CLT SLAB SPAN TABLES

The following span tables are intended for use in pre-analysis designs, and are a guide for panel thicknesses. The structural design of the mass timber structures must be done on a per project basis and requires the input of a registered structural engineer. The design of these structures must be done in accordance with *SANS 10163-1: The Structural Use of Timber* and international best practice.

CLT floor and slab slabs are often governed by serviceability criteria such as deflection and vibrations induced by foot traffic. Recommended maximum spans for various panel thicknesses and live loads are given for both design criteria. The vibration check can be ignored for inaccessible roof panels where minimal foot traffic is expected.

These span tables are only based on serviceability criteria. No strength checks have been performed.

NOTES:

1. Unless noted, the span tables assume a uniform loading over the panel. No line loads or point loads have been checked, nor has any account been made for penetrations in the panel, all of which can reduce the allowable spans specified in the tables.
2. Density of SA pine used for calculations = 500 kg/m^3
3. Deflection=controlled spans are based on a limit of SPAN/300.
4. The cantilever back-span is 1.5 * cantilever span, with the back-span having no live load.
5. For the continuous beam, only one span has a live load.
6. The continuous span for all panels is limited to 4.1m, which is half of the maximum length of panel currently manufactured by XLAM.
7. Deflections were calculated using guidance from the Canadian CLT Handbook (2019 Edition). This method takes into account the long-term effect of creep, for which a dry service condition was assumed (average moisture content is 15% or less, and never exceeds 19%). No live load duration factor was applied as a 'standard term' duration was assumed. Serviceability load factors were taken from SANS 10160-1.
   The following formula was used to calculate deflection:

$$\Delta_{TOTAL} = \gamma_G * k_{creep} * (\Delta_{OW} + \Delta_{MISC}) + \gamma_Q * \Delta_Q$$

γ_G	Serviceability permanent/dead load factor = 1.1
k_{creep}	Creep adjustment factor = 2.0
Δ_{OW}	Deflection due to own weight of CLT
Δ_{MISC}	Deflection due to miscellaneous permanent/dead load of 50 kg/m^2
γ_Q	Serviceability imposed/live load factor = 1.0
Δ_Q	Deflection due to uniform imposed/live load

8. The Canadian and Swedish CLT Handbooks (2019 Editions) have differing approaches for calculating the vibration-controlled spans. Both are given for comparison.
9. For both methods only the own weight of the CLT was used. Additional mass can influence the vibration performance.
10. The tables assume bending in the longitudinal (major) direction i.e. outer lamella in the direction of the span. Thus, the allowable spans cannot be used for minor axis bending.

V2.0 – July 2023

STANDARD SIZES

XLAM

COVERING LAYER IN THE TRANSVERSE PANEL DIRECTION TT (WALL)

Nominal Thickness (mm)	Item	Layers	Lamella Structure (mm)					Standard Panel Widths (m)					Maximum Panel Length (m)
			T	L	T	L	T						
45	XT3/45	3	**15**	15	**15**			2.2	/	2.4	/	2.6	8.25
65	XT3/65	3	**15**	35	**15**			2.2	/	2.4	/	2.6	8.25
85	XT3/85	3	**35**	15	**35**			2.2	/	2.4	/	2.6	8.25
105	XT3105	3	**35**	35	**35**			2.2	/	2.4	/	2.6	8.25
135	XT5/135	5	**35**	15	**35**	15	**35**	2.2	/	2.4	/	2.6	8.25

COVERING LAYER IN THE LONGITUDINAL PANEL DIRECTION TL (CEILING/ROOF)

Nominal Thickness (mm)	Item	Layers	Lamella Structure (mm)					Standard Panel Widths (m)					Maximum Panel Length (m)
			L	T	L	T	L						
85	XL3/85	3	**35**	15	**35**			2.2	/	2.4	/	2.6	8.25
105	XL3105	3	**35**	35	**35**			2.2	/	2.4	/	2.6	8.25
135	XL5/135	5	**35**	15	**35**	15	**35**	2.2	/	2.4	/	2.6	8.25
155	XL5/155	5	**35**	35	**15**	35	**35**	2.2	/	2.4	/	2.6	8.25
175	XL5/175	5	**35**	35	**35**	35	**35**	2.2	/	2.4	/	2.6	8.25
210	XL5/210	5	**35**	35	**35*2**	35	**35**	2.2	/	2.4	/	2.6	8.25

Max dimensions of master elements 8250x2700x210mm
Min dimensions of master elements 2200x1800x85mm
Special XLAM element designs are available on request

