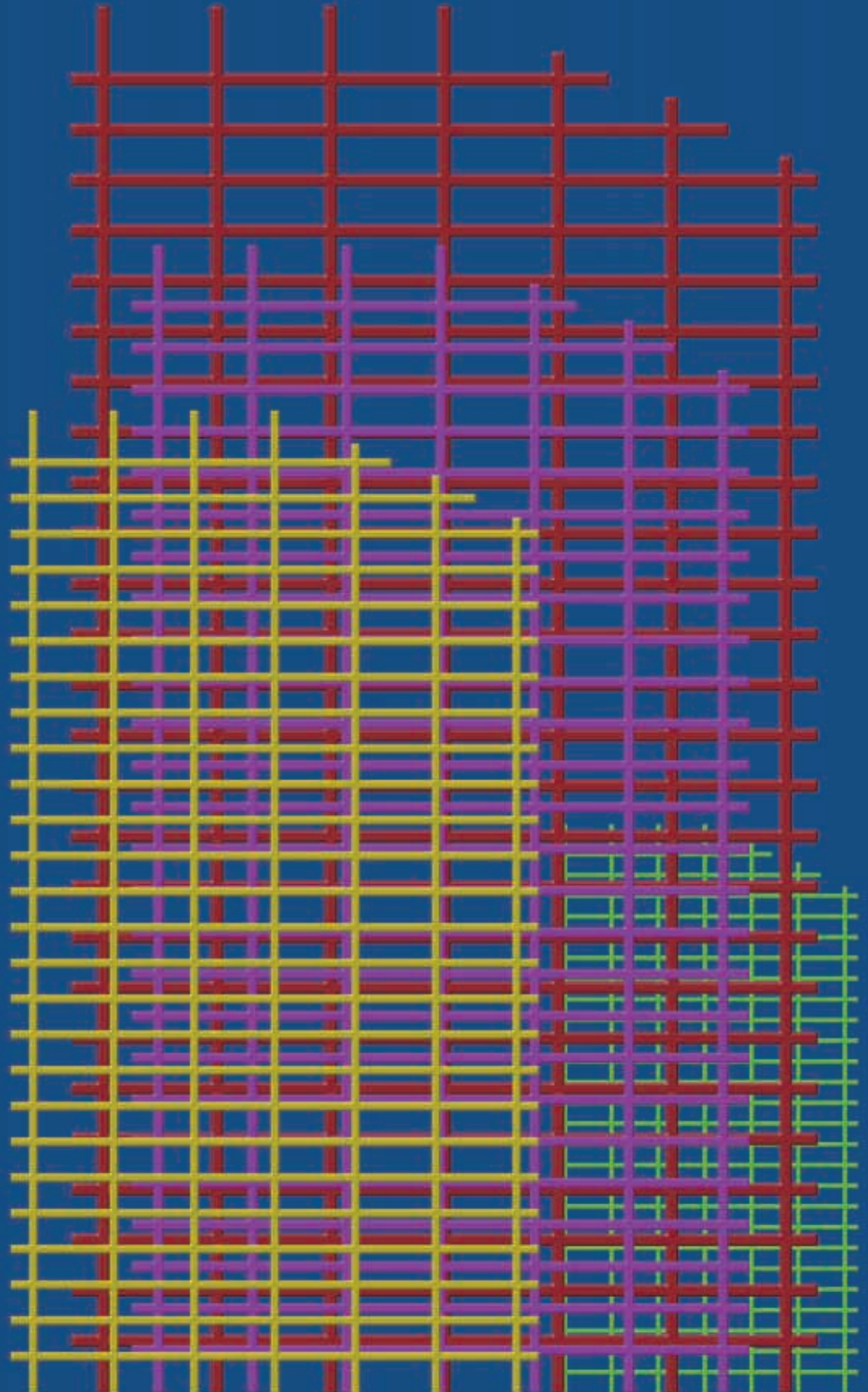




NP FORM

LVL FORMWORK BEAMS

NZ/AUS E11



**LVL
FORMWORK
BEAMS**

**DESIGN GUIDES
&
SPAN TABLES**

Introduction

NP FORM is structural Laminated Veneer Lumber (LVL) manufactured by Nelson Pine Industries Limited under the trade name NelsonPine LVL. NP FORM is intended for use as concrete formwork - Joists, Bearers, Walers, Soldiers and Supports.

