

GENERAL DESIGN INFORMATION

For floor construction where live loading is heavier than customarily found in residential occupancies, tabular data are provided.

The tabulated spans are based on bending strength using the live load indicated in each table heading plus a dead load of 10 psf. In calculating the required modulus of elasticity for the tabulated span, the live load only was used, since this is in accordance with established practice for design of floor joists.

SPAN

While the effective span length for an isolated beam is customarily taken as the distance from face to face

of supports plus one-half the required length of bearing at each end, it is the practice in designing joists spaced not over 24 in. apart to consider the span as the clear distance between supports.

NET SIZES OF LUMBER

Joists are customarily specified in terms of nominal sizes, but calculations to determine the allowable span and required modulus of elasticity are based on actual sizes.

DESIGN STRESSES

Unit design values for design of wood joists are given in the National Design Specification for Wood Construc-

tion, available from the American Forest & Paper Association.

ADJUSTMENT OF MODULUS OF ELASTICITY

The modulus of elasticity values listed in the tables for joists are those required for spans if deflection under the live load is $\leq 1/360$. Where other deflection limits are the tabular E values may be adjusted by them by the following factors:

For limit of $1/300$: 0.833

For limit of $1/240$: 0.667

For limit of $1/180$: 0.500

FLOOR JOISTS—60 LB LIVE LOAD

JOIST (IN.)		EXTREME FIBER STRESS IN BENDING, F_b (PSI)									
SIZE, SPACING		800	1000	1100	1200	1300	1400	1500	1600	1800	
2 x 6	12	8-1 1.012	8-6 1.186	8-11 1.368	9-3 1.558	9-8 1.757	10-0 1.964	10-5 2.179	10-9 2.400	11-5 2.863	
	16	7-0 0.880	7-4 1.031	7-9 1.189	8-1 1.355	8-5 1.528	8-8 1.708	9-0 1.894	9-1 2.091	9-10 2.489	
	24	5-8 0.708	6-0 0.829	6-4 0.957	6-7 1.089	6-10 1.229	7-1 1.374	7-4 1.523	7-3 1.637	8-0 2.002	
2 x 8	12	10-7 1.012	11-2 1.186	11-9 1.368	12-3 1.558	12-9 1.757	13-3 1.964	13-8 2.179	14-1 2.400	15-0 2.863	
	16	9-2 0.880	9-8 1.031	10-2 1.189	10-7 1.355	11-0 1.528	11-5 1.708	11-10 1.894	12-3 2.191	13-0 2.489	
	24	7-6 0.708	7-11 0.829	8-3 0.957	8-7 1.089	9-0 1.229	9-4 1.374	9-7 1.523	9-11 1.677	10-7 2.002	
2 x 10	12	13-6 1.012	14-3 1.186	14-11 1.368	15-7 1.558	16-3 1.757	16-10 1.964	17-5 2.179	18-0 2.400	19-1 2.863	
