NORDIC LAM™

1-3/4-INCH WALL STUDS

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NORDIC LAM™
WALL STUDS

SCOPE

This technical note features stud tables for glued laminated studs. These stud tables are intended for determining the feasibility of using tall wood stud walls for a given residential application. In a commercial application, a fully engineered design is required for each tall wall to consider the specific design considerations for that site, the effect of openings, the connections and other details. This document addresses the design of wall studs for wind perpendicular to the wall surface and vertical loads only. Complete structural analysis with consideration of loads originating from adjoining elements (e.g. lateral shear loads) is beyond the scope of this publication.

ASSUMPTIONS USED TO DEVELOP THE STUD TABLES

- The studs are laterally braced to prevent buckling in the narrow dimension.
- The loads are uniformly distributed along the top of the wall.
- The Component & Cladding (C&C) loads shown in the Wall Design Wind Load table are used in strength calculations (Table D).
- The wind loads have been taken as 0.42 times the C&C loads for the purpose of the determining deflection limits herein (per IBC 2012, Table 1604.3.)
- Total load deflection criteria is stud length/120. Calculated total load deflection for each stud is given in the tables.
- The ratio of specified axial dead load to live load is 1. The tables can be used conservatively when the specified axial dead load is less than the specified axial live load.
- Stud sizes are based on Allowable Stress Design. The load combinations considered are:
    1. axial load alone
    2. axial dead load plus wind, and
    3. axial dead load plus wind plus axial live load
- In conformance with the IBC, a load reduction factor of 0.75 is applied to the wind and axial live loads in load combination 3.
- Load cases 2 and 3 are based on a load duration factor of 1.60.
- Eccentric axial loading of the studs is considered with maximum eccentricity equal to 1/6th of the stud depth.
- Studs are assumed to be pinned at both ends (buckling length coefficient, K_e = 1.0).
- The tables can only be used for untreated studs in dry service conditions.
- Resistance values were calculated based on published values and NDS 2012.

TABLE A.
LIMITATIONS OF CONVENTIONAL CONSTRUCTION[1,2]

TYPE OF WALL	STUD SIZE	STUD HEIGHT[3]	MAXIMUM SPACING
Walls supporting roof and ceiling only	2x4 2x6	10' 10'	24" 24"
Walls supporting one floor, roof and ceiling	2x4 2x6	10' 10'	16" 24"
Walls supporting two floors, roof and ceiling	2x4 2x6	10' 10'	--- 16"
Walls supporting one floor only	2x4 2x6	10' 10'	24" 24"
Nonbearing walls	2x4 2x6	14' 20'	24" 24"

(1) Per IRC, Table R602.3(5)
(2) Maximum wind speed: 100 mph (3-second gust), per IRC, Section R301.2.1.1
(3) Listed heights are distances between points of lateral support placed perpendicular to the plane of the wall.

HOW TO USE THE TABLES

- Determine the BASIC WIND SPEED for the building location. This is found in the 2012 IRC, Figure R301.2(4); 2012 IBC, Figure 1609; ASCE 7-10, Figure 6-1 (*see Technical Note 13*); or may be obtained from the local jurisdiction.
- Determine the EFFECTIVE WIND AREA for the appropriate wall height (Table C).
- Determine the WALL DESIGN WIND LOAD in psf for the effective wind area and basic wind speed (Table D). Linear interpolation between 10 ft^2 and 100 ft^2 is acceptable, otherwise use the load associated with the lower effective area.
- Adjust the Wall Design Wind Load for height and exposure by multiplying by the appropriate ADJUSTMENT COEFFICIENT (Table E).
- Calculate the LATERAL LOAD in plf based on the spacing of the studs.

  Lateral Load (plf) = Adjusted Wall Design Wind Load (psf) x Stud On-Center Spacing (ft)
- Calculate the uniformly distributed dead load based on structure supported. Also, consideration is to be given to the self weight of the wall. Under many conditions it is appropriate to include the weight of the top half of the wall.
- Calculate the uniformly distributed live load based on live loads due to snow and associated rain and tributary width of the roof.
- The stud tables are appropriate for the typical case where the axial dead load does not exceed the axial live load.
- Calculate the total AXIAL LOAD in lbs based on the spacing of the studs.

  Axial Load (lbs) = [Dead Load (plf) + Live Load (plf)] x Stud On-Center Spacing (ft)
- **Studs:** Select a stud depth based on the stud length and the axial load (Table 1). The associated DEFLECTION should be considered for appropriateness where finishes are susceptible to cracking (Table B).
- **Columns and/or headers:** Select a column for lateral and axial loads which are greater than or equal to calculated loads (Tables 2, 4, and 6), and/or a header for lateral and uniform loads which are greater than or equal to calculated loads (Tables 3, 5, and 7).

TABLE B.
TYPICAL DEFLECTION REQUIREMENTS

TYPE OF WALL	MAXIMUM DEFLECTION
Exterior walls with plaster or stucco finish	L/360
Exterior walls with brittle finishes	L/240
Exterior walls with flexible finishes	L/120
Members supporting windows	L/175

Note: For finishes that require a deflection stricter than L/360, use a design software or contact your local distributor.

