NORDIC ENGINEERED WOOD
RESIDENTIAL DESIGN
CONSTRUCTION GUIDE

NORDIC LAM™

NORDIC ENGINEERED WOOD

FSC-CERTIFIED PRODUCTS AVAILABLE

FSC
The mark of responsible forestry
FSC® C011517

BRINGING NATURE'S RESOURCES HOME

Nordic Engineered Wood was founded in the year 2000 to develop and promote high quality wood products for use in residential and non-residential construction.

Our vision is built on the founding principles of reliable service, consistent quality, and responsible forestry practices. Chantiers Chibougamau Ltd (CCL) has achieved FSC certification, the international certification system dedicated to promoting responsible management of the forests, to ensure the long term viability of our precious natural resources.

With the addition of its third production line, CCL now boasts annual glulam production capacity in excess of 40 million board feet. Nordic Engineered Wood's goal is to provide the most consistent, high quality finished products available. The Nordic Lam family of products illustrates our continued passion for building on tradition.

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Nordic Lam™
Building on tradition

Harvesting
The raw material used in Nordic Lam products is high density black spruce harvested on 2.0 million acres of land under the stewardship of Chantiers Chibougamau Ltd (CCL). Black spruce is known for its extreme density, fiber strength, and narrow growth rings. CCL utilizes state-of-the-art harvesting and reforestation techniques that ensure the highest quality lam stock, and guarantee that quality for generations to come.

Environmentally Friendly
CCL's state-of-the-art manufacturing facility optimizes fiber while delivering uncompromising quality. Nordic has reduced waste by developing the layup process to utilize more of the tree than ever before. Rigorous adherence to Forest Stewardship Council's forestry management practices minimizes the environmental impact and ensures the long-term viability of our forests.

Quality Control
Nordic Lam manufacturing processes are audited by APA, ensuring product quality and consistent performance. Additional in-house procedures enhance the Nordic Lam product line.

Design Flexibility
Nordic Lam products are cost effective and highly versatile in residential and light commercial applications. Nordic has a grade and dimension to fit every need, enabling architects, designers and specifiers to choose the best available design solution. The 1-3/4-inch wide beam is the perfect framing solution for stairwell openings, saving money, time and labor.

Versatility
Nordic glued laminated products are manufactured in a balanced layup, with no camber, assuring proper installation. Nordic Lam beams and headers are sized for I-joist, standard glulam, and conventional lumber depths. Nordic Lam standard column widths of 3-1/2, 5-1/2 and 7 inches are pre-sized for a seamless fit into conventional framing applications.

Workability
Nordic Lam is exceptionally strong, yet can weigh as much as 25% less than other engineered wood alternatives. Nordic Lam beams and columns can easily be cut, drilled, nailed, and installed using conventional carpentry tools. Nordic Lam black spruce products can be clad or left visible as an attractive architectural feature of the framing system.

EXCLUSIVE ENVIRO–LAM TECHNOLOGY

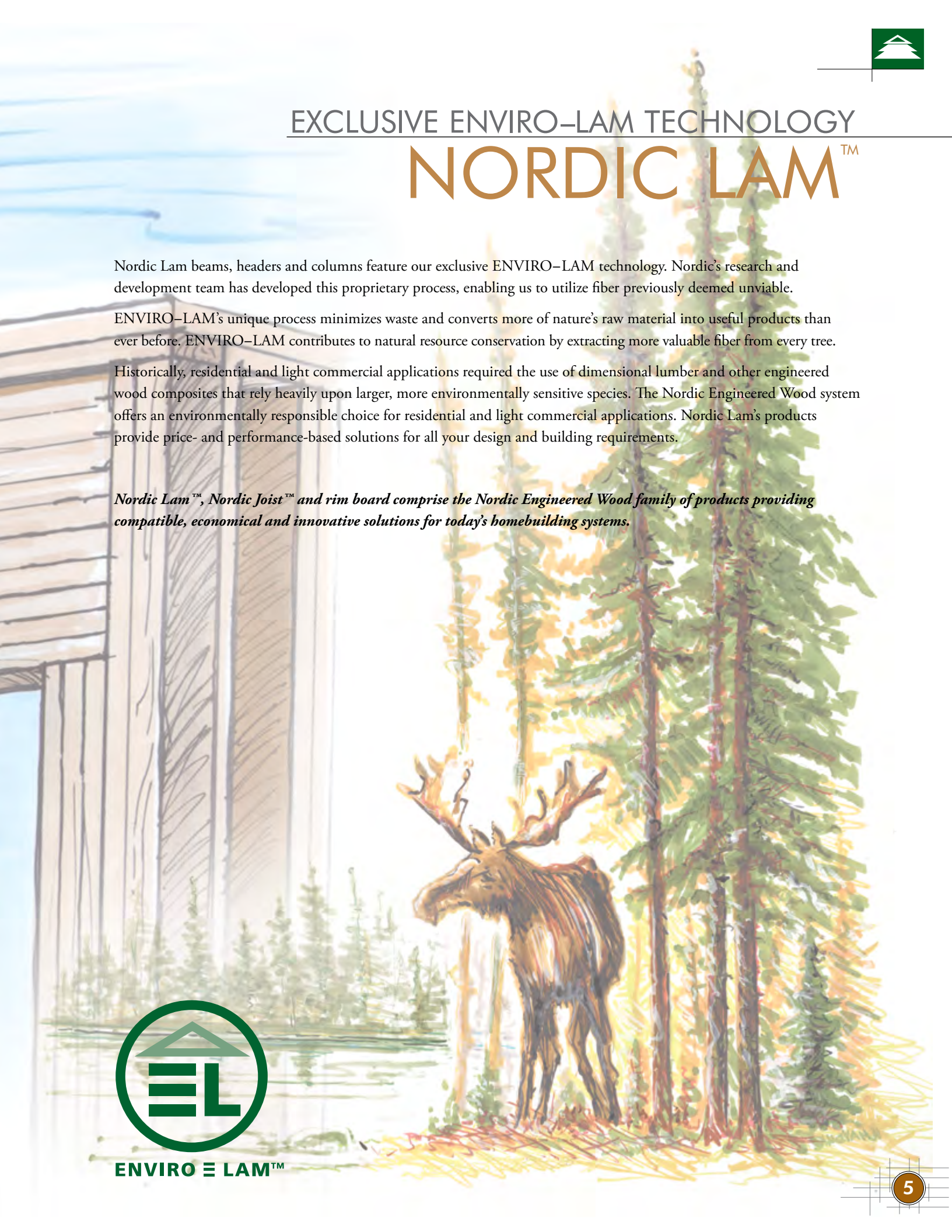
NORDIC LAM™

Nordic Lam beams, headers and columns feature our exclusive ENVIRO–LAM technology. Nordic's research and development team has developed this proprietary process, enabling us to utilize fiber previously deemed unviable.

ENVIRO–LAM's unique process minimizes waste and converts more of nature's raw material into useful products than ever before. ENVIRO–LAM contributes to natural resource conservation by extracting more valuable fiber from every tree.

Historically, residential and light commercial applications required the use of dimensional lumber and other engineered wood composites that rely heavily upon larger, more environmentally sensitive species. The Nordic Engineered Wood system offers an environmentally responsible choice for residential and light commercial applications. Nordic Lam's products provide price- and performance-based solutions for all your design and building requirements.

Nordic Lam™, Nordic Joist™ and rim board comprise the Nordic Engineered Wood family of products providing compatible, economical and innovative solutions for today's homebuilding systems.



ENVIRO ≡ LAM™

GLULAM BASICS

Anatomy of a Glulam

A glulam is made up of wood laminations, or "lams" that are bonded together with adhesives. The grain of all laminations runs parallel with the length of the member. Because they are engineered products, glued laminated timbers are manufactured to meet a range of design stresses. Beams are manufactured with the strongest lams on the bottom and top of the beam, where maximum tension and compression stresses occur. This concept allows the lumber resource to be used more efficiently by placing higher grade lumber in zones that have the maximum stresses, and lumber with less structural quality in lower stressed zones.

Axis Orientation

Glulam beams are typically installed with the wide face of the laminations perpendicular to the applied load (bending about X-X axis). These are commonly referred to as horizontally laminated members. If this same member is rotated 90 degrees such that the load is applied to the wide face of the laminations (bending about Y-Y axis), it is considered to be a vertically laminated member. Glulam members have different tabulated stress properties depending on whether the member is used in a horizontal or vertical orientation. Refer to Nordic Lam specified strengths on page 8.

Balanced Beams

Nordic Lam balanced members are symmetrical in lumber quality about the mid-height. Balanced beams are used in applications such as cantilevers or continuous spans, in addition to simple spans, where either the top or bottom of the member may be stressed in tension due to service loads.

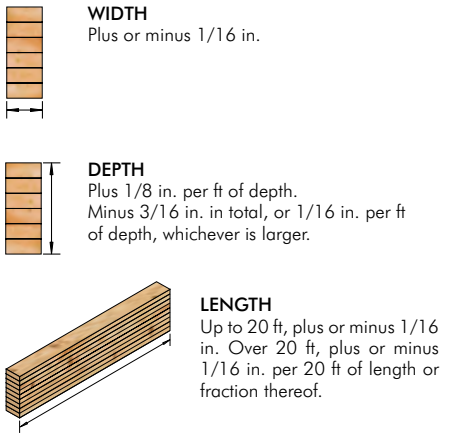
Appearance Classification

Glulam is available in a range of appearances, all looking different but having the same structural characteristics for a given strength grade. The appearance classification is not related to lumber layup requirements and thus does not affect design values of the beam. Nordic Lam appearance classifications are:

Industrial – Used for concealed applications or where appearance is not of primary importance. Stock beams are supplied with this appearance and are provided in widths designed to fit flush with 2x4 and 2x6 wall framing.

Architectural – The appearance of choice in applications where members are exposed to view, because they have a smooth, attractive finish. Available only as a custom order where finished appearance is of primary importance.

FIGURE 1
DIMENSIONAL TOLERANCES



WIDTH
Plus or minus 1/16 in.

DEPTH
Plus 1/8 in. per ft of depth.
Minus 3/16 in. in total, or 1/16 in. per ft of depth, whichever is larger.

LENGTH
Up to 20 ft, plus or minus 1/16 in. Over 20 ft, plus or minus 1/16 in. per 20 ft of length or fraction thereof.

SQUARENESS
The tolerances shall be within plus or minus 1/8 in. per ft of specified depth unless a specially shaped section is specified. Squareness is measured by placing one side of a square along a top or bottom face and determining the offset from the other side of the square to the side of the member.

STRAIGHTNESS
The tolerances are applicable at the time of manufacture without allowance for dead load deflection.
Up to 20 ft, the tolerance is plus or minus 1/4 in. Over 20 ft increase tolerance 1/8 in. per each additional 20 ft or fraction thereof, but not to exceed 3/4 in.

Trademarks and Acceptances

The APA EWS trademark signifies that the products are manufactured in conformance with ANSI Standard A190.1, American National Standard for Structural Glued Laminated Timber. Typical information included in the trademark is shown on the sample trademark below. The APA EWS trademark is recognized by all major model building codes for the certification of glued laminated timber.

Checking

Glued laminated timbers may develop seasoning checks as a normal function of the moisture stabilization process. The degree of checking in individual members will be influenced by the rate at which the member moisture content changes from a moisture content level at the time of manufacture to its expected in-service level. When checks do occur, they are primary an aesthetic concern and can be filled with an elastomeric filler to improve appearance. To reduce the possibility and severity of checking, it is important to coordinate delivery schedules to minimize job site storage. Guard against direct exposure of glulam members to severe conditions.

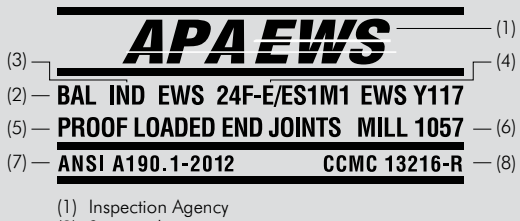
Preservative Treatment

Although glulam does not require preservative treatment for most uses, certain applications may present environmental conditions conducive to decay, insect or marine borer attack, such as the long-term or frequent presence of moisture (generally 20 percent or greater moisture content of the wood) accompanied by temperatures ranging from 50 to 90°F. When those conditions cannot be avoided, glulam must be pressure-preservative-treated. For additional information on different treatments for specific applications, please contact Nordic Engineered Wood.

Fire Resistance

Glulam beams and columns provide architectural warmth and beauty along with structural strength and natural fire resistance. In the presence of fire, the outer portion of a glulam member becomes charred. This layer of charred wood then functions as an insulator, helping to protect the undamaged interior of the member from the heat. The rate of advancement of this insulating char layer into the remaining, undamaged portion of the member is approximately 1.5 inches per hour and forms the theoretical basis of the equations used to predict fire endurance. For further information on fire-resistance, please contact Nordic Engineered Wood.

FIGURE 2
APA GRADE STAMP



(1) Inspection Agency
(2) Structural use
BAL - Balanced member
(3) Appearance grade
IND - Industrial
ARCH - Architectural
(4) Combination
(5) Specific requirements
(6) Plant number
(7) Referenced standard (U.S.)
(8) Evaluation report (Canada)

Production lot *(not shown)*

SPECIFIED STRENGTHS

SPECIFIED STRENGTHS AND DESIGN PROPERTIES [1,2,3] (psi)

APPLICATION	BEAMS AND HEADERS	COLUMNS
APPEARANCE GRADE	INDUSTRIAL	INDUSTRIAL
STRESS GRADE	24F-1.9E	ES12
EWS LAYUP COMBINATION	24F-E/ES1M1	ES12/NPG
Bending about X-X axis		
Bending at extreme fibre (F_{bx})[4,5]	4453 psi	4453 psi
Longitudinal shear (F_{vx})[6]	319 psi	319 psi
Compression perpendicular to grain (F_{cpx})[7]	1088 psi	1088 psi
Shear-free modulus of elasticity (E_x)	1.9E+06 psi	1.9E+06 psi
Apparent Modulus of Elasticity ($E_{x,app.}$)[8]	1.8E+06 psi	1.8E+06 psi
Bending about Y-Y axis		
Bending at extreme fibre (F_{by})[5]	2045 psi	4453 psi
for 3 laminations	n/a	4453 psi
Longitudinal shear (F_{vy})[6]	218 psi	319 psi
Compression perpendicular to grain (F_{cpy})[7]	551 psi	1088 psi
Shear-free modulus of elasticity (E_y)	1.6E+06 psi	1.9E+06 psi
Apparent modulus of elasticity ($E_{y,app.}$)[8]	1.5E+06 psi	1.8E+06 psi
Axially loaded		
Compression parallel to grain (F_c)	2393 psi	4786 psi
for 3 laminations	n/a	3539 psi
Tension parallel to grain (F_t)	1944 psi	2959 psi
Tension perpendicular to grain (F_{tp})	74 psi	74 psi
Modulus of elasticity (E_a)[8]	1.6E+06 psi	1.9E+06 psi
Mean relative density	0.42	0.47
Density (for member weight)	35 pcf	35 pcf

(1) The combinations in this table are applicable to members consisting of 4 or more laminations, unless otherwise noted.

(2) The tabulated design values are for dry service conditions. For wet service conditions, multiply the tabulated values by the wet service condition factors, K_S, per CSA O86-09, Clause 6.4.2.

(3) The tabulated design values are for standard term duration of load. For other durations of load, see applicable design code (CSA O86-09, Clauses 4.3.2 and 6).

(4) Nordic Lam bending members are symmetrical throughout the depth of the member (balanced layups). Vertically glued-laminated beams shall be designed using the specified strengths and modulus of elasticity for bending about Y-Y axis. (Clause 6.5.3 of CSA O86-09 is not applicable.)

(5) The tabulated specified strengths in bending (F_{bx} and F_{by}) shall be multiplied by a size factor, K_{Zbg}. The size factor formula is: $K_{Zbg} = 1.03\ (BL)^{-0.18} \leq 1.0$, where B = net beam width (m), and L = length of beam segment from point of zero moment to point of zero moment (m).

(6) At the location of notches in rectangular members, the specified strength in shear (F_v) shall be multiplied by a notch factor, K_N, determined per CSA O86-09, Clause 6.5.7.2.2.

(7) The compression perpendicular to grain strength values (F_{cpx}) shall be permitted to be adjusted by a size factor for bearing, K_{Zcp}, per CSA O86-09, Clause 6.5.9.2.

(8) The tabulated apparent E values already include a 5% shear deflection. For column stability calculations, E_{05} shall be determined by multiplying the tabulated apparent modulus of elasticity by 0.87.

(9) Design of glulam members shall be in accordance to CSA O86-09 Standard.

Nordic Lam products are listed in APA Product Report PR-L294C and CCMC Evaluation Report 13216-R.

FACTORED RESISTANCES (plf)

24F-1.9E BEAMS AND HEADERS

WIDTH (in.)	DEPTH (in.)	MOMENT (lbf-ft)	SHEAR (lb)	M. OF INERTIA (in.^{4})	WEIGHT (lbf/ft)
1-ply 1-3/4	9-1/2	8791	3182	125	4.0
	11-7/8	13,736	3978	244	5.1
	14	19,092	4689	400	6.0
	16	24,937	5359	597	6.8
	18	31,561	6029	851	7.7
2-ply 1-3/4 or 3-1/2	9-1/2	17,582	6364	250	8.1
	11-7/8	27,472	7955	488	10.1
	14	38,184	9379	800	11.9
	16	49,874	10,718	1195	13.6
	18	63,121	12,058	1701	15.3
3-ply 1-3/4 or 5-1/2	9-1/2	26,374	9546	375	12.1
	11-7/8	41,209	11,933	733	15.2
	14	57,277	14,068	1201	17.9
	16	74,810	16,078	1792	20.4
	18	94,682	18,087	2552	23.0
4-ply 1-3/4 or 7	9-1/2	35,165	12,728	500	16.2
	11-7/8	54,945	15,910	977	20.2
	14	76,369	18,757	1601	23.8
	16	99,747	21,437	2389	27.2
	18	126,243	24,116	3402	30.6

NOTES:

1. Moment and shear resistances are based on dry conditions and standard term duration of load.
2. Moment resistances shall be adjusted by the lesser of the size factor, K_{Zbg}, or the lateral stability factor, K_L.
3. Member weight is based on density of 35 pcf.
4. For 3-ply 1-3/4 or 5-1/2-inch beams, the tabulated values are based on a net width of 5-1/4 inches. For 5-1/2-inch beams, the tabulated values may be increased by 5%.