Manufacture

NelsonPine LVL is an engineered wood composite made out of rotary peeled veneers, laid up with grain orientation parallel to each other and bonded with an adhesive. One of the main purposes of LVL is to disperse or remove strength-reducing characteristics. NelsonPine LVL is an engineered, highly predictable, uniform lumber product, because natural defects such as knots, slope of grain and splits have been dispersed throughout the veneer assembly or have been removed altogether. In addition to this, the veneer sheets are placed in a specific sequence and location within the product to maximise the potential of the stiffer and stronger veneer grades. This can be considered as an engineered configuration of the veneers. Using highly sophisticated continuous billet pressing technology and microwave pre-heating, it is pressed as a 1.250m nominal width continuous billet in various standard thicknesses. It can be docked to any specified length and ripped into standard widths for use as structural elements. NP Form is dimensionally stable, resists warping and twisting and is machined to consistently uniform sizes.

Structural reliability

The structural properties for NP FORM have been determined by testing in accordance with the requirements of AS/NZS 4357.0:2005 Structural Laminated Veneer Lumber.

LVL Grade

NP FORM is manufactured from NelsonPine LVL-E11 grade LVL.

Characteristic Properties - E11 Grade

Property	Unit	Characteristic	
		Value	
Modulus of Elasticity (MoE)	GPa	11.0	
Bending (f _b)	MPa	48.0	
Tension parallel to grain (f _t)	MPa	30.0	
Compression perpendicular to grain			
Parallel to gluelines (2.5mm indentation) (f _p)	MPa	12.0	
Perpendicular to gluelines (2.5mm indentation) (f _p)	MPa	12.0	
Compression parallel to grain (f _c)	MPa	45.0	
Shear in beam (f _s)	MPa	6.0	

Characteristic Stress

For strength properties, characteristic stress or strength is the lower 5-percentile value determined with 75% confidence, based on tests on a representative sample from full size test specimens. For stiffness properties, the characteristic value is the mean value.

Veneer

Thickness	2.5 to 3.6mm
Species	Radiata Pine
Grade	CD – Metriguard graded
Joints	scarf / overlap / butt

Joint group	JD5	Fixings parallel to gluelines
	JD4	Fixings perpendicular to gluelines

Density	560kg/m ³
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Moisture content

The average moisture content of NP FORM is 8 to 15%

Dimensional tolerances

Dimensional tolerances applying to NP FORM are as follows:

	Plus	Minus
Length:	15mm	0mm
Depth:	2mm	2mm
Thickness:	2mm	2mm

Adhesive

The adhesive used in the manufacture of NP FORM is Phenol Formaldehyde (Type "A", AS 2754.1 - 1985).

Branding of NelsonPine LVL

For your protection, NP FORM is branded with the product manufacturer as well as the PAA JAS/ANZ product certification marking. Look alike substitution products may not perform to the same high standards.

Do not accept unauthorised substitute materials.



Finish

Arris's removed (3mm chamfer)

Water repellent sealer-colour blue

Standard NP FORM Sections and Mass

NP FORM Size	Mass
dx (mm)	kg/m
95x47	2.5
95x65	3.5
130x65	4.7
130x77	5.6
150x77	6.5

Other section sizes available on request

Standard available lengths in metres

6.0, 5.4, 4.8, 4.2, 3.6, 3.0

Other lengths available to suit your requirements up to 12.0.

