NORDIC LAM™

1-1/2-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.
- Total load deflection criteria is stud length/180. Calculated total load deflection for each stud is given in the tables.
- The ratio of specified axial dead load to live load is 1. This table can be used conservatively when the specified axial dead load is less than the specified axial live load.
- Stud sizes are based on Limit States Design. The load combinations considered are:
  1. axial load alone — 1.25D + 1.5L
  2. axial dead load plus wind — 1.25D + 1.4W
  3. axial load plus wind as companion load — 1.25D + (1.5L or 1.5S) + 0.4W
  4. axial load plus wind as principal load — 1.25D + 1.4W + (0.5L or 0.5S)
- In conformance with the NBC, an importance factor of 0.75 is applied to the wind and axial loads in load combinations 2, 3, and 4 for serviceability limit states.
- Load cases 2, 3, and 4 are based on a load duration factor of 1.15.
- 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 (effective length factor, K_e = 1.0).
- The tables can only be used for untreated studs in dry service conditions.
- Factored resistance values were calculated based on published values and CSA O86-09.

TABLE A.
LIMITATIONS OF CONVENTIONAL CONSTRUCTION(1)

TYPE OF WALL	STUD SIZE	STUD HEIGHT(2)	MAXIMUM SPACING
Walls supporting roof and ceiling only	2x3 2x4	8' 10'	16" 24"
Walls supporting one floor, roof and ceiling	2x4 2x6	10' 10'	16" 24"
Walls supporting two floors, roof and ceiling	2x4 2x6	10' 12'	12" 16"
Nonbearing walls	2x3 2x4	8' 12'	16" 16"

(1) Per NBC, Table 9.23.10.1.
(2) Listed heights are distances between points of lateral support placed perpendicular to the plane of the wall.

HOW TO USE THE TABLES

- Determine the REFERENCE VELOCITY PRESSURE, q (in kPa), based on a probability of being exceeded in any one year of 1 in 50, for the building location. This is found in the NBC 2010, Appendix C, Table C-2; or may be obtained from the local jurisdiction.
- Determine the EXPOSURE FACTOR, C_e, from Table C, the COMPOSITE GUST EFFECT FACTOR-EXTERNAL PRESSURE COEFFICIENT, C_gC_p, from Table D, and the INTERNAL GUST EFFECT FACTOR AND INTERNAL PRESSURE COEFFICIENT, C_{gi} and C_{pi}, from Table E.
- Adjust the maximum SPECIFIED WIND PRESSURE in kPa: $p = q \times C_e \times (C_gC_p + C_{gi} \times C_{pi})$
- Calculate the LATERAL LOAD in plf based on the spacing of the studs:

  Lateral Load (plf) = Specified Wind Pressure (kPa) x 20.89 x Stud On-Centre Spacing (ft)

  Where 20.89 is the conversion factor from kPa to psf.
- Calculate the uniformly distributed factored dead load based on the 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 factored 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-Centre 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 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.