MAXIMUM
UNIFORM LOADS (plf)

24F-1.9E BEAMS AND HEADERS — FLOOR LOADS - 100% (plf)

WIDTH (in.)	DEPTH (in.)	CRITERIA	SPAN (ft)												
			6	8	10	12	14	16	18	20	22	24	26	28	30
1-ply 1-3/4	9-1/2	L/360 LL		651	333	193	122	81	57	42	---	---	---	---	---
		L/240 TL			496	285	178	118	82	58	---	---	---	---	---
		Fact. Load	1948	1094	698	483	354	270	212	171	---	---	---	---	---
		End/Int. B.	3.4/8.4	2.6/6.3	2.1/5.1	1.7/4.2	1.5/3.6	1.5/3.2	1.5/3	1.5/3	---	---	---	---	---
	11-7/8	L/360 LL			651	377	237	159	112	81	61	47	37	---	---
		L/240 TL					351	233	162	117	87	66	51	---	---
		Fact. Load	2605	1711	1093	757	554	423	333	268	221	184	156	---	---
		End/Int. B.	4.5/11.2	4/9.8	3.2/7.9	2.7/6.6	2.3/5.6	2/4.9	1.8/4.4	1.6/4	1.5/3.6	1.5/3.3	1.5/3	---	---
	14	L/360 LL				618	389	261	183	133	100	77	61	49	40
		L/240 TL						385	269	194	144	110	85	67	53
		Fact. Load	2981	2121	1520	1053	772	589	464	374	308	258	218	187	162
		End/Int. B.	5.2/12.8	4.9/12.2	4.4/10.9	3.7/9.1	3.2/7.8	2.8/6.8	2.5/6.1	2.2/5.5	2/5	1.9/4.6	1.7/4.2	1.6/3.9	1.5/3.7
	16	L/360 LL					580	389	273	199	150	115	91	73	59
		L/240 TL							403	292	218	166	129	102	82
		Fact. Load	3326	2366	1816	1377	1009	771	607	490	404	338	287	246	213
		End/Int. B.	5.8/14.3	5.5/13.6	5.3/13.1	4.8/11.9	4.1/10.2	3.6/8.9	3.2/7.9	2.9/7.1	2.6/6.5	2.4/6	2.2/5.5	2.1/5.1	1.9/4.8
	18	L/360 LL					827	554	389	284	213	164	129	103	84
		L/240 TL								418	312	238	186	147	118
		Fact. Load	3663	2606	2000	1611	1279	977	770	622	512	429	364	312	271
		End/Int. B.	6.3/15.8	6/15	5.8/14.4	5.6/13.9	5.2/12.9	4.5/11.3	4/10	3.6/9	3.3/8.2	3/7.5	2.8/6.9	2.6/6.4	2.4/6
2-ply 1-3/4 or 3-1/2	9-1/2	L/360 LL		1302	667	386	243	163	114	83	63	48	38	30	---
		L/240 TL			992	571	356	236	163	117	86	64	49	37	---
		Fact. Load	3829	2188	1396	967	707	539	424	342	280	234	198	169	---
		End/Int. B.	3.3/8.3	2.6/6.3	2.1/5.1	1.7/4.2	1.5/3.6	1.5/3.2	1.5/3	1.5/3	1.5/3	1.5/3	1.5/3	1.5/3	---
	11-7/8	L/360 LL			1302	754	475	318	223	163	122	94	74	59	48
		L/240 TL					702	467	325	234	173	131	101	79	62
		Fact. Load	4597	3270	2185	1514	1109	846	666	537	441	369	312	268	232
		End/Int. B.	4/9.9	3.8/9.4	3.2/7.9	2.7/6.6	2.3/5.6	2/4.9	1.8/4.4	1.6/4	1.5/3.6	1.5/3.3	1.5/3	1.5/3	1.5/3
	14	L/360 LL				1235	778	521	366	267	200	154	121	97	79
		L/240 TL						770	537	388	289	220	170	134	107
		Fact. Load	5261	3742	2873	2106	1544	1178	928	749	616	515	437	375	325
		End/Int. B.	4.6/11.3	4.3/10.8	4.2/10.3	3.7/9.1	3.2/7.8	2.8/6.8	2.5/6.1	2.2/5.5	2/5	1.9/4.6	1.7/4.2	1.6/3.9	1.5/3.7
	16	L/360 LL					1161	778	546	398	299	230	181	145	118
		L/240 TL							806	584	435	332	258	204	163
		Fact. Load	5869	4175	3205	2581	2018	1541	1214	980	807	676	573	492	426
		End/Int. B.	5.1/12.6	4.8/12	4.6/11.5	4.5/11.2	4.1/10.2	3.6/8.9	3.2/7.9	2.9/7.1	2.6/6.5	2.4/6	2.2/5.5	2.1/5.1	1.9/4.8
	18	L/360 LL						1107	778	567	426	328	258	207	168
		L/240 TL								835	624	477	372	295	237
		Fact. Load	6464	4598	3529	2842	2366	1953	1539	1243	1024	857	728	625	542
		End/Int. B.	5.6/13.9	5.3/13.2	5.1/12.7	4.9/12.3	4.8/11.9	4.5/11.3	4/10	3.6/9	3.3/8.2	3/7.5	2.8/6.9	2.6/6.4	2.4/6

See notes on page 11.

24F-1.9E BEAMS AND HEADERS — FLOOR LOADS - 100% (plf) (continued)

WIDTH (in.)	DEPTH (in.)	CRITERIA	SPAN (ft)												
			6	8	10	12	14	16	18	20	22	24	26	28	30
3-ply 1-3/4 or 5-1/2	9-1/2	L/360 LL		1954	1000	579	365	244	172	125	94	72	57	46	37
		L/240 TL			1488	856	535	354	245	175	129	96	73	56	43
		Fact. Load	5338	3281	2095	1450	1061	809	636	512	421	351	297	254	218
		End/Int. B.	3.1/7.7	2.6/6.3	2.1/5.1	1.7/4.2	1.5/3.6	1.5/3.2	1.5/3	1.5/3	1.5/3	1.5/3	1.5/3	1.5/3	1.5/3
	11-7/8	L/360 LL			1954	1131	712	477	335	244	183	141	111	89	72
		L/240 TL					1053	700	487	351	260	197	152	118	93
		Fact. Load	6409	4559	3278	2270	1663	1269	998	805	662	553	469	402	345
		End/Int. B.	3.7/9.2	3.5/8.8	3.2/7.9	2.7/6.6	2.3/5.6	2/4.9	1.8/4.4	1.6/4	1.5/3.6	1.5/3.3	1.5/3	1.5/3	1.5/3
	14	L/360 LL				1853	1167	782	549	400	301	232	182	146	119
		L/240 TL						1154	806	582	433	330	255	201	160
		Fact. Load	7335	5217	4004	3159	2315	1767	1392	1123	924	773	655	562	484
		End/Int. B.	4.2/10.5	4/10	3.9/9.6	3.7/9.1	3.2/7.8	2.8/6.8	2.5/6.1	2.2/5.5	2/5	1.9/4.6	1.7/4.2	1.6/3.9	1.5/3.6
	16	L/360 LL					1741	1167	819	597	449	346	272	218	177
		L/240 TL							1209	876	653	498	387	306	245
		Fact. Load	8183	5820	4467	3597	2995	2312	1822	1471	1211	1013	860	738	635
		End/Int. B.	4.7/11.8	4.5/11.2	4.3/10.7	4.2/10.4	4.1/10.1	3.6/8.9	3.2/7.9	2.9/7.1	2.6/6.5	2.4/6	2.2/5.5	2.1/5.1	1.9/4.7
	18	L/360 LL						1661	1167	851	639	492	387	310	252
		L/240 TL								1253	936	715	558	442	355
		Fact. Load	9012	6410	4919	3961	3298	2813	2309	1865	1536	1286	1092	937	808
		End/Int. B.	5.2/12.9	4.9/12.3	4.8/11.8	4.6/11.4	4.5/11.1	4.4/10.8	4/10	3.6/9	3.3/8.2	3/7.5	2.8/6.9	2.6/6.4	2.4/6
4-ply 1-3/4 or 7	9-1/2	L/360 LL		2605	1334	772	486	326	229	167	125	96	76	61	49
		L/240 TL			1984	1142	713	472	327	234	172	129	98	75	58
		Fact. Load	6757	4375	2793	1933	1415	1079	848	683	560	460	383	323	275
		End/Int. B.	3/7.3	2.6/6.3	2.1/5.1	1.7/4.2	1.5/3.6	1.5/3.2	1.5/3	1.5/3	1.5/3	1.5/3	1.5/3	1.5/3	1.5/3
	11-7/8	L/360 LL			2605	1507	949	636	447	326	245	188	148	119	96
		L/240 TL					1404	934	650	468	347	262	202	158	125
		Fact. Load	8113	5770	4370	3027	2217	1692	1331	1074	881	724	604	510	436
		End/Int. B.	3.5/8.8	3.4/8.3	3.2/7.9	2.7/6.6	2.3/5.6	2/4.9	1.8/4.4	1.6/4	1.5/3.6	1.5/3.2	1.5/3	1.5/3	1.5/3
	14	L/360 LL				2470	1556	1042	732	534	401	309	243	194	158
		L/240 TL						1539	1074	777	577	439	340	268	213
		Fact. Load	9285	6603	5068	4081	3087	2357	1856	1497	1230	1012	845	715	611
		End/Int. B.	4/10	3.8/9.5	3.7/9.1	3.6/8.8	3.2/7.8	2.8/6.8	2.5/6.1	2.2/5.5	2/5	1.8/4.5	1.7/4.1	1.5/3.7	1.5/3.4
	16	L/360 LL					2322	1556	1093	796	598	461	363	290	236
		L/240 TL							1612	1167	870	664	517	408	327
		Fact. Load	10358	7367	5653	4553	3790	3083	2429	1961	1611	1327	1109	938	803
		End/Int. B.	4.5/11.2	4.3/10.6	4.1/10.2	4/9.9	3.9/9.6	3.6/8.9	3.2/7.9	2.9/7.1	2.6/6.5	2.4/5.8	2.2/5.3	2/4.9	1.8/4.5
	18	L/360 LL						2215	1556	1134	852	656	516	413	336
		L/240 TL								1670	1247	954	744	589	473
		Fact. Load	11408	8113	6226	5013	4173	3559	3079	2486	2044	1684	1408	1193	1021
		End/Int. B.	4.9/12.3	4.7/11.7	4.5/11.2	4.4/10.9	4.3/10.6	4.1/10.3	4/10	3.6/9	3.3/8.2	3/7.4	2.7/6.7	2.5/6.2	2.3/5.7

NOTES:

1. Values shown are the maximum uniform loads, in pounds per linear foot (plf), that can be applied to the beam in addition to its own weight.
2. Selected beam shall satisfy both live (LL) and total (TL) specified loads, and the total factored load (Fact. Load). When no value is shown in the live load and/or total load row, the factored total load governs the design.
3. Table is based on uniform loads and the most restrictive of simple or continuous spans, and dry-use conditions. Span is measured centre to centre of supports. The maximum uniform loads are for standard term duration of load.
4. Maximum deflection = L/360 under specified live load, and L/240 under specified total load. Other deflection limits may apply. For deflection limit of L/480, multiply live load values by 0.75. The resulting live load shall not exceed the factored total load shown.
5. Table values assume that lateral support is provided at each support and continuously along the compression edge of the beam.
6. Multiple pieces may be used when properly connected. For 3-ply 1-3/4 or 5-1/2-inch beams, the tabulated values are based on a net width of 5-1/4 inches. For 5-1/2-inch beams, the tabulated values may be increased by 5%.
7. Sufficient bearing length shall be provided at supports. Review bearing length requirements (shown in inches) to ensure adequacy.

ALLOWABLE
AXIAL LOADS (lbs)

AXIAL RESISTANCES (lbs)

EFFECTIVE COLUMN LENGTH (ft)	LAMINATION NET WIDTH = 3-1/2 in.			NET WIDTH = 5-1/2 in.		= 7 in.
	NET DEPTH			NET DEPTH		NET DEPTH
	3-1/2 in	5-1/2 in.	7 in.	5-1/2 in.	7 in.	7 in.
6	15,244	26,074	33,185	57,899	73,690	102,522
7	12,921	21,763	27,698	52,912	67,258	96,211
8	10,867	18,096	23,031	47,853	60,530	89,704
9	9110	15,042	19,145	42,898	54,161	83,151
10	7631	12,519	15,934	38,204	48,279	76,698
11	6396	10,439	13,280	33,954	42,940	70,469
12	5367	8722	11,084	30,150	38,152	64,556
13	4513	7304	9276	26,768	33,891	59,015
14	3803	6132	7786	23,774	30,113	53,875
15	---	---	---	21,128	26,772	49,144
16	---	---	---	18,791	23,818	44,810
17	---	---	---	16,726	21,207	40,855
18	---	---	---	14,901	18,897	37,254
19	---	---	---	13,286	16,853	33,979
20	---	---	---	11,857	15,044	31,002
21	---	---	---	10,593	13,443	28,297
22	---	---	---	9474	12,026	25,838
23	---	---	---	---	---	23,603
24	---	---	---	---	---	21,572

ALLOWABLE BEARING LOADS (lbs)

SPECIES OR GRADE	BEARING AREA (in.^{2})					
	12.25	19.25	24.50	30.25	38.50	49.00
	3-1/2 in. x 3-1/2 in. =	3-1/2 in. x 5-1/2 in. =	3-1/2 in. x 7 in. =	5-1/2 in. x 5-1/2 in. =	3-1/2 in. x 7 in. =	7 in. x 7 in. =
D. Fir-L	11,442	17,980	22,884	28,255	35,961	45,768
Hem-Fir	7,519	11,816	15,038	18,567	23,631	30,076
S-P-F	8,663	13,614	17,327	21,393	27,227	34,653
Northern	5,721	8,990	11,442	14,127	17,980	22,884
ES11	9,481	14,898	18,961	23,411	29,796	37,922
24F-1.9E	12,259	19,265	24,519	30,273	38,529	49,037

NOTES:

1. Values shown in the above table are the maximum axial loads, in pounds (lbs), that can be applied to the column in addition to its own weight. Values shown in the table below are the maximum bearing loads, in pounds (lbs).
2. The tabulated axial resistances are based on simply axially loaded columns subjected to a maximum eccentricity of either 1/6 column width or 1/6 column depth, whichever is worse. For side loads, other eccentric end loads, or other combined axial and flexural loads, see CSA O86-09.
3. The tabulated bearing resistances are based on the compression perpendicular to grain resistance of the supporting material.
4. The values are based on standard term duration of load and dry-use conditions. The bearing resistances shall not be increased by any load duration factor.
5. The column is assumed to be unbraced, except at the column ends, and the effective column length is equal to the actual column length.
6. These values are for preliminary design use only. Final design should include a complete analysis, including bearing resistance of the foundation supporting the column. When the column is used in a wall system, review bearing resistance requirements above to ensure adequacy.

NORDIC LAM™
Flexibility, Stability, Quality

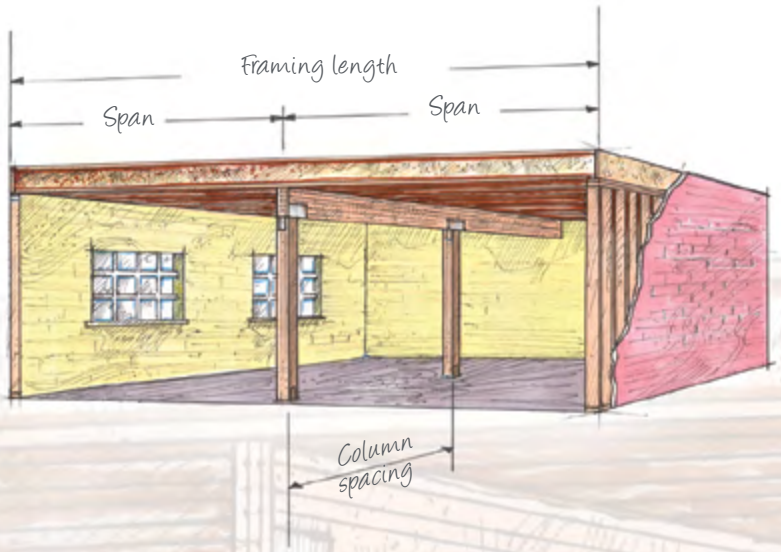
Nordic Lam offers versatility and design options

Nordic Lam is a highly versatile product that can be manufactured to meet many design and appearance requirements for residential framing. One of the most common applications for glulam in home construction are garage door headers. Glulam can span distances long enough to allow garage door openings for up to three cars.

10 Reasons to use Nordic Lam headers

1. Nordic Lam headers come as a single piece: they don't have to be nailed together like some other header materials.
2. Nordic Lam is dry, straight, and dimensionally stable. Because it won't warp or twist, it makes it easy to frame a straight garage door opening.
3. Nordic Lam is manufactured under strict industry-wide quality control standards, which means you can count on every piece to perform as intended.
4. Nordic Lam is stronger than lumber headers, allowing wider openings with smaller members.
5. Nordic Lam can be supplied in long lengths, so it's simple to extend the header over narrow end walls to gain added lateral strength at little additional cost.
6. Nordic Lam is available in all major market areas and can be ordered in cut-to-length sizes, eliminating jobsite waste and cost.
7. Nordic Lam is available in widths that match standard 2x4 and 2x6 wall construction, so there's no need for furring when you connect headers to end walls.
8. Nordic Lam is supplied with zero camber assuring a level garage door opening with no sag.
9. Nordic Lam is easy to work with using traditional carpentry tools.
10. And, Nordic Lam is environmentally friendly – it's manufactured from small dimension lumber harvested from managed timberlands.

FLOOR BEAMS



FLOOR BEAMS tables show the size of the beams needed to support various floor systems. The tables are valid for loads on one floor only, i.e., a second story floor or a story floor over a basement. Verify that floor loading of 40 psf live load and 15 psf dead load is appropriate.

Find the length of supported floor framing *(framing length)*. If floor joists are simple span, then the framing length may be taken as 80% of the sum of spans of the floor joists. When floor joists span continuously over the beam, these tables require that both spans are equal on either side of the beam.

For floor beam applications not conforming to these conditions, use a design software or contact Nordic Technical Services.

