

26 Brule Crescent

Calculations for new beams

Typical beam is LVL 1.9E

Width of member (b)	5.25 in	5.25 in	
Depth of member (d)	16 in	14 in	
Section Modulus Provided ($bd^2/6$)	224.00 in ³	171.50 in ³	
Bending stress (F_b)	4500.00 psi		
Snow Load (Etobicoke) (S_s)	23.00 psf (1.1 kPa)		OBC SB-1
Rain Load (S_r)	8.35 psf (0.4 kPa)		
Specified Snow Load $S = 0.55 \times S_s + S_r$	21.00 psf x 1.5 =	31.5 psf (factored)	OBC 9.4.2.2
Live Loads	30.00 psf x 1.5 =	45 psf (factored)	
Dead Loads	12.00 psf x 1.25 =	15 psf (factored)	
Total Loads	63.00 psf =	91.5 psf (factored)	(roof and floor)

Beam 1 (over living room)

Supported Joist length	11.50 ft	
Span (l)	14.50 ft	
Linear Load (w)	1052.25 plf	
Moment ($wl^2/8$)	27654.45 ft lbs	
Section Modulus required $S = M/F_b$	73.75 in ³	OK

Beam 2 (over foyer)

supported joist length	4.00 ft	
supported roof length	9.00 ft	
Span (l)	16.70 ft	
linear load from roof and floor (w)	1189.50 plf	
Moment due to uniform loads ($wl^2/8$)	41467.46 ft lbs	
Point load at midspan (from Beam 1)	7628.81 lbs	
Location of point load from support (a)	10.70 ft	
Location of point load from support (b)	6.00 ft	
Moment due to point load (Pab/l)	29327.53 ft lbs	
Total combined moment	70794.99 ft lbs	
Section Modulus required $S = M/F_b$	188.79 in ³	OK

Beam 3 (over Kitchen)

Supported Joist length	11.50 ft	
Span	18.50 ft	
Linear Load	1052.25 plf	
Moment	45016.57 ft lbs	
Section Modulus required $S = M/F_b$	120.04 in ³	OK

Specified Strengths and Moduli of Elasticity (Standard Term) for new LVL 1.9E beams

- Shear modulus of elasticity G = 118750 psi
- Modulus of Elasticity E = 1.9 x 10⁶ psi
- Flexural Stress Fb = 4805 psi ⁽¹⁾
- Tension Stress Ft = 2870 psi ⁽²⁾
- Compression perpendicular to grain Fc1 = 1365 psi ⁽³⁾
- Compression parallel to grain Fc1 = 4005 psi
- Horizontal shear perpendicular to glue line Fv = 530 psi

Notes

- (1) For 12" depth, for others multiply by (12/d)^{0.136}
- (2) Ft has been reduced to reflect the volume effects of length, width and depth for a range of common applications
- (3) Fc1 shall not be increased for load duration

1 3/4" 1.9E Microllam® LVL Factored Resistances (Standard Term)

Design Property	Depth									
	7 1/4"	9 1/4"	9 1/2"	11 1/4"	11 7/8"	14"	16"	18"	18 3/4"	20"
Factored Moment Resistance (ft-lbs)	5,915	9,315	9,790	13,420	14,845	20,175	25,875	32,230	34,775	39,220
Factored Shear Resistance (lbs)	4,035	5,150	5,285	6,260	6,610	7,790	8,905	10,015	10,435	11,130
Moment of Inertia (in. ⁴)	56	115	125	208	244	400	597	851	961	1,167
Weight (plf)	3.7	4.7	4.8	5.7	6.1	7.1	8.2	9.2	9.6	10.2

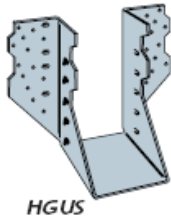
Note: Design properties given for one ply only (1 3/4"). For 3 ply beam (5 1/4" width), multiply design values x 3.

