STRUCTURAL
TIMBER
EXPERTS
SINCE 1992

Techlam Structural Laminated Flooring Span Tables

techlam®
timber redefined

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structural laminated timber products

STRUCTURAL TIMBER EXPERTS SINCE 1992

1 Introduction

This submission presents design span tables for Techlam structural laminated flooring.
Strength, deflection, vibration and fire performance limitations are considered. Also typical performance specifications regarding installed moisture content and durability requirements are described.

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2 Structural Analysis

2.1 Reference Documents:

Structural analysis/design conforms to the following standards:

Table 1. Standards & Codes	
NZS1170 [1]	New Zealand Standard: Structural Design Actions.
NZS 3603:1993 [2]	New Zealand Standard: Timber Structures.
EC5 [3]	Eurocode 5: Design of Timber Structures - Part 1-1: General - Common rules and rules for buildings.
Hamm et al, 2010 [4]	Floor vibration from Hamm et al, 2010 [4] are considered in addition to the above codes and standards.
AS/NZS 1720.4:2019 [5]	Timber Structures - Part 4: Fire Resistance of timber elements

2.2 Floor Thickness and Plank Size:

Five difference floor thicknesses are considered based on the manufacturers recommendations;

- 42mm
- 65mm
- 90mm
- 115mm
- 135mm

Table 2. Plank Thickness & Sizes		
Thickness Range: 42 - 135 mm	 240mm **Width**	 300mm **Width**

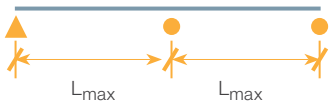
240mm or 300mm wide tongue & grooved glue-laminated planks can be used for each floor thickness (with a minimum of 4 laminations per plank).

2.3 Floor Support Arrangement

Three floor arrangements are considered; single span, double span and a cantilever (see Table 3).

Span length limits for a double span floor will be conservative for continuous floors with more than two spans. For the cantilevered floor, the cantilever length limit ($L_{c,max}$) has been calculated assuming the back span is equal to the span limit for the single span ($L_{max\ (single\ span)}$).

Table 3. Floor Support Arrangements

Single span floor:	Double span floor:	Cantelevered floor:
		

2.4 Floor Loading

Load on the Techlam flooring is assumed to be dead load (G) and live load (Q) only:

Table 4. Floor Loading: Dead Loads & Live Loads

2.4.1 Dead loads, G:	2.4.2 Live loads, Q:
• Dead loads include the self-weight of the floor system and an allowance for superimposed dead load. • For the self-weight of the floor, the timber density is taken as 470 kg/m³ based on AS/NZS1170.1:2002. • Typical lower and upper bound superimposed dead loads of 0.2KPa and 0.5KPa are considered. • The upper bound is sufficient to account for 8mm tile flooring, 6mm cement board, ceiling runners and 13mm plasterboard ceiling lining.	• Four categories of live load are considered, each category corresponds to different occupancy types and floor use. • Both uniformly distributed and concentrated loads are applied (see Table 5). • The concentrated live load **(CLL)** is assumed to be applied as a point load • It is assumed that 3-240mm planks resist the applied point load due to load sharing through the tongue and grooved joints for vibration checks • It is assumed that 2-240mm planks resist the applied point load due to load sharing through to tongue and grooved joints for deflection checks

Table 5. Specific Live Load Uses

Distributed Live Load, Qu (KPa)	Long-term factor for distributed load, ψ l	Concentrated Live Load, Qc (KN)	Long-term factor for concentrated load, ψ l	**Specific Use from AS/NZS 1170.1:2002**		
1.5	0.4	1.8	0.4	Domestic and residential buildings.Self-contained dwelling, general areas.		
2	0.4	2.7	0.4	Non self-contained dwellings, general areas. Domestic and residential buildings.	**OR:** Self-contained dwelling, balconies, landings and roofs used for floor type activities.	
3	0.4	2.7	0.4	Office and work areas. Offices for general use and communal kitchens.		
5	0.6	4.5	0.6	Office/work areas: Commercial/ industrial/ institutional kitchens, factories,workshops and general industrial buildings.	**OR:** Areas where people congregate excluding areas subject to wheeled vehicles, drill halls, drill rooms, stages in public assembly areas.	**OR:** Warehouses or storage areas: Reading/file rooms, office storage space, vault/strong rooms and plant rooms.

The concentrated live load is assumed to be applied as a load point. It is assumed that 3-240mm planks resist the applied point load due to load sharing through the tongue and grooved joints for vibration checks and that 2-240mm planks resist the applied point load due to load sharing through to tongue and grooved joints for deflection check.