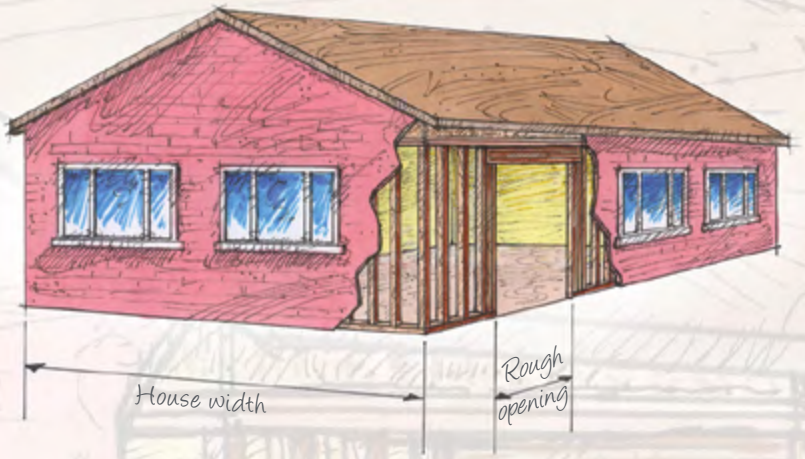
24F-1.9E BEAMS

FRAMING LENGTH (ft)	COLUMN SPACING - CENTRE TO CENTRE (ft)								
	6	8	10	12	14	16	18	20	22
24	3-1/2x9-1/2 5-1/2x9-1/2 7x9-1/2	3-1/2x9-1/2 5-1/2x9-1/2 7x9-1/2	3-1/2x9-1/2 5-1/2x9-1/2 7x9-1/2	3-1/2x11-7/8 5-1/2x11-7/8 7x9-1/2	3-1/2x14 5-1/2x11-7/8 7x11-7/8	3-1/2x16 5-1/2x14 7x11-7/8	3-1/2x18 5-1/2x16 7x14	3-1/2x18 5-1/2x16 7x16	--- 5-1/2x18 7x16
28	3-1/2x9-1/2 5-1/2x9-1/2 7x9-1/2	3-1/2x9-1/2 5-1/2x9-1/2 7x9-1/2	3-1/2x11-7/8 5-1/2x9-1/2 7x9-1/2	3-1/2x11-7/8 5-1/2x11-7/8 7x9-1/2	3-1/2x14 5-1/2x11-7/8 7x11-7/8	3-1/2x16 5-1/2x14 7x14	3-1/2x18 5-1/2x16 7x14	--- 5-1/2x16 7x16	--- 5-1/2x18 7x16
32	3-1/2x9-1/2 5-1/2x9-1/2 7x9-1/2	3-1/2x9-1/2 5-1/2x9-1/2 7x9-1/2	3-1/2x11-7/8 5-1/2x9-1/2 7x9-1/2	3-1/2x14 5-1/2x11-7/8 7x9-1/2	3-1/2x14 5-1/2x14 7x11-7/8	3-1/2x16 5-1/2x14 7x14	3-1/2x18 5-1/2x16 7x14	--- 5-1/2x18 7x16	--- 5-1/2x18 7x18
36	3-1/2x9-1/2 5-1/2x9-1/2 7x9-1/2	3-1/2x9-1/2 5-1/2x9-1/2 7x9-1/2	3-1/2x11-7/8 5-1/2x9-1/2 7x9-1/2	3-1/2x14 5-1/2x11-7/8 7x11-7/8	3-1/2x16 5-1/2x14 7x11-7/8	3-1/2x18 5-1/2x14 7x14	--- 5-1/2x16 7x14	--- 5-1/2x18 7x16	--- --- 7x18
40	3-1/2x9-1/2 5-1/2x9-1/2 7x9-1/2	3-1/2x9-1/2 5-1/2x9-1/2 7x9-1/2	3-1/2x11-7/8 5-1/2x9-1/2 7x9-1/2	3-1/2x14 5-1/2x11-7/8 7x11-7/8	3-1/2x16 5-1/2x14 7x11-7/8	3-1/2x18 5-1/2x16 7x14	--- 5-1/2x16 7x16	--- 5-1/2x18 7x16	--- --- 7x18

NOTES:

1. Table is based on continuous floor joist with equal spans, and the most restrictive of simple or continuous beam with equal spans. If floor joists are not continuous, it is permissible to consider a total floor joist span that is equal to 0.8 times the total of both spans.
2. Table is based on residential floor loading of 40 psf live load and 15 psf dead load, and dry-service conditions. A live load reduction factor for tributary area has been applied in accordance with NBC 2010, Section 4.1.5.8. Roof framing must be trusses supported at exterior walls only.
3. Maximum deflection = L/360 under live load, and L/240 under total load. Other deflection limits may apply.
4. Table values assume that lateral support is provided at each support and continuously along the top edge of the beam.
5. Multiple pieces may be used when properly connected. For 3-ply 1-3/4-inch beams, use the beam sizes for 5-1/2-inch width.
6. Minimum bearing length shall be 3 inches for the end bearings, and 7 inches for the intermediate bearings, except in shaded areas. In those cases, 4-1/2 and 10-1/2 inches are required for end and intermediate bearings, respectively. Bearing lengths are based on Nordic Lam's bearing strength for applicable grade. Bearing lengths may need to be increased if support member's specified bearing strength is less.
7. For other loading conditions refer to maximum uniform load tables or use a design software.

1-STORY HEADERS



1-STORY HEADERS tables indicate the appropriate size header for various roof truss spans with 2-foot overhang. If the overhang is greater than 2 feet, additional engineering analysis is required.

Determine the roof loading and go to the appropriate section of the table. Find the width of the building that meets or exceeds that of the roof trusses. Locate the rough opening size that meets or exceeds the door or window rough opening size. Select the header size shown in the appropriate case.

For one-story header applications not conforming to these conditions, use a design software or contact Nordic Technical Services.

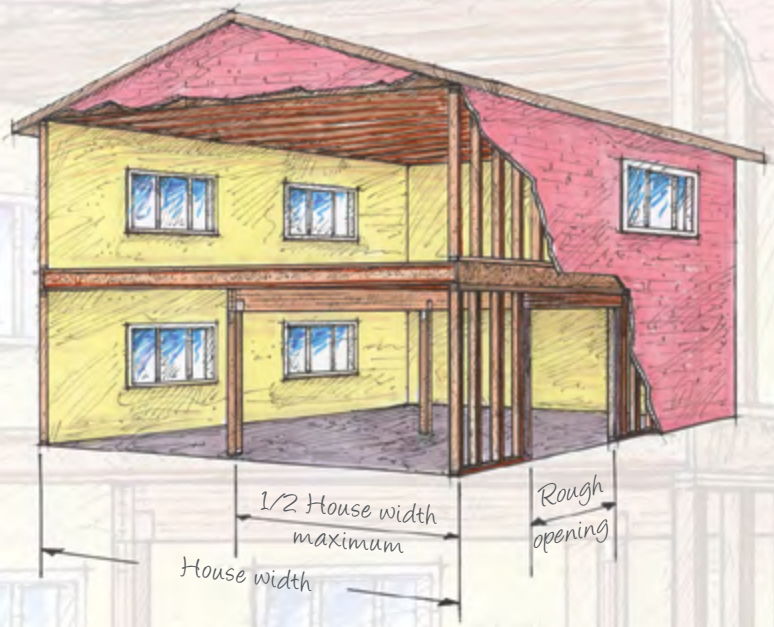
24F-1.9E HEADERS

HOUSE WIDTH (ft)	ROOF SNOW LOADS / ROUGH OPENINGS								
	30 psf LL + 15 psf DL			40 psf LL + 15 psf DL			50 psf LL + 15 psf DL		
	6'-0"	9'-0"	12'-0"	6'-0"	9'-0"	12'-0"	6'-0"	9'-0"	12'-0"
24	3-1/2 x 9-1/2 5-1/2 x 9-1/2	3-1/2 x 9-1/2 5-1/2 x 9-1/2	3-1/2 x 14 5-1/2 x 11-7/8	3-1/2 x 9-1/2 5-1/2 x 9-1/2	3-1/2 x 9-1/2 5-1/2 x 9-1/2	3-1/2 x 14 5-1/2 x 11-7/8	3-1/2 x 9-1/2 5-1/2 x 9-1/2	3-1/2 x 11-7/8 5-1/2 x 9-1/2	3-1/2 x 14 5-1/2 x 14
28	3-1/2 x 9-1/2 5-1/2 x 9-1/2	3-1/2 x 9-1/2 5-1/2 x 9-1/2	3-1/2 x 14 5-1/2 x 11-7/8	3-1/2 x 9-1/2 5-1/2 x 9-1/2	3-1/2 x 9-1/2 5-1/2 x 9-1/2	3-1/2 x 14 5-1/2 x 14	3-1/2 x 9-1/2 5-1/2 x 9-1/2	3-1/2 x 11-7/8 5-1/2 x 9-1/2	3-1/2 x 16 5-1/2 x 14
32	3-1/2 x 9-1/2 5-1/2 x 9-1/2	3-1/2 x 9-1/2 5-1/2 x 9-1/2	3-1/2 x 14 5-1/2 x 11-7/8	3-1/2 x 9-1/2 5-1/2 x 9-1/2	3-1/2 x 11-7/8 5-1/2 x 9-1/2	3-1/2 x 16 5-1/2 x 14	3-1/2 x 9-1/2 5-1/2 x 9-1/2	3-1/2 x 11-7/8 5-1/2 x 9-1/2	3-1/2 x 16 5-1/2 x 14
36	3-1/2 x 9-1/2 5-1/2 x 9-1/2	3-1/2 x 9-1/2 5-1/2 x 9-1/2	3-1/2 x 14 5-1/2 x 14	3-1/2 x 9-1/2 5-1/2 x 9-1/2	3-1/2 x 11-7/8 5-1/2 x 9-1/2	3-1/2 x 16 5-1/2 x 14	3-1/2 x 9-1/2 5-1/2 x 9-1/2	3-1/2 x 11-7/8 5-1/2 x 9-1/2	3-1/2 x 16 5-1/2 x 14
40	3-1/2 x 9-1/2 5-1/2 x 9-1/2	3-1/2 x 11-7/8 5-1/2 x 9-1/2	3-1/2 x 16 5-1/2 x 14	3-1/2 x 9-1/2 5-1/2 x 9-1/2	3-1/2 x 11-7/8 5-1/2 x 9-1/2	3-1/2 x 16 5-1/2 x 14	3-1/2 x 9-1/2 5-1/2 x 9-1/2	3-1/2 x 11-7/8 5-1/2 x 11-7/8	3-1/2 x 16 5-1/2 x 14

NOTES:

1. Table is based on roof snow loads only, and NBC 2010 Edition. The header is assumed to carry 1/2 the span of the roof framing plus a 24-inch overhang.
2. Table is based on roof snow loads (as indicated) and 15 psf dead load, and dry-use conditions.
3. Maximum deflection = L/240 under live load, and the lesser of L/180 or 5/16 inch under total load. Other deflection limits may apply.
4. Table values assume that lateral support is provided at each support and continuously along the top edge of the beam.
5. Multiple pieces may be used when properly connected. For 3-ply 1-3/4-inch beams, use the beam sizes for 5-1/2-inch width.
6. Minimum bearing length shall be 3 inches for the end bearings, except in shaded areas. In those cases, 4-1/2 inches is required. Bearing across the full width of header is required. Bearing length is based on Nordic Lam's bearing strength for applicable grade. Bearing lengths may need to be increased if support member's specified bearing strength is less.
7. For other loading conditions refer to maximum uniform load tables or use a design software.

2-STORY HEADERS



2-STORY HEADERS tables consider the combined loads from various roof truss spans with a 2-foot overhang, a wall, and a second story floor (1/4 of total floor joist length). An intermediate floor beam is assumed at mid-span. If the overhang exceeds 2 feet, additional engineering analysis is required.

Verify that floor loading of 40 psf live load and 15 psf dead load is appropriate. Determine the roof loading and go to the appropriate section of the table. Find the width of the building that meets or exceeds that of the roof trusses. Locate the rough opening size that meets or exceeds the door or window rough opening size. Select the header size shown in the appropriate case.

For two-story header applications not conforming to these conditions, use a design software or contact Nordic Technical Services.

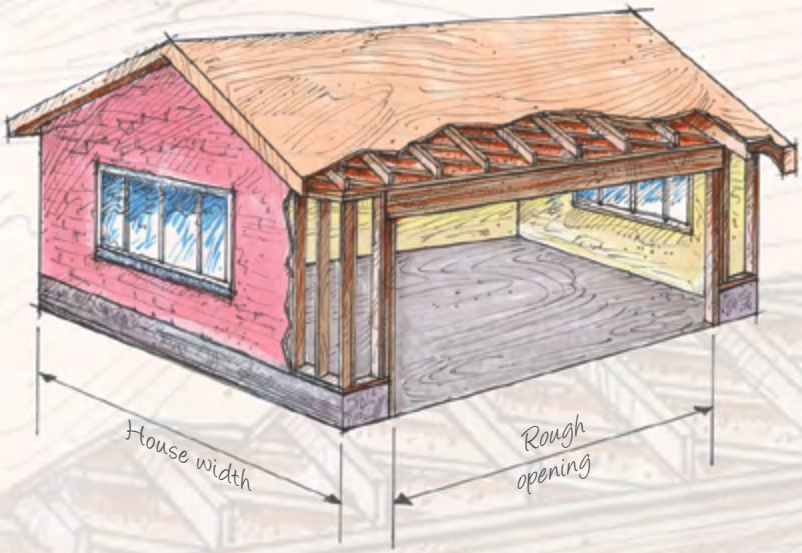
24F-1.9E HEADERS

HOUSE WIDTH (ft)	ROOF SNOW LOADS / ROUGH OPENINGS								
	30 psf LL + 15 psf DL			40 psf LL + 15 psf DL			50 psf LL + 15 psf DL		
	6'-0"	9'-0"	12'-0"	6'-0"	9'-0"	12'-0"	6'-0"	9'-0"	12'-0"
24	3-1/2 x 9-1/2 5-1/2 x 9-1/2	3-1/2 x 9-1/2 5-1/2 x 9-1/2	3-1/2 x 14 5-1/2 x 14	3-1/2 x 9-1/2 5-1/2 x 9-1/2	3-1/2 x 11-7/8 5-1/2 x 9-1/2	3-1/2 x 14 5-1/2 x 14	3-1/2 x 9-1/2 5-1/2 x 9-1/2	3-1/2 x 11-7/8 5-1/2 x 9-1/2	3-1/2 x 16 5-1/2 x 14
28	3-1/2 x 9-1/2 5-1/2 x 9-1/2	3-1/2 x 11-7/8 5-1/2 x 9-1/2	3-1/2 x 16 5-1/2 x 14	3-1/2 x 9-1/2 5-1/2 x 9-1/2	3-1/2 x 11-7/8 5-1/2 x 9-1/2	3-1/2 x 16 5-1/2 x 14	3-1/2 x 9-1/2 5-1/2 x 9-1/2	3-1/2 x 11-7/8 5-1/2 x 9-1/2	3-1/2 x 16 5-1/2 x 14
32	3-1/2 x 9-1/2 5-1/2 x 9-1/2	3-1/2 x 11-7/8 5-1/2 x 9-1/2	3-1/2 x 16 5-1/2 x 14	3-1/2 x 9-1/2 5-1/2 x 9-1/2	3-1/2 x 11-7/8 5-1/2 x 9-1/2	3-1/2 x 16 5-1/2 x 14	3-1/2 x 9-1/2 5-1/2 x 9-1/2	3-1/2 x 11-7/8 5-1/2 x 9-1/2	3-1/2 x 16 5-1/2 x 14
36	3-1/2 x 9-1/2 5-1/2 x 9-1/2	3-1/2 x 11-7/8 5-1/2 x 9-1/2	3-1/2 x 16 5-1/2 x 14	3-1/2 x 9-1/2 5-1/2 x 9-1/2	3-1/2 x 11-7/8 5-1/2 x 9-1/2	3-1/2 x 16 5-1/2 x 14	3-1/2 x 9-1/2 5-1/2 x 9-1/2	3-1/2 x 11-7/8 5-1/2 x 11-7/8	3-1/2 x 18 5-1/2 x 14
40	3-1/2 x 9-1/2 5-1/2 x 9-1/2	3-1/2 x 11-7/8 5-1/2 x 9-1/2	3-1/2 x 16 5-1/2 x 14	3-1/2 x 9-1/2 5-1/2 x 9-1/2	3-1/2 x 11-7/8 5-1/2 x 11-7/8	3-1/2 x 18 5-1/2 x 16	3-1/2 x 9-1/2 5-1/2 x 9-1/2	3-1/2 x 11-7/8 5-1/2 x 11-7/8	3-1/2 x 18 5-1/2 x 16

NOTES:

1. Table is based on floor and roof snow loads only, and NBC 2010 Edition. The header is assumed to carry 1/2 the span of the roof framing plus a 24-inch overhang, a wall, and a second story floor (1/4 of the total floor joist length).
2. Table is based on roof snow load (as indicated) and 15 psf dead load, residential floor loading of 40 psf live load and 15 psf dead load, and dry-use conditions. A live load reduction factor for tributary area has been applied in accordance with NBC 2010, Section 4.1.5.8. Roof framing must be trusses supported at exterior walls only.
3. Maximum deflection = L/360 under live load, and the lesser of L/240 or 5/16 inch under total load. Other deflection limits may apply.
4. Table values assume that lateral support is provided at each support and continuously along the top edge of the beam.
5. Multiple pieces may be used when properly connected. For 3-ply 1-3/4-inch beams, use the beam sizes for 5-1/2-inch width.
6. Minimum bearing length shall be 3 inches for the end bearings, except in shaded areas. In those cases, 4-1/2 inches is required. Bearing across the full width of header is required. Bearing length is based on Nordic Lam's bearing strength for applicable grade. Bearing lengths may need to be increased if support member's specified bearing strength is less.
7. For other loading conditions refer to maximum uniform load tables or use a design software.

GARAGE DOOR HEADERS



GARAGE DOOR HEADERS tables indicate the appropriate size header for various roof truss spans with 2-foot overhang. If the overhang is greater than 2 feet, additional engineering analysis is required.

Determine the roof loading and go to the appropriate section of the table. Find the width of the building that meets or exceeds that of the roof trusses. Locate the rough opening size that meets or exceeds the garage door rough opening size. Select the header size shown in the appropriate case.

For garage door header applications not conforming to these conditions, use a design software or contact Nordic Technical Services.

