TIMBER FLOOR BEAM V5.10

Engineering Building & Infrastructure Pty Ltd

Beam:	**(Floor Beam M2- Mezzanine) 180mm x 50mm Smart LVL19** (Douglas Fir) (WA only) (Single span)**	
Bending:	**M(dl)* = 0.89kNm (+ve) < øM(dl) = 9.87kNm, M* = 0.89kNm (+ve) < øM = 13.85kNm**	**OK (0.09,0.06)**
Shear:	**V(dl)* = 0.71kN < øV(dl) = 17.54kN, V* = 0.71kN < øV = 24.62kN**	**OK (0.04,0.03)**
Deflection:	**δDL = L/-12607 (0mm) , δΨs.LL = L/-420 (-12mm), δTotal = L/-407 (-12mm), 1kN mid. δ = 5.6mm**	**OK (0.04,0.03)**
Reactions:	**(Each end) Rdl = 0.53kN, Rll = -1.69kN, R* = 0.71kN**	

Geometry

(House member affecting ≤ 25m² or secondary building member)

Category =	1	(1) House, (2) Primary building elements, (3) Important			
House =	Y	(Y)es,(N)o	Edge restrained =	B	(T)ension, (C)ompression, (B)oth
Span (L) =	5000	mm	Lay.t (Top) =	600	mm
Centres (cts) =	450	mm	Lay.b (Bottom) =	600	mm
Span type =	S	(S)ingle,(D)ouble			

Loadings

Floor area (A) =	2.25	m²	Live load type =	N	(N)ormal, (S)torage, (M)anual		
					AS/NZS 1170.0 - Table 4.1		
Uniform dead loads							
Floor dead load (wdl) =	0.35	kPa *	450	mm +	kN/m =	0.16	kN/m
Wall dead load (wdl) =		kPa *	450	mm +	kN/m =	0.00	kN/m
Other dead load (wdl) =		kPa *		mm +	kN/m =	0.00	kN/m
Include S.Wt =	Y	(Y)es,(N)o			S.Wt =	0.05	kN/m
					Σwdl =	0.21	kN/m
Uniform live loads							
Floor live load (wll) =	-1.50	kPa *	450	mm +	kN/m =	-0.68	kN/m
Partitions (wll) =		kPa *	450	mm +	kN/m =	0.00	kN/m
Alternate point live load =	-7.50	kN	Distr. to	1	members	Σwll =	-0.68 kN/m

Point loads

Dead load (pdl) =	kN	Position =	2500 mm from LHS
Live load (pll) =	kN	Shear using PL at support =	N (Y)es,(N)o

Short term LL factor (Ψsu) =	1.00	(Ψsp) =	1.00
Long term LL factor (Ψlu) =	0.33 / 0.40 (wdl*)	(Ψlp) =	0.33 / 0.40 (pdl*)
wdl* = 1.35*wdl =	0.29 kN/m	M(dl+Ψl.ll)* =	0.89 kNm (Max at 2500mm)
w* = 1.35*wdl =	0.29 kN/m	M* =	0.89 kNm (Max at 2500mm)
pdl* = 1.2*pdl+1.5*Ψlp*pll =	0.00 kN	V(dl+Ψl.ll)* =	0.71 kN
p* = 1.2*pdl+1.5*pll =	0.00 kN	V* =	0.71 kN

Bending and Shear capacity - Cl 3.2.1 & Cl 3.2.5

Member =	180mm x 50mm Smart LVL19	Area (A) =	9000 mm²
Description =	LVL19 seasoned softwood	Section modulus (Zx) =	270 x10³ mm³
Design depth (dD) =	180 mm	Stiffness (Ix) =	24.3 x10⁶ mm⁴
Design width (dW) =	50 mm	Modulus of elasticity (E) =	19000 MPa - Cl 8.3

S1 = (dD/dW)^1·35*(Lay.b/dD)^0·25 =	7.62	For bottom tension edge restrained - Cl 3.2.3.2(a)			
k12d =	1.000	for ρbd*S1 ≤ 10 - Cl 3.2.4	f'b =	75.0	MPa
k12 =	1.000	for ρb*S1 ≤ 10 - Cl 3.2.4	f's =	6.0	MPa
			Material constant (ρbd) =	1.12	(rbd=0.25)
Strength reduction factor (ø) =	0.95	Table 2.1	Material constant (ρb) =	1.12	(rb=0.25)
øM(dl) = ø*(k1=0.57)*k4*k6*k9*k12d*f'b*Zx =	9.87	kNm	Duration factor (k1) =	0.80	
øM = ø*k1*k4*k6*k9*k12*f'b*Zx =	13.85	kNm	Moisture factor (k4) =	1.00	
øV(dl) = ø*(k1=0.57)*k4*k6*f's*(2/3*A) =	17.54	kN	Temp. factor (k6) =	0.90	
øV = ø*k1*k4*k6*f's*(2/3*A) =	24.62	kN	Sharing factor (k9) =	1.00	
			Size modifier (mod.b) =	1.00	
			Size modifier (mod.s) =	1.00	

Deflections

			Duration factor (j2) =	2.0		
Ireq'd j2.(DL+Ψl.LL) (16mm) =	-0.6 x10⁶ mm⁴	< Critical	j2.(DL+Ψl.LL) =	-0.4	mm	Span / -12607
Ireq'd Ψs.LL (12mm) =	-24.1 x10⁶ mm⁴		Ψs.δLL =	-11.9	mm	Span / -420
Ireq'd Total (L/250) =	-14.9 x10⁶ mm⁴		δTotal =	-12.3	mm	Span / -407
			1kN midspan δ =	5.6	mm	