2.5 Floor Strength Limitations

The floor strength is based on stress graded timber, with the characteristic stresses as shown in the table below. The bending and shear strength of the timber is enhanced by a parallel support factor (k_6) of 1.33.

2.6 Floor Deflection Limitations

The following long-term deflection limits are applied for the different floor arrangements: The long-term load case of G+ψIQ is applied for both uniformly distributed and concentrated loads, with a creep factor (k_2) of 1.5 (as per section 8 in NZS3603:1992). Concentrated live loads are applied as per the floor strength checks.

2.7 Floor Vibration Limitations

Floor Vibration is often a critical design consideration for timber flooring. The required vibration performance of a floor depends on its specific use and the sensitivity of the occupants. Hence, four different vibration performance levels are considered. These performance levels are based on New Zealand Standards [1], Eurocode 5 [3] and recent research [4]. The limiting requirements for each performance level are described in the following table:

Table 6. Characteristic Stresses for Floor System

Stress Grade	Bending strength, f_b (MPa)	Shear strength, f_s (MPa)
MSG10	20	3.8
MSG8	14	3.8

Table 7. Deflection limitations for floor system

Floor arrangement	Deflection limit
Single span	$L_{max}/300$
Double span	$L_{max}/300$
Cantilevered	$L_{c,max}/150$

Table 8. Floor Vibration Limits

Performance Level	Frequency Limit (Hz)	Deflection Limit for 1KN point load (mm)		
N/A			Vibration is not a concern; E.g. commercial and Industrial applications, roofs.	**Complies** with recommendations from New Zealand Standards.
Low	8	1	Occupants not sensitive to floor vibration; E.g. floor spans within one tenancy or unit.	
Medium	8	0.5	Occupants moderately sensitive to floor vibration; E.g. floor spans within one tenancy or unit.	**Exceeds** recommendations from New Zealand Standards.
High	8	0.25	Occupants highly sensitive to floor vibration; E.g. inter-unit/tenancy floors.	

(Live load is not considered when determining the natural frequency of the floor, based on recommendations from Hamm et al, 2010 [4].)

2.8 Fire Performance Limitations:

The fire resistance rating (FRR_{max}) for the floor systems are determined for the maximum allowable spans (L_{max}) and cantilever length ($L_{c,max}$).

It is assumed that only the underside of the floor is exposed to fire and that the char rate of the timber is 0.65mm/min +7mm as per ASNZS 1720.4.

3 Material Requirements

Glue laminated timber is to be New Zealand Radiata Pine as specified in accordance with AS/NZS1328:1998 Glued Laminated Structural Timber.

Timber is to be kiln dried to a moisture content of not greater than 15% at the time of lamination and installation.

Timber is to be for internal use only (fully protected from the weather and inside the building envelope).

All timber treatment is to comply with NZS 3640:2003 and AS/NZS1604.5:2002.

All timber shall be separated from concrete or external timber (e.g. bearers) using a damp proof membrane.

4 Span tables

The span tables for the three floor arrangements are given in Appendix A.

5 Airborne & Impact Sound

The below predicted performance is for the flooring in isolation, and does not include allowance for any potential noise flanking through junctions, edges, penetrations, fixings, etc.

Table 9: STC & IIC Values

Plank Thickness	Predicted STC	Predicted IIC
42	28	10
65	30	12
90	33	17
115	36	22
135	37	25

6 Disclaimer

Whilst every care has been taken to ensure that the above span tables are accurate, the authors/PTL Structural Engineers take no responsibility for any errors or omissions or for any specifications or work based on its contents.

Furthermore, the designer must satisfy themselves that the design assumptions listed in this guide are appropriate for the intended floor system.

7 References

[1] NZS1170.0. (2002). Structural Design Actions - Part 0 - General principles, NZ Standards, Wellington.

[2] NZS3603. (1999). Timber Structures Standard, New Zealand Standards, Wellington.

[3] EC5. (1994). “Eurocode 5: Design of Timber Structures - Part 1-1: General - Common rules and rules for buildings.” ECS, Brussels, Belgium.

[4] Hamm, P., Richter, A., and Winter, S. (2010). “Floor vibrations - new results.” World Conference on Timber Engineering, Riva del Garda, Italy, pp. 10.

[5] AS/NZS1720.4 (2019) Timber Structures - Part 4: Fire resistance of timber elements, Standards New Zealand, Wellington.