24F-1.9E HEADERS

HOUSE WIDTH (ft)	ROOF SNOW LOADS / ROUGH OPENINGS								
	30 psf LL + 15 psf DL			40 psf LL + 15 psf DL			50 psf LL + 15 psf DL		
	6'-0"	9'-0"	12'-0"	6'-0"	9'-0"	12'-0"	6'-0"	9'-0"	12'-0"
24	3-1/2 x 9-1/2	3-1/2 x 14	3-1/2 x 14	3-1/2 x 9-1/2	3-1/2 x 14	3-1/2 x 16	3-1/2 x 9-1/2	3-1/2 x 16	3-1/2 x 18
	5-1/2 x 9-1/2	5-1/2 x 11-7/8	5-1/2 x 11-7/8	5-1/2 x 9-1/2	5-1/2 x 11-7/8	5-1/2 x 14	5-1/2 x 9-1/2	5-1/2 x 14	5-1/2 x 14
28	3-1/2 x 9-1/2	3-1/2 x 14	3-1/2 x 16	3-1/2 x 9-1/2	3-1/2 x 16	3-1/2 x 18	3-1/2 x 9-1/2	3-1/2 x 16	3-1/2 x 18
	5-1/2 x 9-1/2	5-1/2 x 11-7/8	5-1/2 x 14	5-1/2 x 9-1/2	5-1/2 x 14	5-1/2 x 14	5-1/2 x 9-1/2	5-1/2 x 14	5-1/2 x 16
32	3-1/2 x 9-1/2	3-1/2 x 14	3-1/2 x 16	3-1/2 x 9-1/2	3-1/2 x 16	3-1/2 x 18	3-1/2 x 11-7/8	3-1/2 x 18	---
	5-1/2 x 9-1/2	5-1/2 x 11-7/8	5-1/2 x 14	5-1/2 x 9-1/2	5-1/2 x 14	5-1/2 x 14	5-1/2 x 9-1/2	5-1/2 x 14	5-1/2 x 16
36	3-1/2 x 9-1/2	3-1/2 x 16	3-1/2 x 16	3-1/2 x 11-7/8	3-1/2 x 16	3-1/2 x 18	3-1/2 x 11-7/8	3-1/2 x 18	---
	5-1/2 x 9-1/2	5-1/2 x 11-7/8	5-1/2 x 14	5-1/2 x 9-1/2	5-1/2 x 14	5-1/2 x 16	5-1/2 x 9-1/2	5-1/2 x 16	5-1/2 x 16
40	3-1/2 x 9-1/2	3-1/2 x 16	3-1/2 x 18	3-1/2 x 11-7/8	3-1/2 x 18	---	3-1/2 x 11-7/8	---	---
	5-1/2 x 9-1/2	5-1/2 x 14	5-1/2 x 14	5-1/2 x 9-1/2	5-1/2 x 14	5-1/2 x 16	5-1/2 x 9-1/2	5-1/2 x 16	5-1/2 x 18

NOTES:

1. Table is based on roof snow loads only, and NBC 2010 Edition. The header is assumed to carry 1/2 the span of the roof framing plus a 24-inch overhang.
2. Table is based on roof snow loads (as indicated) and 15 psf dead load, and dry-use conditions.
3. Maximum deflection = L/240 under live load, and L/180 under total load. Other deflection limits may apply.
4. Table values assume that lateral support is provided at each support and continuously along the top edge of the beam.
5. Multiple pieces may be used when properly connected. For 3-ply 1-3/4-inch beams, use the beam sizes for 5-1/2-inch width.
6. Minimum bearing length shall be 3 inches for the end bearings, except in shaded areas. In those cases, 4-1/2 inches is required. Bearing across the full width of header is required. Bearing length is based on Nordic Lam's bearing strength for applicable grade. Bearing lengths may need to be increased if support member's specified bearing strength is less.
7. For other loading conditions refer to maximum uniform load tables or use a design software.

FLOOR
FRAMING DETAILS

Concealed or Exposed

Glulam floor beams can be installed within the floor joist cavity if a concealed application is desired. Many stocking distributors inventory glulam in I-joist-compatible depths (IJC) for use with I-joist framing systems but most standard-depth stock beams can easily be used in a concealed floor application with minimal furring. They can also be partially concealed in the floor joist cavity or left completely exposed below the floor framing, adding increased aesthetic value to the room below.

Details 3a through 3o illustrate a variety of simple floor-framing details incorporating glulam beams.

Glulam Columns

When a design calls for a column, glulam is an excellent option. Nordic Lam columns are available in standard widths of 3-1/2", 5-1/2" and 7", and can be ordered in larger dimensions.

FIGURE 3
FLOOR FRAMING DETAILS

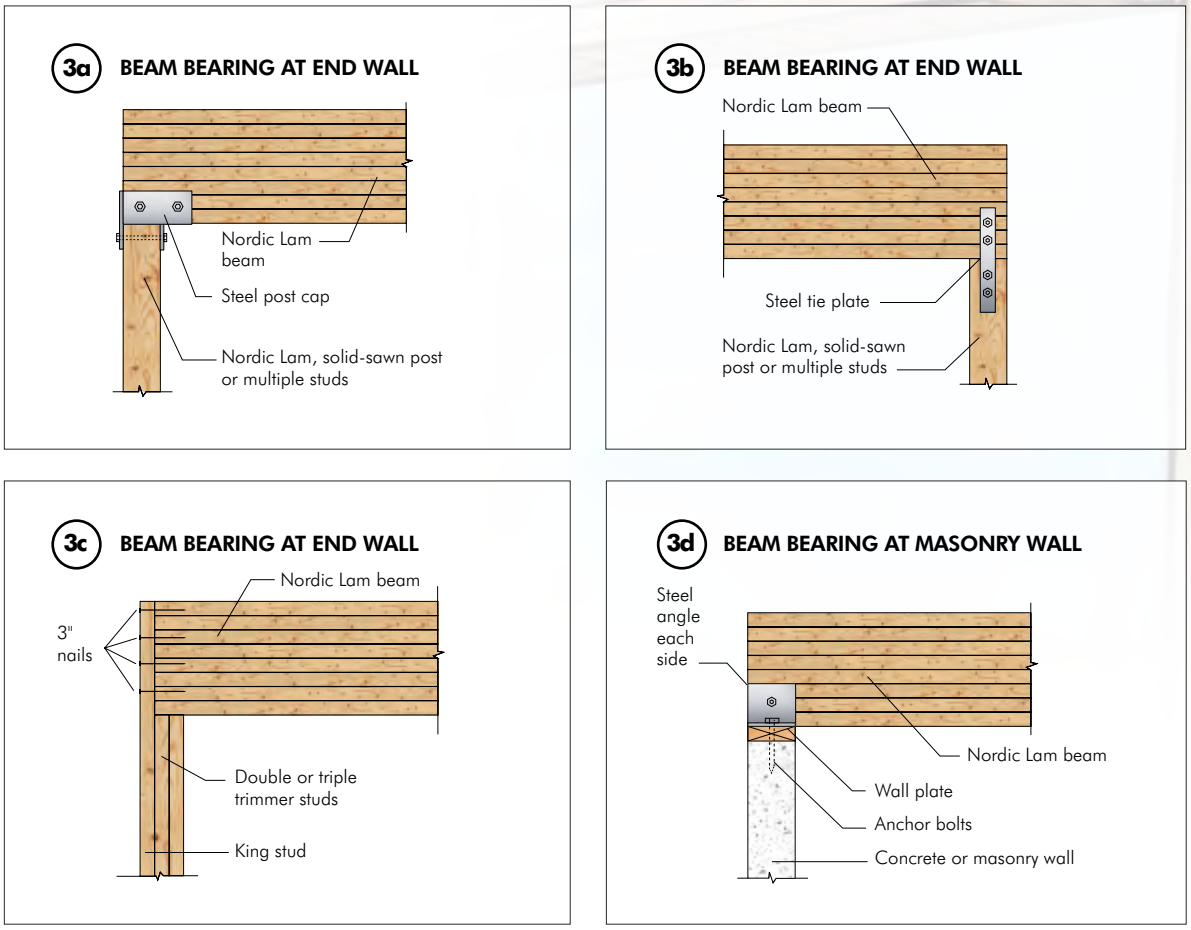
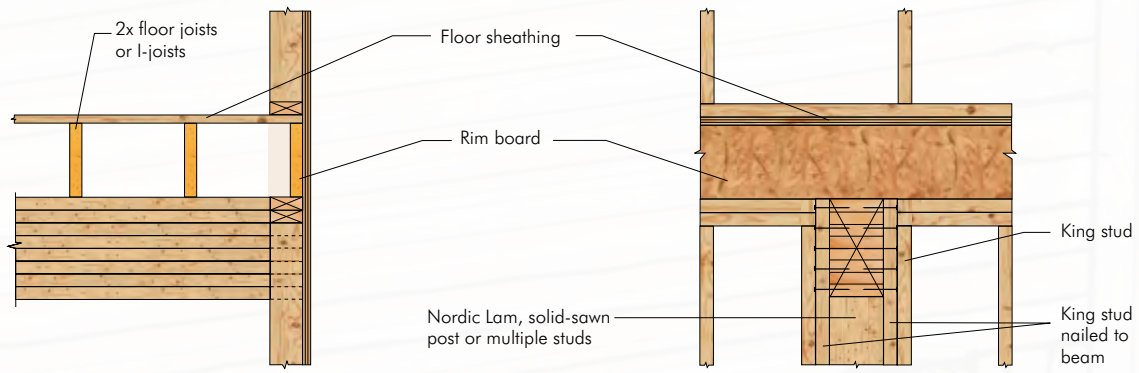
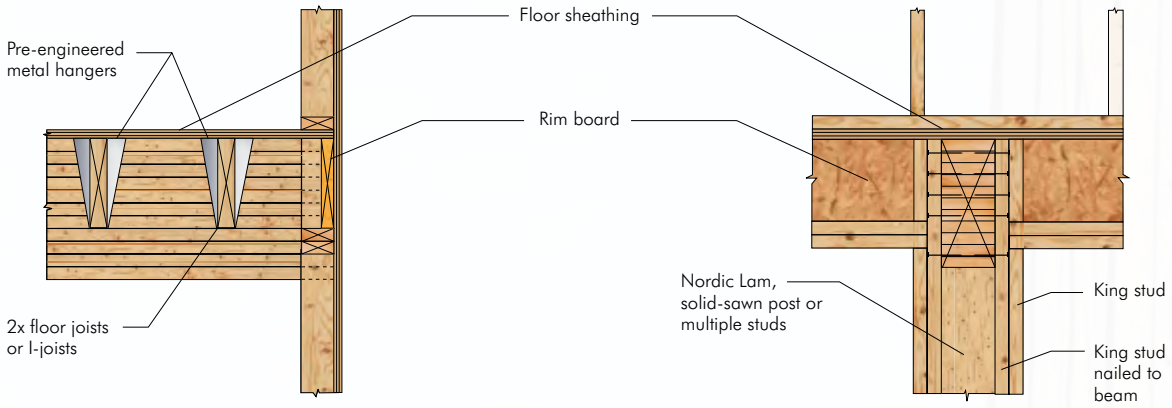


FIGURE 3 (continued)

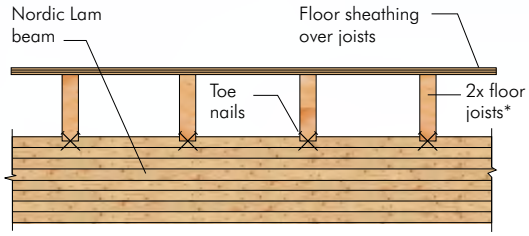
3e BEAM SUPPORT AT END WALL WITH FLOOR JOISTS OVER BEAM



3f BEAM SUPPORT AT END WALL WITH FLOOR JOISTS FLUSH WITH BEAM

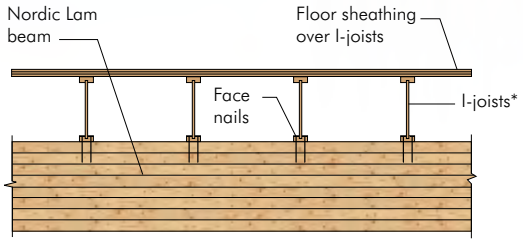


3g LUMBER JOISTS BEARING ON FLOOR BEAM



*Blocking between joists not shown for clarity

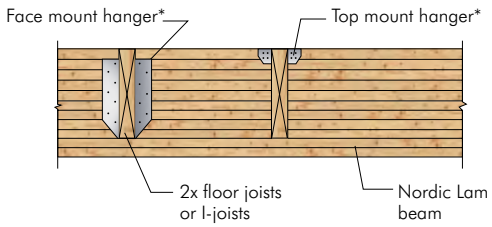
3h I-JOISTS BEARING ON FLOOR BEAM



*Blocking between joists not shown for clarity

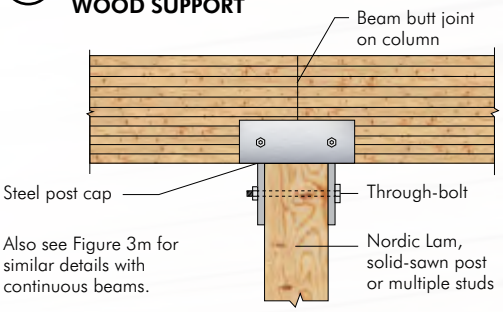
FIGURE 3 (continued)

3j JOIST MOUNTED FLUSH WITH FLOOR BEAM



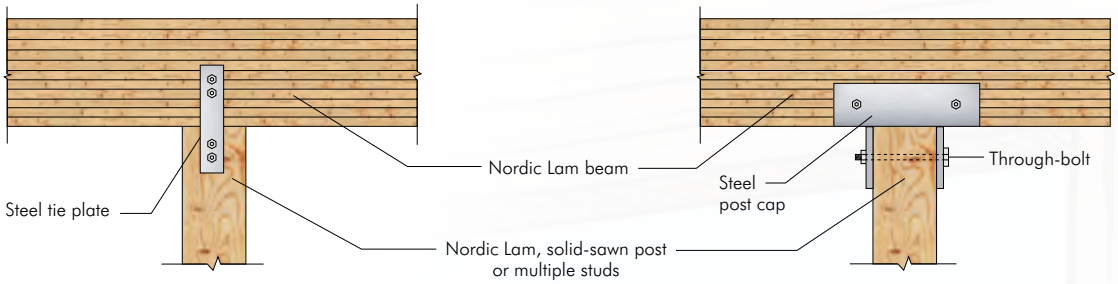
*Hangers installed per the manufacturer's recommendation; the use of mixed hanger types is for illustration purpose only.

3k BEAM BUTTING OVER INTERMEDIATE WOOD SUPPORT

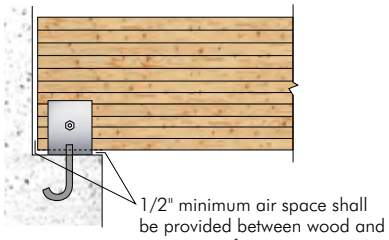


Also see Figure 3m for similar details with continuous beams.

3m CONTINUOUS FLOOR BEAM OVER INTERMEDIATE WOOD SUPPORTS



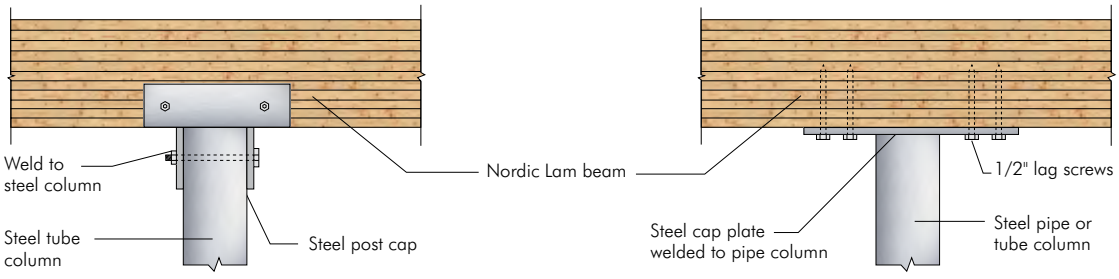
3n BEAM SITTING IN CONCRETE OR MASONRY WALL POCKET



NOTES:

1. PROVIDE ADEQUATE BEARING LENGTH AND BEARING ACROSS THE FULL WIDTH TO SUPPORT GLULAM BEAM. SEE BEARING LENGTH REQUIREMENTS ON PAGE 26, AND CONSULT LOCAL BUILDING CODE FOR SPECIFIC REQUIREMENTS.
2. HEAVY CONCENTRATED LOADS SUCH AS HEATING/ COOLING UNITS, CRANE RAILS OR MAIN FRAMING MEMBERS SUSPENDED FROM THE BOTTOM OF BEAMS INDUCE TENSION PERPENDICULAR-TO-GRAIN AND MAY CAUSE SPLITTING. EXCEPT FOR LIGHT LOADS SUCH AS HUNG CEILINGS (INCL. 2X– FRAMING), SPRINKLER SYSTEMS, LIGHTING APPLIANCES, ETC., ALWAYS SUSPEND CONCENTRATED LOADS FROM THE BEAM TOP, UNLESS DESIGNED OTHERWISE BY A QUALIFIED ENGINEER.

3o CONTINUOUS BEAM OVER INTERMEDIATE STEEL COLUMN

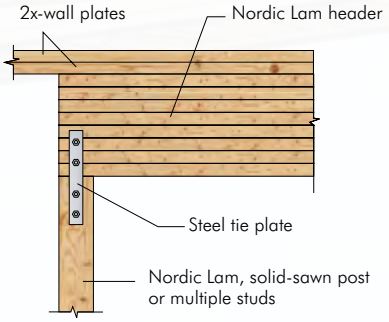


GARAGE DOOR
FRAMING DETAILS

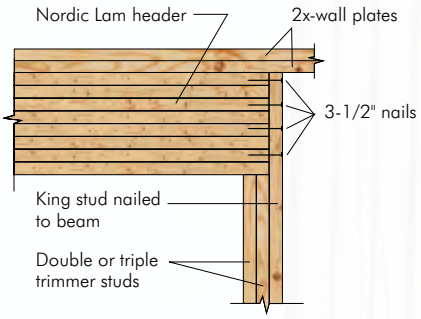
Nordic trademarked glulam beams are supplied with zero camber which makes it easy to connect glulam with other wood frame components. Details 4a to 4e illustrate some of the many simple connection details that can be used with glulam in residential garage door framing.