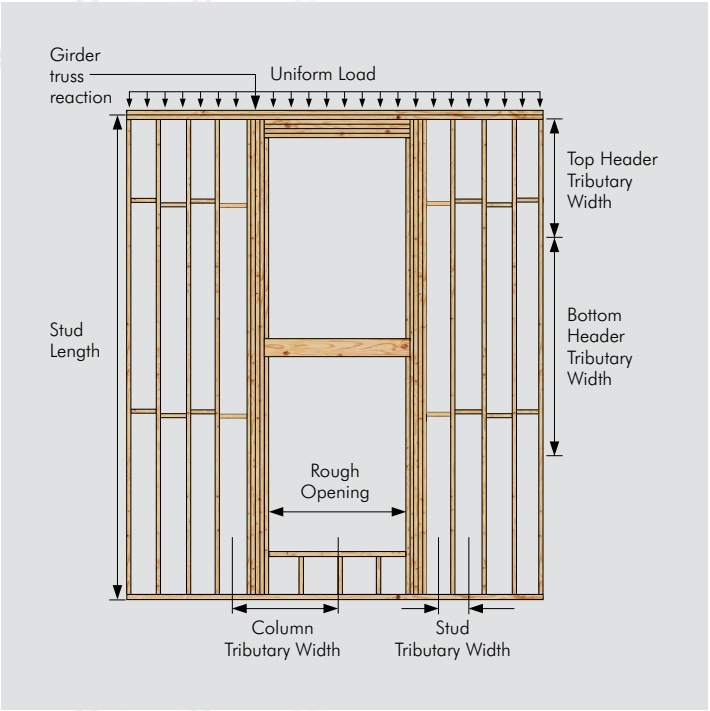

TABLE C.
EFFECTIVE WIND AREA

WALL HEIGHT (ft)	EFFECTIVE WIND AREA (ft^2)
10	33
12	48
14	65
16	85
≥ 18	100

NOTE:

1. Values are based on $L^2/3$ with a maximum of 100 ft^2, where L = wall height (ft).

TABLE D.
WALL DESIGN WIND LOAD (psf)

EFFECTIVE WIND AREA (ft^2)	BASIC WIND SPEED (mph)							
	85	90	100	110	120	130	140	150
≤ 10	14.1	15.8	19.5	23.6	28.1	33.0	38.2	43.9
20	13.5	15.1	18.7	22.6	26.9	31.6	36.7	42.1
50	12.7	14.3	17.6	21.3	25.4	29.8	34.6	39.7
≥ 100	12.2	13.6	16.8	20.4	24.2	28.4	33.0	37.8

NOTES:

1. Tabulated wind loads are based on the analytical procedure defined in ASCE 7-10 (3-second gust). Design wind pressures on C&C elements in the interior zone of an enclosed structure have been determined with the following assumptions:
   - Topographical factor of 1.0
   - Importance factor of 1.0
   - Mean roof height of 30 feet
   - Exposure Category B
2. The effective wind area is the span length multiplied by an effective width that need not be less than one-third the span length. For effective areas between those given above the load may be interpolated, otherwise use the load associated with the lower effective area.
3. See 2012 IRC, Figure R301.2(4); 2012 IBC, Figure 1609; or ASCE 7-10, Figure 6-1 (see Technical Note 13) for basic wind speeds.
4. Table values shall be adjusted for height and exposure by multiplying by the adjustment coefficient in Table E.
5. To calculate the lateral load along the stud (in plf), multiply the adjusted wall design wind load (in psf) by the stud on-center spacing (in ft).

TABLE E.
HEIGHT AND EXPOSURE ADJUSTMENT COEFFICIENTS

MEAN ROOF HEIGHT (ft)	EXPOSURE		
	B	C	D
15	1.00	1.21	1.47
20	1.00	1.29	1.55
25	1.00	1.35	1.61
30	1.00	1.40	1.66
35	1.05	1.45	1.70
40	1.09	1.49	1.74
45	1.12	1.53	1.78
50	1.16	1.56	1.81
55	1.19	1.59	1.84
60	1.22	1.62	1.87

NOTES:

1. The mean roof height is the average of the roof eave height and the height to the highest point on the roof surface, except that eave height shall be used for roof angle of less than or equal to 10 degrees.
2. The exposure categories are generally defined as follows (see ASCE 7-10, Section 6.5.6 for complete definitions):
   Exposure B: Urban and suburban areas, wooded areas.
   Exposure C: Open terrain with scattered obstructions having heights generally less than 30 ft.
   Exposure D: Flat, unobstructed areas.