Floor or Roof—Standard Term (PLF)

Span	Condition	3 1/2" Width			5 1/4" Width										
		18"	18 3/4"	20"	7 1/4"	9 1/4"	9 1/2"	11 1/4"	11 7/8"	14"	16"	18"	18 3/4"	20"	
6'	Unfactored Resistance (LL) L/360				1880										
	Unfactored Resistance (TL) L/240														
	Total Factored Resistance				3836	5169	5346	6660	7163						
	Min. End/Int. Bearing (in.)				2.0/5.0	2.7/6.8	2.8/7.0	3.5/8.7	3.8/9.4						
8'	Unfactored Resistance (LL) L/360				843	1666	1793	2828	3261						
	Unfactored Resistance (TL) L/240				978										
	Total Factored Resistance				2207	3479	3657	4606	4925	6075					
	Min. End/Int. Bearing (in.)				1.5/3.9	2.4/6.1	2.6/6.4	3.2/8.1	3.4/8.6	4.3/10.6					
9'-6"	Unfactored Resistance (LL) L/360				509	1032	1113	1779	2062	3200					
	Unfactored Resistance (TL) L/240				498	1534	1655								
	Total Factored Resistance				1562	2463	2589	3551	3929	4877					
	Min. End/Int. Bearing (in.)				1.5/3.5	2.1/5.1	2.2/5.4	3.0/7.4	3.3/8.2	4.1/10.1					
10'	Unfactored Resistance (LL) L/360				417	893	963	1545	1793	2795					
	Unfactored Resistance (TL) L/240				406	1326	1430								
	Total Factored Resistance				1408	2221	2335	3203	3544	4576					
	Min. End/Int. Bearing (in.)				1.5/3.5	1.9/4.9	2.0/5.1	2.8/7.0	3.1/7.8	4.0/10.0					
12'	Unfactored Resistance (LL) L/360				205	530	573	928	1081	1708					
	Unfactored Resistance (TL) L/240				193	781	845	1374	1603						
	Total Factored Resistance				975	1538	1617	2219	2455	3340					
	Min. End/Int. Bearing (in.)				1.5/3.5	1.6/4.1	1.7/4.3	2.3/5.9	2.6/6.5	3.5/8.8					
14'	Unfactored Resistance (LL) L/360				112	339	367	598	698	1113	1613				
	Unfactored Resistance (TL) L/240				100	495	536	880	1029	1648					
	Total Factored Resistance				713	1126	1184	1626	1799	2448	3143				
	Min. End/Int. Bearing (in.)				1.5/3.5	1.5/3.5	1.5/3.7	2.0/5.0	2.2/5.5	3.0/7.5	3.9/9.7				
16'-6"	Unfactored Resistance (LL) L/360	946	1059		58	210	227	372	435	699	1021	1419	1588		
	Unfactored Resistance (TL) L/240				47	301	326	541	634	1026	1506				
	Total Factored Resistance	1875	2024		510	807	848	1165	1290	1757	2256	2813	3036		
	Min. End/Int. Bearing (in.)	4.1/10.2	4.4/11.0		1.5/3.5	1.5/3.5	1.5/3.5	1.7/4.3	1.9/4.7	2.6/6.4	3.3/8.2	4.1/10.2	4.4/11.0		
18'-6"	Unfactored Resistance (LL) L/360	687	770	922	37	150	162	266	312	503	738	1030	1155	1384	
	Unfactored Resistance (TL) L/240				26	211	229	382	450	733	1082	1518			
	Total Factored Resistance	1488	1606	1813	403	639	672	923	1022	1393	1790	2232	2409	2719	
	Min. End/Int. Bearing (in.)	3.6/9.1	3.9/9.8	4.4/11.1	1.5/3.5	1.5/3.5	1.5/3.5	1.5/3.8	1.7/4.2	2.3/5.7	2.9/7.3	3.6/9.1	3.9/9.8	4.4/11.1	

Figure 1 Span table for Microllam LVL beams

Typical Hanger



Face Mount Hangers

Supported Member Depth	Supported Member Depth	Hanger	Nail Type		Maximum Factored Resistance (lbs)
			Header	Joist	
1 3/4"	9 1/4" – 9 1/2"	HU7	16d	10d x 1 1/2"	2,015
	11 1/4" – 14"	HU11	16d	10d x 1 1/2"	3,700
	14"	HU14	16d	10d x 1 1/2"	4,715
3 1/2"	9 1/4" – 11 1/4"	HU48	16d	10d	1,680
	11 1/4" – 16"	HU412	16d	10d	2,690
		HGUS412	16d	16d	11,210
	14" – 20"	HU416	16d	10d	3,365
		HGUS414	16d	16d	11,870
5 1/4"	9 1/4" – 11 7/8"	HU5.31/9	16d	16d	2,355
	9 1/2" – 14"	HU5.31/11	16d	16d	2,690
	11 7/8" – 18"	HU5.31/14	16d	16d	3,030
	14" – 20"	HGUS5.50/14	16d	16d	11,870