

Nordic X-Lam Slabs

CHECKLIST: Nordic X-Lam Slabs

To verify that the Slab Selection Tables are appropriate for the structure being designed, the following questions should be asked (the appropriate adjustment factor is given in brackets):

1. Is load duration "normal" (C_D)?

C_D is a load duration factor. The tables are based on a normal duration of loading ($C_D = 1.0$), which includes the effects of dead loads plus live loads due to use and occupancy, and snow loads.

2. Is the service condition "dry" (C_M)?

C_M is a wet service factor. The tables are limited to dry service conditions ($C_M = 1.0$).

3. Are the applicable total load and live load deflection limits based on $L/240$ and $L/360$, respectively?

The tables are based on deflection limits of $\text{span}/240$ under design total load and $\text{span}/360$ under design live load. For other deflection limits, multiply the values accordingly.

5. Should floor vibrations be considered?

The designer is advised to check the maximum floor vibrations for CLT slab elements. The proposed design method² for controlling vibrations in CLT floors is based on a research project at the Technical University of Munich. See allowable floor spans on page 6.

5. Should creep effects be considered?

The time dependent deformation (creep) factor $K_{cr} = 2.0$ is recommended for dry service conditions. This factor has been considered in the selection tables.

6. Is the loading uniform?

The tables are based on uniform loads. In some applications, floor or roof slabs may have to be designed for a concentrated live load (as defined in article 1607.4 of the 2012 IBC) or other non-uniform loading. In these cases refer to NDS-2012 and the CLT Manual, U.S. Edition.

If the answer to any of those questions is no, consult Nordic. Otherwise, the Slab Selection Tables may be used directly. The selection tables provide the maximum uniform design total or live load, w_{Δ} , that may be applied to a panel to ensure that the design criteria are met.

Note: The tables are based on standard depths for bending about the longitudinal (strong) axis of the panel. The slab self weight has not been considered in the calculation of maximum loads (i.e. it shall be included in the design total load). Consult Nordic for other options.

¹ Hamm P., Richter A., Winter S. Floor vibrations - new results. WCTE 2010

Slab Selection Tables

Nordic X-Lam E1

w_{Δ}

L/240 deflection limit, simple span
Allowable uniform total load w_{Δ} (psf)

Span (ft)	Layup Combinaison					
	78-3s	105-3s	131-5s	175-5s	220-7s	244-7l 314-9l
10,0	97,5	219				
10,5	84,9	192				
11,0	74,4	169	268			
11,5	65,5	149	237			
12,0	57,9	133	211			
12,5	51,5	118	188			
13,0		106	168			
13,5		95,2	151			
14,0		85,8	137	306		
14,5		77,7	124	278		
15,0		70,5	112	254		
15,5		64,2	102	232		
16,0		58,6	93,3	212		
16,5		53,6	85,4	195		
17,0			78,4	179	338	
17,5			72,1	165	312	
18,0			66,5	153	289	
18,5			61,4	141	268	
19,0			56,8	131	248	
19,5			52,7	122	231	
20,0				113	215	349
20,5				105	201	326
21,0				98,5	187	305
21,5				92,0	175	285
22,0				86,2	164	267
22,5				80,8	154	251
23,0				75,8	145	236
23,5				71,2	136	222
24,0				67,0	128	209
24,5				63,1	121	197
25,0				59,5	114	186
25,5				56,2	108	176
26,0				53,1	102	166
26,5					96,3	157
27,0					91,2	149

Note:

1. A complete design shall include the verification of the capacity, a consideration for the effects of floor vibration and creep when applicable, and fire safety requirements..

Slab Selection Tables

Nordic X-Lam E1

w_{Δ}

L/240 deflection limit, double span
Allowable uniform total load w_{Δ} (psf)

Span (ft)	Layup Combinaison					
	78-3s	105-3s	131-5s	175-5s	220-7s	244-7l 314-9l
10,0	137					
10,5	119	268				
11,0	105	236				
11,5	92,2	209				
12,0	81,6	186	295			
12,5	72,6	166	264			
13,0	64,8	149	236			
13,5	58,1	134	213			
14,0	52,3	121	192			
14,5		109	174			
15,0		99,2	158			
15,5		90,3	144	325		
16,0		82,5	131	298		
16,5		75,5	120	273		
17,0		69,3	110	252		
17,5		63,7	102	232		
18,0		58,7	93,7	214		
18,5		54,3	86,5	199		
19,0			80,1	184	349	
19,5			74,3	171	324	
20,0			69,0	159	302	
20,5			64,2	148	282	
21,0			59,9	139	263	
21,5			55,9	130	246	
22,0			52,3	121	231	375
22,5			48,9	114	217	352
23,0			45,9	107	204	331
23,5			43,1	100,4	191	312
24,0			40,5	94,4	180	294
24,5			38,1	89,0	170	277
25,0				83,9	160	261
25,5				79,2	152	247
26,0				74,9	143	234
26,5				70,9	136	221
27,0					129	210 400

Note:

1. A complete design shall include the verification of the capacity, a consideration for the effects of floor vibration and creep when applicable, and fire safety requirements..

