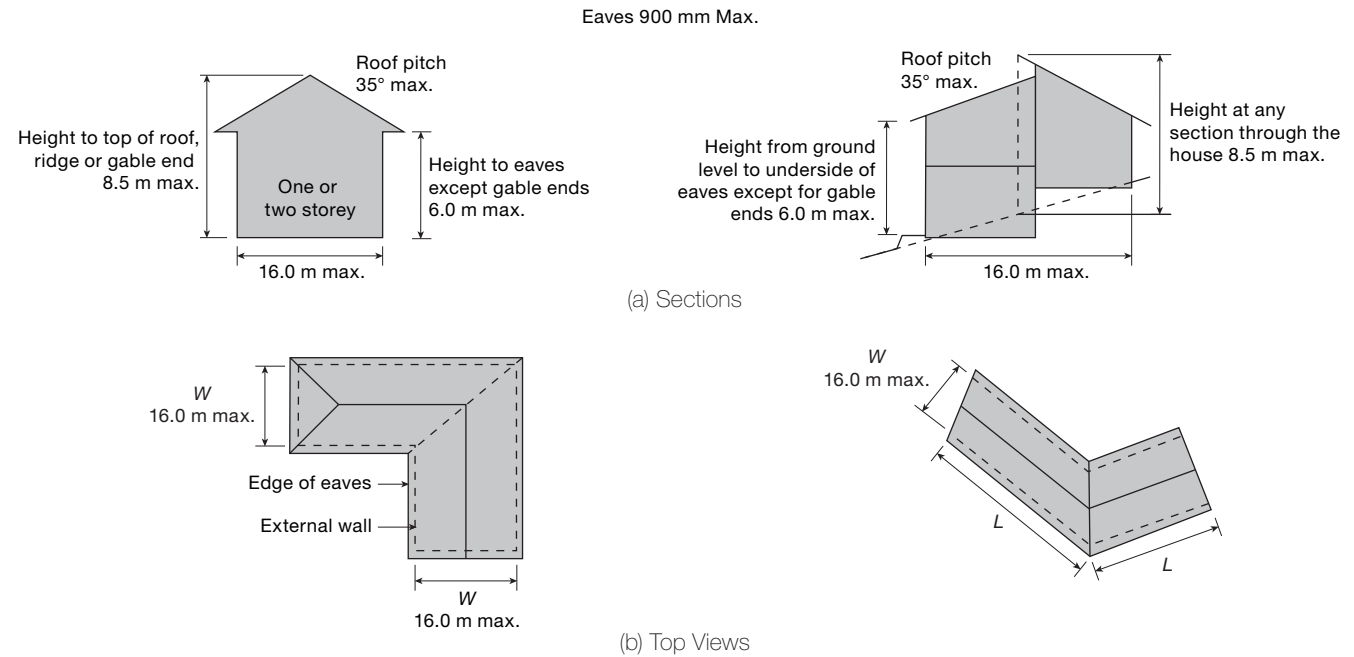
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Figure 1.1: Geometric Building Parameters



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1.2.6 Wall Height

The distance from ground level to the underside of eaves must not exceed 6.0 m, and from ground level to the highest point of the roof (neglecting chimneys) must not exceed 8.5 m.

1.2.7 Roof Pitch

The maximum roof pitch shall not exceed 35°.

1.2.8 Spacing of Bracing

The spacing of bracing elements in the building must comply with the requirements of AS 4055.

1.2.9 Roof Types

Roof construction may be hip, gable, skillion, cathedral, trussed or pitched or any combination of these.

Two types of roof cladding are included in span tables where appropriate. These are:

- Sheet metal roof
- Tile roof

1.2.10 Building Masses

Building masses relevant to each member type are presented with the tables. Prior to selecting and designing from the span tables, the designer must determine the building mass appropriate for the member being designed.

The mass of a member being designed has been accounted for in the development of the span tables.

Refer to Section 3 for details of masses used in this document.

1.3 Terminology and Definitions

The terminology and definitions given in this section are used throughout this publication. Some of the common applications of LSB members in typical residential framed structures are illustrated in Figure 1.2.

Balcony

An external trafficable floor area of a house, being more than 1 m above ground level.

Bearer

A sub-floor member supporting the floor joists.

Ceiling Load Width (CLW)

The contributory width of ceiling, usually measured horizontally, that imparts ceiling load to a member.

Combined Hanging / Strutting Beams

Single span beams installed within the roof space supporting roof loads via struts to the top edge, and ceiling loads from ceiling joists from the bottom edge.

Continuous Span

The span of a member with supports at both ends and at one or more intermediate point.

Floor Load Width (FLW)

The contributory width of floor, measured horizontally, that imparts floor load to a member.

Floor Joist

A member that directly supports the flooring.