Structural Design - NZ/AUS E11

The span data and standard designs provided in this document have been obtained in accordance with, and satisfy the following Australian and New Zealand design standards:

AS3610	1995 Formwork for Concrete inclusive of Suppl. 1 & 2
AS1720.1	1997 Timber Structures Part 1: Design Methods
NZS 3603	1993 Timber Structures Standard. Incl. of Suppl. 1

The design capacities have been obtained using the following factors:

For AS1720.1, $\phi = 0.85$, $k_1 = 0.97$

For NZS3603, $\phi = 0.90$, $k_1 = 0.80$

NP FORM span tables and design guide may be used for formwork to construction works identified as having importance levels 1 and 2.

When this is not the case, mandatory design verification is required by a suitably qualified person.

Assumptions

The designs assume that the formface used provides lateral restraint to the joists. Therefore, connections should be made between the two at no greater than 600mm centres along the joists.

Storage and Handling

NP FORM is supplied in plastic wrapped and strapped form. It is recommended, that in order to achieve the maximum re-use potential, the following rules are followed:

NP FORM is to be kept dry during storage and transport

Store under a ventilated cover and place fillets between each layer

Stack NP FORM clear of ground on at least three evenly spaced bearers

Bearers and fillets should be placed vertically in line and support the NP FORM evenly and flat

Avoid mechanical damage during handling

Re-seal cut edges with a water repellent paint

Application of Capacity Tables

NP FORM is structural Laminated Veneer Lumber manufactured in accordance with AS/NZS 4357.0:2005 by Nelson Pine Industries Ltd, Nelson, New Zealand.

The capacity tables have been prepared to assist designers and builders in the selection of Formwork Joists, Bearers and Support framing.

Reference should be made to AS 3610-1995 plus supplements 1 & 2 and a Structural Engineer experienced in timber construction for details and methods of developing lateral restraint, providing adequate support, as well as overall stability, which are outside the scope of this publication.

Substitution

All Load span tables in this document are designed using the in-grade tested properties of NelsonPine LVL. Other LVL manufacturers may have different properties and therefore cannot be designed using these Load span tables.