	16	11-9 0.880	12-3 1.031	13-0 1.189	13-6 1.355	14-0 1.528	14-6 1.708	15-1 1.894	15-7 2.191	16-7 2.489	
	24	9-6 0.708	10-0 0.829	10-6 0.957	11-0 1.089	11-6 1.229	11-11 1.374	12-4 1.523	12-9 1.677	13-6 2.002	
2 x 12	12	16-6 1.012	17-4 1.186	18-2 1.368	19-0 1.558	19-9 1.757	20-6 1.964	21-3 2.179	21-11 2.400	23-3 2.863	
	16	14-3 0.880	15-0 1.031	15-9 1.189	16-6 1.355	17-2 1.528	17-10 1.708	18-5 1.894	19-0 2.191	20-2 2.489	
	24	11-7 0.708	12-3 0.829	12-10 0.957	13-5 1.089	13-11 1.229	14-5 1.374	14-11 1.523	15-5 1.677	16-5 2.002	
2 x 14	12	19-5 1.012	20-5 1.186	21-5 1.368	22-4 1.558	23-3 1.757	24-2 1.964	25-0 2.179	25-10 2.400	27-5 2.863	
	16	16-10 0.880	17-8 1.031	18-6 1.189	19-4 1.355	20-2 1.528	20-11 1.708	21-8 1.894	22-5 2.191	23-9 2.489	
	24	13-8 0.708	14-5 0.829	15-1 0.957	15-9 1.089	16-5 1.229	17-0 1.374	17-7 1.523	18-2 1.677	19-3 2.002	
3 x 6	12	10-4 1.307	10-11 1.531	11-6 1.766	12-0 2.012	12-6 2.269	13-0 2.535	13-5 2.811	13-10 3.098	14-8 3.696	
	16	9-0 1.136	9-6 1.330	10-0 1.535	10-5 1.748	10-10 1.972	11-3 2.203	11-8 2.444	12-0 2.691	12-9 3.212	
	24	7-4 0.914	7-9 1.070	8-1 1.235	8-5 1.406	8-9 1.586	9-1 1.773	9-5 1.966	9-9 2.166	10-4 2.584	
3 x 8	12	13-8 1.307	14-5 1.531	15-2 1.766	15-10 2.012	16-6 2.269	17-1 2.535	17-8 2.811	18-3 3.098	19-4 3.696	
	16	11-10 1.136	12-6 1.330	13-1 1.535	13-8 1.748	14-3 1.972	14-10 2.203	15-4 2.444	15-10 2.691	16-9 3.212	
	24	9-7 0.914	10-1 1.070	10-7 1.235	11-1 1.406	11-7 1.586	12-0 1.773	12-5 1.966	12-10 2.166	13-7 2.584	
3 x 10	12	17-5 1.307	18-5 1.531	19-4 1.766	20-2 2.012	21-0 2.269	21-9 2.535	22-7 2.811	23-4 3.098	24-9 3.696	
	16	15-2 1.136	16-0 1.330	16-9 1.535	17-6 1.748	18-2 1.972	18-10 2.203	19-6 2.444	20-2 2.691	21-5 3.212	
	24	12-4 0.914	13-0 1.070	13-7 1.235	14-2 1.406	14-9 1.586	15-4 1.773	15-10 1.966	16-4 2.166	17-5 2.584	
3 x 12	12	21-3 1.307	22-4 1.531	23-5 1.766	24-6 2.012	25-6 2.269	26-6 2.535	27-5 2.811	28-4 3.098	30-0 3.696	
	16	18-5 1.136	19-5 1.330	20-4 1.535	21-3 1.748	22-2 1.972	23-0 2.203	23-9 2.444	24-6 2.691	26-0 3.212	
	24	15-0 0.914	15-9 1.070	16-6 1.235	17-3 1.406	18-0 1.586	18-8 1.773	19-4 1.966	20-0 2.166	21-2 2.584	
3 x 14	12	25-0 1.307	26-4 1.531	27-7 1.766	28-10 2.012	30-1 2.269	31-3 2.535	32-4 2.811	33-4 3.098	35-4 3.696	
	16	21-8 1.136	22-10 1.330	24-0 1.535	25-1 1.748	26-1 1.972	27-1 2.203	28-0 2.444	28-11 2.691	30-8 3.212	
	24	17-7 0.914	18-7 1.070	19-6 1.235	20-4 1.406	21-2 1.586	22-0 1.773	22-9 1.966	23-6 2.166	24-11 2.584	