Flooring or Decking

Boards or sheets overlying floor joists intended to support floor loads.

Hanging Beams

Single span beams installed within the roof space to provide support for ceiling joists where supporting walls are widely spaced.

Imposed Load

A variable load resulting from the intended use or occupancy of the structure.

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Limit States

States beyond which the structure no longer satisfies the design criteria.

Lintel

The horizontal stiffening member in a wall frame spanning an opening.

Loadbearing Wall

A wall that supports roof loads, floor loads, or both roof and floor loads.

Non-Loadbearing Wall

An internal partition wall not supporting roofs or floors.

Permanent Load

A load that is likely to act continuously and for which variations in magnitude with time are small compared to the mean value.

Rafters

Members which run parallel to the fall of the roof and support roof battens or purlins. They may also support ceilings, either directly or via ceiling battens or joists.

Roof Beams

Ridge or intermediate beams that support rafters, and run perpendicular to the slope of the roof.

Roof Load Width (RLW)

The contributory width of roof, measured along the slope of the roof, that imparts roof load to roof members and loadbearing wall members and their supporting structure.

Serviceability Limit States

States that correspond to conditions beyond which specified service criteria for a structure or structural element are no longer met (the criteria are based on the intended use and may include limits on deformation, vibratory response, degradation or other physical aspects).

Sheet Roof

A roof clad with sheet metal, metal tiles and other metal deck roofing up to 10 kg/m².

Single Span

The span of a member supported at both ends with no intermediate supports.

Spacing

The centre-to-centre distance between parallel structural members.

Span

The centre-to-centre distance between supports to structural members.

Strutting Beams

Near horizontal, single span beams installed within the roof space, clear of ceilings which provide support to under-purlins via struts.

Tile Roof

A roof clad with slate, terracotta or concrete tiles of mass up to 60 kg/m².

Verandah Beams

Beams which span between posts and support roof loads imposed by rafters or trusses.

Ultimate Limit States

States associated with collapse, or with other similar forms of structural failure (this generally corresponds to the maximum load-carrying resistance of a structure).

1.4 Limit States Design

All values presented in the Tables are calculated in accordance with the Limit States Design requirements of AS/NZS 1170.0, AS 4055, AS/NZS 4600 and other applicable Standards. All wind speeds and wind pressures specified in this document are limit state values.

1.5 Units

The units in the tables are consistent with those in the SI (metric) system. The base units used in the tables are:

Property	Units	Symbol
Force	Newton	N
Length	Metre	m
Mass	Kilogram	kg
Stress	Megapascal	MPa

All spans presented in the tables are rounded to the nearest 0.1 m (100 mm).

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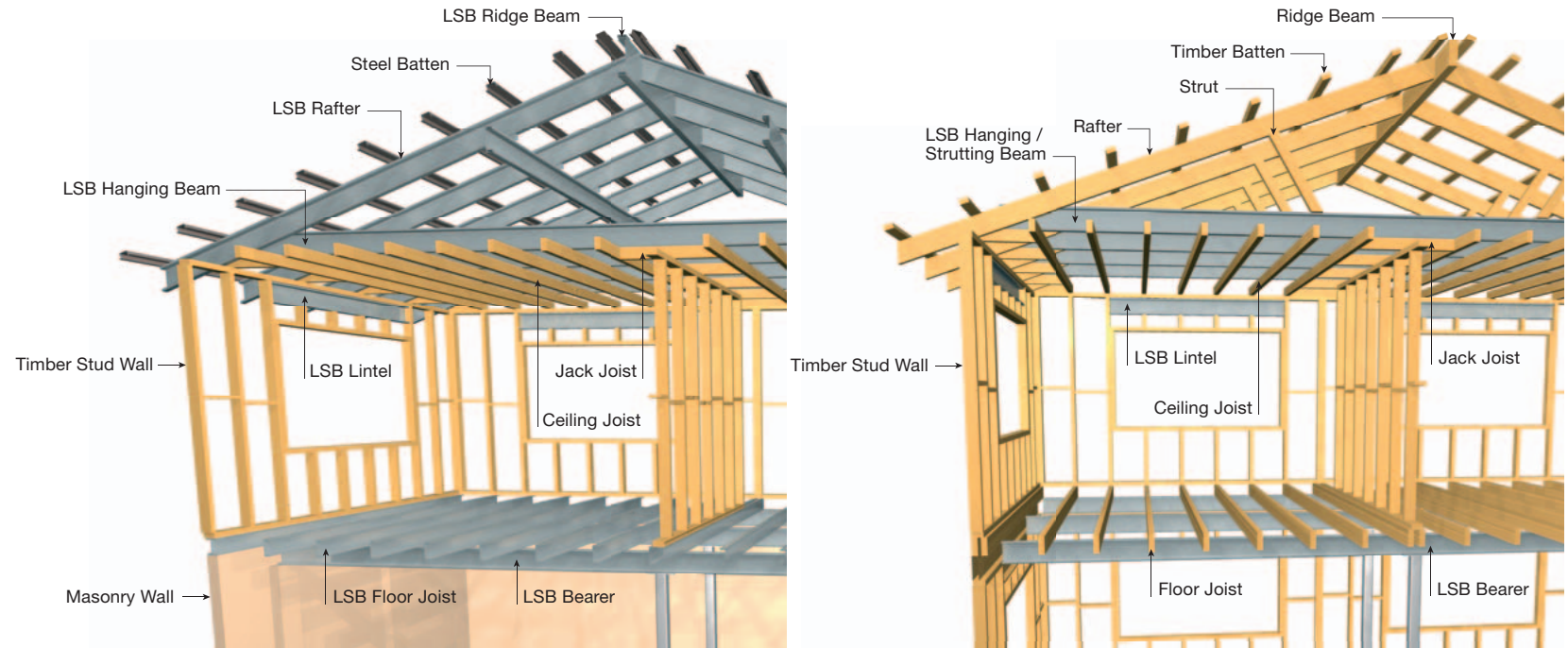
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Figure 1.2: Typical LSB Framing Members



