

Laminated Veneer Lumber





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LVL is a modern engineered wood composite product (EWP) made from rotary peeled veneers laid up with parallel grain orientation. A primary feature of LVL is to disperse or remove strength-reducing characteristics of wood by lessening natural defects such as knots, slope of grain and splits that are inherent in sawn timber. The veneers are placed in a specific sequence or "recipe" to maximise the potential of the stiffer and stronger veneer grades.

LVL is a high quality product that is more uniform and offers improved structural properties over sawn timber.

For the consumers protection all LVL sourced from Lumberworx Ltd is manufactured in mills approved by EWPA (Australia) or APA – The Engineered Wood Association (USA) and stamped with the mill number and grade. LVL sourced from the USA has been independently accredited by a New Zealand chartered engineer as meeting the requirements of the New Zealand Building Code (see Lumberworx website).

Lumberworx Ltd distributes 2 grades of LVL in 45 & 63mm – E11 & E13, and one grade in 90mm – E14. The 'E' refers to the elasticity of the member which indicates stiffness in the same way as SG 8 and SG 10 does for sawn timber and GL 8 and GL 10 does for Glulam.

Structural Reliability

The structural properties for LVL are determined by testing in accordance with the requirements of AS/NZS 4357:2005 Structural Laminated Veneer Lumber for New Zealand product and ASTM D5456 (The Standard Specification for Evaluation of Structural Composite Lumber Products) for merchandise from USA.

"I have structurally reviewed the data and methodology for deriving the structural properties for Louisiana Pacific Laminated Veneer Lumber, grades E13 and E14. The derivation of the properties has been performed by H R Design Group Ltd, Queensland Australia.

The structural properties shown in table 2 are consistent with the requirements of the NZ Building Code, B1 Structure and may be used for the specific design of timber components utilising NZS 3603:1993 Timber Structures Standard.

Connections may be designed using NZS3603:1993 J4 joint group properties."

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Table 1: Structural Properties for Nelson Pine Industries Laminated Veneer Lumber Grades E11 & E13

Property	Unit	LVL 13 Values	LVL 11 Values	
Modulus of Elasticity	E	GPa	13.2	11.0
Modulus of Rigidity	G	MPa	660	550
Bending*	(f'b)	MPa	48.0	48.0
Tension parallel to grain#	(f't)	MPa	33.0	30.0
Compression perpendicular to grain	(f'p)	MPa	12.0	12.0
Compression parallel to grain	(f'c)	MPa	45.0	45.0
Shear in Beam	(f's)	MPa	6.0	6.0

* Bending values for 90mm depth - use chart below for depths above 90mm

Tension parallel to grain for 150mm depth - use chart below for depths above 150mm

Size Factor k_{24} for Strength of LVL

Depth of LVL member (mm)	90	150	200	240	300	360	400	460	610
* Bending	1.00	0.93	0.88	0.85	0.82	0.79	0.78	0.76	0.73
# Tension parallel to grain	1.00	1.00	0.96	0.92	0.89	0.86	0.85	0.83	0.79

For shear and compression, size factor = 1.0

For tension perpendicular to grain, refer to AS 1720, 1:1997

Data supplied by Nelson Pine Industries Ltd.

Table 2: Characteristic Structural Properties of LP LVL Grades E13 & E14

Grade	Edge					Flat					Axial	
	f_b^1	f_s	$f_{c,perp}$	E	G	f_b^3	f_s	$f_{c,perp}$	E	G	f_c	f_t^2
	MPa	MPa	MPa	GPa	MPa	MPa	MPa	MPa	GPa	MPa	MPa	MPa
E13	40.2	5.3	12.0	13.2	660	38.0	3.1	7.4	12.3	615	32.3	23.7
E14	44.8	5.3	12.0	14.0	700	43.2	3.1	7.4	13.7	685	43.9	26.7

- The edge bending strength shown is normalised for 300mm deep section. For other depths, adjust the bending strength by multiplying by the size factor $(300/d)^{0.143}$ (not to exceed 1.19), where d = depth of section considered.
- The tension strength shown is normalised for 150mm deep section. For deeper sections, adjust the tension strength by multiplying by the size factor $(150/d)^{0.167}$, where d = depth of the section considered.
- The flat bending strength shown is normalised to the standard LVL section widths. Flat-wise bending strength does not need to be adjusted for size factor.

Data supplied by Louisiana Pacific.



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Design Software

Lumberworx Ltd recommends HR Design Group software for the determination of member sizes and grades.