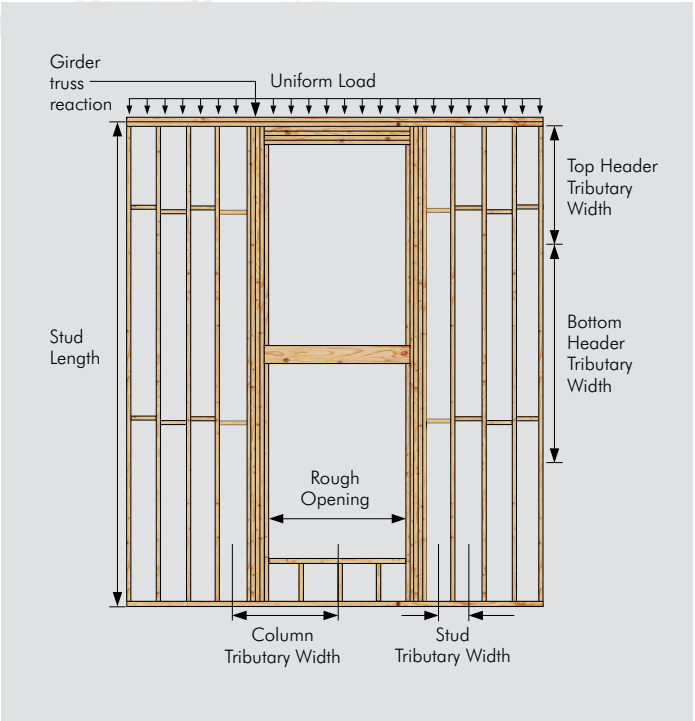

TABLE C.
EXPOSURE FACTOR, C_e

MEAN ROOF HEIGHT (ft)	C_e - OPEN TERRAIN	C_e - ROUGH TERRAIN
Less than 20	0.90	0.70
21	0.91	
22	0.92	
23	0.93	
24	0.94	
25	0.95	
26	0.95	
27	0.96	
28	0.97	
29	0.98	
30	0.98	

NOTES:

1. The mean roof height for low-rise construction is measured from above grade to the mean height of the roof, or to the eave if the roof slope is less than 7°.
2. Open Terrain: Level terrain with only scattered buildings, trees, or other obstructions, open water or shorelines thereof.
   Rough Terrain: Suburban, urban, or wooded terrain, extending upwind from the building uninterrupted for at least 1 km.

TABLE D.
COMPOSITE GUST EFFECT FACTOR-EXTERNAL PRESSURE COEFFICIENT, C_{gp}

EFFECTIVE WIND AREA (ft^2)	C_{gp}
10	2.10
15	2.10
20	2.09
25	2.08
30	2.08
35	2.07
40	2.07
45	2.06
50	2.06
55	2.05
60	2.04

TABLE E.
INTERNAL GUST EFFECT FACTOR, C_{gi}, AND INTERNAL PRESSURE COEFFICIENT, C_{pi}

BUILDING CATEGORY		C_{gi}	C_{pi}
1	Buildings without any large or significant openings, but with small and uniformly distributed openings amounting to less than 0.1% of total surface area.	2.00	0.15
2	Buildings in which significant openings, if there are any, can be relied on to be closed during storms but in which background leakage may not be uniformly distributed. Most low-rise buildings fall into this category provided that all elements - especially shipping doors - are designed to be fully wind-resistant.	2.00	0.45
3	Buildings with large or significant openings. For example, sheds with one or more open sides, industrial buildings with shipping doors, ventilators or the like, which have a high probability of being open during a storm, or not being fully wind-resistant to design wind loads.	2.00	0.70