Slab Selection Tables

Nordic X-Lam E1

w_{Δ}

L/360 deflection limit, simple span
Allowable uniform live load w_{Δ} (psf)

Span (ft)	Layup Combinaison						
	78-3s	105-3s	131-5s	175-5s	220-7s	244-7l	314-9l
10,0	65,0	146					
10,5	56,6	128					
11,0	49,6	113	179				
11,5	43,7	99,5	158				
12,0	38,6	88,4	140				
12,5	34,3	78,8	125				
13,0	30,7	70,6	112				
13,5	27,5	63,4	100,9				
14,0	24,7	57,2	91,1	204			
14,5	22,3	51,8	82,4	186			
15,0	20,2	47,0	74,9	169			
15,5		42,8	68,2	155			
16,0		39,1	62,2	142	266		
16,5		35,7	57,0	130	245		
17,0		32,8	52,3	119	226		
17,5		30,1	48,1	110	208		
18,0		27,8	44,3	102	193		
18,5		25,7	40,9	94,2	178		
19,0		23,7	37,9	87,3	166	268	
19,5		22,0	35,1	81,1	154	250	
20,0		20,4	32,6	75,5	143	233	
20,5			30,4	70,3	134	217	
21,0			28,3	65,6	125	203	
21,5			26,4	61,4	117	190	
22,0			24,7	57,4	109	178	
22,5			23,1	53,8	103	167	
23,0			21,7	50,5	96,5	157	
23,5			20,3	47,5	90,7	148	
24,0				44,7	85,4	139	264
24,5				42,1	80,5	131	249
25,0				39,7	75,9	124	236
25,5				37,5	71,7	117	223
26,0				35,4	67,8	111	211
26,5				33,5	64,2	105	200
27,0				31,7	60,8	99,3	190

Note:

1. A complete design shall include the verification of the capacity, a consideration for the effects of floor vibration and creep when applicable, and fire safety requirements..

Slab Selection Tables

Nordic X-Lam E1

w_{Δ}

L/360 deflection limit, double span
Allowable uniform live load w_{Δ} (psf)

Span (ft)	Layup Combinaison						
	78-3s	105-3s	131-5s	175-5s	220-7s	244-7l	314-9l
10,0	91,3						
10,5	79,6	179					
11,0	69,7	158					
11,5	61,4	139					
12,0	54,4	124					
12,5	48,4	111	176				
13,0	43,2	99,2	158				
13,5	38,7	89,2	142				
14,0	34,9	80,5	128				
14,5	31,5	72,8	116				
15,0	28,5	66,1	105				
15,5	25,9	60,2	95,9	217			
16,0	23,6	55,0	87,6	198			
16,5	21,6	50,3	80,2	182			
17,0		46,2	73,6	168			
17,5		42,5	67,7	155			
18,0		39,2	62,4	143	270		
18,5		36,2	57,7	132	250		
19,0		33,5	53,4	123	232		
19,5		31,0	49,5	114	216		
20,0		28,8	46,0	106	201		
20,5		26,8	42,8	99,0	188		
21,0		25,0	39,9	92,4	176		
21,5		23,3	37,3	86,4	164	267	
22,0		21,8	34,8	80,9	154	250	
22,5		20,4	32,6	75,8	144	235	
23,0			30,6	71,2	136	221	
23,5			28,7	66,9	128	208	
24,0			27,0	63,0	120	196	
24,5			25,4	59,3	113	185	
25,0			24,0	56,0	107	174	
25,5			22,6	52,8	101	165	
26,0			21,3	49,9	95,5	156	
26,5			20,2	47,3	90,4	148	
27,0				44,8	85,7	140	267

Note:

1. A complete design shall include the verification of the capacity, a consideration for the effects of floor vibration and creep when applicable, and fire safety requirements..

Slab Selection Tables

Nordic X-Lam E1

l_{max} Vibration criteria - 30 psf dead load
Allowable spans (ft)

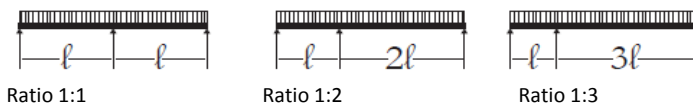
	Combination						
	78-3s	105-3s	131-5s	175-5s	220-7s	244-7l	314-9l
Standard criteria							
1:1 Ratio	6'-7"	10'-2"	15'-11"	19'-4"	22'-3"	24'-11"	28'-8"
1:2 Ratio	6'-7"	10'-2"	16'-5"	21'-9"	25'-1"	28'-1"	32'-4"
1:3 Ratio	6'-7"	10'-2"	16'-5"	22'-3"	25'-8"	28'-9"	33'-1"
Enhanced criteria							
1:1 Ratio	4'-8"	7'-2"	11'-7"	16'-9"	19'-3"	21'-7"	24'-10"
1:2 Ratio	4'-8"	7'-2"	11'-7"	17'-10"	21'-9"	24'-4"	28'-0"
1:3 Ratio	4'-8"	7'-2"	11'-7"	17'-10"	22'-3"	24'-11"	28'-8"

l_{max} Vibration criteria - 50 psf dead load
Allowable spans (ft)