FIGURE 4
GARAGE DOOR HEADER FRAMING DETAILS

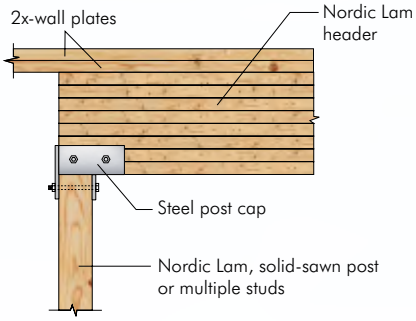
4a GARAGE DOOR HEADER TO END WALL



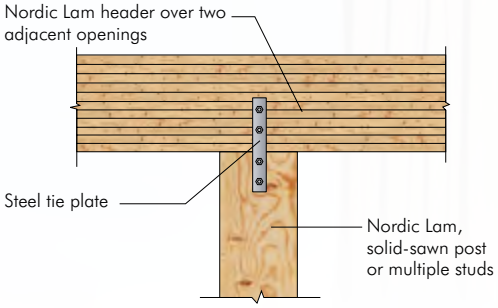
4b GARAGE DOOR HEADER TO END WALL



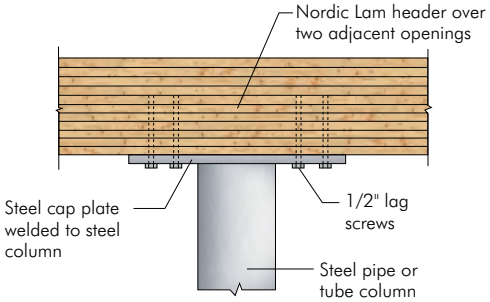
4c GARAGE DOOR HEADER TO END WALL



4d GARAGE DOOR HEADER OVER INTERMEDIATE SUPPORT



4e GARAGE DOOR HEADER OVER INTERMEDIATE SUPPORT

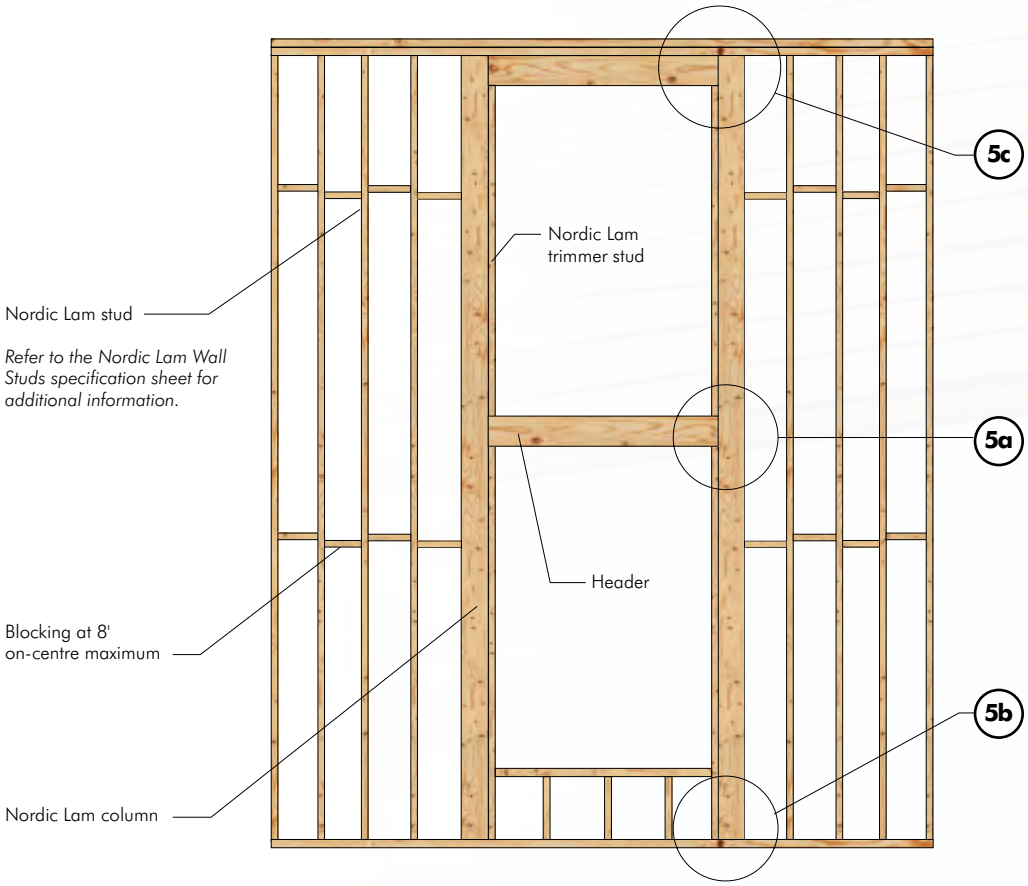


NOTES:

1. PROVIDE ADEQUATE BEARING LENGTH AND BEARING ACROSS THE FULL WIDTH TO SUPPORT GLULAM BEAM. SEE BEARING LENGTH REQUIREMENTS ON PAGE 26, AND CONSULT LOCAL BUILDING CODE FOR SPECIFIC REQUIREMENTS.
2. HEAVY CONCENTRATED LOADS SUCH AS HEATING/ COOLING UNITS, CRANE RAILS OR MAIN FRAMING MEMBERS SUSPENDED FROM THE BOTTOM OF BEAMS INDUCE TENSION PERPENDICULAR-TO-GRAIN AND MAY CAUSE SPLITTING. EXCEPT FOR LIGHT LOADS SUCH AS HUNG CEILINGS (INCL. 2X– FRAMING), SPRINKLER SYSTEMS, LIGHTING APPLIANCES, ETC., ALWAYS SUSPEND CONCENTRATED LOADS FROM THE BEAM TOP, UNLESS DESIGNED OTHERWISE BY A QUALIFIED ENGINEER.

COLUMN
FRAMING DETAILS

FIGURE 5
COLUMN FRAMING DETAILS



All additional blocking, trimmers, plates, etc. not specified should be the same as the typical stud material.

5a HEADER TO COLUMN

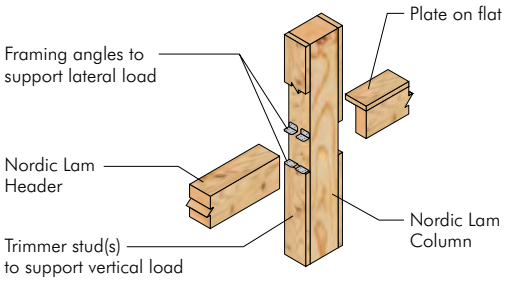


Plate width must equal wall thickness to provide lateral bracing. (Plate not required if header width equals the wall thickness.)

5b COLUMN TO BOTTOM PLATE

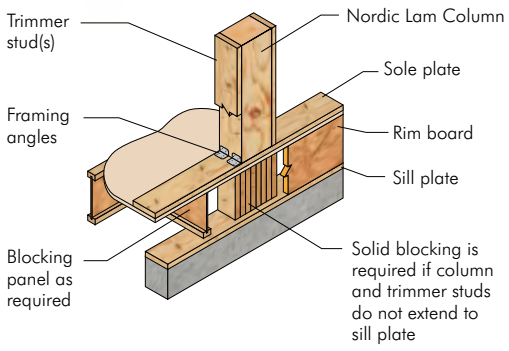
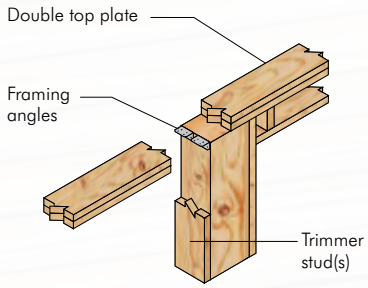
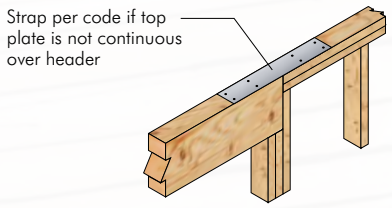


FIGURE 5 (continued)

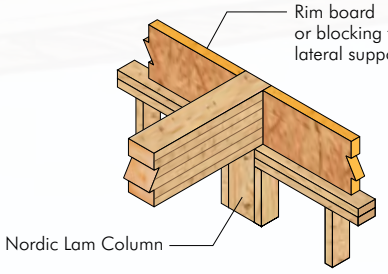
5c COLUMN TO TOP PLATE



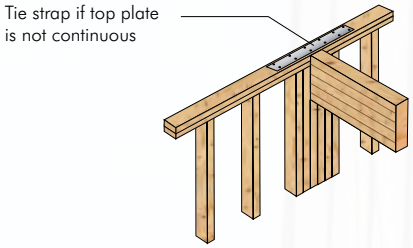
5d BEARING FOR DOOR OR WINDOW HEADER



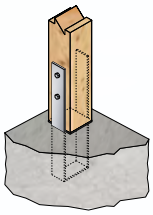
5e BEARING AT WALL



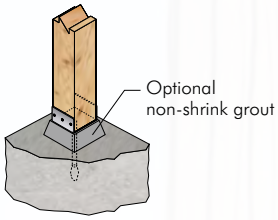
5f BEAM TO FRAME



5g COLUMN BASE

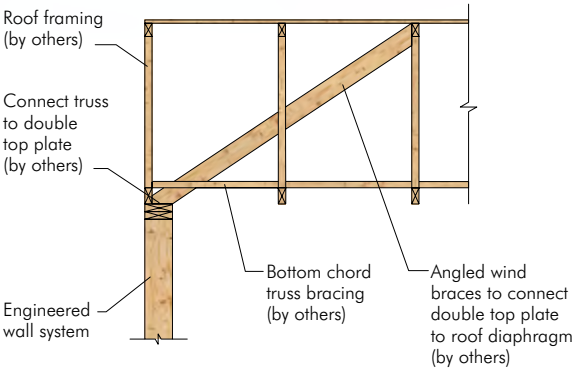


5h ELEVATED COLUMN BASE

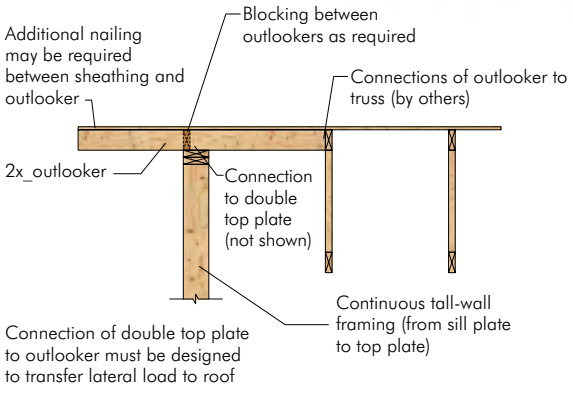


5j WIND BRACE

Wall bracing is necessary if double top plate is not attached directly to the roof/floor diaphragm.



5k ROOF OUTLOOKER



HOLES
IN GLULAM BEAMS

HORIZONTAL HOLES

Horizontal holes in glued laminated timbers are limited in size and location to maintain the structural integrity of the beam. Figure 6 shows the zones of a uniformly loaded, simply supported beam where the field drilling of holes may be considered. These non-critical zones are located in portions of the beam stressed to less than 50 percent of specified bending strength and less than 50 percent of specified shear strength. For beams of more complex loading or other than simple spans, similar diagrams may be developed.

Field-drilled horizontal holes should be used for access only and should not be used as attachment points for brackets or other load bearing hardware unless specifically designed as such by the engineer or designer of record.

These field drilled horizontal holes should meet the following guidelines:

1. **Hole size:** The hole diameter should not exceed 1-1/2 inches or 1/10 the beam depth, whichever is smaller.
2. **Hole location:** The hole should have a minimum clear distance, as measured from the edge of the hole to the nearest edge of the beam, of 4 hole diameters to the top or bottom face of the beam and 8 hole diameters from the end of the beam. Note that the horizontal hole should not be drilled in the moment-critical zone, as defined in Figure 6, unless approved by an engineer or architect qualified in engineered timber design.
3. **Hole spacing:** The minimum clear spacing between adjacent holes, as measured between the nearest edge of the holes, should be 8 hole diameters based on the largest diameter of any adjacent hole in the beam.
4. **Number of holes:** The maximum number of holes should not exceed 1 hole per 5 feet of beam length. In other words, the maximum number of holes should not exceed 4 for a 20-foot-long beam. The hole spacing limitation, as given above, should be satisfied separately.

For glulam members that have been oversized or for glulam joists, the guidelines given above may be relaxed based on an engineering analysis. Regardless of the hole location, holes drilled horizontally through a member should be positioned and sized with the understanding that the beam will deflect over a period of time under in-service loading conditions. This deflection could cause distress to supported equipment or piping unless properly considered.

VERTICAL HOLES

Whenever possible, avoid drilling vertical holes through glulam beams. As a rule of thumb, vertical holes drilled through the depth of a glulam beam cause a reduction in the capacity at that location directly proportional to the ratio of 1-1/2 times the diameter of the hole to the width of the beam. For example, a 1-inch hole drilled in a 6-inch-wide beam would reduce the capacity of the beam at that section by approximately (1 x 1-1/2) / 6 = 25%. For this reason, when it is necessary to drill vertical holes through a glulam member, the holes should be positioned in areas of the member that are stressed to less than 50 percent of design in bending. In a simply supported, uniformly loaded beam, this area would be located from the end of the beam inward approximately 1/8 of the beam span. In all cases, the minimum clear edge distance, as measured from either side of the member to the nearest edge of the vertical hole, should be 2-1/2 times the hole diameter. Use a drill guide to minimize “wandering” of the bit as it passes through knots or material of varying density, and to ensure a true alignment of the hole through the depth of the beam.

HOLES FOR SUPPORT OF SUSPENDED EQUIPMENT

Heavy equipment or piping suspended from glulam beams should be attached such that load is applied to the top of the members to avoid introducing tension perpendicular-to-grain stresses. Any horizontal holes required for support of significant weight, such as suspended heating and cooling units or main water lines, must be located above the neutral axis of the member and in a zone stressed to less than 50 percent of the specified flexural strength (see Figure 6). Fasteners supporting light loads such as light fixtures must be placed at least four laminations or 25 percent of beam depth, whichever is greater, away from the tension face of the member. The design capacity of the beam should be checked for all such loads to ensure proper performance.

PROTECTION OF FIELD-CUT NOTCHES AND HOLES

Frequently, glulam beams are provided with the ends sealed by a protective coating. This sealer is applied to the end grain of the glulam beams to retard the migration of moisture in and out of the beam ends during transit and jobsite storage. Field cutting a notch in the end of a beam can change the moisture absorption characteristics of the beam at the notch location. This can result in seasoning checks or even localized splitting developing at the root of the notch. To minimize this possibility, all notches should be sealed immediately after cutting using a water-repellent sealer. Sealing other field-cut locations as well as field-drilled holes is also recommended. These sealers can be applied with a brush, swab, roller or spray gun.

FIGURE 6
MAXIMUM HOLES IN BEAMS

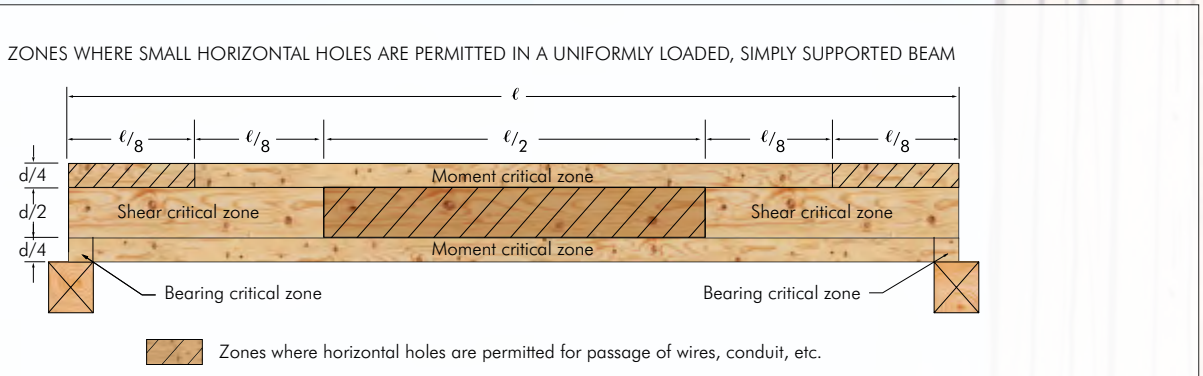
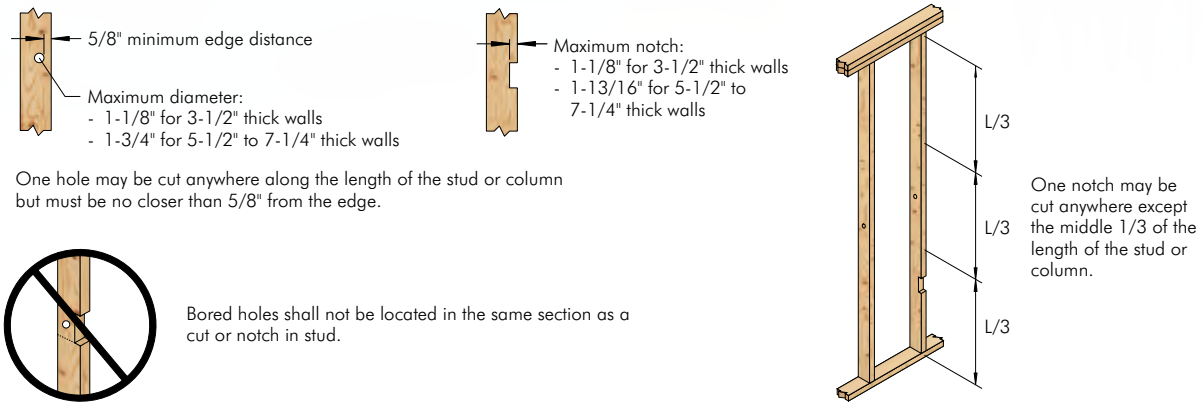


FIGURE 7
MAXIMUM HOLES IN STUDS



BEARING LENGTH REQUIREMENTS

BEARING LENGTH REQUIREMENTS (in.)

