NelsonPine
Laminated Veneer Lumber LVL

LVL FRAMING TECHNICAL DATA SHEET

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NPIL/JULY2017

An Introduction to NelsonPine LVL

NelsonPine Laminated Veneer Lumber (LVL) is a structural engineered wood product manufactured from rotary peeled veneers, assembled with parallel grain orientation and bonded with an exterior structural adhesive.

LVL is built up with a specific sequence of structurally graded veneer sheets resulting in a finished product that has less variability, a higher strength:stiffness ratio and more predictable performance than sawn timber.

The continuous press system used in the manufacture of NelsonPine LVL means that deeper and longer product dimensions are available in LVL than in sawn timber, whilst using a similar log specification as the raw material.

Advantages of NelsonPine LVL Framing

NelsonPine LVL is an excellent alternative to conventional sawn timber or cold rolled steel framing. LVL is manufactured to achieve consistent strength, stiffness and stability.

- NelsonPine LVL is straight and less prone to distortion than sawn timber.
- The LVL manufacturing process means the product is highly consistent allowing efficient engineering design.
- LVL is resistant to bow, crook and twist, so less time is spent straightening walls.
- NelsonPine LVL H1.2 Framing is glue line treated plus surface coating with Azotek, which gives it a complete cross section treatment, which can be cut, drilled and machined without any need for retreatment of exposed surfaces.
- LVL is available in longer lengths than sawn timber.
- LVL is an Acceptable Solution as per NZS 3640 for treatment and NZS 3604 Clause 2.3.9 for timber framing.

Environmental Benefits of NelsonPine LVL Framing

NelsonPine LVL is produced in a modern technologically advanced manufacturing plant which has strict environmental controls on plant and product emissions. Burning of wood waste generated at Nelson Pine provides most of the on-site thermal energy requirements making the manufacture of NelsonPine LVL greenhouse neutral. Timber construction has been internationally accepted as an "environmentally responsible" choice, when compared to alternative materials such as steel, concrete or aluminium.

- NelsonPine LVL is manufactured from locally grown renewable plantation radiata pine.
- NelsonPine LVL is Forestry Stewardship Council (FSC) certified.
- Nelson Pine Industries Ltd is accredited by Telarc with ISO 14001 Environmental Management Certification.

Quality Systems at Nelson Pine Industries Ltd

Nelson Pine Industries Ltd has stringent quality systems covering the management systems, the LVL production process and LVL product properties.

Nelson Pine Industries is independently third party audited by the Engineered Wood Products Association of Australasia (EWPAA) and by Telarc.

The EWPAA Product Certification Scheme provides the framework for the NelsonPine LVL certification to AS/NZS 4357 Structural Laminated Veneer Lumber. Conformance with AS/NZS 4357 makes NelsonPine LVL suitable for NZS 3603 and NZS 3604 structural applications.

Nelson Pine Industries Ltd is accredited by Telarc with ISO 9001 Quality Management Systems Certification.

NelsonPine LVL Product Specification

Actual Size: 90x45 mm & 140x45 mm with arrised corners.

Timber Species: Radiata Pine.

Adhesive: Phenolic producing Type A Bond in accordance with AS/NZS 2098

Moisture Content: Approximately 10-12% ex plant.

Formaldehyde Class: Eo in accordance with Table 1, AS/NZS 4357.0

Treatment: H1.2 Azotek full cross section treatment as per NZS 3640, which is an acceptable solution as per Amendment 8 B2/AS1 of the New Zealand Building Code and can be confidently used where H1.2 Boron timber is used.

Use of Fasteners: The actives in the Azotek H1.2 treatment are non-corrosive to common timber fasteners including bright steel, zinc plated and galvanised coatings. The joint strength group of nails and screws in NelsonPine LVL 8 is J5 for face and edge.

Structural Properties: *Refer to Table 1.*

NelsonPine LVL as an Acceptable Solution of the New Zealand Building Code

NelsonPine LVL 8 H1.2 and LVL 11 H1.2 are suitable to be substituted as an acceptable solution in place of No. 1 Framing, SG6 and SG8 sawn timber as ordinary timber in timber framed buildings within New Zealand as per NZS 3604 Timber Framed Buildings Clause 2.3.9. NelsonPine LVL 8 H1.2 and LVL 11 H1.2 will meet the structural and durability requirements of the NZ Building Codes Clauses B1 and B2 when installed correctly in accordance with NZS 3604 and NZS 3602.

Durability of NelsonPine LVL

The radiata pine veneers used in the manufacture of NelsonPine LVL are treated to H1.2 using the Azotek H1.2 glue line plus surface treatment process as per NZS 3640 Chemical Preservation of Round and Sawn Timber.

The dark brown Phenol Formaldehyde thermosetting adhesive that is used in the manufacture of NelsonPine LVL produces a Type A-bond that is durable and permanent under conditions of full weather exposure and long term stress. Formaldehyde based resins have been well proven and documented as a structural adhesive in the wood industry for over 70 years. The adhesive bond is regularly tested during manufacturing process in accordance with the quality assurance program independently audited by the Engineered Wood Products Association of Australasia.