	Combination						
	78-3s	105-3s	131-5s	175-5s	220-7s	244-7l	314-9l
Standard criteria							
1:1 Ratio	6'-7"	10'-2"	14'-6"	17'-9"	20'-7"	23'-1"	26'-9"
1:2 Ratio	6'-7"	10'-2"	16'-4"	20'-0"	23'-2"	26'-0"	30'-2"
1:3 Ratio	6'-7"	10'-2"	16'-5"	20'-5"	23'-8"	26'-7"	30'-11"
Enhanced criteria							
1:1 Ratio	4'-8"	7'-2"	11'-7"	15'-4"	17'-10"	20'-0"	23'-2"
1:2 Ratio	4'-8"	7'-2"	11'-7"	17'-3"	20'-1"	22'-6"	26'-2"
1:3 Ratio	4'-8"	7'-2"	11'-7"	17'-8"	20'-6"	23'-1"	26'-9"

Notes:

1. The allowable spans are based on a dead load of 30 or 50 psf in addition to the panel self weight.
2. The ratios represent the spans ratios (see figures below). For a simple span, use a ratio of 1:1.
3. The allowable spans are based on Hamm-Richter-Winter design method to control floor vibrations and take into account the following assumptions: live load neglected in the calculation of the mass, panels supported on both sides, damping factor of 1.0%.
4. It should be noted that floor vibrations evaluation is subjective, and that other floor compositions and bearing conditions may increase the floor performance.
5. The allowable spans only consider floor vibration criteria.



Nordic X-Lam Slabs (continued)

EXAMPLE : Roof Slab

Roof slab

Given a slab of 4-1/8 in. (105-3s); self weight = 11 psf
 Design dead load = 40 psf (including slab self weight)
 Design dead load (for creep effects) = $2.0 \times 40 = 80$ psf
 Design snow load = 30 psf
 Beam spacing (span) = 15.5 ft
 Dry service condition, untreated lumber, double span pattern
 Deflection limits: L/240 based on live load, L/180 based on total load

Technical note T-T21

Deflection criteria check

Design live (snow) load $w_L = 30$ psf
 Design total load $w = 40 + 30 = 70$ psf ($80 + 30 = 110$ psf to account for creep effects)

Using the appropriate deflection adjustments:

$w_{\Delta} = (360/240) \times 59.5 = 89.2$ psf > 30 psf for L/240 deflection (live load)	✓	Table w_{Δ} , double span, L/360
$w_{\Delta} = (240/180) \times 89.2 = 118$ psf > 110 psf for L/180 deflection (total load)	✓	Table w_{Δ} , double span, L/240

Use E1 105-3s, 4-1/8-inch thick slab.

Note: A complete design shall include the verification of bending and bearing capacities. Where slabs are used to support roof loads, the allowable spans for slabs may be limited by the IBC concentrated live load requirements (refer to article 1607.4 of the 2012 IBC).

EXAMPLE : Floor slab

Floor slab

Given a slab of 6-7/8 in. (175-5s); self weight = 18.3 psf ~ 20 psf
 Design dead load = 50 psf (including slab self weight)
 Design dead load (for creep effects) = $2.0 \times 50 = 100$ psf
 Design live load = 40 psf
 Beam spacing (span) = 17.5 ft
 Dry service condition, untreated lumber, simple span pattern
 Deflection limits: L/240 based on total load, L/360 based on live load; standard vibration criteria

Technical note T-T21

Serviceability criteria check

Design dead load excluding slab self weight $w_D = 30$ psf
 Design live load $w_L = 40$ psf
 Design total load $w = 50 + 40 = 90$ psf ($100 + 40 = 140$ psf to account for creep effects)

$w_{\Delta} = 165$ psf ≥ 140 psf for L/240 deflection (total load)	✓	Table w_{Δ} , L/240, simple span
$w_{\Delta} = 110$ psf ≥ 40 psf for L/360 deflection (live load)	✓	Table w_{Δ} , L/360, simple span
$\ell_{max} = 19'-4" \geq 17'-5"$ for simple span (ratio 1:1)	✓	Table ℓ_{max} , 30 psf, standard cr.

Use E1 175-5s, 6-7/8-inch thick slab.

Note: A complete design shall include among other things the verification of a concentrated live load (if applicable), bending and bearing capacities, and fire safety requirements.