ES11 STUDS

TABLE 1.
MAXIMUM FACTORED AXIAL LOADS AND LATERAL DEFLECTIONS

STUD LENGTH (ft)	AXIAL LOAD / DEFLECTION RATIO	NORDIC LAM 1-1/2" x 5-1/2" LATERAL LOAD (plf)					NORDIC LAM 1-1/2" x 7-1/4" LATERAL LOAD (plf)				
		15	30	45	60	75	15	30	45	60	75
8	Axial Load (lbs)	6383	6383	6383	6383	6383	8414	8414	8414	8414	8414
	Deflection Ratio	L/2888	L/1444	L/962	L/722	L/577	L/6615	L/3307	L/2205	L/1653	L/1323
9	Axial Load (lbs)	6383	6383	6383	6383	6383	8414	8414	8414	8414	8414
	Deflection Ratio	L/2028	L/1014	L/676	L/507	L/405	L/4646	L/2323	L/1548	L/1161	L/929
10	Axial Load (lbs)	6383	6383	6383	6383	4745	8414	8414	8414	8414	8414
	Deflection Ratio	L/1478	L/739	L/492	L/369	L/295	L/3387	L/1693	L/1129	L/846	L/677
11	Axial Load (lbs)	6383	6383	6383	4448	1887	8414	8414	8414	8414	8414
	Deflection Ratio	L/1111	L/555	L/370	L/277	L/222	L/2544	L/1272	L/848	L/636	L/508
12	Axial Load (lbs)	6245	6245	4765	2211		8414	8414	8414	8414	8414
	Deflection Ratio	L/855	L/427	L/285	L/213		L/1960	L/980	L/653	L/490	L/392
13	Axial Load (lbs)	5605	5527	3043			8414	8414	8414	8414	6797
	Deflection Ratio	L/673	L/336	L/224			L/1541	L/770	L/513	L/385	L/308
14	Axial Load (lbs)	5028	4169				8414	8414	8414	7070	3887
	Deflection Ratio	L/538	L/269				L/1234	L/617	L/411	L/308	L/246
15	Axial Load (lbs)	4509	3020				8414	8414	7872	4713	1105
	Deflection Ratio	L/438	L/219				L/1003	L/501	L/334	L/250	L/200
16	Axial Load (lbs)	4045	2032				8110	8110	5948	2529	
	Deflection Ratio	L/361	L/180				L/826	L/413	L/275	L/206	
17	Axial Load (lbs)	3547					7472	7472	4233		
	Deflection Ratio	L/301					L/689	L/344	L/229		
18	Axial Load (lbs)	3068					6881	6079	2677		
	Deflection Ratio	L/253					L/580	L/290	L/193		
19	Axial Load (lbs)	2487					6335	4839			
	Deflection Ratio	L/215					L/493	L/246			
20	Axial Load (lbs)	1990					5834	3742			
	Deflection Ratio	L/184					L/423	L/211			
21	Axial Load (lbs)						5372	2763			
	Deflection Ratio						L/365	L/182			
22	Axial Load (lbs)						4875				
	Deflection Ratio						L/318				
23	Axial Load (lbs)						4401				
	Deflection Ratio						L/278				
24	Axial Load (lbs)						3876				
	Deflection Ratio						L/245				
25	Axial Load (lbs)						3302				
	Deflection Ratio						L/216				
26	Axial Load (lbs)						2792				
	Deflection Ratio						L/192				
27	Axial Load (lbs)										
	Deflection Ratio										
28	Axial Load (lbs)										
	Deflection Ratio										
29	Axial Load (lbs)										
	Deflection Ratio										
30	Axial Load (lbs)										
	Deflection Ratio										

NOTES:

1. Values shown are the maximum factored axial load, 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. Sizes shown in the table are based on dry service conditions.
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 resistance of 841 psi, adjusted per CSA O86.
5. One face of the stud must be laterally supported by sheathing, fastened to meet the requirements of NBC Part 9. 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.
MAXIMUM FACTORED AXIAL AND LATERAL LOADS