HR Design Group is a leader in engineering design software which can be downloaded from their web site.

Visit HR Design direct on www.hrdesigngroup.com.au

Over the past 10 years, HR Design Group has been involved in the development of software for major timber producers in Australia and around the Pacific Rim. The program has been a progressive and continuous development of engineering design techniques and innovations and is driven by widespread use of their software and their extensive engineering and design expertise.

HR Design Group software has created such a demand by designers that a growing number of manufacturers have provided HR Design Group with permission to include their products in the software. This now includes Lumberworx I-Beams, LVL and other EWP's available from Lumberworx, which allows a single design program for the majority of EWP brands available in New Zealand.

The software allows simple selection between Australia and New Zealand building standards and this has been audited by Lignum Structural Ltd for New Zealand conditions.

This is an important tool for designers and engineers as an independent and impartial appraisal of timber performance

"I have reviewed the structural design methodologies, along with the loading, strength and deflection criteria for the HR Design software QD V2 and I am satisfied that use of the software by appropriately qualified persons will provide suitable member selections. To ensure compliance with Section B1 of the New Zealand Building regulations 1992 selected members must be installed in accordance with manufacturers' instructions or NZS3604:2011."

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 Lignum Structural Ltd



LVL Section Sizes Available from Lumberworx				
	35mm	45mm	63mm	90mm
LVL 11 Truss & Frame Packs only Fixed Lengths	90x35	90x45 115x45 140x45 190x45 240x45		
LVL11 Structural	150x35 170x35 200x35 240x35 300x35 360x35	150x45 170x45 200x45 240x45 300x45 360x45 400x45	150x63 170x63 200x63 240x63 300x63 360x63 400x63 460x63 610x63	
LVL 13 Structural		150x45 170x45 200x45 240x45 300x45 360x45 400x45	150x63 170x63 200x63 240x63 300x63 360x63 400x63 460x63 610x63	
LVL 14 Structural				150x90 200x90 240x90 300x90 360x90 400x90 460x90* 610x90* * Special Order



Technical Details

Fixing of LVL

All fixings for LVL are to be in accordance with NZS3604:2011.

Where LVL is to be used for applications other than residential dwellings, specific design of joints is recommended.

Deep Joist Restraint

For deep floor joists, i.e. where the depth of a floor joist exceeds four (4) times its thickness, continuous blocking or strutting is required at mid span to comply with Clause 7.1.2.3 of NZS3604:2011.

Permanent Blocking

To conform with NZS3604:2011 Clause 7.1.2.2 & 7.1.2.4 permanent blocking is required along all lines of support between every second floor joist spacing to assist with buckling restraint and lateral load transfer to the walls below. Alternatively a rimboard may be fixed to the ends of LVL joists.

Holes in Floor Joists

Holes in uniformly loaded floor joists (excluding overhangs) are to be in accordance with NZS3604:2011. Clause 7.1.7. In summary holes will be:

- Within the middle third of the joist depth
- Not more than 3 times the depth of the joist from the face of a support (to the far side of the outer hole)
- Not more in diameter than one-fifth the depth of the joist or 32mm, whichever is less
- At minimum spacing measured along the joist between the edges of the holes of not less than the depth of the joist.

If holes are required in floor joists outside the scope of NZS3604:2011, specific engineering design will be required.

Notches & Birdsmouths in Rafters

Notches & Birdsmouths are permitted in accordance with NZS3604:2011 Clause 10.2.1.3.6 where the net depth of the rafter at the notch shall not be less than 80% of the actual rafter depth, nor less than 65mm. The bearing width is not to be less than 32mm.

Rip Sawing of LVL

LVL may be ripped along the board to achieve a smaller standard section depth without affecting the basic strength properties (such as ripping a 300mm board to 240mm). It is important that the new member is not cut undersize.

Never rip LVL through the thickness to achieve a narrower section size (such as ripping a 63mm member to 45mm) as this may change the structural properties of the member.

Multiple Members – Nailing/Screwing Patterns

The use of double or triple section beams (except pole bearers) relies on the effective load transfer between members to ensure the two beams act together as a single member.

The nailing pattern specified in NZS 3604:2011 at Clause 2.4.4.7 is satisfactory for top loaded laminations but for side loaded applications additional nailing will be required.

The following is recommended for side loaded beams:

35mm and 45mm LVL

240mm or less in depth
50mm in from ends and both edges, a row of nails 200mm apart on both sides of the laminated member (total 4 rows of nails)

Over 240mm in depth
50mm in from ends and both edges, and at the centre line, a row of nails 200mm apart on both sides of the laminated member (total 6 rows of nails)

For the purposes of lamination, the nails are to extend approximately 90% of the combined member thickness.