Table 1. NelsonPine LVL 8 & 11 Limit State Design Characteristic Values

Property		LVL 8 (MPa)	LVL 11 (MPa)
Modulus of Elasticity (average)	MoE	8000	11000
Modulus of Elasticity (lower bound)	MoE	7000	9900
Bending Strength	f'b	30.0	38.0
Tension Parallel to grain	f't	20.0	26.0
Compression Parallel to grain	f'c	30.0	38.0
Compression Perpendicular to Grain	f'c	7.0	10.0
Shear in Beams Edge	f's	5.0	5.0

All values are in the edge orientation as a joist

Moisture Content of NelsonPine LVL

When exposed to moisture during construction NelsonPine LVL may swell due to the uptake of moisture, as will sawn timber.

The width of product (90 or 140 mm) will exhibit reversible swell, returning to its original width once the moisture content has reduced to original, however the thickness (45mm) exhibits some irreversible swell due to the slight compression in the hot press during the manufacturing process. The amount of compression released will depend on the highest moisture content that the LVL reaches.

Table 2. Dimensional Swell: Approximate dimension of framing at a given moisture content

Moisture Content %		Thickness mm	Width mm	Width mm	Length mm
10%		44.8	90.0	140.0	2400.0
14%	Likely internal framing moisture content in a modern air conditioned building.	**45.7**	**90.7**	**141.1**	**2400.1**
20%		46.5	91.8	142.9	2400.3
29%	Fibre Saturation Point – no further swelling occurs.	47.2	93.5	145.4	2400.8

Moisture Content measurement in NelsonPine LVL (developed by Scion Research Institute)

Using a resistance type moisture meter:

1. It is recommended that a resistance type moisture meter with a sliding hammer type electrode is used to test the moisture content of framing.
2. The resistance moisture meter should be calibrated to AS/NZS 1080.1
3. Drive the sliding hammer electrode into the stud, with the probes driven to 1/3 of the depth of the timber being measured (15 mm for 45 mm thick NelsonPine LVL).
4. Take the measurement, and record the measurement and the location of the stud.
5. Test studs approximately mid-height, with the probes parallel to the grain into the inner side of the studs.
6. Repeat from step 3 by testing ten studs throughout the house.
7. After testing ten studs, use Table 3 to convert the moisture meter readings.
8. Acceptable moisture content for closing in a building is typically when nine out of ten corrected measurements are less than or equal to 20% (33% uncorrected reading).
9. In practice, this means 9 out of 10 unconverted meter readings must be 33 or less.

Table 3: Conversion of resistance moisture meter readings to true moisture content for NelsonPine LVL

If a resistance type moisture meter reads:																										
8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	**33**	34
Corrected moisture content (%) is:																										
6	6	7	8	8	9	10	10	11	11	12	13	13	14	14	15	15	16	16	17	17	18	18	19	19	**20**	20

Handling of NelsonPine LVL

NelsonPine LVL can be handled in much the same way as sawn timber. LVL can be cut, drilled and machined using traditional hand tools, power tools and CNC machinery. The LVL veneers are slightly densified during the manufacturing process making nailing into the face of the LVL harder than sawn pine. Pneumatic and larger impulse nail gun drivers have been successful in driving nails home in NelsonPine LVL, however the smaller nail guns that many builders use have struggled to drive the nail all the way in and need to be hand hammered home.

Health and Safety Precautions when using NelsonPine LVL

General

- All work with LVL should be carried out in such a way as to minimise the generation of dust and vapours.
- Under factory conditions, sawing, drilling, sanding etc should be done with equipment fitted with exhaust devices capable of removing dust and vapour at source. Hand power tools should only be used in well ventilated areas so as to avoid the spread of dust and vapours.
- Storage and work areas should be well ventilated.
- Work areas should be cleaned at least daily and dust removed by vacuum cleaning or wet sweeping method.

Skin Protection

- Wear loose, comfortable long-sleeved shirts and trousers.
- After handling LVL, wash with mild soap and water. Do not scratch or rub the skin if it becomes irritated.
- Wash work clothes regularly and separate from other clothes. Comfortable work gloves meeting the requirements of AS/NZS 2161 should be worn.

Respiratory Protection

- A Class P2 or higher filter respirator should be worn when sawing, drilling, sanding etc.
- Respirators should comply with AS/NZS 1716 and be selected, used and maintained in accordance with AS/NZS 1715.

Eye Protection

- Safety glasses or non-fogging goggles meeting the requirements of AS/NZS 1337 should be worn when sawing, drilling, sanding etc.

Storage of NelsonPine LVL

To ensure the full benefits of NelsonPine LVL as a dry, straight, distortion free material are available at the time of installation, the following recommendations regarding storage are made:

- Stack on evenly spaced level bearers to keep flat and straight.
- Stack well clear of the ground for good ventilation.
- Store under cover to keep dry prior to installation.
- Take care to re-wrap remaining material after opening.