FACTORED REACTION (lbs)	24F-1.9E BEAM WIDTH (in.)			
	1-ply 1-3/4	2-ply 1-3/4 or 3-1/2	3-ply 1-3/4 or 5-1/2	4-ply 1-3/4 or 7
1500	1-1/2	1-1/2	1-1/2	1-1/2
3000	1-3/4	1-1/2	1-1/2	1-1/2
4500	2-3/4	1-1/2	1-1/2	1-1/2
6000	3-1/2	1-3/4	1-1/2	1-1/2
7500	4-1/2	2-1/4	1-1/2	1-1/2
9000	5-1/4	2-3/4	1-3/4	1-1/2
10,500	6	3	2	1-1/2
12,000	7	3-1/2	2-1/2	1-3/4
13,500	7-3/4	4	2-3/4	2
15,000	8-3/4	4-1/2	3	2-1/4
16,500	9-1/2	4-3/4	3-1/4	2-1/2
18,000		5-1/4	3-1/2	2-3/4
19,500		5-3/4	3-3/4	3
21,000		6	4	3
22,500		6-1/2	4-1/2	3-1/4
24,000		7	4-3/4	3-1/2
25,500		7-1/2	5	3-3/4
27,000		7-3/4	5-1/4	4
28,500		8-1/4	5-1/2	4-1/4
30,000		8-3/4	5-3/4	4-1/2
31,500		9	6	4-1/2
33,000		9-1/2	6-1/2	4-3/4
34,500		10	6-3/4	5
36,000			7	5-1/4
37,500			7-1/4	5-1/2
39,000			7-1/2	5-3/4
40,500			7-3/4	6
42,000			8	6
43,500			8-1/2	6-1/4
45,000			8-3/4	6-1/2

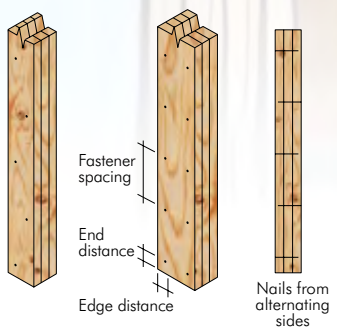
NOTES:

1. Minimum bearing lengths are 1-1/2 and 3-1/2 inches at end and intermediate supports, respectively.
2. Bearing across the full width of beam is required. Lateral support is required at all bearing points and along compression edge.
3. Bearing lengths are based on factored compressive resistance perpendicular to grain under the effect of all applied loads.
4. Bearing lengths under the effect of only those applied loads acting within a distance from the centre of the support equal to the depth of the member shall be in accordance with CSA O86-09 Standard.
5. Bearing lengths may need to be increased if support member's maximum bearing strength is less.
6. For 3-ply 1-3/4 or 5-1/2-inch beams, the tabulated values are based on a net width of 5-1/4 inches. For 5-1/2-inch beams, the tabulated bearing lengths may be decreased by 5%, however, not shorter than the minimum required bearing lengths as per Note 1.

MULTIPLE VERTICAL MEMBER CONNECTIONS

ES11 NORDIC LAM BUILT-UP COLUMNS FASTENER PATTERN

COLUMN	NAILS & BOLTS			NAILS		BOLTS	
	FASTENER SIZE	MAXIMUM FASTENER SPACING	NUMBER OF ROWS	MINIMUM EDGE DISTANCE	MINIMUM END DISTANCE	MINIMUM EDGE DISTANCE	MINIMUM END DISTANCE
2-ply, 2x4 2-ply, 2x6 2-ply, 2x8	3" (0.144") Nails or 1/2" bolts	9"	1 2 2	1-1/4" 1-3/8" 2-1/8"	1-7/8"	3/4"	2-1/2"
3-ply, 2x4 3-ply, 2x6 3-ply, 2x8	4-1/2" (0.212") Nails or 1/2" bolts	9"	1 2 2	1-1/4" 1-3/8" 2-1/8"	2-1/2"	3/4"	2-1/2"
4-ply, 2x4 4-ply, 2x6 4-ply, 2x8	6" (0.276") Nails or 1/2" bolts	9"	1 2 2	1-1/4" 1-3/8" 2-1/8"	3-3/4"	3/4"	2-1/2"



NOTES:

1. Connection patterns shown are those required per CSA O86-09. Resistances shall be be calculated per CSA O86-09.
2. Individual studs assumed to be continuous over the full height of the built-up column and of the same grade.
3. Verify bearing resistance of the supporting member.
4. Nails are common wire nails, shall conform to ASTM F1667 and have a minimum yield strength of 90,000 psi.
5. Bolts shall conform to ASTM A307 and have a minimum yield strength of 45,000 psi. Bolt holes are recommended to be not more than 1/32 inch greater than the diameter of the bolts. Standard cut washers shall be used between head and nut of the bolt and the glulam.
6. Install one row staggered, or two rows parallel in vertical direction.
7. Nails shall be driven alternately from either face along the member's length.

MULTIPLE HORIZONTAL MEMBER CONNECTIONS

TOP-LOADED BEAMS

1-3/4" Width Pieces:

- Minimum of 2 rows 3-1/2" common wire nails (0.162 x 3-1/2 inches) at 12" o.c. for beam depths less than 14"
- Minimum of 3 rows 3-1/2" common wire nails (0.162 x 3-1/2 inches) at 12" o.c. for 14" to 18" beam depths
- Nailed connections require an additional row of nails when nail size is smaller than specified above (minimum 0.128" x 3")
- 4-Ply beams shall be attached with minimum of 2 rows 1/2-inch-diameter bolts or 1/4 x 6-inch wood screws at 24" o.c.

3-1/2" Width Pieces:

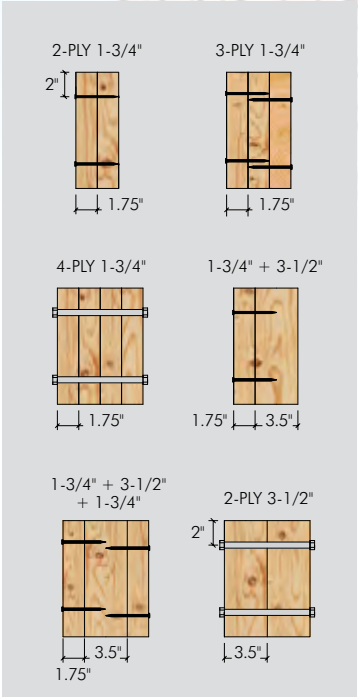
- Minimum of 2 rows 1/2-inch-diameter bolts or 1/4 x 6-inch wood screws at 24" o.c. staggered.

SIDE-LOADED BEAMS

MAXIMUM FACTORED UNIFORM LOAD (plf) APPLIED TO EITHER OUTSIDE MEMBER			2-PLY 1-3/4"	3-PLY 1-3/4"	4-PLY 1-3/4"	1-3/4"+ 3-1/2"	1-3/4" + 3-1/2" + 1-3/4"	2-PLY 3-1/2"
CONNECTOR	SPACING	ROWS	NAILS OR SCREWS ONE SIDE OR THROUGH BOLTS	NAILS OR SCREWS BOTH SIDES OR THROUGH BOLTS	SCREWS ONE OR BOTH SIDES OR THROUGH BOLTS	NAILS OR SCREWS ONE SIDE OR THROUGH BOLTS	NAILS OR SCREWS BOTH SIDES OR THROUGH BOLTS	SCREWS ONE OR BOTH SIDES OR THROUGH BOLTS
3-1/2" Common Wire Nails	12" o.c.	2 Rows	765	575	N/A	575	505	N/A
		3 Rows	1150	860	N/A	860	755	N/A
	6" o.c.	2 Rows	1535	1150	N/A	1150	1010	N/A
		3 Rows	2305	1725	N/A	1725	1515	N/A
1/2" A307 Bolts	24" o.c.	2 Rows	655	490	435	490	435	1310
	12" o.c.	2 Rows	1310	980	870	980	870	2620
	6" o.c.	2 Rows	2620	1965	1745	1965	1745	5240
1/4" Simpson SDW Screws	24" o.c.	2 Rows	650	645	570	645	570	1010
	16" o.c.	2 Rows	975	965	860	965	860	1515
	12" o.c.	2 Rows	1300	1285	1145	1285	1145	2020
1/4" USP SDS Screws	24" o.c.	2 Rows	705	525	470	525	470	705
	18" o.c.	2 Rows	935	705	620	705	620	935
	12" o.c.	2 Rows	1395	1050	935	1050	935	1395

NOTES:

1. Verify adequacy of beam in uniform load tables or design software prior to using values listed above.
2. Glulam beams are assumed to be full length, have adequate lateral bracing to avoid buckling, have the same stiffness and bending capacity, and have adequate bearing at supports to carry the applied load. Concentrated loads require special consideration.
3. Resistances given are for multiple-beam connections under standard term load duration. Increases for other load durations are permitted.
4. Nails shall conform to ASTM F1667 and have a minimum yield strength of 90,000 psi. Nails shall be located a minimum of 2 inches from the top and bottom of the member with a minimum spacing of 2 inches between rows. The end distance shall not be less than 3 inches. Multiply tabulated connection capacities by 0.83 for 3-1/4" common wire nails (0.148 x 3-1/4 inches).
5. Bolts shall conform to ASTM A307 and have a minimum yield strength of 45,000 psi. Bolt holes are recommended to be not more than 1/32 inch greater than the diameter of the bolts and shall be located a minimum of 2 inches away from the glulam end and edges. Standard cut washers shall be used between head and nut of the bolt and the glulam.
6. Simpson SDW Screws: All screw pattern to be installed from one side only. Screws shall be installed with the screw head in the loaded ply. If beam loaded on screw tip side, lower tabulated values by 15%. Required screw lengths: 1-3/4" 2-ply beam = 3-3/8", 1-3/4" 3-ply beam = 5", 4-ply 1-3/4" and 2-ply 3-1/2" beams = 6-3/4". Minimum required fastener distances: to beam end: 6"; vertically to top/bottom edges: 1-7/16"; vertically between screws: 2-1/2" (staggered).
7. USP SDS Screws: Screws to be installed from both sides always, except in case of 1-3/4" 2-ply and 1-3/4"+3.5" beams. If installed on one side only, screws shall be installed with the screw head in the loaded ply. Required screw lengths: 3.5" for all combinations, except for 1-3/4" 4-ply beams and 3-1/2" 2-ply beams, where the screw length shall be 6". Minimum required fastener distances: to beam end: 4"; vertically from top/bottom edges: 1-1/2"; vertically inbetween screws: 2-1/2" (staggered).
8. 4-ply beams are recommended to be used only when loads are applied to both sides, or if the beam is not fully loaded. The lesser load should be at least 25% of the higher load on the opposite side.
9. Offset connector spacing so that protruding fasteners do not interfere with intersecting side members. Stagger all fasteners installed from opposite side.



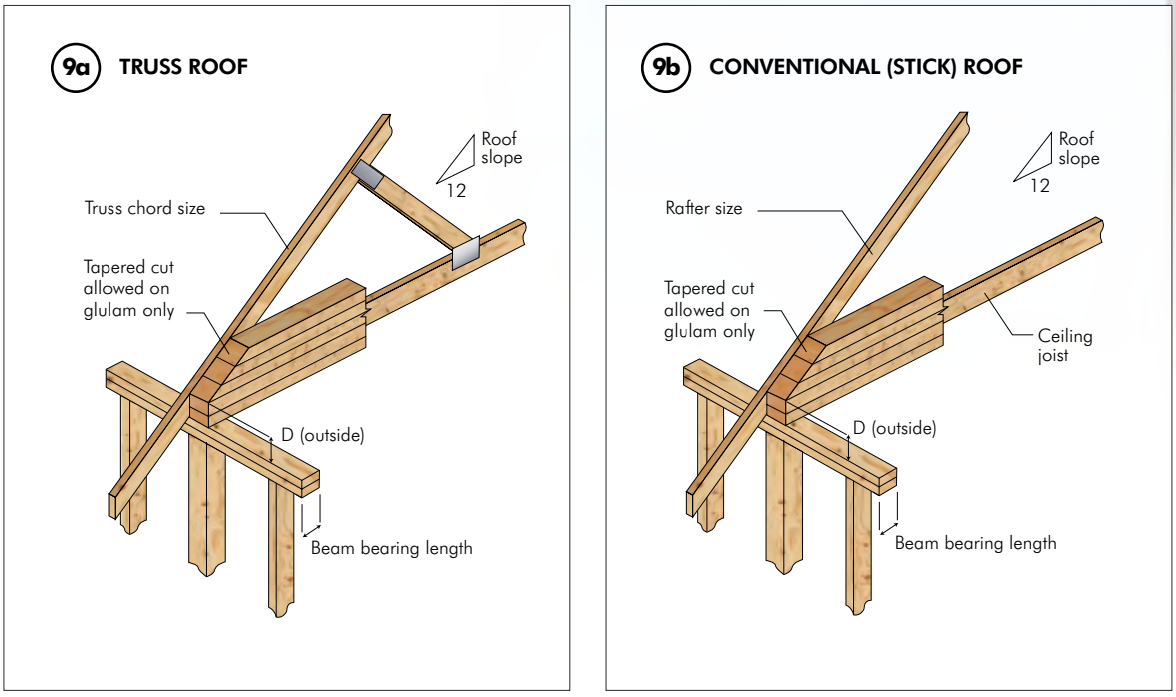
TAPERED CUT
MAXIMUM END REACTIONS

MAXIMUM END REACTIONS FOR 3-1/2" BEAM MEMBERS[1] – TRUSS ROOF

BEAM DEPTH (in.)	TRUSS CHORD SIZE	BEARING LENGTH (in.)	TRUSS SLOPE									
			4/12		6/12		8/12		10/12		12/12	
			D (in.)	R (lbs)	D (in.)	R (lbs)	D (in.)	R (lbs)	D (in.)	R (lbs)	D (in.)	R (lbs)
9-1/2	2x4	3-1/2	3-7/8	---	4-1/8	---	4-3/8	---	4-3/4	---	5-1/8	---
		5-1/2	3-7/8	---	4-1/8	---	4-3/8	---	4-3/4	---	5-1/8	---
	2x6	3-1/2	6	4716	6-3/8	6000	6-3/4	6343	7-3/8	No Effect	8	No Effect
		5-1/2	6	5576	6-3/8	6330	6-3/4	No Effect	7-3/8	No Effect	8	No Effect
11-7/8	2x4	3-1/2	3-7/8	---	4-1/8	---	4-3/8	---	4-3/4	---	5-1/8	---
		5-1/2	3-7/8	---	4-1/8	---	4-3/8	---	4-3/4	---	5-1/8	---
	2x6	3-1/2	6	---	6-3/8	---	6-3/4	7082	7-3/8	7734	8	7942
		5-1/2	6	---	6-3/8	---	6-3/4	7745	7-3/8	7955	8	No Effect
14	2x4	3-1/2	7-7/8	6016	10-1/8	8823	12-3/8	No Effect	14-3/4	No Effect	17-1/8	No Effect
		5-1/2	7-7/8	5433	10-1/8	9225	12-3/8	No Effect	14-3/4	No Effect	17-1/8	No Effect
	2x6	3-1/2	10	7843	12-3/8	No Effect	14-3/4	No Effect	17-3/8	No Effect	20	No Effect
		5-1/2	10	8518	12-3/8	No Effect	14-3/4	No Effect	17-3/8	No Effect	20	No Effect
16	2x4	3-1/2	7-7/8	---	10-1/8	8702	12-3/8	10596	14-3/4	No Effect	17-1/8	No Effect
		5-1/2	7-7/8	---	10-1/8	9638	12-3/8	10718	14-3/4	No Effect	17-1/8	No Effect
	2x6	3-1/2	10	6348	12-3/8	10345	14-3/4	No Effect	17-3/8	No Effect	20	No Effect
		5-1/2	10	7639	12-3/8	10633	14-3/4	No Effect	17-3/8	No Effect	20	No Effect
18	2x4	3-1/2	7-7/8	---	10-1/8	7672	12-3/8	11296	14-3/4	12051	17-1/8	No Effect
		5-1/2	7-7/8	---	10-1/8	9212	12-3/8	11806	14-3/4	No Effect	17-1/8	No Effect
	2x6	3-1/2	10	7429	12-3/8	10548	14-3/4	12007	17-3/8	No Effect	20	No Effect
		5-1/2	10	7875	12-3/8	11269	14-3/4	No Effect	17-3/8	No Effect	20	No Effect

See footnotes on page 29.