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NP FORM Design load and deflection table - NZ/AUS E11

Section Size mm	Clear Span m	Maximum Design Load kN/m	Deflection for Unit Load mm/(kN/m)	Loads for Deflection Limits		Maximum Design Load kN/m	Deflection for Unit Load mm/(kN/m)	Loads for Deflection Limits		
				d=L/270 kN/m	d=3mm kN/m			d=L/270 kN/m	d=3mm kN/m	
		Single Span				Multiple Spans				
95x47	0.9	24.1	0.24	14.39	12.94	22.8	0.13	27.25	24.52	
	1.2	13.5	0.75	6.05	4.08	13.5	0.40	11.48	7.74	
	1.5	8.1	8.7	1.83	3.09	1.65	8.7	0.97	5.87	3.15
	1.8	5.3	6.0	3.80	1.77	0.78	6.0	2.01	3.38	1.51
	2.1	3.6	4.4	7.04	1.11	0.41	4.4	3.72	2.12	0.80
	2.4	2.6	3.4	12.01	0.73	0.23	3.4	6.35	1.41	0.46
95x65	0.9	33.3	0.17	19.90	17.90	31.6	0.09	37.69	33.91	
	1.2	18.7	0.55	8.37	5.64	18.7	0.29	15.88	10.71	
	1.5	12.0	1.34	4.27	2.29	12.0	0.71	8.11	4.36	
	1.8	8.3	2.77	2.45	1.08	8.3	1.47	4.68	2.08	
	2.1	6.1	6.3	5.14	1.53	0.57	6.1	2.72	2.93	1.11
	2.4	4.6	4.8	8.77	1.01	0.32	4.7	4.63	1.95	0.63
130x65	0.9	54.0	0.07	51.03	45.92	43.2	0.04	96.62	86.95	
	1.2	35.1	0.22	21.50	14.49	32.4	0.11	40.73	27.48	
	1.5	22.4	0.53	10.98	5.91	22.4	0.28	20.83	11.22	
	1.8	15.3	16.1	1.10	6.33	2.82	15.6	0.58	12.03	5.39
	2.1	10.7	11.8	2.03	3.97	1.50	11.4	1.07	7.56	2.88
	2.4	7.8	8.0	3.47	2.64	0.86	8.7	1.83	5.05	1.67
	2.7	5.9	6.9	5.55	1.84	0.52	6.9	2.93	3.53	1.02
	3.0	4.6	5.6	8.82	1.28	0.38	5.6	4.24	2.81	0.77
130x77	0.9	64.0	0.06	60.45	54.40	51.2	0.03	114.45	103.00	
	1.2	41.6	0.18	25.47	17.17	38.4	0.10	48.25	32.55	
	1.5	26.6	0.45	13.01	7.00	26.6	0.24	24.67	13.30	
	1.8	18.4	0.93	7.50	3.34	18.4	0.49	14.25	6.38	
	2.1	13.5	1.73	4.70	1.78	13.5	0.91	8.95	3.42	
	2.4	10.3	10.7	2.95	3.13	1.02	10.4	1.56	5.98	1.98
	2.7	7.9	8.4	4.73	2.18	0.61	8.2	2.50	4.18	1.21
	3.0	6.1	6.8	7.21	1.57	0.38	6.6	3.81	3.03	0.77
150x77	0.9	73.9	0.04	92.88	83.59	59.1	0.02	175.84	158.25	
	1.2	55.4	0.12	39.14	26.40	44.3	0.06	74.14	50.02	
	1.5	35.4	0.30	20.01	10.77	35.4	0.16	37.93	20.45	
	1.8	24.6	0.61	11.55	5.18	24.6	0.32	21.92	9.83	
	2.1	17.9	18.6	1.14	7.25	2.75	18.0	0.60	13.78	5.27
	2.4	13.2	14.2	1.94	4.83	1.58	13.8	1.02	9.21	3.06
	2.7	10.0	11.2	3.11	3.37	0.96	10.9	1.64	6.45	1.89
	3.0	7.8	9.1	4.73	2.44	0.61	8.8	2.50	4.68	1.21
	3.3	6.2	7.3	6.93	1.82	0.39	7.3	3.66	3.50	0.81
	3.6	5.0	6.1	9.82	1.38	0.26	6.1	5.19	2.68	0.55