Additional Information for Fabricators

Frame & Truss Manufacture

The swelling in the thickness of the LVL is partially irrecoverable and can typically sit at 46-47 mm during construction if wet but swelling will reduce slightly once the framing is enclosed and dries out. For multiple studs the swelling in each stud can compound to cause bowing in frames and around openings. The following practices can reduce the effect:

- Cover the finished frames with plastic for delivery to site.
- Under size dwangs/nogs by 1-2 mm to allow for swelling. Exact dwang length varies by climate, season and accuracy of cut.
- Leave end dwangs/nogs to be installed by the builders at the time of lining to reduce the effect of bowing on frame squareness. Alternatively install a sliding end dwang/nog that can be fixed onsite by the builder to suit.
- Using the NelsonPine LVL 8 Stud charts or NelsonPine Design software to increase stud spacing, reducing the number of studs.
- Use the strength of LVL to minimise the amount of multiple studs under load bearing applications.
- If the fabricator is using trenched top and bottom plates ensure the trenches are a minimum 48 mm wide to accommodate thickness swell of the stud.
- Use a sawn timber bottom plate or Hiandri plate packers to minimise bottom plate swelling.

Additional Information for Builders

Prevention of Swelling in LVL Frames

- The best way to prevent swelling of LVL is by enclosing the frames as soon as possible or by choosing a dry period of installation.
- Bottom plate packers such as Hiandri are available that keep the bottom plate off the slab, clear of water pooling and have good airflow around the framing (Refer to Hiandri Installation Manual).
- Allow floors to drain by drilling drainage holes in the floor plate.
- Cut out bottom plates in door openings as soon as possible. This mitigates longitudinal swelling in the bottom plate of the frames.
- Install plasterboard lining 10 mm off floor as per manufacturers' recommendations. This mitigates width variances in the bottom three veneers in the bottom plate that may be swollen.

Weather Exposure

Exposure of NelsonPine 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 long periods of time can result in swelling and discolouration.

Provided the product can be enclosed within the building and allowed to dry to below 20% moisture content prior to lining, the product will be structurally fit for purpose.

Surface Appearance

NelsonPine LVL is a structural material and the face veneers may contain characteristics such as knots, small knot holes, scarf joints and glue marks. The surface may be planed or sanded and painted or stained or left unfinished. It should be noted that a sanded or planed surface makes the product more susceptible to surface swelling and cracking due to lathe checks becoming exposed in the outer veneer.

Appendix

Mould and Fungi on LVL

Mould is a surface growth that can occur under favourable temperature and moisture conditions, but does not cause structural degradation. Most mould growth on LVL will show as black spots which will cease growth below 18% moisture content and can be cleaned with oxalic acid.

H1.2 Azotek treated NelsonPine LVL has a short term resistance to mould growth, but Azotek is primarily formulated to protect against fungal decay, as this spreads through and attacks the cell structure, causing structural degradation.

Fungal attack can occur even in H1.2 treated product after prolonged periods of exposure under the conditions conducive to fungal growth. Where high moisture exposure has been for extended periods, the LVL may need to be investigated for structural integrity. It is not possible to generalise on how long an excessive exposure period is, as it depends on local conditions. Where it is suspected decay has set in, replace the component or ask your supplier for advice.

Swelling Remedial Techniques

If the framing does get wet and construction is to continue:

- Enclose the frame as soon as possible.
- Knock out dwangs/nogs in frames to keep the frame end studs straight. Replace dwangs/nogs before lining once the moisture content is below 20%.
- Do not line the frames until the moisture content is below 20%.
- If planing is necessary, then planing the top and bottom veneers is allowable to return them to their original thickness, however it is unadvisable to plane LVL width wise as it will shrink back to an undersized member once equalised to internal moisture content conditions.

References and Sources of information

- NelsonPine LVL H1.2 MSDS
- NelsonPine LVL Product Technical Statement
- NelsonPine LVL Specific Engineering Design Guide
- NelsonPine LVL Stud Framing Brochure
- NelsonPine Design software, available at www.nelsonpine.co.nz
- New Zealand Building code
- NZS 3602 – Timber and Wood-based Products for use in Building
- NZS 3603 – Timber Structures Standard
- NZS 3604 – Timber Framed Buildings
- NZS 3640 – Preservation of Round and Sawn Timber
- Scion Procedure for testing MC of NelsonPine LVL
- Scion report; Moisture meter correction figures for NelsonPine LVL Framing. December, 2015 available at www.nelsonpine.co.nz
- BRANZ Bulletin BU585; Measuring moisture content in timber and concrete

NelsonPine Laminated Veneer Lumber LVL ®

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PRODUCT CERTIFIED paa ENGINEERED WOOD AS/NZS 4357.0

Telarc. Registered Quality ISO 9001

Telarc. Registered Environment ISO 14001

Plantation Grown. All veneers used in the manufacture of NelsonPine LVL are peeled from sustainable plantation grown Pinus Radiata logs.

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