COLUMN LENGTH (ft)	AXIAL AND LATERAL LOADS	5-1/2" WALL THICKNESS					7-1/4" WALL THICKNESS				
		1-1/2" 2x	1-1/2" 3x	3-1/2"	5-1/2"	7-1/4" (Plank)	1-1/2" 2x	1-1/2" 3x	3-1/2"	5-1/2"	7-1/4"
8	Axial Load (lbs)	12766	19150	19268	30279	39913	16828	25243	25399	39913	52613
	Lateral Load (plf)	150	150	150	150	150	150	150	150	150	150
9	Axial Load (lbs)	12766	19150	19268	30279	39913	16828	25243	25399	39913	52613
	Lateral Load (plf)	127	150	150	150	150	150	150	150	150	150
10	Axial Load (lbs)	12766	19150	19268	30279	39913	16828	25243	25399	39913	52613
	Lateral Load (plf)	89	134	121	150	150	150	150	150	150	150
11	Axial Load (lbs)	12766	19150	19268	30279	39913	16828	25243	25399	39913	52613
	Lateral Load (plf)	64	96	87	137	150	150	150	150	150	150
12	Axial Load (lbs)	11924	17831	19268	30275	39646	16828	25243	25399	39913	52613
	Lateral Load (plf)	49	74	64	100	133	122	150	150	150	150
13	Axial Load (lbs)	10745	16044	17263	26902	35250	16828	25243	25399	39913	52613
	Lateral Load (plf)	39	59	51	81	107	93	140	127	150	150
14	Axial Load (lbs)	9673	14427	15349	23916	31353	16828	25243	25399	39913	52613
	Lateral Load (plf)	32	48	42	66	87	73	109	98	150	150
15	Axial Load (lbs)	8704	12970	13648	21279	27908	16658	24712	25399	39913	52613
	Lateral Load (plf)	26	39	35	55	73	57	87	77	121	150
16	Axial Load (lbs)	7830	11662	12147	18950	24863	15389	22846	24927	38745	50714
	Lateral Load (plf)	22	33	29	46	61	48	72	62	98	130
17	Axial Load (lbs)	7039	10489	10823	16893	22171	14207	21105	22794	35457	46433
	Lateral Load (plf)	19	28	25	40	52	40	60	53	83	110
18	Axial Load (lbs)	6331	9438	9654	15076	19792	13110	19487	20848	32452	42517
	Lateral Load (plf)	16	24	22	34	45	34	51	45	71	94
19	Axial Load (lbs)	5698	8498	8622	13469	17688	12096	17989	19077	29712	38941
	Lateral Load (plf)	13	20	19	30	39	29	44	39	61	81
20	Axial Load (lbs)	5132	7657	7710	12049	15827	11159	16604	17464	27214	35680
	Lateral Load (plf)	12	17	16	25	34	25	38	34	54	71
21	Axial Load (lbs)	4627	6905	6903	10793	14181	10296	15326	15996	24938	32706
	Lateral Load (plf)	10	15	14	22	29	22	33	30	47	62
22	Axial Load (lbs)	4175	6234	6191	9683	12716	9501	14149	14660	22865	29955
	Lateral Load (plf)	9	13	12	19	25	20	29	26	42	55
23	Axial Load (lbs)						8770	13065	13443	20976	27458
	Lateral Load (plf)						17	26	24	37	49
24	Axial Load (lbs)						8097	12067	12336	19255	25189
	Lateral Load (plf)						15	23	21	33	44
25	Axial Load (lbs)						7479	11149	11327	17687	23127
	Lateral Load (plf)						14	20	19	30	39
26	Axial Load (lbs)						6911	10305	10408	16257	21252
	Lateral Load (plf)						12	18	17	26	35
27	Axial Load (lbs)						6388	9529	9571	14955	19546
	Lateral Load (plf)						11	16	15	24	31
28	Axial Load (lbs)						5909	8816	8808	13765	17993
	Lateral Load (plf)						10	14	14	21	28
29	Axial Load (lbs)						5468	8162	8114	12676	16581
	Lateral Load (plf)						9	13	12	19	25
30	Axial Load (lbs)						5058	7554	7481	11686	15294
	Lateral Load (plf)						8	12	11	17	23

NOTES:

1. Values shown are the maximum factored 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 1.15 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 841 psi.
5. 1-1/2-inch built-up columns have been designed for ES11 stud grade. Built-up columns shall be nailed in accordance with CSA O86-09, 6.5.8.7.
6. One face of the column must be laterally supported by sheathing, fastened to meet the requirements of NBC, Part 9. 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.
MAXIMUM FACTORED 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	1001	725	423	254	166	105	64	--	--	--
		L/360 WL	500	500	500	500	444	301	214	--	--	--
		End B.	1.5	1.5	1.5	1.5	1.5	1.5	1.5	--	--	--
	5-1/2	L/240 TL	2307	1762	1424	1083	523	384	316	207	140	97
		L/360 WL	500	500	500	500	500	394	280	206	156	120
		End B.	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	7-1/4	L/240 TL	3041	2322	1878	1575	1356	728	660	482	329	230
		L/360 WL	500	500	500	500	500	500	369	271	205	159
		End B.	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	9-1/4	L/240 TL	3880	2963	2396	2010	1731	1519	1078	1012	692	488
		L/360 WL	500	500	500	500	500	500	471	346	262	203
		End B.	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	11-1/4	L/240 TL	4718	3604	2914	2445	2105	1847	1646	1483	1254	887
		L/360 WL	500	500	500	500	500	500	500	421	318	246
		End B.	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
7	3-1/2	L/240 TL	1274	963	609	394	228	133	82	52	--	--
		L/360 WL	500	500	500	500	500	500	440	324	--	--
		End B.	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	--	--
	5-1/2	L/240 TL	2003	1529	1235	1036	755	534	334	217	146	101
		L/360 WL	500	500	500	500	500	500	500	500	385	298
		End B.	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	7-1/4	L/240 TL	3870	2956	2390	2005	1726	1484	933	614	418	293
		L/360 WL	500	500	500	500	500	500	500	500	423	327
		End B.	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	9-1/4	L/240 TL	4938	3771	3049	2558	2203	1933	1722	1287	881	621
		L/360 WL	500	500	500	500	500	500	500	500	500	418
		End B.	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	11-1/4	L/240 TL	6005	4587	3708	3111	2679	2351	2094	1888	1596	1129
		L/360 WL	500	500	500	500	500	500	500	500	500	500
		End B.	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5

NOTES:

1. Values shown are the maximum factored 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 1.15 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.
MAXIMUM FACTORED AXIAL AND LATERAL LOADS

COLUMN LENGTH (ft)	AXIAL AND LATERAL LOADS	5-1/2" WALL THICKNESS					7-1/4" WALL THICKNESS				
		1-1/2" 2x	1-1/2" 3x	3-1/2"	5-1/2"	7-1/4" (Plank)	1-1/2" 2x	1-1/2" 3x	3-1/2"	5-1/2"	7-1/4"
8	Axial Load (lbs)	12766	19150	19268	30279	39913	16828	25243	25399	39913	52613
	Lateral Load (plf)	150	150	150	150	150	150	150	150	150	150
9	Axial Load (lbs)	12766	19150	19268	30279	39913	16828	25243	25399	39913	52613
	Lateral Load (plf)	150	150	150	150	150	150	150	150	150	150
10	Axial Load (lbs)	8787	19150	19268	30279	39913	16828	25243	25399	39913	52613
	Lateral Load (plf)	139	150	150	150	150	150	150	150	150	150
11	Axial Load (lbs)	9448	15198	19268	30279	39913	16828	25243	25399	39913	52613
	Lateral Load (plf)	104	150	146	150	150	150	150	150	150	150
12	Axial Load (lbs)	9533	14268	19268	30275	39646	16472	25243	25399	39913	52613
	Lateral Load (plf)	80	120	112	150	150	150	150	150	150	150
13	Axial Load (lbs)	9289	13886	17263	26902	35250	11600	25243	25399	39913	52613
	Lateral Load (plf)	63	95	88	139	150	143	150	150	150	150
14	Axial Load (lbs)	8861	13234	15349	23916	31353	12203	23114	25399	39913	52613
	Lateral Load (plf)	51	76	71	111	147	116	150	150	150	150
15	Axial Load (lbs)	8339	12446	13648	21279	27908	12515	18627	25399	39913	52613
	Lateral Load (plf)	41	62	58	90	119	94	141	132	150	150
16	Axial Load (lbs)	7707	11484	12147	18950	24863	12480	18580	24927	38745	50714
	Lateral Load (plf)	34	51	47	74	98	78	116	109	150	150
17	Axial Load (lbs)	6902	10290	10778	16832	22100	12220	18199	22794	35457	46433
	Lateral Load (plf)	28	42	40	62	82	65	97	90	142	150
18	Axial Load (lbs)	6187	9228	9577	14963	19651	11817	17605	20848	32452	42517
	Lateral Load (plf)	24	36	33	52	69	54	82	76	120	150
19	Axial Load (lbs)	5551	8283	8524	13324	17504	11327	16880	19077	29712	38941
	Lateral Load (plf)	20	30	28	44	59	46	69	65	102	134
20	Axial Load (lbs)	4986	7443	7601	11886	15619	10789	16083	17464	27214	35680
	Lateral Load (plf)	17	26	24	38	50	40	60	56	87	115
21	Axial Load (lbs)	4485	6697	6790	10621	13960	10144	15108	15996	24938	32706
	Lateral Load (plf)	15	22	21	33	43	34	51	48	75	99
22	Axial Load (lbs)	4040	6035	6077	9510	12490	9334	13907	14628	22830	29914
	Lateral Load (plf)	13	20	18	29	38	30	45	42	66	86
23	Axial Load (lbs)						8592	12807	13372	20879	27326
	Lateral Load (plf)						26	39	37	57	76
24	Axial Load (lbs)						7913	11799	12236	19112	24992
	Lateral Load (plf)						23	34	32	51	67
25	Axial Load (lbs)						7292	10876	11208	17512	22883
	Lateral Load (plf)						20	30	28	45	59
26	Axial Load (lbs)						6723	10031	10276	16062	20977
	Lateral Load (plf)						18	27	25	40	52
27	Axial Load (lbs)						6204	9259	9431	14745	19250
	Lateral Load (plf)						16	24	23	35	47
28	Axial Load (lbs)						5729	8553	8665	13547	17686
	Lateral Load (plf)						14	22	20	32	42
29	Axial Load (lbs)						5295	7907	7970	12456	16271
	Lateral Load (plf)						13	20	18	29	38
30	Axial Load (lbs)						4899	7317	7340	11467	14987
	Lateral Load (plf)						12	18	16	26	34

