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 roof 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. The cantilever back-span is 1.5 * cantilever span, with the back-span having no live load.
4. For the continuous beam, only one span has a live load.
5. The continuous beam maximum span assumes that there is no limit to the total length of a CLT panel. In reality, the maximum continuous span will also be limited to half of the maximum length that a manufacturer can produce.
6. Deflection-controlled spans are based on a limit of SPAN/300.
7. Deflections are calculated using the shear analogy method and 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 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 load of 50 kg/m^2 for floors and 20 kg/m^2 for roofs
γ_Q	Serviceability imposed load factor = 1.0
Δ_Q	Deflection due to uniform imposed 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 lamellas in the direction of the span. Thus, the allowable spans cannot be used for minor axis bending.
11. All timber SA Pine Grade S5.
12. The values in the span tables are based on the standard layups given. Any difference to the layup will affect the maximum span, and the values below will not be relevant.

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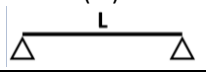
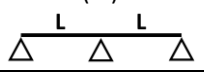
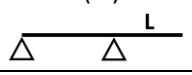
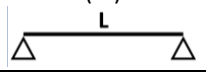
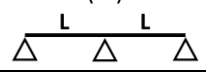
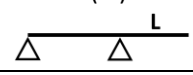
DEFLECTION-CONTROLLED CLT FLOOR SLABS – S5 SA PINE

Panel Thickness (mm)	**Live Load** (kN/m^2)	**Single Span** (m) 	**Continuous Span** (m) 	**Cantilever** (m) 
66	1.5	2.33	2.88	0.77
	2	2.22	2.71	0.72
	2.5	2.12	2.57	0.68
	3	2.04	2.45	0.64
	4	1.90	2.27	0.59
	5	1.80	2.13	0.54
77	1.5	2.64	3.27	0.87
	2	2.51	3.08	0.81
	2.5	2.41	2.93	0.77
	3	2.32	2.80	0.73
	4	2.17	2.59	0.66
	5	2.05	2.43	0.61
88	1.5	3.06	3.80	1.02
	2	2.92	3.59	0.96
	2.5	2.80	3.41	0.91
	3	2.70	3.26	0.86
	4	2.53	3.03	0.79
	5	2.40	2.84	0.74
99	1.5	3.37	4.1	1.11
	2	3.22	3.97	1.05
	2.5	3.09	3.77	0.99
	3	2.98	3.61	0.94
	4	2.79	3.35	0.86
	5	2.64	3.15	0.80

Panel Thickness (mm)	**Live Load** (kN/m^2)	**Single Span** (m) 	**Continuous Span** (m) 	**Cantilever** (m) 
110	1.5	3.50	4.35	1.16
	2	3.35	4.12	1.09
	2.5	3.22	3.92	1.03
	3	3.11	3.76	0.98
	4	2.93	3.50	0.90
	5	2.78	3.29	0.84
121	1.5	3.77	4.70	1.27
	2	3.62	4.45	1.19
	2.5	3.49	4.25	1.13
	3	3.37	4.07	1.08
	4	3.17	3.80	0.99
	5	3.01	3.58	0.93
132	1.5	4.24	5.32	1.42
	2	4.07	5.04	1.33
	2.5	3.93	4.82	1.27
	3	3.80	4.62	1.21
	4	3.58	4.31	1.11
	5	3.40	4.06	1.03
143	1.5	4.52	5.68	1.52
	2	4.35	5.39	1.44
	2.5	4.19	5.15	1.37
	3	4.06	4.95	1.31
	4	3.83	4.62	1.20
	5	3.65	4.36	1.12

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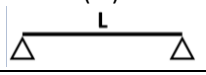
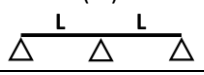
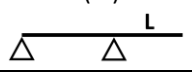
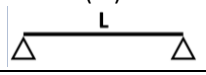
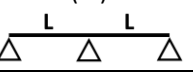
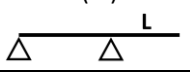
DEFLECTION-CONTROLLED CLT FLOOR SLABS – S5 SA PINE

Panel Thickness (mm)	**Live Load** (kN/m^2)	**Single Span** (m) 	**Continuous Span** (m) 	**Cantilever** (m) 
154	1.5	4.73	5.95	1.57
	2	4.55	5.65	1.48
	2.5	4.39	5.40	1.48
	3	4.25	5.19	1.34
	4	4.01	4.84	1.23
	5	3.82	4.57	1.14
165	1.5	4.98	6.27	1.66
	2	4.80	5.96	1.57
	2.5	4.64	5.71	1.49
	3	4.49	5.49	1.43
	4	4.25	5.13	1.32
	5	4.04	4.85	1.23
176	1.5	5.29	6.69	1.78
	2	5.10	6.37	1.69
	2.5	4.94	6.10	1.61
	3	4.79	5.87	1.54
	4	4.53	5.49	1.42
	5	4.32	5.19	1.33
187	1.5	5.54	7.01	1.86
	2	5.34	6.68	1.76
	2.5	5.17	6.40	1.68
	3	5.01	6.16	1.60
	4	4.75	5.77	1.48
	5	4.53	5.46	1.38