63mm LVL

For 63mm LVL members screws will be required to achieve adequate penetration

240mm or less in depth
50mm in from ends and both edges, a row of screws 200mm apart on both sides of the laminated member staggered on alternate sides (total 4 rows of screws)

Over 240mm in depth
50mm in from ends and both edges, and at the centre line, a row of screws 400mm apart on both sides of the laminated member (total 6 rows of screws)

Triple Sections

Laminate two sections as above then fix the third lamination with the same pattern.

NOTE: Side loaded beams must be securely restrained within the floor space to ensure the member cannot rotate.

LVL Durability

Short Term Exposure to Humid Conditions and Weather

Exposure of LVL to the weather for a limited time when framed into a structure is acceptable and will not result in any structural damage. Exposure to weather for longer periods could result in some swelling and discoloration.

Laminated Members

Laminated members exposed to weather during construction may accumulate and trap moisture between the individual sections. Lumberworx recommends a bead of elastomeric adhesive to the edge of each join and a temporary waterproof membrane covering the laminated member while the member is exposed to weather.

Treatment

The most effective treatment for LVL is LOSP (Light Organic Solvent Preservative) to Hazard class H3.1. All treated LVL members supplied by Lumberworx are treated at a facility approved for this treatment. After cutting or drilling through LOSP treated LVL the cut should be repaired with a product such as Metalex or Osmose "Reseal".

Sub-floors

Untreated LVL is permitted for subfloor applications – Reference NZS3602:2003 Table1 – C (1C.1)

Protect all LVL built members from the weather by covering sub-floor members with external cladding.

Midfloors

Untreated LVL may be used in midfloor applications (except for boundary joists and rimboards) - Reference NZS3602:2003 Table1 – E (1E.2). Also note comment C110.3.1 for possible treatment of flooring and floor framing under wet areas (described as laundries, bathrooms, kitchens & toilets).

LVL Boundary joists, rimboards and beams in external framing are to be H3.1 LOSP treated.

Members Not Exposed to Weather

Untreated LVL can be used for roof trusses, pitched rafters with open space above the ceiling line and in unlined buildings - Reference NZS3602:2003 Table1 – E (1E.1 & E.3).

Members Protected from Weather Applications (with some risk of moisture penetration)

LVL can be used in sheltered situations where direct exposure to the weather is avoided. For enclosed balcony framing, flat roof framing and enclosed skillion roof framing, LOSP treatment to H3.1 is required.

External Use

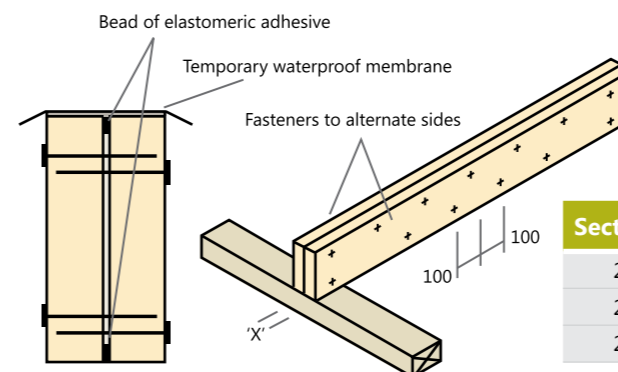
LVL is not suited to external applications where exposed to weather.

Storage and Handling of LVL

All timber, including LVL may expand when exposed to moisture. To maintain the benefits of LVL as a dry, straight and true material it is recommended that these be:

- Stacked flat and straight on evenly spaced bearers
- Stacked clear of the ground with good ventilation
- Stored under cover to keep dry prior to installation
- Re-wrapped after opening packs

Fastening Arrangement for Double Section LVL Beams

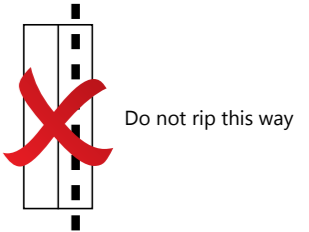


Section Size 'X'	Fastener Type & Size
2 x 35mm	75mm x 3.06mm power driven nails
2 x 45mm	90mm x 3.15mm power driven nails
2 x 63mm	100mm x 6.3mm Type 17 screws

Ripping of LVL



OK to rip this way



Do not rip this way

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