NOTES:

1. Values shown are the maximum factored 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 1.15 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 841 psi.
5. 1-1/2-inch built-up columns have been designed for ES11 stud grade. Built-up columns shall be nailed in accordance with CSA O86-09, 6.5.8.7.
6. One face of the column must be laterally supported by sheathing, fastened to meet the requirements of NBC, Part 9. 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.
MAXIMUM FACTORED 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	1001	725	423	254	149	95	64	--	--	--
		L/240 WL	500	500	500	500	500	452	320	--	--	--
		End B.	1.5	1.5	1.5	1.5	1.5	1.5	1.5	--	--	--
	5-1/2	L/240 TL	2307	1762	1424	1083	523	366	290	207	140	97
		L/240 WL	500	500	500	500	500	402	320	261	216	181
		End B.	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	7-1/4	L/240 TL	3041	2322	1878	1575	1356	728	507	411	329	230
		L/240 WL	500	500	500	500	500	500	422	344	285	238
		End B.	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	9-1/4	L/240 TL	3880	2963	2396	2010	1731	1519	970	673	556	478
		L/240 WL	500	500	500	500	500	500	500	438	364	304
		End B.	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	11-1/4	L/240 TL	4718	3604	2914	2445	2105	1847	1646	1147	826	715
		L/240 WL	500	500	500	500	500	500	500	500	443	365
		End B.	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
7	3-1/2	L/240 TL	1274	963	609	394	228	133	82	52	--	--
		L/240 WL	500	500	500	500	500	500	500	486	--	--
		End B.	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	--	--
	5-1/2	L/240 TL	2003	1529	1235	1036	755	534	334	217	146	101
		L/240 WL	500	500	500	500	500	500	500	500	500	447
		End B.	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	7-1/4	L/240 TL	3870	2956	2390	2005	1726	1484	933	614	418	293
		L/240 WL	500	500	500	500	500	500	500	500	462	390
		End B.	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	9-1/4	L/240 TL	4938	3771	3049	2558	2203	1933	1722	1287	881	593
		L/240 WL	500	500	500	500	500	500	500	500	500	497
		End B.	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	11-1/4	L/240 TL	6005	4587	3708	3111	2679	2351	2094	1888	1596	1129
		L/240 WL	500	500	500	500	500	500	500	500	500	500
		End B.	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5

NOTES:

1. Values shown are the maximum factored 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 1.15 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.
MAXIMUM FACTORED AXIAL AND LATERAL LOADS