Charged dimensions: Minimum length x minimum width required for master panel , including any cut-outs which may result
Charged length: from minimum production length of 2.2m up to max 8.25m, in 10cm increments
Charged width: 2.20 / 2.40 / 2.60 / 2.80

CLT STRENGTH

XLAM

COVERING LAYER IN THE TRANSVERSE PANEL DIRECTION TT (WALL)

Nominal Thickness (mm)	Item	Layers	Lamella Structure (mm)					Major Strength Direction			
			T	L	T	L	T	$M_r,0$ (kNm/ m of width)	(EI)eff,0 (Nmm^2/m of width)	(GA)eff,0 (N/m of width	Vr,0 (kN/ m of width)
45	XT3/45	3	**15**	15	**15**			3.18	5.71E+10	2.66E+06	12.00
65	XT3/65	3	**15**	35	**15**			5.84	1.52E+11	3.34E+06	17.33
85	XT3/85	3	**35**	15	**35**			11.71	3.97E+11	6.59E+06	22.67
105	XT3/105	3	**35**	35	**35**			17.32	7.26E+11	6.20E+06	28.00
135	XT5/135	5	**35**	15	**35**	15	**35**	27.11	1.46E+12	1.32E+07	36.00

COVERING LAYER IN THE LONGITUDINAL PANEL DIRECTION TL (CEILING/ROOF)

Nominal Thickness (mm)	Item	Layers	Lamella Structure (mm)					Major Strength Direction			
			L	T	L	T	L	$M_r,0$ (kNmm/ m of width)	(EI)eff,0 (Nmm^2/m of width)	(GA)eff,0 (N/m of width)	Vr,0 (kN/ m of width)
45	XL3/45	3	**15**	15	**15**			3.18	5.71E+10	2.66E+06	12.00
65	XL3/65	3	**15**	35	**15**			5.84	1.52E+11	3.34E+06	17.33
85	XL3/85	3	**35**	15	**35**			11.71	3.97E+11	6.59E+06	22.67
105	XL3/105	3	**35**	35	**35**			17.32	7.26E+11	6.20E+06	28.00
135	XL5/135	5	**35**	15	**35**	15	**35**	27.11	1.46E+12	1.32E+07	36.00
155	XL5/155	5	**35**	35	**15**	35	**35**	32.94	2.04E+12	9.36E+06	41.33
175	XL5/175	5	**35**	35	**35**	35	**35**	39.86	2.78E+12	1.24E+07	46.67
210	XL5/210	5	**35**	35	**35*2**	35	**35**	53.84	4.51E+12	1.85E+07	56.00

Max dimensions of master elements 8250x2700x210mm
Min dimensions of master elements 2200x1800x45mm
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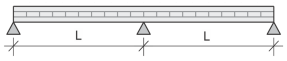
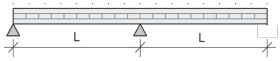
Charged dimensions: Minimum length x minimum width required for master panel , including any cut-outs which may result
Charged length: from minimum production length of 2.2m up to max 8.25m, in 10cm increments
Charged width: 2.20 / 2.40 / 2.60 / 2.80

SPAN TABLE

FLOORS - 1KN Dead Load

XLAM

Panel Layup	Nominal Thickness (mm)	SIMPLE SPAN (m) 				CONTINUOUS SPAN (m) 				CANTILEVER SPAN (m) 			
		Vibration	0.5KN	1.5KN	2.5KN	Vibration	0.5KN	1.5KN	2.5KN	Vibration	0.5KN	1.5KN	2.5KN
XL3/45	**45**	1.85	**1.85**	1.75	1.50	2.22	**2.22**	**2.22**	1.95	0.69	**0.69**	**0.69**	0.66
XL3/65	**65**	2.35	**2.35**	**2.35**	2.10	2.82	**2.82**	**2.82**	2.75	0.87	**0.87**	**0.87**	**0.87**
XL3/85	**85**	3.01	**3.01**	**3.01**	**2.95**	3.61	**3.61**	**3.61**	**3.61**	1.11	**1.11**	**1.11**	**1.11**
XL3/105	**105**	3.50	**3.50**	**3.50**	**3.50**	4.20	**4.20**	**4.20**	**4.20**	1.30	**1.30**	**1.30**	**1.30**
XL5/135	**135**	4.16	**4.16**	**4.16**	**4.16**	4.99	**4.99**	**4.99**	**4.99**	1.54	**1.54**	**1.54**	**1.54**
XL5/155	**155**	4.50	**4.50**	**4.50**	**4.50**	5.40	**5.40**	**5.40**	**5.40**	1.67	**1.67**	**1.67**	**1.67**
XL5/175	**175**	4.86	**4.86**	**4.86**	**4.86**	5.83	**5.83**	**5.83**	**5.83**	1.80	**1.80**	**1.80**	**1.80**
XL5/210	**210**	5.47	**5.47**	**5.47**	**5.47**	6.56	**6.56**	**6.56**	**6.56**	2.03	**2.03**	**2.03**	**2.03**