FIGURE 9
MAXIMUM END REACTIONS



MAXIMUM END REACTIONS FOR 3-1/2" BEAM MEMBERS[1] – CONVENTIONAL ROOF

BEAM DEPTH (in.)	RAFTER SIZE	BEARING LENGTH (in.)	RAFTER SLOPE									
			4/12		6/12		8/12		10/12		12/12	
			D (in.)	R (lbs)	D (in.)	R (lbs)	D (in.)	R (lbs)	D (in.)	R (lbs)	D (in.)	R (lbs)
9-1/2	2x6	3-1/2	4-5/8	---	4-3/8	---	4-1/4	---	4-1/8	---	4-1/4	---
		5-1/2	3-7/8	---	3-3/8	---	2-7/8	---	2-1/2	---	2-1/4	---
	2x8	3-1/2	6-3/8	5313	6-1/4	5977	6-3/8	6267	6-1/2	6361	6-3/4	No-Effect
		5-1/2	5-3/4	5313	5-1/4	5977	5	---	4-3/4	---	4-3/4	---
	2x10	3-1/2	8-1/2	No-Effect	8-1/2	No-Effect	8-3/4	No-Effect	9	No-Effect	9-1/2	No-Effect
		5-1/2	7-7/8	No-Effect	7-1/2	No-Effect	7-3/8	No-Effect	7-3/8	No-Effect	7-1/2	No-Effect
	2x12	3-1/2	10-5/8	No-Effect	10-3/4	No-Effect	11-1/8	No-Effect	11-5/8	No-Effect	12-3/8	No-Effect
		5-1/2	10	No-Effect	9-3/4	No-Effect	9-3/4	No-Effect	10	No-Effect	10-3/8	No-Effect
11-7/8	2x6	3-1/2	4-5/8	---	4-3/8	---	4-1/4	---	4-1/8	---	4-1/4	---
		5-1/2	3-7/8	---	3-3/8	---	2-7/8	---	2-1/2	---	2-1/4	---
	2x8	3-1/2	6-3/8	---	6-1/4	---	6-3/8	---	6-1/2	---	6-3/4	7753
		5-1/2	5-3/4	---	5-1/4	---	5	---	4-3/4	---	4-3/4	---
	2x10	3-1/2	8-1/2	6898	8-1/2	7594	8-3/4	7884	9	No-Effect	9-1/2	No-Effect
		5-1/2	7-7/8	6898	7-1/2	7594	7-3/8	7884	7-3/8	No-Effect	7-1/2	No-Effect
	2x12	3-1/2	10-5/8	7952	10-3/4	No-Effect	11-1/8	No-Effect	11-5/8	No-Effect	12-3/8	No-Effect
		5-1/2	10	7952	9-3/4	No-Effect	9-3/4	No-Effect	10	No-Effect	10-3/8	No-Effect
14	2x6	3-1/2	4-5/8	---	4-3/8	---	4-1/4	---	4-1/8	---	4-1/4	---
		5-1/2	3-7/8	---	3-3/8	---	2-7/8	---	2-1/2	---	2-1/4	---
	2x8	3-1/2	6-3/8	---	6-1/4	---	6-3/8	---	6-1/2	---	6-3/4	---
		5-1/2	5-3/4	---	5-1/4	---	5	---	4-3/4	---	4-3/4	---
	2x10	3-1/2	8-1/2	5383	8-1/2	7502	8-3/4	8552	9	9086	9-1/2	9322
		5-1/2	7-7/8	5383	7-1/2	---	7-3/8	---	7-3/8	---	7-1/2	---
	2x12	3-1/2	10-5/8	8499	10-3/4	9121	11-1/8	9351	11-5/8	No-Effect	12-3/8	No-Effect
		5-1/2	10	8499	9-3/4	9121	9-3/4	9351	10	No-Effect	10-3/8	No-Effect
16	2x8	3-1/2	6-3/8	---	6-1/4	---	6-3/8	---	6-1/2	---	6-3/4	---
		5-1/2	5-3/4	---	5-1/4	---	5	---	4-3/4	---	4-3/4	---
	2x10	3-1/2	8-1/2	---	8-1/2	---	8-3/4	---	9	9593	9-1/2	10239
		5-1/2	7-7/8	---	7-1/2	---	7-3/8	---	7-3/8	---	7-1/2	---
	2x12	3-1/2	10-5/8	7601	10-3/4	9365	11-1/8	10210	11-5/8	10597	12-3/8	10716
		5-1/2	10	7601	9-3/4	9365	9-3/4	10210	10	10597	10-3/8	10716
18	2x8	3-1/2	6-3/8	---	6-1/4	---	6-3/8	---	6-1/2	---	6-3/4	---
		5-1/2	5-3/4	---	5-1/4	---	5	---	4-3/4	---	4-3/4	---
	2x10	3-1/2	8-1/2	---	8-1/2	---	8-3/4	---	9	---	9-1/2	---
		5-1/2	7-7/8	---	7-1/2	---	7-3/8	---	7-3/8	---	7-1/2	---
	2x12	3-1/2	10-5/8	7860	10-3/4	8748	11-1/8	10468	11-5/8	11387	12-3/8	11850
		5-1/2	10	7860	9-3/4	---	9-3/4	---	10	11387	10-3/8	11850

NOTES:

1. Values (R) shown are the maximum end reactions for 3-1/2-inch beam width. For 1-3/4, 5-1/2 and 7-inch wide beams, multiply by 0.5, 1.5 and 2.0, respectively.
2. For preliminary design use only. Validate final design of beam with Nordic Technical Services.
3. Maximum end reactions for cantilevered truss roof applications, based on a 12-inch cantilever.
4. Verify adequacy of beam in uniform load tables or design software prior to using values listed above.
5. The tabulated maximum end reactions apply only to combination 24F-1.9E glulam members.
6. Bearing across the full width of beam is required. Lateral support is required at all bearing points and along compression edge.
7. Concentrated loads are not permitted in the tapered cut region. Uplift reactions may require additional considerations.
8. Bearing lengths are based on Nordic Lam's bearing strength. Bearing lengths may need to be increased if support member's maximum bearing strength is less.
9. The values are based on standard term duration of load and dry-use conditions.

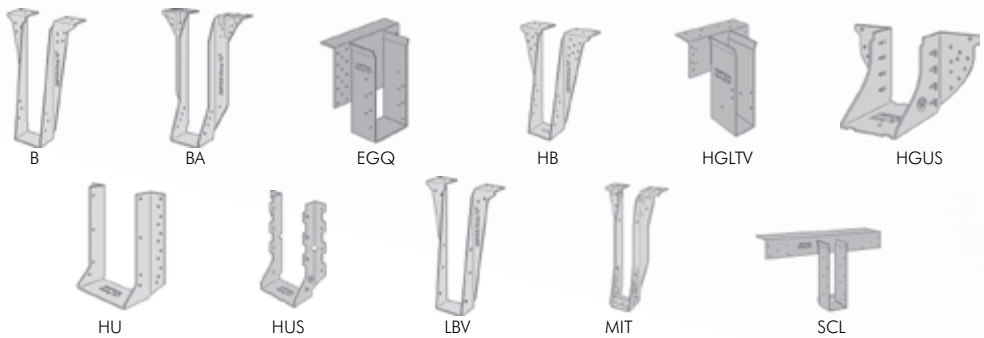
SIMPSON STRONG-TIE CONNECTORS - FACTORED RESISTANCES (lbs)

BEAM WIDTH (in.)	BEAM DEPTH (in.)	FACE MOUNT						TOP MOUNT					
		MODEL	B. DIM.	Fasteners		Uplift (115)	Download S-P-F	MODEL	B. DIM.	Fasteners		Uplift (115)	Download S-P-F
				Header	Joist					Header	Joist		
1-ply 1-3/4	9-1/2	HU9	2-1/2	24-16d	10-10dx1½	2265	4660	MIT9.5	2-1/2	8-16d	2-10dx1½	320	2420
		HUS1.81/10	3	30-16d	10-16d	4010	5200	B1.81/9.5	3	14-16d	6-10dx1½	1170	3910
	11-7/8	HU11	2-1/2	30-16d	10-10dx1½	2265	4660	MIT11.88	2-1/2	8-16d	2-10dx1½	320	2420
		HUS1.81/10	3	30-16d	10-16d	4010	5200	BA1.81/11.88	3	16-16d	2-10dx1½	1390	4370
	14	HU14	2-1/2	36-16d	14-10dx1½	2695	5450	MIT1.81/14	2-1/2	8-16d	2-10dx1½	320	2420
		HUS1.81/10	3	30-16d	10-16d	4010	5200	B1.81/14	3	14-16d	6-10dx1½	1170	3910
2-ply 1-3/4 or 3-1/2	9-1/2	HHUS410	3	30-16d	10-16d	4310	7000	LBV3.56/9.5	2-1/2	10-16d	2-10dx1½	305	3125
		HGUS410	4	46-16d	16-16d	4855	10,400	HB3.56/9.5	3-1/2	22-16d	10-16d	2525	5945
	11-7/8	HHUS410	3	30-16d	10-16d	4310	7000	BA3.56/11.88	3	16-16d	8-10dx1½	1390	4370
		HGUS412	4	56-16d	20-16d	5425	10,645	HB3.56/11.88	3-1/2	22-16d	10-16d	2525	5945
	14	HHUS410	3	30-16d	10-16d	4310	7000	BA3.56/14	3	16-16d	8-10dx1½	1390	4370
		HGUS414	4	66-16d	22-16d	7195	11,645	SCL3.62/14	4	6-16d	6-16d	1530	6775
	16	HGUS414	4	66-16d	22-16d	7195	11,645	BA3.56/16	3	16-16d	8-10dx1½	1390	4370
								SCL3.62/16	4	6-16d	6-16d	1530	6775
	18	HGUS414	4	66-16d	22-16d	7195	11,645	HB3.56/18	3-1/2	22-16d	10-16d	2525	5945
								SCL3.62/18	5	12-16d	12-16d	2310	11,490
3-ply 1-3/4 or 5-1/2	9-1/2	HHUS5.50/10	3	30-16d	10-16d	4310	7485	HB5.50/9.5	3-1/2	22-16d	10-16d	2525	5945
		HGUS5.50/10	4	46-16d	16-16d	4855	10,400	GLTV5.59	5	10-16d	6-16d	1520	7470
	11-7/8	HHUS5.50/10	3	30-16d	10-16d	4310	7485	HB5.50/11.88	3-1/2	22-16d	10-16d	2525	5945
		HGUS5.50/12	4	56-16d	20-16d	5425	10,645	HGLTV5.511	6	18-16d	6-16d	1520	9830
	14	HHUS5.50/10	3	30-16d	10-16d	4310	7485	HB5.50/14	3-1/2	22-16d	10-16d	2525	5945
		HGUS5.50/14	4	66-16d	22-16d	7195	11,645	EGQ5.50-SDS[6]	6	28-SDS¼x3	12-SDS¼x3	6415	23,930
	16	HGUS5.50/14	4	66-16d	22-16d	7195	11,645	HB5.50/16	3-1/2	22-16d	10-16d	2525	5945
								EGQ5.50-SDS[6]	6	28-SDS¼x3	12-SDS¼x3	6415	23,930
	18	HGUS5.50/14	4	66-16d	22-16d	7195	11,645	HGLTV5.518	6	18-16d	6-16d	1520	9830
		HGU5.50-SDS[6]	5-1/4	36-SDS¼x2½	24-SDS¼x2½	10,295	14,630	EGQ5.50-SDS[6]	6	28-SDS¼x3	12-SDS¼x3	6415	23,930
4-ply 1-3/4 or 7	9-1/2	HHUS7.25/10	3-5/16	30-16d	10-16d	4310	7650	HB7.12/9.5	3-1/2	22-16d	10-16d	2525	5945
		HGUS7.25/10	4	46-16d	16-16d	4855	11,190	SCL7.25/9.5	4	6-16d	6-16d	1085	6775
	11-7/8	HHUS7.25/10	3 -5/16	30-16d	10-16d	4310	7650	HB7.12/11.88	3-1/2	22-16d	10-16d	2525	5945
		HGUS7.25/12	4	56-16d	20-16d	5425	11,435	EGQ7.25-SDS[6]	6	28-SDS¼x3	12-SDS¼x3	6415	23,930
	14	HGUS7.25/14	4	66-16d	22-16d	7195	12,920	EGQ7.25-SDS[6]	6	28-SDS¼x3	12-SDS¼x3	6415	23,930
		HGU7.25-SDS[6]	5-1/4	36-SDS¼x2½	24-SDS¼x2½	10,295	14,630						
	16	HGUS7.25/14	4	66-16d	22-16d	7195	12,920	EGQ7.25-SDS[6]	6	28-SDS¼x3	12-SDS¼x3	6415	23,930
		HHGU7.25-SDS[6]	5-1/4	44-SDS¼x2½	28-SDS¼x2½	15,655	19,195						
	18	HGUS7.25/14	4	66-16d	22-16d	7195	12,920	EGQ7.25-SDS[6]	6	28-SDS¼x3	12-SDS¼x3	6415	23,930
		HHGU7.25-SDS[6]	5-1/4	44-SDS¼x2½	28-SDS¼x2½	15,655	19,195	EGQ7.25-SDS3[5]	6	28-SDS¼x3			

NOTES:

1. Verify adequacy of beam in uniform load tables or design software.
2. Leave 1/16" max. clearance between the end of the supported member and the support member or hanger.
3. Loads may not be increased for duration of load.
4. HU, LBV, and BA hangers use both round and triangular holes.
5. Glulam headers made primarily from Spruce-Pine-Fir.
6. When ordering EGQ, HGU or HHGU, specify height.
7. The « B Dim. » is the depth of the hanger.

SIMPSON Strong-Tie™



USP STRUCTURAL CONNECTORS - FACTORED RESISTANCES (lbs)

BEAM WIDTH (in.)	BEAM DEPTH (in.)	FACE MOUNT						TOP MOUNT					
		MODEL	B. DIM.	Fasteners		Uplift (115)	Download S-P-F	MODEL	B. DIM.	Fasteners		Uplift (115)	Download S-P-F
				Header	Joist					Header	Joist		
1-ply 1-3/4	9-1/2	HD17925	2	(18) 16d	(6) 10d x 1-1/2	1424	5123	THO17950	2	(6) 10d	(2) 10d x 1-1/2	391	1560
		HUS179[7]	3	(30) 16d	(10) 16d	4285	6408	PHXU1795	3-1/4	(8) 16d	(6) 10d x 1-1/2	859	4420
	11-7/8	HD17112	2	(22) 16d	(6) 10d x 1-1/2	1424	4200	THO17118	2	(6) 10d	(2) 10d x 1-1/2	391	1555
		HUS179[7]	3	(30) 16d	(10) 16d	4285	6408	PHXU17118	3-1/4	(8) 16d	(6) 10d x 1-1/2	859	4420
	14	HD1714	2	(26) 16d	(8) 10d x 1-1/2	1424	4200	BPH1714	2 -3/8	(10) 16d	(4) 10d x 1-1/2	554	3235
		HUS179[7]	3	(30) 16d	(10) 16d	4285	6408	PHXU1714	3-1/4	(8) 16d	(6) 10d x 1-1/2	859	4420
2-ply 1-3/4 or 3-1/2	9-1/2	THD410	3	(38) 16d	(20) 10d	5148	8193	PHXU3595	3-1/4	(8) 16d	(6) 10d	916	5170
		THDH410[7]	4	(46) 16d	(12) 16d	5311	10,480	HLBH3595	6	(15) NA16D-RS	(6) 16d	1257	12,840
	11-7/8	THD410	3	(38) 16d	(20) 10d	5148	8193	PHXU35118	3-1/4	(8) 16d	(6) 10d	916	5170
		THDH412[7]	4	(56) 16d	(14) 16d	6990	11,452	HLBH35118	6	(15) NA16D-RS	(6) 16d	1257	12,840
	14	THD410	3	(38) 16d	(20) 10d	5148	8193	PHXU3514	3-1/4	(8) 16d	(6) 10d	916	5170
		THDH414[7]	4	(66) 16d	(16) 16d	8048	11,452	HLBH3514	6	(15) NA16D-RS	(6) 16d	1257	12,840
	16	THD412	3	(48) 16d	(20) 10d	5148	8193	PHXU3516	3-1/4	(8) 16d	(6) 10d	916	5170
		THDH414[7]	4	(66) 16d	(16) 16d	8048	11,452	HLBH3516	6	(15) NA16D-RS	(6) 16d	1257	12,840
	18	THD412	3	(48) 16d	(20) 10d	5148	8193	PHXU3518	3-1/4	(8) 16d	(6) 10d	916	5170
		THDH414[7]	4	(66) 16d	(16) 16d	8048	11,452	HLBH3518	6	(15) NA16D-RS	(6) 16d	1257	12,840
3-ply 1-3/4 or 5-1/2	9-1/2	THD610	3	(38) 16d	(20) 10d	4562	8843	PHXU5595	3-1/4	(8) 16d	(6) 10d	916	5170
		THDH610[7]	4	(46) 16d	(16) 16d	4991	9365	HLBH5595	6	(15) NA16D-RS	(6) 16d	1257	12,840
	11-7/8	THD610	3	(38) 16d	(20) 10d	4562	8843	PHXU55118	3-1/4	(8) 16d	(6) 10d	916	5170
		THDH612[7]	4	(56) 16d	(20) 16d	6465	10,980	HLBH55118	6	(15) NA16D-RS	(6) 16d	1257	12,840
	14	THD610	3	(38) 16d	(20) 10d	4562	8843	PHXU5514	3-1/4	(8) 16d	(6) 10d	916	5170
		THDH614[7]	4	(66) 16d	(22) 16d	7640	13,355	HLBH5514	6	(15) NA16D-RS	(6) 16d	1257	12,840
	16	THD612	3	(48) 16d	(20) 10d	6994	9787	PHXU5516	3-1/4	(8) 16d	(6) 10d	916	5170
		THDH614[7]	4	(66) 16d	(22) 16d	7640	13,355	HLBH5516	6	(15) NA16D-RS	(6) 16d	1257	12,840
	18	THD612	3	(48) 16d	(20) 10d	6994	9787	PHXU5518	3-1/4	(8) 16d	(6) 10d	916	5170
		THDH614[7]	4	(66) 16d	(22) 16d	7640	13,355	HLBH5518	6	(15) NA16D-RS	(6) 16d	1257	12,840
4-ply 1-3/4 or 7	9-1/2	THD7210	3	(38) 16d	(20) 10d	4562	8843	PHXU7195	3-1/4	(8) 16d	(6) 10d	916	5170
		THDH7210[7]	4	(46) 16d	(12) 16d	5311	10,480	HLBH7195	6	(15) NA16D-RS	(6) 16d	1370	12,840
	11-7/8	THD7210	3	(38) 16d	(20) 10d	4562	8843	PHXU71118	3-1/4	(8) 16d	(6) 10d	916	5170
		THDH7212[7]	4	(56) 16d	(14) 16d	6990	11,452	HLBH71118	6	(15) NA16D-RS	(6) 16d	1370	12,840
	14	THD7210	3	(38) 16d	(20) 10d	4562	8843	PHXU7114	3-1/4	(8) 16d	(6) 10d	916	5170
		THDH7214[7]	4	(66) 16d	(16) 16d	8048	11,452	HLBH7114	6	(15) NA16D-RS	(6) 16d	1370	12,840
	16	HD7120	2-1/2	(16) 16d	(6) 10d	3149	5123	PHXU7116	3-1/4	(8) 16d	(6) 10d	916	5170
		THDH7214[7]	4	(66) 16d	(16) 16d	8048	11,452	HLBH7116	6	(15) NA16D-RS	(6) 16d	1370	12,840
	18	HD7140	2-1/2	(20) 16d	(8) 10d	3149	5123	PHXU7118	3-1/4	(8) 16d	(6) 10d	916	5170
		THDH7214[7]	4	(66) 16d	(16) 16d	8048	11,452	HLBH7118	6	(15) NA16D-RS	(6) 16d	1370	12,840

NOTES:

1. Verify adequacy of beam in uniform load tables or design software.
2. Leave 1/16" max. clearance between the end of the supported member and the support member or hanger.
3. Loads listed are based on hanger attachment to a S-P-F species glulam header. Some loads may be increased for duration of load adjustments. Refer to USP's Full Line Catalog for details.
4. Uplift loads have been increased 15% for wind and seismic loading; no further increase shall be permitted.
5. Top mount hangers require a minimum 3" header thickness for THO series hangers; 3-1/2" minimum header thickness for all other stock numbers.
6. 10d x 1-1/2 nails are 0.148" diameter x 1-1/2" long, 10d nails are 0.148" diameter x 3" long, and 16d nails are 0.162" diameter x 3-1/2" long. Minimum nail penetration shall be 1-1/2" for 10d nails and 1-5/8" for 16d nails. 16d sinkers are 0.148" diameter x 3-1/4" long and may be used where 10d commons are specified.
7. Joist nails need to be toe nailed at a 30° to 45° angle to achieve listed loads for THDH and HUS models.
8. The « B Dim. » is the depth of the hanger.