COLUMN LENGTH (ft)	AXIAL AND LATERAL LOADS	5-1/2" WALL THICKNESS					7-1/4" WALL THICKNESS				
		1-1/2" 2x	1-1/2" 3x	3-1/2"	5-1/2"	7-1/4" (Plank)	1-1/2" 2x	1-1/2" 3x	3-1/2"	5-1/2"	7-1/4"
8	Axial Load (lbs)	12766	19150	19268	30279	39913	16828	25243	25399	39913	52613
	Lateral Load (plf)	150	150	150	150	150	150	150	150	150	150
9	Axial Load (lbs)	12766	19150	19268	30279	39913	16828	25243	25399	39913	52613
	Lateral Load (plf)	150	150	150	150	150	150	150	150	150	150
10	Axial Load (lbs)	8649	19150	19268	30279	39913	16828	25243	25399	39913	52613
	Lateral Load (plf)	139	150	150	150	150	150	150	150	150	150
11	Axial Load (lbs)	7561	15198	19268	30279	39913	16828	25243	25399	39913	52613
	Lateral Load (plf)	115	150	150	150	150	150	150	150	150	150
12	Axial Load (lbs)	6624	9918	16724	30275	39646	16472	25243	25399	39913	52613
	Lateral Load (plf)	97	145	150	150	150	150	150	150	150	150
13	Axial Load (lbs)	5812	8696	15766	26902	35250	11600	25243	25399	39913	52613
	Lateral Load (plf)	83	124	118	150	150	143	150	150	150	150
14	Axial Load (lbs)	5837	8725	14664	22897	31353	10459	23114	25399	39913	52613
	Lateral Load (plf)	67	101	94	148	150	124	150	150	150	150
15	Axial Load (lbs)	5886	8792	13251	20674	27342	9445	16680	25399	39913	52613
	Lateral Load (plf)	55	82	77	121	150	108	150	150	150	150
16	Axial Load (lbs)	5764	8607	11754	18349	24084	8539	12732	21729	38745	50714
	Lateral Load (plf)	45	68	63	99	131	95	142	145	150	150
17	Axial Load (lbs)	5541	8275	10442	16310	21415	7730	11531	20762	35457	46433
	Lateral Load (plf)	38	56	53	83	109	84	126	121	150	150
18	Axial Load (lbs)	5263	7862	9293	14521	19072	7558	11276	19685	32009	42517
	Lateral Load (plf)	32	48	44	70	92	73	109	102	150	150
19	Axial Load (lbs)	4959	7409	8284	12949	17013	7712	11506	18564	28957	38858
	Lateral Load (plf)	27	40	38	59	78	62	93	86	136	150
20	Axial Load (lbs)	4646	6943	7396	11566	15200	7697	11486	16960	26448	34805
	Lateral Load (plf)	23	35	32	51	67	53	79	74	116	150
21	Axial Load (lbs)	4320	6452	6616	10351	13606	7566	11293	15494	24174	31719
	Lateral Load (plf)	20	30	28	44	58	46	69	64	101	133
22	Axial Load (lbs)	3899	5825	5930	9281	12188	7360	10987	14168	22114	28970
	Lateral Load (plf)	17	26	24	38	50	40	60	56	87	115
23	Axial Load (lbs)						7104	10607	12967	20248	26490
	Lateral Load (plf)						35	52	49	77	101
24	Axial Load (lbs)						6818	10182	11879	18556	24250
	Lateral Load (plf)						31	46	43	67	89
25	Axial Load (lbs)						6515	9732	10892	17020	22223
	Lateral Load (plf)						27	41	38	60	79
26	Axial Load (lbs)						6206	9272	9996	15626	20388
	Lateral Load (plf)						24	36	34	53	70
27	Axial Load (lbs)						5897	8811	9184	14361	18728
	Lateral Load (plf)						22	32	30	47	62
28	Axial Load (lbs)						5522	8245	8447	13208	17223
	Lateral Load (plf)						19	29	27	42	56
29	Axial Load (lbs)						5111	7634	7778	12155	15859
	Lateral Load (plf)						17	26	24	38	50
30	Axial Load (lbs)						4735	7074	7171	11200	14622
	Lateral Load (plf)						16	24	22	35	45