GL8 Techlam Laminated T&G Flooring Span Tables // Single Span

Floor depth (mm)	Superimposed dead load (kPa)	Live load (kPa)	Live load (kN)	Vibration performance level (see page 7): Not applicable $L_{c,max}$ (mm)	Not applicable FRR_{max} (min)	Low $L_{c,max}$ (mm)	Low FRR_{max} (min)	Medium $L_{c,max}$ (mm)	Medium FRR_{max} (min)	High $L_{c,max}$ (mm)	High FRR_{max} (min)
42	0.2	1.5	1.8	1610	30	1190	30	950	30	750	30
		2	2.7	1360	15						
		3	2.7	1360							
		5	4.5	950		950	15		15		15
	0.5	1.5	1.8	1550		1190	30		30		30
		2	2.7	1320			15				
		3	2.7	1320							
		5	4.5	930		930		930	15		15
65	0.2	1.5	1.8	2850	45	1850	60	1470	60	1160	60
		2	2.7	2490			45				
		3	2.7	2490							
		5	4.5	1780	30	1780	30		45		45
	0.5	1.5	1.8	2630	45	1850	60		60		60
		2	2.7	2380			45				
		3	2.7	2380							
		5	4.5	1730	30	1730	30		45		45
90	0.2	1.5	1.8	4080	60	2560	60	2030	90	1610	90
		2	2.7	3740							
		3	2.7	3570							
		5	4.5	2780					60		60
	0.5	1.5	1.8	3760			90		90		90
		2	2.7	3490			60				
		3	2.7	3390							
		5	4.5	2690					60		60
115	0.2	1.5	1.8	5060	90	3270	120	2600	120	2060	120
		2	2.7	4830			90				
		3	2.7	4470							
		5	4.5	3590					90		90
	0.5	1.5	1.8	4720			120		120		120
		2	2.7	4550			90				
		3	2.7	4260							
		5	4.5	3500					90		90
135	0.2	1.5	1.8	5800	120	3840	120	3050	150	2420	150
		2	2.7	5560							
		3	2.7	5170							
		5	4.5	4180	90				120		120
	0.5	1.5	1.8	5450	120				150		150
		2	2.7	5250					120		
		3	2.7	4930							
		5	4.5	4080	90						120

GL8 Techlam Laminated T&G Flooring Span Tables // Double Span

Floor depth (mm)	Superimposed dead load (kPa)	Live load (kPa)	Live load (kN)	Vibration performance level (see page 7): Not applicable $L_{c,max}$ (mm)	Not applicable FRR_{max} (min)	Low $L_{c,max}$ (mm)	Low FRR_{max} (min)	Medium $L_{c,max}$ (mm)	Medium FRR_{max} (min)	High $L_{c,max}$ (mm)	High FRR_{max} (min)
42	0.2	1.5	1.8	1940	15	1330	30	1060	30	840	30
		2	2.7	1620							
		3	2.7	1620							
		5	4.5	1120		1120	15		15		15
	0.5	1.5	1.8	1880		1330	30		30		30
		2	2.7	1590			15				
		3	2.7	1590							
		5	4.5	1110		1110			15		15
65	0.2	1.5	1.8	3530	45	2060	60	1640	60	1300	60
		2	2.7	3010			45				
		3	2.7	3010							
		5	4.5	2120	30		30		45		45
	0.5	1.5	1.8	3320	45		60		60		60
		2	2.7	2910			45				
		3	2.7	2910							
		5	4.5	2090	30		30		45		45
90	0.2	1.5	1.8	5190	60	2860	90	2260	90	1800	90
		2	2.7	4660			60				
		3	2.7	4660							
		5	4.5	3360					60		60
	0.5	1.5	1.8	4820			90		90		90
		2	2.7	4400			60				
		3	2.7	4400							
		5	4.5	3270					60		60
115	0.2	1.5	1.8	6750		3650	120	2890	120	2300	120
		2	2.7	6190			90				
		3	2.7	5980							
		5	4.5	4680					90		90
	0.5	1.5	1.8	6250					120		120
		2	2.7	5820							
		3	2.7	5700							
		5	4.5	4530					90		90
135	0.2	1.5	1.8	7770	90	4280	120	3390	150	2700	150
		2	2.7	7370							
		3	2.7	6920					120		
		5	4.5	5600	60		90				120
	0.5	1.5	1.8	7290	90		120		150		150
		2	2.7	6910							
		3	2.7	6600					120		
		5	4.5	5460	60		90				120