ES11 STUDS

TABLE 1.
ALLOWABLE AXIAL LOADS AND LATERAL DEFLECTIONS

STUD LENGTH (ft)	AXIAL LOAD / DEFLECTION RATIO	NORDIC LAM 1-3/4" x 5-1/2" LATERAL LOAD (plf)					NORDIC LAM 1-3/4" x 7-1/4" LATERAL LOAD (plf)				
		15	20	30	40	50	15	20	30	40	50
8	Axial Load (lbs) Deflection Ratio	5259 L/6017	5259 L/4513	5259 L/3008	5259 L/2256	5259 L/1805	6933 L/13783	6933 L/10337	6933 L/6891	6933 L/5168	6933 L/4134
9	Axial Load (lbs) Deflection Ratio	5259 L/4226	5259 L/3169	5259 L/2113	5259 L/1584	5259 L/1267	6933 L/9680	6933 L/7260	6933 L/4840	6933 L/3630	6933 L/2904
10	Axial Load (lbs) Deflection Ratio	5259 L/3081	5259 L/2310	5259 L/1540	5259 L/1155	5259 L/924	6933 L/7057	6933 L/5292	6933 L/3528	6933 L/2646	6933 L/2117
11	Axial Load (lbs) Deflection Ratio	4814 L/2314	4814 L/1736	4814 L/1157	4814 L/868	4814 L/694	6933 L/5302	6933 L/3976	6933 L/2651	6933 L/1988	6933 L/1590
12	Axial Load (lbs) Deflection Ratio	4363 L/1782	4363 L/1337	4363 L/891	4363 L/668	4363 L/534	6933 L/4083	6933 L/3062	6933 L/2041	6933 L/1531	6933 L/1225
13	Axial Load (lbs) Deflection Ratio	3957 L/1402	3957 L/1051	3957 L/701	3957 L/525	3719 L/420	6933 L/3212	6933 L/2409	6933 L/1606	6933 L/1204	6933 L/963
14	Axial Load (lbs) Deflection Ratio	3596 L/1122	3596 L/842	3596 L/561	3417 L/421	3107 L/336	6586 L/2571	6586 L/1928	6586 L/1285	6586 L/964	6586 L/771
15	Axial Load (lbs) Deflection Ratio	3277 L/912	3277 L/684	3223 L/456	2899 L/342	2580 L/273	6113 L/2090	6113 L/1568	6113 L/1045	6113 L/784	6113 L/627
16	Axial Load (lbs) Deflection Ratio	2994 L/752	2994 L/564	2782 L/376	2451 L/282	2125 L/225	5673 L/1722	5673 L/1292	5673 L/861	5673 L/646	5673 L/516
17	Axial Load (lbs) Deflection Ratio	2744 L/627	2744 L/470	2400 L/313	2063 L/235	1731 L/188	5268 L/1436	5268 L/1077	5268 L/718	5268 L/538	4993 L/430
18	Axial Load (lbs) Deflection Ratio	2523 L/528	2419 L/396	2067 L/264	1726 L/198	1387 L/158	4898 L/1210	4898 L/907	4898 L/605	4764 L/453	4360 L/363
19	Axial Load (lbs) Deflection Ratio	2317 L/449	2131 L/336	1776 L/224	1431 L/168	1085 L/134	4560 L/1028	4560 L/771	4560 L/514	4210 L/385	3796 L/308
20	Axial Load (lbs) Deflection Ratio	2065 L/385	1879 L/288	1521 L/192	1171 L/144		4252 L/882	4252 L/661	4142 L/441	3714 L/330	3291 L/264
21	Axial Load (lbs) Deflection Ratio	1843 L/332	1656 L/249	1296 L/166	942 L/124		3971 L/762	3971 L/571	3705 L/381	3270 L/285	2840 L/228
22	Axial Load (lbs) Deflection Ratio	1646 L/289	1458 L/217	1097 L/144			3715 L/662	3715 L/497	3313 L/331	2871 L/248	2435 L/198
23	Axial Load (lbs) Deflection Ratio						3482 L/580	3420 L/435	2960 L/290	2513 L/217	2071 L/174
24	Axial Load (lbs) Deflection Ratio						3269 L/510	3106 L/382	2641 L/255	2190 L/191	1741 L/153
25	Axial Load (lbs) Deflection Ratio						3066 L/451	2822 L/338	2354 L/225	1899 L/169	1443 L/135
26	Axial Load (lbs) Deflection Ratio						2810 L/401	2564 L/301	2093 L/200	1634 L/150	984 L/120
27	Axial Load (lbs) Deflection Ratio						2577 L/358	2330 L/268	1857 L/179	1394 L/134	
28	Axial Load (lbs) Deflection Ratio						2364 L/321	2117 L/241	1642 L/160	1174 L/120	
29	Axial Load (lbs) Deflection Ratio						2170 L/289	1922 L/217	1446 L/144		
30	Axial Load (lbs) Deflection Ratio						1993 L/261	1745 L/196	1267 L/130		

NOTES:

1. Values shown are the allowable axial loads, in pounds (lbs), that can be applied to the stud in addition to the lateral load, and the deflection ratio, based on the span (L).
2. The table is based on dry-use conditions. The values are based on a duration of load factor of 1.60 for combined axial and lateral loads.
3. The designer must ensure that the design assumptions used to develop the table are appropriate for the application. See page 2 for stud table design assumptions. For additional design information, contact Nordic Engineered Wood.
4. The table is based on a compression perpendicular-to-grain stress of 450 psi, adjusted per NDS 2012, 3.10.4.
5. One face of the stud must be laterally supported by sheathing, fastened to meet the requirements of IRC or IBC. The other face must be sheathed with either structural sheathing or drywall.
6. Maximum spacing of full depth blocking is 8 ft.