NOTES:

1. Material is S5 Graded SA Pine
2. Laminations are 35mm or 15mm thick
3. Specified modulus of elasticity and strength in major strength direction: E0 = 9500 MPa; fb,0 = 11.8 MPa; fv,0 = 1.5 MPa; fvr,0 = 0.5 MPa; fc,0 = 11.5 MPa; ft,0 = 5.5 MPa
4. Specified modulus of elasticity and strength in minor strength direction: E90 = 9500 MPa; fb,90 = 11.8 MPa; fv,90 = 1.5 MPa; fvr,90 = 0.5 MPa;
5. Dead load includes panel self-weight plus 1.0 kPa flooring load.
6. Bold text indicates span governed by vibration; regular text indicates span governed by dead plus live load deflection limit of L/300.
7. All spans are assumed to be equal for multi-span panels.
8. Spans shown represent distance between the centerlines of supports.
9. Maximum spans shown are only to be used for preliminary design.
10. Engineer to ensure that L/300 deflection limit is appropriate for intended use.
11. The following factors were used for calculations: KD = 1.0; KS = 1.0; KT = 1.0; KH = 1.0.
12. Shear stiffness has been reduced by 50% to account for creep deformation.

Max dimensions of master elements 8250x2700x210mm
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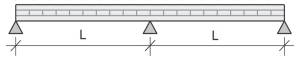
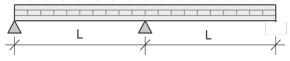
Charged dimensions: Minimum length x minimum width required for master panel , including any cut-outs which may result
Charged length: from minimum production length of 2.2m up to max 8.25m, in 10cm increments
Charged width: 2.20 / 2.40 / 2.60 / 2.80

SPAN TABLE

ROOFS - 0.5KN Dead Load

XLAM

Panel Layup	Nominal Thickness (mm)	SIMPLE SPAN (m) 			CONTINUOUS SPAN (m) 			CANTILEVER SPAN (m) 		
		0.5KN	1.5KN	2.5KN	0.5KN	1.5KN	2.5KN	0.5KN	1.5KN	2.5KN
XL3/45	**45**	2.40	1.85	1.60	3.00	2.40	2.05	1.05	0.80	0.70
XL3/65	**65**	3.30	2.60	2.25	**4.20**	3.30	2.85	1.45	1.10	0.95
XL3/85	**85**	4.60	3.60	3.15	**5.80**	**4.60**	4.00	2.00	1.55	1.35
XL3/105	**105**	5.60	4.40	3.80	**7.10**	**5.60**	**4.85**	2.45	1.90	1.60
XL5/135	**135**	7.10	5.60	4.90	**9.00**	**7.10**	**6.20**	3.10	2.45	2.10
XL5/155	**155**	7.90	6.25	5.40	**10.00**	**7.95**	**6.85**	3.45	2.70	2.30
XL5/175	**175**	8.80	6.95	6.05	**11.15**	**8.80**	**7.65**	3.85	3.00	2.60
XL5/210	**210**	10.40	8.20	7.10	**13.10**	**10.35**	**9.00**	4.55	3.55	3.10

NOTES:

1. Material is S5 Graded SA Pine
2. Laminations are 35mm or 15mm thick
3. Specified modulus of elasticity and strength in major strength direction: E0 = 7800 MPa; fb,0 = 11.5 MPa; fv,0 = 1.6 MPa; fvr,0 = 0.4 MPa; fc,0 = 18 MPa; ft,0 = 6.7 MPa
4. Specified modulus of elasticity and strength in minor strength direction: E0 = 7800 MPa; fb,0 = 11.5 MPa; fv,0 = 1.6 MPa; fvr,0 = 0.4 MPa; fc,0 = 18 MPa; ft,0 = 6.7 MPa
5. Dead load includes panel self-weight plus 0.5 kPa additional load.
6. Bold text indicates span governed by manufacturing size and are limited to half the length of the maximum panel size (4100mm)
7. All spans are assumed to be equal for multi-span panels.
8. Spans shown represent distance between the centerlines of supports.
9. Maximum spans shown are only to be used for preliminary design.
10. Engineer to ensure that L/300 deflection limit is appropriate for intended use.
11. The following factors were used for calculations: KD = 1.0; KS = 1.0; KT = 1.0; KH = 1.0.
12. Shear stiffness has been reduced by 50% to account for creep deformation.

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