USP STRUCTURAL CONNECTORS
A MiTek Company

STORAGE
AND HANDLING GUIDELINES

Glulam beams must be stored properly and handled with care to assure optimum performance. Beams may be protected with sealants, primers or paper wrap when they leave the manufacturing plant. Sealants on the ends of beams help guard against moisture penetration and checking. A coat of sealant should be applied to the ends of any beams trimmed or otherwise cut in the field. Surface sealants, which can be applied to the top, bottom, and sides of beams, resist dirt and moisture and help control checking and grain raising. Use a penetrating sealant if beams will be stained or given a natural finish.

Water-resistant wrappings are another way to protect beams from exposure to moisture, dirt and scratches during transit, storage and erection. Because sunlight can discolor beams, opaque wrappings are recommended. Beams can be wrapped individually, by the bundle or by the load. If it is necessary to remove portions of the wrapping during the erection sequence to facilitate making connections, remove all of the wrapping to avoid uneven discoloration due to exposure to the sun.

Glulam beams are commonly loaded and unloaded with a fork lift. For greater stability, the sides of the beams, rather than the bottoms, should rest on the forks. Supporting extremely long beams on their sides, however, can cause them to flex excessively, increasing the risk of damage. Use multiple forklifts to lift long glulam members. If a crane with slings is used to load or unload beams, provide adequate blocking between the cable and the member. Use wooden cleats or blocking to protect corners. Only non-marring fabric slings should be used to lift glulams. Using spreader bars can reduce the likelihood of damage when lifting especially long beams with a crane.

When transporting beams, stack them on lumber blocking or skids when loading them on rail cars or trucks. Beams can rest on their sides or bottoms. Secure the load with straps to keep it from shifting. Protect beam corners with “softeners” when strapping down the load.

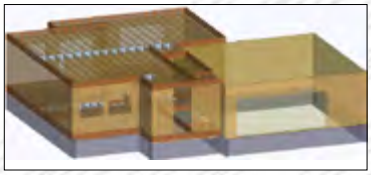
In the distribution yard and on the jobsite, a well-drained covered storage site is recommended. Keep glulam members off the ground with lumber blocking, skids or rack systems. Beams should remain wrapped to protect them from moisture, dirt, sunlight, and scratches. At the job site, use similar storage provisions when possible.

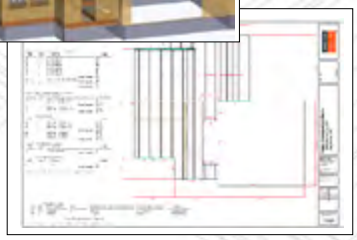
One of the advantages of the high strength to weight ratio of glulam beams is that in many residential and light commercial applications they can be installed with forklifts, front-end loaders and other commonly available construction equipment. That eliminates the time and cost required to have a crane on the jobsite.

SOFTWARE

Component Solutions EWP Edition®

ISTRUCT™



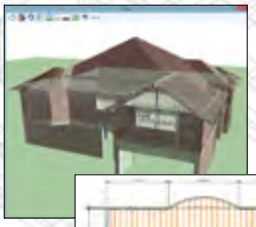


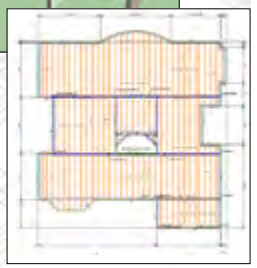
Component Solutions EWP Edition by Simpson Strong-tie and iStruct by CSD (Calculated Structured Designs) are software that integrate and automate all of the major functions that take place in specifying and engineering building components and materials for wood frame structures.

Design, analyze, engineer, calculate, plan, report, generate takeoffs, and finalize the sale all with one software solution. Generate a full house design including all engineered wood floor and roof systems, taking into account all live and gravity loads as they are transferred down through the structure, and complete with all individual component calculations.

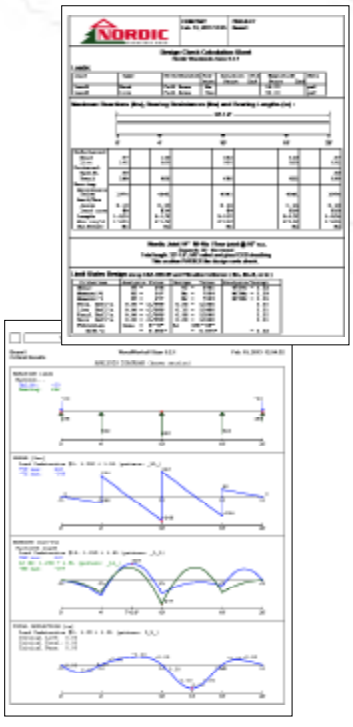
In addition, any Nordic glulam and joist may be sized separately and independent from any structure.

Component Solutions EWP Edition and iStruct are available to distributors.





Nordic Sizer



Nordic Sizer by WOODWORKS® is a software program that can be used to design individual members (joists, beams, floor/roof slabs, columns, wall panels) using the full range of Nordic's engineered wood products: glued laminated timber beams and columns, prefabricated wood I-joists, glulam decking, and cross-laminated timber (CLT).

Nordic Sizer analyzes and designs simple and multiple span members for factored dead, live, snow, and wind loads as per CSA O86, automatically patterns loads and checks all load combinations as per NBC. Joists and beams may be set horizontally, sloped, or axially rotated (purlins). Columns, studs, and wall panels may be analyzed under combinations of axial and bending loads, and in consideration of load excentricities.

The user may also specify deflection limits, lateral bracing, end notches, web holes, built-up members, service conditions, and floor composition for vibration calculation. Fire design according to NBC, Division B, D-2.11 and D-2.4, but also according to an alternative char-rate method is available for all solid timber products. Material, grade and series, width and thickness may all be specified as 'unknown' - a list of acceptable sections with all the combinations for a given span and loading situation will be generated.

Nordic Sizer is available to engineers, architects, and specifiers working with Nordic products.

LOAD DEVELOPMENT
EXAMPLES

EXAMPLE 1: FLUSH BEAM

Uniform loads: 40 psf live load, and 15 psf dead load.

1° Determine the tributary width (in feet).
In this example, the tributary width is 16/2+20/2 = 18 feet.

2° Determine the live and total load (in plf) on the beam:
Live Load (LL) = 40 psf x 18 ft = 720 plf
Total Load (TL) = (40 + 15) psf x 18 ft = 990 plf
Total Factored Load = (1.5x40 + 1.25x15) psf x 18 ft = 1418 plf

3° Use the appropriate allowable uniform load table (pages 10-11) and match the span of the beam with the 'SPAN' column of thetable. Always round the beam span up to the next even foot. In this example, use 14 feet.

4° Going from top to bottom, find a beam that supports a live loadequal to or greater than 720 plf, a total load equal to or greater than 990 plf, and a factored load equal to or greater than 1418 plf. All checks must be made to properly size the beam.

5° A 3-1/2x14 24F-1.9E will work (778 > 720, and 1544 > 1418).

Values may be interpolated if required.

EXAMPLE 2: DROPPED BEAM

Uniform loads: 40 psf live load, and 15 psf dead load.

When the beam is dropped and the I-joists are continuous over thebeam, there is more load transferred to the beam. When I-joist spansare equal, this increase is 25%. If both spans are not equal, there is a potential for more than 25% increase. Complicated calculationsare required to determine this increase. A simple and safe way to calculate this load is as follows::

1° Assume both spans of the I-joist to be the longest span. In the example, this should be the 17 feet span.

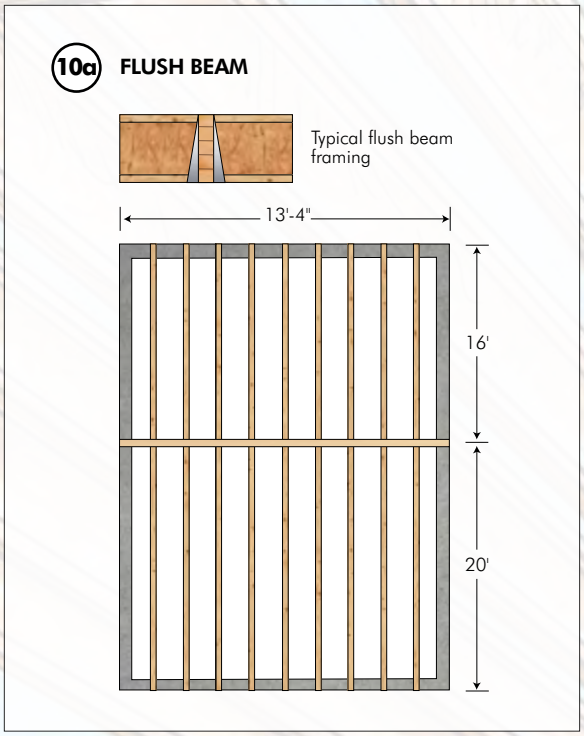
2° Calculate the load on the beam as if it were flush and increase by 25%:
Live Load (LL) = 40 psf x 17 ft x 1.25 = 850 plf
Total Load (TL) = (40 + 15) psf x 17 ft x 1.25 = 1169 plf
Total Factored Load = (1.5x40 + 1.25x15) psf x 17 ft x 1.25 = 1674 plf

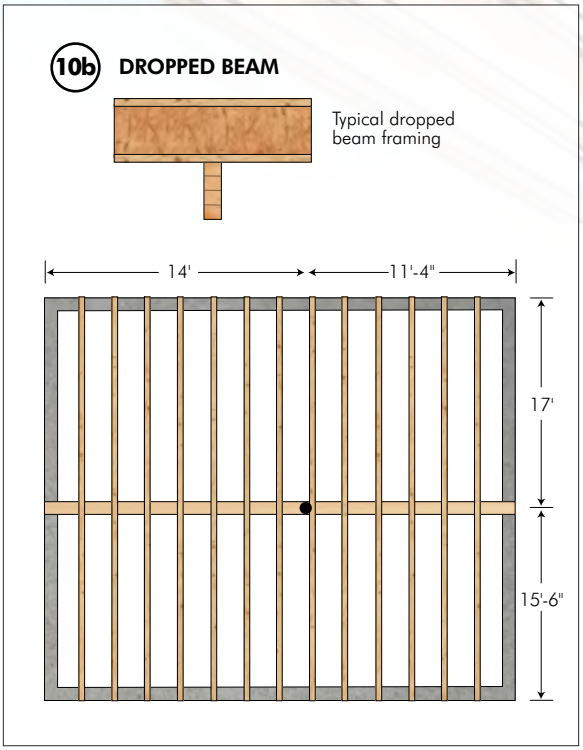
3° Use the longest span of the beam (round up to the next even foot) and use the appropriate plf table. In this example, use a span of 14 feet and verify for live, total, and factored loads.

4° A 5-1/2x14 24F-1.9E will work (1167 > 850 and 2315 > 1674).

This method will always be safe provided the long span of the I-joist is not more than 5 times longer than the shorter span. When possible, a sizing program should be used.

FIGURE 10
LOAD DEVELOPMENT EXAMPLES





CONVERSION FACTORS

CONVERSION FACTORS

ITEM	IMPERIAL – METRIC			METRIC – IMPERIAL		
LENGTH	1 in.	=	25.4 mm	1 mm	=	0.0393701 in.
		=	0.0254 m	1 m	=	39.3701 in.
	1 ft	=	0.3048 m		=	3.28084 ft
	1 yd	=	0.9144 m		=	1.09361 yd
	1 mile	=	1.60934 km	1 km	=	0.621371 mile
LENGTH / TIME	1 ft/s	=	0.3048 m/s	1 m/s	=	3.28084 ft/s
	1 mph	=	1.60934 km/h	1 km/h	=	0.621371 mph
AREA	1 $in.^2$	=	645.16 mm^2	1 mm^2	=	0.001550 $in.^2$
	1 ft^2	=	0.0929030 m^2	1 m^2	=	10.7639 ft^2
	1 acre	=	0.404686 ha	1 ha	=	2.47105 acres
	1 mi^2	=	2.58999 km^2	1 km^2	=	0.386102 mi^2
VOLUME	1 $in.^3$	=	16387.1 mm^3	1 mm^3	=	0.0000610237 $in.^3$
	1 ft^3	=	0.0283168 m^3	1 m^3	=	35.3147 ft^3
	1 yd^3	=	0.764555 m^3		=	1.30795 yd^3
	1 fl oz (US)	=	29.5735 ml	1 ml	=	0.0338141 fl oz (US)
	1 gal (US)	=	3.78541 l	1 l	=	0.264172 gal (US)
MASS	1 oz	=	28.3495 g	1 g	=	0.0352740 oz
	1 lb	=	0.453592 kg	1 kg	=	2.20462 lb
	1 short ton (2,000 lbs)	=	0.907185 tons	1 Mg	=	1.10231 short tons
MASS / VOLUME	1 lb/ft^3	=	16.1085 kg/m^3	1 kg/m^3	=	0.062079 lb/ft^3
FORCE	1 lb	=	4.44822 N	1 N	=	0.224809 lb
STRESS	1 $lb/in.^2$ (psi)	=	0.00689476 N/mm^2 (MPa)	1 N/mm^2 (MPa)	=	145.038 $lb/in.^2$ (psi)
LOADING	1 lb/ft^2 (psf)	=	0.0478803 kN/m^2 (KPa)	1 kN/m^2 (KPa)	=	20.8854 lb/ft^2 (psf)
	1 lb/ft (plf)	=	0.0145939 kN/m	1 kN/m	=	68.5218 lb/ft (plf)
MOMENT	1 lb-ft	=	0.00135582 kN-m	1 kN-m	=	737.561 lb-ft
TEMPERATURE	1 °F	=	(°F-32) / 1.8 °C	1 °C	=	32 + 1.8 (°C) °F

NOTES:

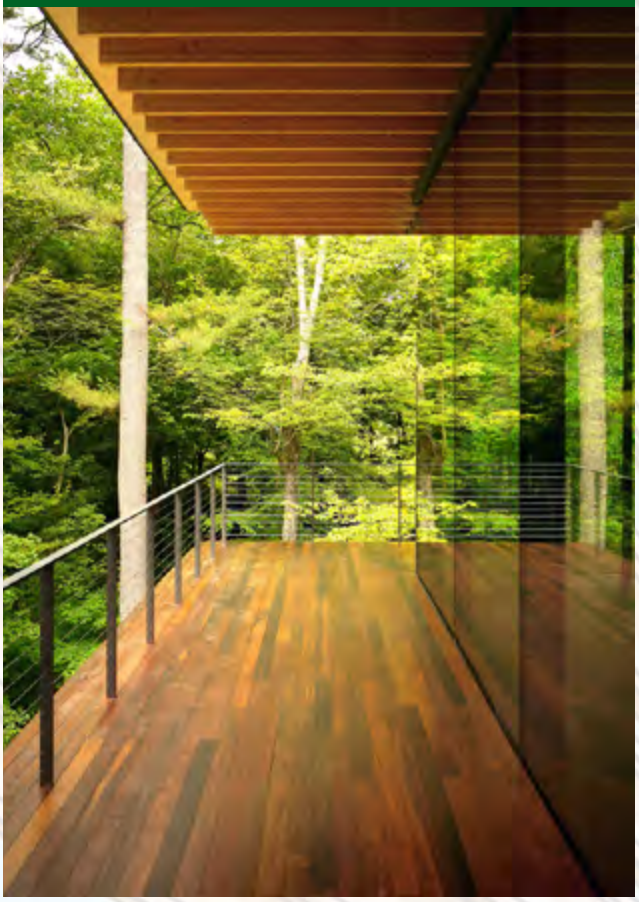
1. 9.80665 Newton (N) = 1.0 kilogram (kg) x 9.80665 m/s^2
2. 1.0 Pascal (Pa) = 1.0 Newton per square meter (N/m^2)

PORTFOLIO

Peel Youth Village
Mississauga, ON (2005)

Residence
Lac Saint-Joseph, Que. (2006)

Residence
New Canaan, CT (2011)



Frank Lloyd Wright
Apex, PA (2006)

PRODUCT WARRANTY

CHANTIERS CHIBOUGAMAU

PRODUCT WARRANTY

Chantiers Chibougamau guarantees that, in accordance with our specifications, Nordic products are free from manufacturing defects in material and workmanship.

Furthermore, Chantiers Chibougamau warrants that our products, when utilized in accordance with our handling and installation instructions, will meet or exceed our specifications for the lifetime of the structure.

ONE SMALL STEP FOR NORDIC ENGINEERED WOOD

ONE GIANT STEP
FOR INDUSTRY

From its inception Nordic Engineered Wood has strived to provide the most efficient wood products with the least environmental impacts. That's why Nordic Engineered Wood, in its exclusive partnership with Chantiers Chibougamau Ltd., has become a leader in demanding well-managed forestry practices.

Back in 2000, Nordic was one of the first in North America to demand that the wood used in its products meet or exceed the ISO 14001 Standard. Continuing its ongoing commitment to responsible wood solutions, Nordic Engineered Wood is proud to offer products that are certified by the Forest Stewardship Council, the international benchmark of well-managed forests.

What's in a logo?

With all the certification bodies out there, trying to do the right thing and buying responsibly produced products can be confusing. The FSC label makes it easy to make the right choice when buying wood products. This is what sets FSC apart:

Only FSC

- prohibits conversion of natural forests or other habitat around the world
- prohibits the use of highly hazardous pesticides around the world
- respects human rights with particular attention to indigenous peoples
- is the only forest ***certification system*** that is supported by all major environmental groups.
- identifies areas that need special protection (e.g. cultural or sacred sites, habitats of endangered animals or plants.

But most importantly only FSC reviews each certified operation ***at least*** once a year – and if they are found not to comply, the certificate is withdrawn.

"FSC has the highest environmental standard for forest management of any certification system in the world."

Monte Hummel
World Wildlife Fund, Canada

Protecting nature's resources is everyone's responsibility; at Nordic Engineered Wood we are doing our part.

Do yours.

FSC-Certified wood products are available. Consult your local distributor for details.

FSC
www.fsc.org

The mark of responsible forestry

FSC® C011517

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N-C121/ April 2014
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