ES12 COLUMNS

L/360 LATERAL DEFLECTION RATIO

TABLE 2.
ALLOWABLE AXIAL AND LATERAL LOADS

COLUMN LENGTH (ft)	AXIAL AND LATERAL LOADS	5-1/2" WALL THICKNESS					7-1/4" WALL THICKNESS				
		1-3/4" 2x	1-3/4" 3x	3-1/2"	5-1/2"	7-1/4" (Plank)	1-3/4" 2x	1-3/4" 3x	3-1/2"	5-1/2"	7-1/4"
8	Axial Load (lbs)	9591	13922	9591	14541	18872	12642	18352	12642	19167	24877
	Lateral Load (plf)	298	300	300	300	300	300	300	300	300	300
9	Axial Load (lbs)	9591	13922	9591	14541	18872	12642	18352	12642	19167	24877
	Lateral Load (plf)	235	300	300	300	300	300	300	300	300	300
10	Axial Load (lbs)	9591	13922	9591	14541	18872	12642	18352	12642	19167	24877
	Lateral Load (plf)	191	286	231	300	300	300	300	300	300	300
11	Axial Load (lbs)	9327	13922	9591	14541	18872	12642	18352	12642	19167	24877
	Lateral Load (plf)	145	217	174	273	300	274	300	300	300	300
12	Axial Load (lbs)	8538	12808	9591	14541	18872	12642	18352	12642	19167	24877
	Lateral Load (plf)	111	167	134	210	277	230	300	300	300	300
13	Axial Load (lbs)	7807	11711	9591	14541	18872	12642	18352	12642	19167	24877
	Lateral Load (plf)	88	131	105	165	218	196	294	241	300	300
14	Axial Load (lbs)	7142	10713	9591	14541	18872	12642	18352	12642	19167	24877
	Lateral Load (plf)	70	105	84	132	174	161	241	193	300	300
15	Axial Load (lbs)	6541	9813	8734	13745	18124	11893	17840	12642	19167	24877
	Lateral Load (plf)	57	86	68	108	142	131	196	157	246	300
16	Axial Load (lbs)	5978	8976	7923	12469	16443	11117	16676	12642	19167	24877
	Lateral Load (plf)	47	71	56	89	117	108	162	129	203	268
17	Axial Load (lbs)	5479	8227	7216	11356	14974	10387	15581	12642	19167	24877
	Lateral Load (plf)	39	59	47	74	97	90	135	108	169	223
18	Axial Load (lbs)	5036	7562	6595	10380	13687	9707	14560	12642	19167	24877
	Lateral Load (plf)	33	50	40	62	82	76	113	91	143	188
19	Axial Load (lbs)	4642	6971	6049	9520	12554	9077	13615	12184	19167	24877
	Lateral Load (plf)	28	42	34	53	70	64	96	77	121	160
20	Axial Load (lbs)	4291	6443	5566	8761	11553	8474	12738	11292	17799	23478
	Lateral Load (plf)	24	36	29	45	60	55	83	66	104	137
21	Axial Load (lbs)	3976	5971	5138	8087	10664	7915	11897	10488	16534	21810
	Lateral Load (plf)	21	31	25	39	52	48	71	57	90	118
22	Axial Load (lbs)	3694	5548	4756	7486	9871	7405	11131	9764	15393	20305
	Lateral Load (plf)	18	27	22	34	45	41	62	50	78	103
23	Axial Load (lbs)						6940	10432	9109	14361	18944
	Lateral Load (plf)						36	54	44	68	90
24	Axial Load (lbs)						6514	9793	8515	13426	17711
	Lateral Load (plf)						32	48	38	60	79
25	Axial Load (lbs)						6125	9208	7976	12577	16591
	Lateral Load (plf)						28	42	34	53	70
26	Axial Load (lbs)						5768	8672	7485	11804	15569
	Lateral Load (plf)						25	38	30	47	62
27	Axial Load (lbs)						5440	8179	7037	11098	14629
	Lateral Load (plf)						22	34	27	42	56
28	Axial Load (lbs)						5139	7726	6627	10452	13770
	Lateral Load (plf)						20	30	24	38	50
29	Axial Load (lbs)						4861	7308	6251	9860	12984
	Lateral Load (plf)						18	27	22	34	45
30	Axial Load (lbs)						4604	6922	5905	9316	12262
	Lateral Load (plf)						16	25	20	31	41

NOTES:

1. Values shown are the maximum axial loads, in pounds (lbs), and lateral loads, in pounds per lineal foot (plf), that can be applied to the column.
2. Selected column shall satisfy both total axial and lateral wind loads. Refer to page 3 for determining the lateral load.
3. The table is based on dry-use conditions. The values are based on a duration of load factor of 1.60 for combined axial and lateral loads, and 1.00 for axial load only.
4. The table is based on a compression perpendicular-to-grain stress of 450 psi.
5. 1-3/4-inch built-up columns have been designed for ES11 stud grade. Built-up columns shall be nailed in accordance with NDS 2012, 15.3.3.
6. One face of the column must be laterally supported by sheathing, fastened to meet the requirements of IRC or IBC. The other face must be sheathed with either structural sheathing or drywall.
7. Maximum spacing of full depth blocking is 8 ft.

24F HEADERS

L/360 LATERAL DEFLECTION RATIO

TABLE 3.
ALLOWABLE UNIFORM AND LATERAL LOADS (plf)

WIDTH (in.)	DEPTH (in.)	CRITERIA	ROUGH OPENING (ft)									
			3	4	5	6	7	8	9	10	11	12
5-1/2	3-1/2	L/240 TL	697	402	257	176	128	84	51	--	--	--
		L/360 WL	500	500	500	500	340	230	164	--	--	--
		End B.	1.50	1.50	1.50	1.50	1.50	1.50	1.50	--	--	--
	5-1/2	L/240 TL	2785	2128	1438	806	450	404	253	165	112	77
		L/360 WL	500	500	500	500	445	302	214	157	119	92
		End B.	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
	7-1/4	L/240 TL	3671	2805	2269	1759	1012	748	587	386	263	184
		L/360 WL	500	500	500	500	500	398	282	207	157	122
		End B.	1.90	1.90	1.90	1.70	1.50	1.50	1.50	1.50	1.50	1.50
	9-1/4	L/240 TL	4684	3579	2895	2430	2093	1245	1113	809	554	390
		L/360 WL	500	500	500	500	500	500	360	265	200	155
		End B.	2.40	2.40	2.40	2.40	2.40	1.60	1.60	1.50	1.50	1.50
	11-1/4	L/240 TL	5696	4353	3521	2955	2545	2235	1646	1463	1003	709
		L/360 WL	500	500	500	500	500	500	438	322	243	189
		End B.	2.90	2.90	2.90	2.90	2.90	2.90	2.40	2.30	1.80	1.50
7	3-1/2	L/240 TL	887	512	327	225	163	107	65	--	--	--
		L/360 WL	500	500	500	500	500	475	337	--	--	--
		End B.	1.50	1.50	1.50	1.50	1.50	1.50	1.50	--	--	--
	5-1/2	L/240 TL	2128	1208	771	532	387	293	228	174	117	80
		L/360 WL	500	500	500	500	500	500	500	389	294	228
		End B.	1.70	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
	7-1/4	L/240 TL	4672	3570	2888	2243	1663	1187	747	491	335	234
		L/360 WL	500	500	500	500	500	500	500	428	323	251
		End B.	1.90	1.90	1.90	1.70	1.50	1.50	1.50	1.50	1.50	1.50
	9-1/4	L/240 TL	5961	4555	3684	3092	2664	2087	1561	1030	705	497
		L/360 WL	500	500	500	500	500	500	500	500	413	320
		End B.	2.40	2.40	2.40	2.40	2.40	2.10	1.80	1.50	1.50	1.50
	11-1/4	L/240 TL	7250	5540	4481	3761	3239	2844	2451	1862	1277	903
		L/360 WL	500	500	500	500	500	500	500	500	500	389
		End B.	2.90	2.90	2.90	2.90	2.90	2.90	2.80	2.30	1.80	1.50

