

# Part 1

## INTRODUCTION

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## INTRODUCTION

### 1.1 General

The LiteSteel beam (LSB) is a cold-formed high strength steel beam manufactured from a single steel strip on a custom designed and built Dual Electric Resistance Welding (DERW) mill similar to that used for manufacturing circular, square and rectangular hollow sections. It has a channel shape with hollow flanges which give the section high torsional rigidity, contrary to traditional channels.

This publication provides connection design methods and limit state connection capacity tables for a range of standard structural connections which can be used with the LSB. This Connection Design Manual should be read in conjunction with the Design Capacity Tables for LiteSteel® beam (LST 2007a) which provides design aids for member design.

The following design manuals also contain connection details and capacities for specific applications:

- ➔ Residential Construction Manual for LiteSteel® beam (LST 2007b)
- ➔ Industrial & Commercial Floors using LiteSteel® beam (LST 2007c)

### 1.2 Scope

The primary connection types considered in this manual are:

- ➔ Flexible Connections (simple beam connections transmitting shear forces only)
- ➔ Rigid connections (beam connections transmitting bending moment)
- ➔ Base plates (“pinned” base, transmitting axial and shear forces only)
- ➔ Purlin Cleats

Design models and connection capacities are not provided for rigid connections until they are verified by testing. However, some possible configurations for these connections are provided, and design methods discussed in general terms.

Details of various miscellaneous connections are also provided in Part 8.

### 1.3 Design Methods

The designs for all connections to the LSB presented in this manual comply with the provisions of AS/NZS 4600 Cold-formed steel structures where applicable. However, many connection components are hot rolled steel angles, flats or plates, and are therefore designed in accordance with the provisions of AS 4100 Steel structures.

The design models for the connections are generally taken from two sources: Hogan and Thomas (1994) and Syam and Chapman (1996). These design models are modified as required to substitute the design rules from AS/NZS 4600 which apply to the LSB. The designs in these references are based on AS 4100. All such modifications to the design models are noted in the relevant part of this manual.

### 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 4100, AS/NZS 4600 and other applicable standards.

### 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

Except for some minor exceptions, all values in the Tables are rounded to three (3) significant figures.

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### 1.6 Table Format and Usage

The main tables listing design capacities for connections are located at the end of the text portion of each Part of this publication. Tables are numbered firstly in accordance with the Part number in which they occur, and then by the type of information being provided.

Dimensions and section property tables for the current range of LiteSteel beam are also provided in Part 2. This is included to eliminate the need to refer to the Design Capacity Tables (LST 2007a) for this information.

### 1.7 References

#### 1.7.1 Referenced Standards

“AS 1110.1” refers to AS 1110.1: 2000 ISO metric hexagon bolts and screws – Product grade A and B Part 1: Bolts.

“AS 1111.1” refers to AS 1111.1: 2000 ISO metric hexagon bolts and screws – Product grade C - Bolts.

“AS 1112.1” refers to AS 1112.1: 2000 ISO metric hexagon nuts – Style 1 – Product grades A and B.

“AS 1112.3” refers to AS 1112.3: 2000 ISO metric hexagon nuts – Product grade C.

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

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

“AS/NZS 1252” refers to AS/NZS 1252: 1996 High strength steel bolts with associated nuts and washers for structural engineering.

“AS/NZS 1553.1” refers to AS/NZS 1553.1: 1995 Covered electrodes for welding – Low carbon steel electrodes for manual metal-arc welding of carbon steels and carbon-manganese steels.

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

“AS 2203.1” refers to AS 2203.1: 1990 Cored electrodes for arc-welding – Ferritic steel electrodes.

“AS/NZS 2717.1” refers to AS/NZS 2717.1: 1996 Welding – Electrodes – Gas metal arc – Ferritic steel electrodes.

“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 3678” refers to AS 3678: 1996 Structural steel – Hot-rolled plates, floorplates and slabs.

“AS 3679.1” refers to AS 3679.1: 1996 Structural steel – Hot-rolled bars and sections.

“AS 4100” refers to AS 4100: 1998 Steel structures.

“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.

ANSI/AWS D1.3 Structural Welding Code – Sheet Steel.

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

Hogan, T.J. & Thomas, I.R. 1994, “Design of Structural Connections”, 4th ed., Australian Institute of Steel Construction (Note: AISC is now ASI – the Australian Steel Institute).

Packer J.A. & Henderson, J.E. 1997, “Hollow Structural Section Connections and Trusses – A Design Guide”, Canadian Institute of Steel Construction, Ontario, Canada.

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Packer J.A., Wardenier, J., Kurabane, Y., Dutta, D., & Yoemans, N. 1992, "Design Guide for Rectangular Hollow Section (RHS) Joints under Predominantly Static Loading", CIDECT and Verlag TÜV Rheinland.

SSTM 2003, "Design Capacity Tables for Structural Steel Hollow Sections", Smorgon Steel Tube Mills, Brisbane, Australia.

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

LST 2007b, "Residential Construction Manual for LiteSteel® beam", LiteSteel Technologies, Brisbane, Australia.

LST 2007c, "Industrial & Commercial Floors using LiteSteel® beam", LiteSteel Technologies, Brisbane, Australia.

Syam, A. A. & Chapman, B. G. 1996, "Design of Structural Steel Hollow Section Connections", Vol. 1 Design Models, first edition, Australian Institute of Steel Construction (Note: AISC is now ASI – the Australian Steel Institute).

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