Design Load and Deflections Tables

1. The maximum design loads given in the tables are the most conservative of the bending and shear capacities for each span length.

2. The shaded values of the maximum design loads are for members which are laterally restrained at 1200mm maximum spacings. The remaining values are where there are lateral restraints only at the supports.

3. For multiple spans, the values given in the tables assume the most conservative of 2 and 3 span arrangements, where all spans are of equal length and equally loaded.

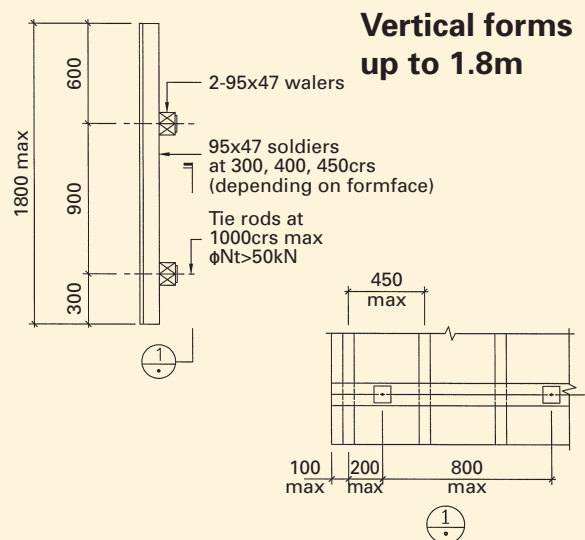
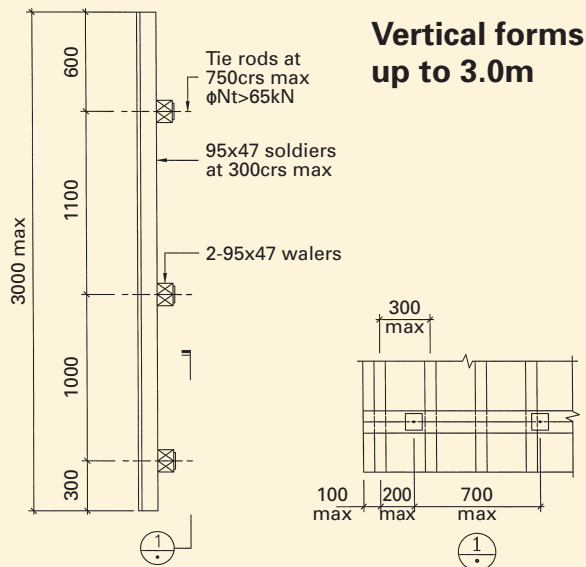
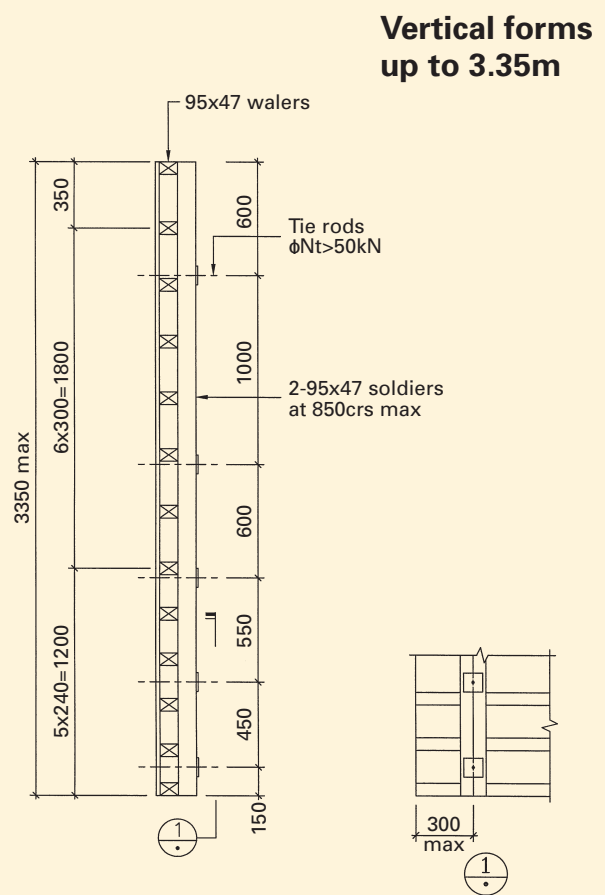
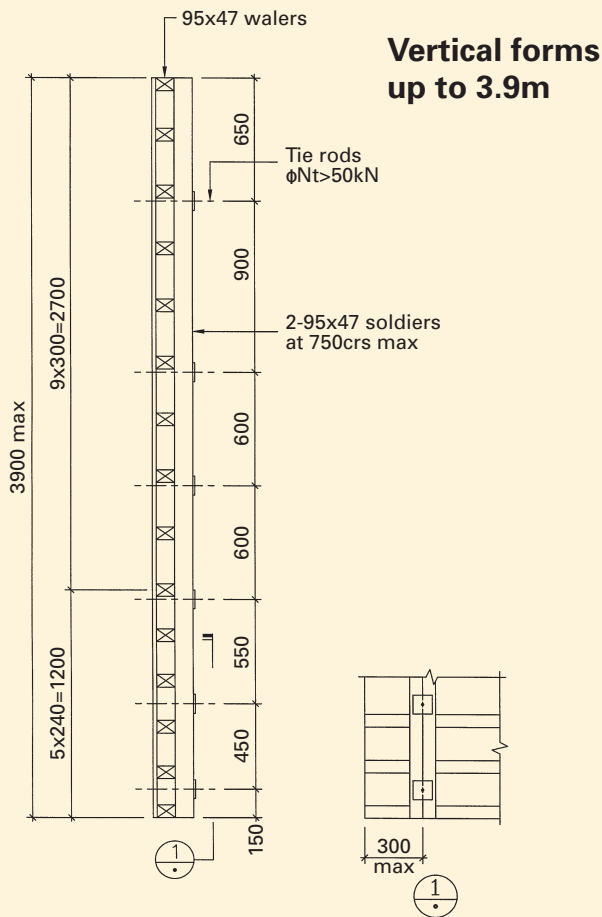
4. For the design of a beam, the ultimate and serviceability limits must both be satisfied, i.e. both the maximum design loads and the deflection limits.