NOTES:

1. Values shown are the maximum uniform (vertical) and lateral loads, in pounds per lineal foot (plf), that can be applied to the header in addition to its own weight.
2. Selected header shall satisfy both total vertical (TL) and wind loads (WL). Refer to page 3 for determining the lateral load.
3. The table is based on uniform loads and dry-use conditions. The values are based on a duration of load factor of 1.60 for combined uniform and lateral loads, and 1.00 for uniform load only.
4. The total load deflection is limited to the most restrictive of L/240 or 5/16 inch.
5. Trimmers shall support the full header width. Verify trimmer maximum allowable axial load to support the header.
6. Multiple pieces may be used when properly connected.
7. Sufficient bearing length shall be provided at supports. Review bearing length requirements (shown in inches) to ensure adequacy.

ES12 COLUMNS

L/240 LATERAL DEFLECTION RATIO

TABLE 4.
ALLOWABLE AXIAL AND LATERAL LOADS

COLUMN LENGTH (ft)	AXIAL AND LATERAL LOADS	5-1/2" WALL THICKNESS					7-1/4" WALL THICKNESS				
		1-3/4" 2x	1-3/4" 3x	3-1/2"	5-1/2"	7-1/4" (Plank)	1-3/4" 2x	1-3/4" 3x	3-1/2"	5-1/2"	7-1/4"
8	Axial Load (lbs)	9591	13922	9591	14541	18872	12642	18352	12642	19167	24877
	Lateral Load (plf)	298	300	300	300	300	300	300	300	300	300
9	Axial Load (lbs)	9591	13922	9591	14541	18872	12642	18352	12642	19167	24877
	Lateral Load (plf)	235	300	300	300	300	300	300	300	300	300
10	Axial Load (lbs)	9591	13922	9591	14541	18872	12642	18352	12642	19167	24877
	Lateral Load (plf)	191	286	300	300	300	300	300	300	300	300
11	Axial Load (lbs)	8984	13477	9591	14541	18872	12642	18352	12642	19167	24877
	Lateral Load (plf)	158	236	260	300	300	274	300	300	300	300
12	Axial Load (lbs)	7946	11919	9591	14541	18872	12642	18352	12642	19167	24877
	Lateral Load (plf)	132	199	201	300	300	230	300	300	300	300
13	Axial Load (lbs)	7059	10588	9591	14541	18872	12642	18352	12642	19167	24877
	Lateral Load (plf)	113	169	158	248	300	196	294	300	300	300
14	Axial Load (lbs)	6300	9449	9203	14462	18872	12421	18352	12642	19167	24877
	Lateral Load (plf)	97	146	126	198	262	169	253	289	300	300
15	Axial Load (lbs)	5648	8471	8376	13162	17350	11298	16948	12642	19167	24877
	Lateral Load (plf)	85	127	103	161	213	147	221	235	300	300
16	Axial Load (lbs)	5215	7823	7645	12014	15836	10302	15453	12642	19167	24877
	Lateral Load (plf)	71	106	85	133	175	129	194	194	300	300
17	Axial Load (lbs)	4842	7262	6998	10998	14497	9417	14126	12642	19167	24877
	Lateral Load (plf)	59	88	71	111	146	115	172	162	254	300
18	Axial Load (lbs)	4499	6749	6426	10097	13310	8632	12948	12539	19167	24877
	Lateral Load (plf)	50	74	59	93	123	102	153	136	214	282
19	Axial Load (lbs)	4186	6279	5917	9298	12256	7933	11899	11664	18329	24161
	Lateral Load (plf)	42	63	51	79	105	92	138	116	182	240
20	Axial Load (lbs)	3901	5851	5464	8586	11317	7313	10969	10866	17076	22509
	Lateral Load (plf)	36	54	43	68	90	83	124	99	156	206
21	Axial Load (lbs)	3641	5461	5059	7949	10479	6910	10365	10140	15935	21005
	Lateral Load (plf)	31	47	37	59	78	71	107	86	135	178
22	Axial Load (lbs)	3404	5106	4696	7379	9727	6531	9796	9479	14895	19635
	Lateral Load (plf)	27	41	33	51	67	62	93	75	117	154
23	Axial Load (lbs)						6175	9262	8876	13947	18385
	Lateral Load (plf)						54	82	65	103	135
24	Axial Load (lbs)						5842	8763	8325	13082	17244
	Lateral Load (plf)						48	72	57	90	119
25	Axial Load (lbs)						5532	8298	7821	12291	16192
	Lateral Load (plf)						42	64	51	80	105
26	Axial Load (lbs)						5242	7864	7360	11566	15217
	Lateral Load (plf)						38	56	45	71	94
27	Axial Load (lbs)						4973	7459	6937	10901	14326
	Lateral Load (plf)						34	50	40	63	84
28	Axial Load (lbs)						4721	7082	6548	10290	13509
	Lateral Load (plf)						30	45	36	57	75
29	Axial Load (lbs)						4487	6730	6190	9727	12759
	Lateral Load (plf)						27	41	33	51	67
30	Axial Load (lbs)						4268	6403	5860	9208	12068
	Lateral Load (plf)						25	37	29	46	61