NOTES:

1. Values shown are the maximum factored 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 1.15 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 841 psi.
5. 1-1/2-inch built-up columns have been designed for ES11 stud grade. Built-up columns shall be nailed in accordance with CSA O86-09, 6.5.8.7.
6. One face of the column must be laterally supported by sheathing, fastened to meet the requirements of NBC, Part 9. 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.
MAXIMUM FACTORED 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	1001	725	423	254	149	81	54	--	--	--
		L/180 WL	500	500	500	500	500	500	427	--	--	--
		End B.	1.5	1.5	1.5	1.5	1.5	1.5	1.5	--	--	--
	5-1/2	L/240 TL	2307	1762	1424	1083	523	366	290	207	140	97
		L/180 WL	500	500	500	500	500	402	320	261	216	183
		End B.	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	7-1/4	L/240 TL	3041	2322	1878	1575	1356	728	507	411	329	230
		L/180 WL	500	500	500	500	500	500	422	344	285	241
		End B.	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	9-1/4	L/240 TL	3880	2963	2396	2010	1731	1519	970	673	556	466
		L/180 WL	500	500	500	500	500	500	500	438	364	307
		End B.	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	11-1/4	L/240 TL	4718	3604	2914	2445	2105	1847	1646	1147	826	715
		L/180 WL	500	500	500	500	500	500	500	500	443	365
		End B.	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
7	3-1/2	L/240 TL	1274	963	609	394	228	133	82	52	--	--
		L/180 WL	500	500	500	500	500	500	500	500	--	--
		End B.	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	--	--
	5-1/2	L/240 TL	2003	1529	1235	1036	755	534	334	217	146	101
		L/180 WL	500	500	500	500	500	500	500	500	500	500
		End B.	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	7-1/4	L/240 TL	3870	2956	2390	2005	1726	1484	933	614	418	293
		L/180 WL	500	500	500	500	500	500	500	500	462	390
		End B.	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	9-1/4	L/240 TL	4938	3771	3049	2558	2203	1933	1722	1287	881	593
		L/180 WL	500	500	500	500	500	500	500	500	500	497
		End B.	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	11-1/4	L/240 TL	6005	4587	3708	3111	2679	2351	2094	1888	1596	1129
		L/180 WL	500	500	500	500	500	500	500	500	500	500
		End B.	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5

NOTES:

1. Values shown are the maximum factored 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 1.15 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™

SPECIFIED STRENGTHS AND 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)	2495 psi	4453 psi
Longitudinal shear (F_{vx})(6)	319 psi	319 psi
Compression perpendicular to grain (F_{cpx})(7)	841 psi	1088 psi
Shear-free modulus of elasticity (E_x)	1.6E+06 psi	1.9E+06 psi
Apparent modulus of elasticity ($E_{x,app.}$)(8)	1.5E+06 psi	1.8E+06 psi
Bending About Y-Y Axis		
Bending at extreme fibre (F_{by})(5)	3249 psi	4453 psi
for 3 laminations	2959 psi	4453 psi
Longitudinal shear (F_{vy})(6)	218 psi	319 psi
Compression perpendicular to grain (F_{cpy}) (7)	841 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)	3234 psi	4786 psi
for 3 laminations	2814 psi	3539 psi
Tension parallel to grain (F_t)	1813 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 (3-lamination applies to 3-1/2 x 3-1/2 in. columns).

(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.

Refer to Nordic Lam Design and Construction Guide for more information.
Nordic Lam products are listed in APA Product Report PR-L294C and CCMC Evaluation Report 13216-R.

NORDIC ENGINEERED WOOD

Sustainable Wood Solutions

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N-C233 / April 2014
Printed in Canada on recycled paper