Panel Thickness (mm)	**Live Load** (kN/m^2)	**Single Span** (m) 	**Continuous Span** (m) 	**Cantilever** (m) 
198	1.5	5.67	7.20	1.90
	2	5.47	6.86	1.80
	2.5	5.30	6.58	1.72
	3	5.15	6.34	1.64
	4	4.88	5.94	1.52
	5	4.66	5.62	1.42
209	1.5	5.89	7.49	1.97
	2	5.69	7.15	1.87
	2.5	5.51	6.89	1.78
	3	5.35	6.61	1.71
	4	5.08	6.20	1.58
	5	4.85	5.87	1.48
220	1.5	6.19	7.83	2.09
	2	5.98	7.49	1.98
	2.5	5.80	7.19	1.90
	3	5.64	6.94	1.82
	4	5.36	6.51	1.69
	5	5.12	6.17	1.58
231	1.5	6.41	8.13	2.16
	2	6.20	7.78	2.05
	2.5	6.02	7.47	1.96
	3	5.85	7.21	1.88
	4	5.57	6.78	1.75
	5	5.32	6.43	1.64

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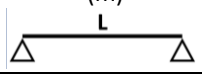
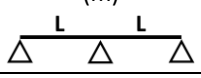
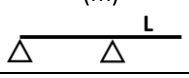
DEFLECTION-CONTROLLED CLT ROOF SLABS – S5 SA PINE

Panel Thickness (mm)	**Layup**	**Single Span** (m) 	**Continuous Span** (m) 	**Cantilever** (m) 
66	22/22/22	3.14	4.07	1.12
77	22/33/22	3.50	4.56	1.24
88	33/22/33	4.00	5.22	1.43
99	33/33/33	4.35	5.70	1.55
110	22/22/22/22/22	4.45	5.83	1.60
121	22/22/33/22/22	4.74	6.00	1.71
132	33/22/22/22/33	5.32	6.00	1.91
143	33/22/33/22/33	5.59	6.00	2.02
154	33/33/22/33/33	5.80	6.00	2.08
165	33/33/33/33/33	6.06	6.00	2.18
176	33/22/22/22/22/22/33	6.41	6.00	2.31
187	33/22/22/33/22/22/33	6.66	6.00	2.39
198	33/33/22/22/22/33/33	6.78	6.00	2.43
209	33/33/22/33/22/33/33	7.01	6.00	2.51
220	33/33/33/22/33/33/33	7.28	6.00	2.63
231	33/33/33/33/33/33/33	7.51	6.00	2.70

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VIBRATION-CONTROLLED CLT FLOOR PANELS
S5 SA PINE

Panel Thickness (mm)	Layup	Vibration-controlled maximum span (m)	
		Canadian method[a]	Swedish (Eurocode) method[b,c]
66	22/22/22	2.42	2.27
77	22/33/22	2.68	2.61
88	33/22/33	3.02	3.05
99	33/33/33	3.28	3.40
110	22/22/22/22/22	3.35	3.54
121	22/22/33/22/22	3.56	3.85
132	33/22/22/22/33	3.96	4.40
143	33/22/33/22/33	4.17	4.72
154	33/33/22/33/33	4.35	5.01
165	33/33/33/33/33	4.54	5.31
176	33/22/22/22/22/22/33	4.79	5.70
187	33/22/22/33/22/22/33	4.99	5.95
198	33/33/22/22/22/33/33	5.10	6.01
209	33/33/22/33/22/33/33	5.28	6.15
220	33/33/33/22/33/33/33	5.48	6.30
231	33/33/33/33/33/33/33	5.66	6.43

a) The Canadian CLT Handbook states: “For multiple-span CLT floors with non-structural elements that are considered to provide an enhanced stiffening effect, including partition walls, finishes and ceilings, and with support conditions beyond simple support, the calculated vibration-controlled span may be increased by up to 20%, provided it is not greater than 8m and that the floor does not have a concrete topping. Accepted finish materials may include wood flooring and ceramic tiles.”

b) Assumed threshold values: a = 1.5 mm/kN and b = 100 m/(Ns^2)

c) Only the stiffness and natural frequency limits were checked. The impulse velocity response check was not included as this is dependent on a number of factors which must be determined on a per project basis.

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