NOTES:

1. Values shown are the maximum axial loads, in pounds (lbs), and lateral loads, in pounds per lineal foot (plf), that can be applied to the column.
2. Selected column shall satisfy both total axial and lateral wind loads. Refer to page 3 for determining the lateral load.
3. The table is based on dry-use conditions. The values are based on a duration of load factor of 1.60 for combined axial and lateral loads, and 1.00 for axial load only.
4. The table is based on a compression perpendicular-to-grain stress of 450 psi.
5. 1-3/4-inch built-up columns have been designed for ES11 stud grade. Built-up columns shall be nailed in accordance with NDS 2012, 15.3.3.
6. One face of the column must be laterally supported by sheathing, fastened to meet the requirements of IRC or IBC. The other face must be sheathed with either structural sheathing or drywall.
7. Maximum spacing of full depth blocking is 8 ft.

24F HEADERS
L/240 LATERAL DEFLECTION RATIO

TABLE 5.
ALLOWABLE UNIFORM AND LATERAL LOADS (plf)

WIDTH (in.)	DEPTH (in.)	CRITERIA	ROUGH OPENING (ft)									
			3	4	5	6	7	8	9	10	11	12
5-1/2	3-1/2	L/240 TL	697	402	257	176	128	84	51	--	--	--
		L/240 WL	500	500	500	500	500	346	245	--	--	--
		End B.	1.50	1.50	1.50	1.50	1.50	1.50	1.50	--	--	--
	5-1/2	L/240 TL	2785	2128	1438	806	396	304	240	165	112	77
		L/240 WL	500	500	500	500	472	364	290	236	179	138
		End B.	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
	7-1/4	L/240 TL	3671	2805	2269	1759	1012	531	420	340	263	184
		L/240 WL	500	500	500	500	500	480	382	311	235	182
		End B.	1.90	1.90	1.90	1.70	1.50	1.50	1.50	1.50	1.50	1.50
	9-1/4	L/240 TL	4684	3579	2895	2430	2093	1245	686	557	554	390
		L/240 WL	500	500	500	500	500	500	488	397	300	233
		End B.	2.40	2.40	2.40	2.40	2.40	1.60	1.50	1.50	1.50	1.50
	11-1/4	L/240 TL	5696	4353	3521	2955	2545	2235	1394	825	826	709
		L/240 WL	500	500	500	500	500	500	500	483	365	283
		End B.	2.90	2.90	2.90	2.90	2.90	2.90	2.00	1.50	1.50	1.50
7	3-1/2	L/240 TL	887	512	327	225	163	107	65	--	--	--
		L/240 WL	500	500	500	500	500	500	500	--	--	--
		End B.	1.50	1.50	1.50	1.50	1.50	1.50	1.50	--	--	--
	5-1/2	L/240 TL	2128	1208	771	532	387	293	228	174	117	80
		L/240 WL	500	500	500	500	500	500	500	500	442	342
		End B.	1.70	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
	7-1/4	L/240 TL	4672	3570	2888	2243	1663	1187	747	434	335	234
		L/240 WL	500	500	500	500	500	500	500	491	407	343
		End B.	1.90	1.90	1.90	1.70	1.50	1.50	1.50	1.50	1.50	1.50
	9-1/4	L/240 TL	5961	4555	3684	3092	2664	2087	1561	1030	640	492
		L/240 WL	500	500	500	500	500	500	500	500	500	438
		End B.	2.40	2.40	2.40	2.40	2.40	2.10	1.80	1.50	1.50	1.50
	11-1/4	L/240 TL	7250	5540	4481	3761	3239	2844	2451	1862	1277	840
		L/240 WL	500	500	500	500	500	500	500	500	500	500
		End B.	2.90	2.90	2.90	2.90	2.90	2.90	2.80	2.30	1.80	1.50

NOTES:

1. Values shown are the maximum uniform (vertical) and lateral loads, in pounds per linear foot (plf), that can be applied to the header in addition to its own weight.
2. Selected header shall satisfy both total vertical (TL) and wind loads (WL). Refer to page 3 for determining the lateral load.
3. The table is based on uniform loads and dry-use conditions. The values are based on a duration of load factor of 1.60 for combined uniform and lateral loads, and 1.00 for uniform load only.
4. The total load deflection is limited to the most restrictive of L/240 or 5/16 inch.
5. Trimmers shall support the full header width. Verify trimmer maximum allowable axial load to support the header.
6. Multiple pieces may be used when properly connected.
7. Sufficient bearing length shall be provided at supports. Review bearing length requirements (shown in inches) to ensure adequacy.