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1.6 Table Format and Usage

The span tables are divided into three groups:

- Section 6: Floor Members
- Section 7: Wall Members
- Section 8: Roof Members

Preceding the span tables for each member type (e.g. floor joists), the specific design assumptions and design loads applicable to that member type are documented, and the method of determining the load width to be used in the tables is illustrated.

1.7 References

1.7.1 Referenced Standards

"AS 1111.1" refers to AS/NZS AS 1111.1: 2000 ISO metric hexagon bolts and screws – Product grade C – Bolts.

"AS 1112.3" refers to AS/NZS AS 1112.3: 2000 ISO metric hexagon nuts – Product grade C.

"AS 1237.1" refers to AS/NZS AS 1237.1: 2002 Plain washers for metric bolts, screws and nuts for general purposes – General plan.

"AS/NZS 1170.0" refers to AS/NZS 1170.0: 2002 Structural design actions Part 0: General principles.

"AS/NZS 1170.1" refers to AS/NZS 1170.1: 2002 Structural design actions Part 1: Permanent, imposed and other actions.

"AS/NZS 1170.2" refers to AS/NZS 1170.2: 2002 Structural design actions Part 2: Wind actions.

"AS/NZS 1170.3" refers to AS/NZS 1170.3: 2003 Structural design actions Part 3: Snow and ice actions.

"AS 1170.4" refers to AS 1170.4: 1993 Minimum design loads on structures Part 4: Earthquake loads.

"AS/NZS 1554.1" refers to AS/NZS 1554: 2004 Structural steel welding – Welding of steel structures.

"AS 1684.1" refers to AS 1684.1: 1999 Residential timber-framed construction Part 1: Design criteria.

"AS 1684.2" refers to AS 1684.2: 1999 Residential timber-framed construction Part 2: Non-cyclonic areas.

"AS 1684.3" refers to AS 1684.2: 1999 Residential timber-framed construction Part 3: Cyclonic areas.

"AS 3566.1" refers to AS 3566.1: 2002 Self-drilling screws for the building and construction industries Part 1: General requirements and mechanical properties.

"AS 3566.2" refers to AS 3566.2: 2002 Self-drilling screws for the building and construction industries Part 2: Corrosion resistance requirements.

"AS 3623" refers to AS 3623: 1993 Domestic metal framing.

"AS 4055" refers to AS 4055: 1992 Wind loads for housing.

"AS 4291.1" refers to AS 4291.1-2000 Mechanical properties of fasteners made of carbon steel and alloy steel – Bolts, screws and studs.

"AS/NZS 4600" refers to AS/NZS 4600: 1996 Cold-formed steel structures.

1.7.2 Other References

AISI 2001, "North American Specification for the Design of Cold-Formed Steel Structural Members", American Iron and Steel Institute, Washington DC, USA.

Buildex 2004, "Product Catalogue and Selection Guide – 2004, Self-Drilling Screws and Rivets", ITW Buildex, Victoria, Australia.

LST 2007a, "Design Capacity Tables for LiteSteel® beam", LiteSteel Technologies, Brisbane, Australia.

LST 2007b, "Connection Design Manual for LiteSteel® beam", LiteSteel Technologies, Brisbane, Australia.

Syam, A. A. 1992, "Beam Formulae", Steel Construction, Vol. 26, No. 1, Australian Institute of Steel Construction, March 1992. (Note: AISC is now ASI – the Australian Steel Institute.)



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