GL8 Techlam Laminated T&G Flooring Span Tables // **Cantilevered**

Floor depth (mm)	Superimposed dead load (kPa)	Live load (kPa)	Live load (kN)	Vibration performance level (see page 7): Not applicable $L_{c,max}$ (mm)	Not applicable FRR_{max} (min)	Low $L_{c,max}$ (mm)	Low FRR_{max} (min)	Medium $L_{c,max}$ (mm)	Medium FRR_{max} (min)	High $L_{c,max}$ (mm)	High FRR_{max} (min)
42	0.2	1.5	1.8	600	15	270	30	210	30	170	30
		2	2.7	410	15	150					
		3	2.7	410	15						
		5	4.5	240	15	240	15		15	130	15
	0.5	1.5	1.8	260	15	270	30		30	170	30
		2	2.7	400	15	200	15				
		3	2.7	400	15						
		5	4.5	240	15	240			15	130	15
65	0.2	1.5	1.8	1380	45	410	60	330	60	260	60
		2	2.7	960	45		45				
		3	2.7	960	45						
		5	4.5	590	30	420	30	260	45		45
	0.5	1.5	1.8	1340	45	410	60	330	60		60
		2	2.7	430	45		45				
		3	2.7	940	45						
		5	4.5	580	30	420	30	270	45		45
90	0.2	1.5	1.8	1660	60	570	90	460	90	360	90
		2	2.7	1730	60		60				
		3	2.7	1450	60						
		5	4.5	1110	60	570			60		60
	0.5	1.5	1.8	1060	60	570	90		90		90
		2	2.7	1640	60		60				
		3	2.7	1380	60						
		5	4.5	1090	60	570			60		60
115	0.2	1.5	1.8	1540	90	740	120	580	120	460	120
		2	2.7	1960	90						
		3	2.7	1820	90						
		5	4.5	1460	90	740	90		90		90
	0.5	1.5	1.8	1580	90	740	120		120		120
		2	2.7	1850	90		90				
		3	2.7	1220	90						
		5	4.5	1420	90	740			90		90
135	0.2	1.5	1.8	2000	120	860	150	680	150	540	150
		2	2.7	1560	120		120				
		3	2.7	1540	120						
		5	4.5	1700	120	860			120		120
	0.5	1.5	1.8	2020	120	860			150		150
		2	2.7	1610	120				120		
		3	2.7	1590	120						
		5	4.5	1650	120	860					120

Deflection at end of cantilever not checked. Engineering judgement required. =

GL10 Techlam Laminated T&G Flooring Span Tables // Single Span

Floor depth (mm)	Superimposed dead load (kPa)	Live load (kPa)	Live load (kN)	Vibration performance level (see page 7): Not applicable $L_{c,max}$ (mm)	Not applicable FRR_{max} (min)	Low $L_{c,max}$ (mm)	Low FRR_{max} (min)	Medium $L_{c,max}$ (mm)	Medium FRR_{max} (min)	High $L_{c,max}$ (mm)	High FRR_{max} (min)
42	0.2	1.5	1.8	1790	30	1280	30	1020	30	810	30
		2	2.7	1510							
		3	2.7	1510							
		5	4.5	1060	15	1050	15		15		15
	0.5	1.5	1.8	1710	30	1280	30		30		30
		2	2.7	1470							
		3	2.7	1470							
		5	4.5	1040	15	1040	15		15		15
65	0.2	1.5	1.8	3130	45	1990	60	1580	60	1250	60
		2	2.7	2760							
		3	2.7	2760							
		5	4.5	1980		1970	45		45		45
	0.5	1.5	1.8	2880		1990	60		60		60
		2	2.7	2620							
		3	2.7	2620							
		5	4.5	1920		1920	45		45		45
90	0.2	1.5	1.8	4400	60	2750	90	2180	90	1740	90
		2	2.7	4100							
		3	2.7	3850							
		5	4.5	3060			60		60		60
	0.5	1.5	1.8	4080			90		90		90
		2	2.7	3820							
		3	2.7	3660							
		5	4.5	2970			60		60		60
115	0.2	1.5	1.8	5450	90	3520	120	2790	120	2220	120
		2	2.7	5200							
		3	2.7	4820							
		5	4.5	3870			90		90		
	0.5	1.5	1.8	5090			120		120		
		2	2.7	4900							
		3	2.7	4580							
		5	4.5	3770			90		90		
135	0.2	1.5	1.8	6240	120	4130	150	3280	150	2610	150
		2	2.7	5980							
		3	2.7	5560			120				
		5	4.5	4500					120		120
	0.5	1.5	1.8	5860			150		150		150
		2	2.7	5650							
		3	2.7	5310			120				
		5	4.5	4390					120		120