ES12 COLUMNS

L/180 LATERAL DEFLECTION RATIO

TABLE 6.
ALLOWABLE AXIAL AND LATERAL LOADS

COLUMN LENGTH (ft)	AXIAL AND LATERAL LOADS	5-1/2" WALL THICKNESS					7-1/4" WALL THICKNESS				
		1-3/4" 2x	1-3/4" 3x	3-1/2"	5-1/2"	7-1/4" (Plank)	1-3/4" 2x	1-3/4" 3x	3-1/2"	5-1/2"	7-1/4"
8	Axial Load (lbs)	9591	13922	9591	14541	18872	12642	18352	12642	19167	24877
	Lateral Load (plf)	298	300	300	300	300	300	300	300	300	300
9	Axial Load (lbs)	9591	13922	9591	14541	18872	12642	18352	12642	19167	24877
	Lateral Load (plf)	235	300	300	300	300	300	300	300	300	300
10	Axial Load (lbs)	9591	13922	9591	14541	18872	12642	18352	12642	19167	24877
	Lateral Load (plf)	191	286	300	300	300	300	300	300	300	300
11	Axial Load (lbs)	8984	13477	9591	14541	18872	12642	18352	12642	19167	24877
	Lateral Load (plf)	158	236	280	300	300	274	300	300	300	300
12	Axial Load (lbs)	7946	11919	9591	14541	18872	12642	18352	12642	19167	24877
	Lateral Load (plf)	132	199	235	300	300	230	300	300	300	300
13	Axial Load (lbs)	7059	10588	9187	14541	18872	12642	18352	12642	19167	24877
	Lateral Load (plf)	113	169	200	300	300	196	294	300	300	300
14	Axial Load (lbs)	6300	9449	8230	12933	18170	12421	18352	12642	19167	24877
	Lateral Load (plf)	97	146	168	265	300	169	253	300	300	300
15	Axial Load (lbs)	5648	8471	7555	11872	15649	11298	16948	12642	19167	24877
	Lateral Load (plf)	85	127	137	215	284	147	221	262	300	300
16	Axial Load (lbs)	5086	7628	6944	10913	14385	10302	15453	12642	19167	24877
	Lateral Load (plf)	74	112	113	177	234	129	194	230	300	300
17	Axial Load (lbs)	4599	6898	6395	10050	13247	9417	14126	12269	19167	24877
	Lateral Load (plf)	66	99	94	148	195	115	172	204	300	300
18	Axial Load (lbs)	4175	6263	5902	9274	12225	8632	12948	11175	17561	24877
	Lateral Load (plf)	59	88	79	125	164	102	153	182	285	300
19	Axial Load (lbs)	3805	5708	5458	8577	11306	7933	11899	10470	16452	22290
	Lateral Load (plf)	53	79	67	106	140	92	138	154	243	300
20	Axial Load (lbs)	3480	5220	5060	7951	10481	7309	10963	9814	15422	20329
	Lateral Load (plf)	48	71	58	91	120	83	124	132	208	274
21	Axial Load (lbs)	3253	4880	4700	7386	9737	6751	10127	9207	14468	19071
	Lateral Load (plf)	42	62	50	78	103	75	113	114	180	237
22	Axial Load (lbs)	3059	4588	4376	6877	9066	6252	9377	8647	13587	17911
	Lateral Load (plf)	36	54	43	68	90	68	103	99	156	206
23	Axial Load (lbs)						5802	8704	8130	12775	16840
	Lateral Load (plf)						63	94	87	137	180
24	Axial Load (lbs)						5397	8096	7653	12027	15853
	Lateral Load (plf)						57	86	77	120	159
25	Axial Load (lbs)						5032	7547	7214	11336	14932
	Lateral Load (plf)						53	79	68	106	140
26	Axial Load (lbs)						4700	7050	6809	10700	14071
	Lateral Load (plf)						49	73	60	95	125
27	Axial Load (lbs)						4428	6642	6435	10112	13280
	Lateral Load (plf)						45	67	54	85	111
28	Axial Load (lbs)						4225	6337	6089	9568	12550
	Lateral Load (plf)						40	60	48	76	100
29	Axial Load (lbs)						4032	6048	5769	9066	11878
	Lateral Load (plf)						36	54	43	68	90
30	Axial Load (lbs)						3851	5776	5473	8600	11256
	Lateral Load (plf)						33	49	39	62	81

NOTES:

1. Values shown are the maximum axial loads, in pounds (lbs), and lateral loads, in pounds per lineal foot (plf), that can be applied to the column.
2. Selected column shall satisfy both total axial and lateral wind loads. Refer to page 3 for determining the lateral load.
3. The table is based on dry-use conditions. The values are based on a duration of load factor of 1.60 for combined axial and lateral loads, and 1.00 for axial load only.
4. The table is based on a compression perpendicular-to-grain stress of 450 psi.
5. 1-3/4-inch built-up columns have been designed for ES11 stud grade. Built-up columns shall be nailed in accordance with NDS 2012, 15.3.3.
6. One face of the column must be laterally supported by sheathing, fastened to meet the requirements of IRC or IBC. The other face must be sheathed with either structural sheathing or drywall.
7. Maximum spacing of full depth blocking is 8 ft.

24F HEADERS
L/180 LATERAL DEFLECTION RATIO

TABLE 7.
ALLOWABLE UNIFORM AND LATERAL LOADS (plf)