NP FORM Bearer table for slab soffit formwork - NZ/AUS E11

Concrete Slab Thickness (mm)	Section Size (mm)	Bearer Spacings (mm)						Bearer Spacings (mm)					
		900	1200	1500	1800	2100	2400	900	1200	1500	1800	2100	2400
		Maximum Single Span (m)						Maximum Multiple Span (m)					
100	95x65	1.3	1.2	1.1	1.0	1.0	0.9	1.6	1.5	1.3	1.2	1.1	1.0
	130x65	1.8	1.6	1.5	1.4	1.3	1.3	2.2	2.0	1.8	1.6	1.4	1.2
	130x77	1.9	1.7	1.6	1.5	1.4	1.4	2.3	2.1	2.0	1.8	1.7	1.6
	150x77	2.2	2.0	1.8	1.7	1.7	1.6	2.7	2.4	2.3	2.1	1.9	1.7
150	95x65	1.2	1.1	1.1	1.0	0.9	0.9	1.5	1.4	1.2	1.1	1.1	1.0
	130x65	1.7	1.5	1.4	1.3	1.3	1.2	2.1	1.9	1.7	1.4	1.2	1.1
	130x77	1.8	1.6	1.5	1.4	1.4	1.3	2.2	2.0	1.9	1.7	1.6	1.5
	150x77	2.1	1.9	1.8	1.7	1.6	1.5	2.6	2.3	2.1	2.0	1.7	1.5
200	130x65	1.6	1.5	1.4	1.3	1.2	1.2	2.0	1.8	1.5	1.3	1.1	1.0
	130x77	1.7	1.6	1.5	1.4	1.3	1.3	2.1	1.9	1.8	1.6	1.5	1.3
	150x77	2.0	1.8	1.7	1.6	1.5	1.4	2.5	2.2	2.0	1.8	1.5	1.3
300	130x65	1.5	1.4	1.3	1.2	1.1	1.1	1.9	1.6	1.2	1.0	0.9	0.8
	130x77	1.6	1.5	1.4	1.3	1.2	1.2	2.0	1.8	1.6	1.5	1.3	1.1
	150x77	1.9	1.7	1.6	1.5	1.4	1.3	2.3	2.0	1.8	1.5	1.3	1.1
400	130x65	1.4	1.3	1.2	1.1	1.1	1.0	1.7	1.3	1.1	0.9	0.8	0.7
	130x77	1.5	1.4	1.3	1.2	1.2	1.1	1.9	1.6	1.5	1.3	1.1	0.9
	150x77	1.7	1.6	1.5	1.4	1.3	1.3	2.2	1.9	1.5	1.3	1.1	0.9
600	130x65	1.3	1.2	1.1	1.0	0.9	0.8	1.4	1.0	0.8	0.7	0.6	0.5
	130x77	1.4	1.3	1.2	1.1	1.1	1.0	1.7	1.4	1.2	1.0	0.8	0.7
	150x77	1.6	1.5	1.3	1.3	1.2	1.1	1.9	1.4	1.2	1.0	0.8	0.7
1000	130x65	1.1	1.0	0.9	0.8	0.7	0.6	0.9	0.7	0.6	0.5	*	*
	130x77	1.2	1.1	1.0	0.9	0.8	0.7	1.3	1.0	0.8	0.7	0.6	0.5
	150x77	1.4	1.3	1.2	1.0	0.9	0.8	1.3	1.0	0.8	0.7	0.6	0.5