GL10 Techlam Laminated T&G Flooring Span Tables // **Double Span**

Floor depth (mm)	Superimposed dead load (kPa)	Live load (kPa)	Live load (kN)	Vibration performance level (see page 7): Not applicable $L_{c,max}$ (mm)	Not applicable FRR_{max} (min)	Low $L_{c,max}$ (mm)	Low FRR_{max} (min)	Medium $L_{c,max}$ (mm)	Medium FRR_{max} (min)	High $L_{c,max}$ (mm)	High FRR_{max} (min)
42	0.2	1.5	1.8	2160	30	1430	30	1140	30	900	30
		2	2.7	1810							
		3	2.7	1810							
		5	4.5	1250	15	1250	15		15		15
	0.5	1.5	1.8	2090	30	1430	30		30		30
		2	2.7	1770	15						
		3	2.7	1770							
		5	4.5	1240		1240	15		15		15
65	0.2	1.5	1.8	3900	45	2220	60	1760	60	1400	60
		2	2.7	3340							
		3	2.7	3340							
		5	4.5	2370			45		45		45
	0.5	1.5	1.8	3640			60		60		60
		2	2.7	3230							
		3	2.7	3230							
		5	4.5	2320			45		45		45
90	0.2	1.5	1.8	5690	60	3080	90	2440	90	1940	90
		2	2.7	5140							
		3	2.7	5140							
		5	4.5	3730			60		60		
	0.5	1.5	1.8	5260			90		90		
		2	2.7	4830							
		3	2.7	4830							
		5	4.5	3630			60		60		
115	0.2	1.5	1.8	7300	90	3930	120	3120	120	2480	120
		2	2.7	6790							
		3	2.7	6450							
		5	4.5	5180	60		90		90		
	0.5	1.5	1.8	6800	90		120		120		
		2	2.7	6360							
		3	2.7	6150			90				
		5	4.5	5000	60				90		
135	0.2	1.5	1.8	8370	90	4620	150	3670	150	2910	150
		2	2.7	8020			120				
		3	2.7	7450							
		5	4.5	6030					120		120
	0.5	1.5	1.8	7860					150		150
		2	2.7	7540							
		3	2.7	7120							
		5	4.5	5880					120		120

GL10 Techlam Laminated T&G Flooring Span Tables // **Cantilevered**

Floor depth (mm)	Superimposed dead load (kPa)	Live load (kPa)	Live load (kN)	Vibration performance level (see page 7): Not applicable $L_{c,max}$ (mm)	Not applicable FRR_{max} (min)	Low $L_{c,max}$ (mm)	Low FRR_{max} (min)	Medium $L_{c,max}$ (mm)	Medium FRR_{max} (min)	High $L_{c,max}$ (mm)	High FRR_{max} (min)
42	0.2	1.5	1.8	810	15	290	30	230	30	180	30
		2	2.7	580	30	220					
		3	2.7	580							
		5	4.5	350	15	310	15	230	15	150	15
	0.5	1.5	1.8	830	30	290	30	230	30	180	30
		2	2.7	570		230					
		3	2.7	570							
		5	4.5	350	15	310	15	230	15	150	15
65	0.2	1.5	1.8	1500	45	450	60	350	60	280	60
		2	2.7	450							
		3	2.7	1220							
		5	4.5	800		450	45	300	45		45
	0.5	1.5	1.8	1390		450	60	350	60		60
		2	2.7	1320							
		3	2.7	1170							
		5	4.5	820		450	45	310	45		45
90	0.2	1.5	1.8	1780	60	620	90	490	90	390	90
		2	2.7	1780							
		3	2.7	1560							
		5	4.5	790		510	60		60		
	0.5	1.5	1.8	1200		620	90		90		
		2	2.7	1700							
		3	2.7	1480							
		5	4.5	1220		620	60		60		60
115	0.2	1.5	1.8	1730	90	790	120	630	120	500	120
		2	2.7	2110							
		3	2.7	1950							
		5	4.5	1570			90		90		
	0.5	1.5	1.8	1770			120		120		
		2	2.7	1390							
		3	2.7	1370							
		5	4.5	1530			90		90		
135	0.2	1.5	1.8	2230	120	930	150	740	150	580	150
		2	2.7	1760							
		3	2.7	1740							
		5	4.5	1840			120		120		120
	0.5	1.5	1.8	2240			150		150		150
		2	2.7	1810							
		3	2.7	1790			120				
		5	4.5	1790		930			120		120

Deflection at end of cantilever not checked. Engineering judgement required. =

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timber redefined

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