WIDTH (in.)	DEPTH (in.)	CRITERIA	ROUGH OPENING (ft)									
			3	4	5	6	7	8	9	10	11	12
5-1/2	3-1/2	L/240 TL	697	402	257	176	128	84	51	--	--	--
		L/180 WL	500	500	500	500	500	461	327	--	--	--
		End B.	1.50	1.50	1.50	1.50	1.50	1.50	1.50	--	--	--
	5-1/2	L/240 TL	2785	2128	1438	806	396	304	240	165	112	77
		L/180 WL	500	500	500	500	472	364	290	236	196	165
		End B.	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
	7-1/4	L/240 TL	3671	2805	2269	1759	1012	531	420	340	263	184
		L/180 WL	500	500	500	500	500	480	382	311	258	218
		End B.	1.90	1.90	1.90	1.70	1.50	1.50	1.50	1.50	1.50	1.50
	9-1/4	L/240 TL	4684	3579	2895	2430	2093	1245	686	556	459	385
		L/180 WL	500	500	500	500	500	500	488	397	330	278
		End B.	2.40	2.40	2.40	2.40	2.40	1.60	1.50	1.50	1.50	1.50
	11-1/4	L/240 TL	5696	4353	3521	2955	2545	2235	1394	823	680	570
		L/180 WL	500	500	500	500	500	500	500	483	401	338
		End B.	2.90	2.90	2.90	2.90	2.90	2.90	2.00	1.50	1.50	1.50
7	3-1/2	L/240 TL	887	512	327	225	163	107	65	--	--	--
		L/180 WL	500	500	500	500	500	500	500	--	--	--
		End B.	1.50	1.50	1.50	1.50	1.50	1.50	1.50	--	--	--
	5-1/2	L/240 TL	2128	1208	771	532	387	293	228	174	117	80
		L/180 WL	500	500	500	500	500	500	500	500	500	456
		End B.	1.70	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
	7-1/4	L/240 TL	4672	3570	2888	2243	1663	1187	747	434	335	234
		L/180 WL	500	500	500	500	500	500	500	491	407	343
		End B.	1.90	1.90	1.90	1.70	1.50	1.50	1.50	1.50	1.50	1.50
	9-1/4	L/240 TL	5961	4555	3684	3092	2664	2087	1561	1030	640	492
		L/180 WL	500	500	500	500	500	500	500	500	500	438
		End B.	2.40	2.40	2.40	2.40	2.40	2.10	1.80	1.50	1.50	1.50
	11-1/4	L/240 TL	7250	5540	4481	3761	3239	2844	2451	1862	1277	840
		L/180 WL	500	500	500	500	500	500	500	500	500	500
		End B.	2.90	2.90	2.90	2.90	2.90	2.90	2.80	2.30	1.80	1.50

NOTES:

1. Values shown are the maximum uniform (vertical) and lateral loads, in pounds per linear foot (plf), that can be applied to the header in addition to its own weight.
2. Selected header shall satisfy both total vertical (TL) and wind loads (WL). Refer to page 3 for determining the lateral load.
3. The table is based on uniform loads and dry-use conditions. The values are based on a duration of load factor of 1.60 for combined uniform and lateral loads, and 1.00 for uniform load only.
4. The total load deflection is limited to the most restrictive of L/240 or 5/16 inch.
5. Trimmers shall support the full header width. Verify trimmer maximum allowable axial load to support the header.
6. Multiple pieces may be used when properly connected.
7. Sufficient bearing length shall be provided at supports. Review bearing length requirements (shown in inches) to ensure adequacy.

DESIGN VALUES
FOR NORDIC LAM™

DESIGN PROPERTIES (1,2,3)

APPLICATION	WALL STUDS	COLUMNS
APPEARANCE GRADE	INDUSTRIAL	INDUSTRIAL
STRESS GRADE	ES11	ES12
EWS LAYUP COMBINATION	ES11/NPG	ES12/NPG
Bending About X-X Axis		
Bending at Extreme Fibre (F_{bx})(4,5)	1350 psi	2400 psi
Longitudinal Shear (F_{vx})(6)	250 psi	250 psi
Compression Perpendicular to Grain (F_{cpx})	450 psi	600 psi
Shear-Free Modulus of Elasticity (E_x)	1.6E+06 psi	1.9E+06 psi
Apparent Modulus of Elasticity ($E_{x,app.}$)(7)	1.5E+06 psi	1.8E+06 psi
Bending About Y-Y Axis		
Bending at Extreme Fibre (F_{by})(8)	1750 psi	2400 psi
for 3 laminations	1600 psi	2400 psi
Longitudinal Shear (F_{vy})(6)	175 psi	250 psi
Compression Perpendicular to Grain (F_{cpy})	450 psi	600 psi
Shear-Free Modulus of Elasticity (E_y)	1.6E+06 psi	1.9E+06 psi
Apparent Modulus of Elasticity ($E_{y,app.}$)(7)	1.5E+06 psi	1.8E+06 psi
Axially Loaded		
Compression Parallel to Grain (F_c)	1550 psi	2300 psi
for 3 laminations	1350 psi	1700 psi
Tension Parallel to Grain (F_t)	975 psi	1600 psi
Modulus of Elasticity (E_a)(7)	1.6E+06 psi	1.9E+06 psi
Specific Gravity	0.41	0.46
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 conditions of use. For wet conditions of use, multiply the tabulated values by the wet service factors, C_M, per ANSI/AWC NDS-2012, 5.3.3.

(3) The tabulated design values are for normal duration of loading. For other durations of loading, see applicable design code (ANSI/AWC NDS-2012, 2.3.2 and Chapter 5).

(4) Nordic Lam bending members are symmetrical throughout the depth of the member (balanced layups).

(5) The tabulated design values in bending, F_{bx}, shall be multiplied by a volume factor, C_v. The volume factor formula is: $C_v = (12/d)^{1/10} \times (5.125/b)^{1/10} \times (21/L)^{1/10} \leq 1.0$, where d = beam depth (in.), b = beam width (in.), and L = beam length (ft).

(6) For non-prismatic members, notched members, members subject to impact or cyclic loading, or shear design of bending members at connections (ANSI/AWC NDS-2012, 3.4.3.3), the design value for shear (F_{vx} and F_{vy}) shall be multiplied by a factor of 0.72.

(7) The tabulated apparent E values already include a 5% shear deflection. For beam stability and column stability calculations, E_{min} shall be determined by multiplying the tabulated apparent modulus of elasticity by 0.528.

(8) The F_{by} values shall be permitted to be increased by multiplying by the size factor, $(12/d)^{1/9}$, where d is the beam depth in inches.

(9) Design of glulam members shall be in accordance to National Design Specification, 2012 Edition.

Refer to the Nordic Lam Design and Construction Guide for more information.
The Nordic Lam products are listed in APA Product Report PR-L294.

NORDIC ENGINEERED WOOD

Sustainable Wood Solutions

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