NP FORM Joist table for slab soffit formwork - NZ/AUS E11

Concrete Slab Thickness (mm)	Section Size (mm)	Joist Spacings (mm)						Joist Spacings (mm)					
		225	300	400	450	480	600	225	300	400	450	480	600
		Maximum Single Span (m)						Maximum Multiple Span (m)					
100	95x47	1.8	1.7	1.5	1.5	1.4	1.3	2.3	2.1	1.9	1.8	1.8	1.6
	95x65	2.1	1.9	1.7	1.6	1.6	1.5	2.5	2.3	2.1	2.0	2.0	1.8
	130x65	2.8	2.5	2.3	2.2	2.2	2.0	3.4	3.1	2.9	2.8	2.7	2.5
	130x77	3.0	2.7	2.5	2.4	2.3	2.2	3.7	3.3	3.0	2.9	2.9	2.7
	150x77	3.4	3.1	2.8	2.7	2.7	2.5	4.2	3.8	3.5	3.4	3.3	3.1
150	95x47	1.7	1.6	1.4	1.4	1.4	1.3	2.2	2.0	1.8	1.7	1.7	1.6
	95x65	2.0	1.8	1.6	1.6	1.5	1.4	2.4	2.2	2.0	1.9	1.9	1.8
	130x65	2.7	2.4	2.2	2.1	2.1	1.9	3.3	3.0	2.7	2.6	2.6	2.4
	130x77	2.8	2.6	2.3	2.3	2.2	2.1	3.5	3.2	2.9	2.8	2.7	2.5
	150x77	3.2	3.0	2.7	2.6	2.5	2.4	4.0	3.7	3.3	3.2	3.1	2.9
200	95x47	1.7	1.5	1.4	1.3	1.3	1.2	2.1	1.9	1.7	1.6	1.6	1.5
	95x65	1.9	1.7	1.6	1.5	1.5	1.4	2.3	2.1	1.9	1.8	1.8	1.7
	130x65	2.6	2.3	2.1	2.0	2.0	1.9	3.2	2.9	2.6	2.5	2.5	2.3
	130x77	2.7	2.5	2.2	2.2	2.1	2.0	3.3	3.0	2.8	2.7	2.6	2.4
	150x77	3.1	2.8	2.6	2.5	2.4	2.3	3.8	3.5	3.2	3.1	3.0	2.8
300	95x47	1.6	1.4	1.3	1.2	1.2	1.1	1.9	1.7	1.6	1.5	1.5	1.4
	95x65	1.7	1.6	1.4	1.4	1.4	1.3	2.2	2.0	1.8	1.7	1.7	1.6
	130x65	2.4	2.2	2.0	1.9	1.9	1.7	2.9	2.7	2.4	2.3	2.3	2.1
	130x77	2.5	2.3	2.1	2.0	2.0	1.8	3.1	2.8	2.6	2.5	2.4	2.3
	150x77	2.9	2.6	2.4	2.3	2.3	2.1	3.6	3.3	3.0	2.9	2.8	2.6
400	95x47	1.5	1.3	1.2	1.2	1.1	1.1	1.8	1.6	1.5	1.4	1.4	1.3
	95x65	1.6	1.5	1.4	1.3	1.3	1.2	2.0	1.9	1.7	1.6	1.6	1.5
	130x65	2.2	2.0	1.9	1.8	1.8	1.6	2.8	2.5	2.3	2.2	2.2	2.0
	130x77	2.4	2.2	2.0	1.9	1.9	1.7	2.9	2.7	2.4	2.3	2.3	2.1
	150x77	2.7	2.5	2.3	2.2	2.1	2.0	3.4	3.1	2.8	2.7	2.6	2.5
600	95x47	1.3	1.2	1.1	1.1	1.0	1.0	1.6	1.5	1.4	1.3	1.3	1.0
	95x65	1.5	1.4	1.2	1.2	1.2	1.1	1.9	1.7	1.5	1.5	1.4	1.3
	130x65	2.0	1.9	1.7	1.6	1.6	1.5	2.5	2.3	2.1	2.0	2.0	1.8
	130x77	2.2	2.0	1.8	1.7	1.7	1.6	2.7	2.4	2.2	2.1	2.1	1.9
	150x77	2.5	2.3	2.1	2.0	2.0	1.8	3.1	2.8	2.6	2.5	2.4	2.2
1000	95x47	1.2	1.1	1.0	0.9	0.9	0.8	1.4	1.3	1.1	1.0	0.9	0.7
	95x65	1.3	1.2	1.1	1.0	1.0	1.0	1.6	1.5	1.3	1.3	1.3	1.1
	130x65	1.8	1.6	1.5	1.4	1.4	1.3	2.2	2.0	1.8	1.8	1.7	1.4
	130x77	1.9	1.7	1.6	1.5	1.5	1.4	2.4	2.1	2.0	1.9	1.8	1.7
	150x77	2.2	2.0	1.8	1.8	1.7	1.6	2.7	2.5	2.2	2.2	2.1	1.9



Soffit Forms

1. The design for the joist and bearer tables include for a 5kPa allowance for stacked materials at all stages of construction in accordance with AS3610. Where this allowance can be reduced, the spans given above may be increased with advice from the formwork designer.

2. The deflections of the joists and bearers have been limited to those required for a Class 3 finish. i.e. the greater of $\text{span}/270$ and 3mm. Since the finish quality is dependent on a number of other factors including formface quality, support deformations and the accuracy of the set up, a Class 3 finish cannot be guaranteed.

3. For multiple spans, the design has assumed the most conservative of 2 and 3 spans and that all spans are of equal length and equally loaded.

4. The design has assumed that the joists are continually restrained by the sheeting and the bearers are restrained by the joists.

5. Where an asterisk appears in the bearer table, the member fails in shear. For specific designs using this range of members, consult a formwork designer.

6. To satisfy the bearing requirements of the timber, the breadth of the bearer must be equal to or greater than the breadth of the joists it is supporting.

7. The design tables are only suitable for horizontal forms. For angled soffits, consult a formwork designer.

8. Span values may be interpolated for intermediate thicknesses of slabs.

9. Spans obtainable are measured from centreline to centreline of the supporting elements.

Standard Vertical Forms

1. The design of the vertical forms is based on a hydrostatic pressure distribution.

2. Deflections of the soldiers and walers have been limited to the greater of $\text{span}/270$ and 3mm as required for a Class 3 finish. Since the finish quality is dependent on a number of factors including the formface used and the accuracy of the set up, a Class 3 finish cannot be guaranteed.

3. Tie bolt holes are not to be bored through any of the soldier or waler members.

4. The distance from the top of the form to the nearest tie rod must be a maximum of 650mm.

5. The forms are not suitable for grout injected concrete, concrete pumped from below, deep re-vibration or external vibration of the concrete.

NP FORM

LVL FORMWORK BEAMS



Guarantee of Quality

NP FORM is manufactured from NelsonPine LVL - E11 Grade. NelsonPine LVL is produced in accordance with the Plywood Association of Australasia Ltd (PAA) quality control programme and product certification scheme to the joint Australian and New Zealand AS/NZS 4357.0:2005 standard - Structural Laminated Veneer Lumber. The PAA is engaged to independently audit that NelsonPine LVL is manufactured under a fully quality controlled process. PAA product certification scheme is accredited under the government Joint Accreditation System of Australia and New Zealand (JAS-ANZ).

PAA's process based quality control scheme includes product testing and monitoring of properties. It provides the basis for PAA's Product certification of NelsonPine LVL as conforming to the requirements of AS/NZS 4357.0:2005 standard - Structural Laminated Veneer Lumber. It also ensures that NelsonPine LVL is "fit for purpose".

Nelson Pine Industries Ltd as manufacturers of NelsonPine LVL and member of the PAA quality control and certification scheme, undertake to replace any NelsonPine LVL found to have a manufacturing defect or not to conform to the claimed performance criteria.

Plantation Grown

All veneers used in the manufacture of NP FORM are peeled from sustainable plantation grown Pinus Radiata logs grown in the Nelson district forests.



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