NOTE: The required modulus of elasticity, E, in 1,000,000 psi is shown below each span, if deflection under the live load is limited to $1/360$.

DESIGN CRITERIA

STRENGTH: 15 psf dead load plus 20 psf live load determines required fiber stress.

DEFLECTION: For 20 psf live load. Limited to span in inches divided by 240.

RAFTERS: Spans are measured along the horizontal projection, and loads are considered as applied on the horizontal projection.

FLAT OR SLOPED RAFTERS—20 LB LIVE LOAD

FLAT ROOF OR CATHEDRAL CEILING WITH NO ATTIC SPACE—SUPPORTING GYPSUM WALLBOARD CEILING

RAFTER SIZE, SPACING (IN.)	EXTREME FIBER STRESS IN BENDING, F_b (PSI)													
	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800
2 x 6	12	8-6 0.26	9-4 0.35	10-0 0.44	10-9 0.54	11-5 0.64	12-0 0.75	12-7 0.86	13-2 0.98	13-8 1.11	14-2 1.24	14-8 1.37	15-2 1.51	15-8 1.66
	16	7-4 0.23	8-1 0.30	8-8 0.38	9-4 0.46	9-10 0.55	10-5 0.65	10-11 0.75	11-5 0.85	11-10 0.96	12-4 1.07	12-9 1.19	13-2 1.31	13-7 1.44
	24	6-0 0.19	6-7 0.25	7-1 0.31	7-7 0.38	8-1 0.45	8-6 0.53	8-11 0.61	9-4 0.70	9-8 0.78	10-0 0.88	10-5 0.97	10-9 1.07	11-1 1.17
2 x 8	12	11-2 0.26	12-3 0.35	13-3 0.44	14-2 0.54	15-0 0.64	15-10 0.75	16-7 0.86	17-4 0.98	18-0 1.11	18-9 1.24	19-5 1.37	20-0 1.51	20-8 1.66
	16	9-8 0.23	10-7 0.30	11-6 0.38	12-3 0.46	13-0 0.55	13-8 0.65	14-4 0.75	15-0 0.85	15-7 0.96	16-3 1.07	16-9 1.19	17-4 1.31	17-10 1.44
	24	7-11 0.19	8-8 0.25	9-4 0.31	10-0 0.38	10-7 0.45	11-2 0.53	11-9 0.61	12-3 0.70	12-9 0.78	13-3 0.88	13-8 0.97	14-2 1.07	14-7 1.17
2 x 10	12	14-3 0.26	15-8 0.35	16-11 0.44	18-1 0.54	19-2 0.64	20-2 0.75	21-2 0.86	22-1 0.98	23-0 1.11	23-11 1.24	24-9 1.37	25-6 1.51	26-4 1.66
	16	12-4 0.23	13-6 0.30	14-8 0.38	15-8 0.46	16-7 0.55	17-6 0.65	18-4 0.75	19-2 0.85	19-11 0.96	20-8 1.07	21-5 1.19	22-1 1.31	22-10 1.44
	24	10-1 0.19	11-1 0.25	11-11 0.31	12-9 0.38	13-6 0.45	14-3 0.53	15-0 0.61	15-8 0.70	16-3 0.78	16-11 0.88	17-6 0.97	18-1 1.07	18-7 1.17
2 x 12	12	17-4 0.26	19-0 0.35	20-6 0.44	21-11 0.54	23-3 0.64	24-7 0.75	25-9 0.86	26-11 0.98	28-0 1.11	29-1 1.24	30-1 1.37	31-1 1.51	32-0 1.66
	16	15-0 0.23	16-6 0.30	17-9 0.38	19-0 0.46	20-2 0.55	21-3 0.65	22-4 0.75	23-3 0.85	24-3 0.96	25-2 1.07	26-0 1.19	26-11 1.31	27-9 1.44
	24	12-3 0.19	13-5 0.25	14-6 0.31	15-6 0.38	16-6 0.45	17-4 0.53	18-2 0.61	19-0 0.70	19-10 0.78	20-6 0.88	21-3 0.97	21-11 1.07	22-8 1.17

NOTE: The required modulus of elasticity, E , in 1,000,000 psi is shown below each span.

DESIGN CRITERIA

STRENGTH: 15 psf dead load plus 30 psf live load determines required fiber stress.

DEFLECTION: For 30 psf live load. Limited to span in inches divided by 240.

RAFTERS: Spans are measured along the horizontal projection, and loads are considered as applied on the horizontal projection.

FLAT OR SLOPED RAFTERS—30 LB LIVE LOAD

FLAT ROOF OR CATHEDRAL CEILING WITH NO ATTIC SPACE—SUPPORTING GYPSUM WALLBOARD CEILING

RAFTER SIZE, SPACING (IN.)	EXTREME FIBER STRESS IN BENDING, F_b (PSI)													
	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800
2 x 6	12	7-6 0.27	8-2 0.36	8-10 0.45	9-6 0.55	10-0 0.66	10-7 0.77	11-1 0.89	11-7 1.01	12-1 1.14	12-6 1.28	13-0 1.41	13-5 1.56	13-10 1.71
	16	6-6 0.24	7-1 0.31	7-8 0.39	8-2 0.48	8-8 0.57	9-2 0.67	9-7 0.77	10-0 0.88	10-5 0.99	10-10 1.10	11-3 1.22	11-7 1.35	12-4 1.48
	24	5-4 0.19	5-10 0.25	6-3 0.32	6-8 0.39	7-1 0.46	7-6 0.54	7-10 0.63	8-2 0.72	8-6 0.81	8-10 0.90	9-2 1.00	9-6 1.10	10-0 1.21
2 x 8	12	9-10 0.27	10-10 0.36	11-8 0.45	12-6 0.55	13-3 0.66	13-11 0.77	14-8 0.89	15-3 1.01	15-11 1.14	16-6 1.28	17-1 1.41	17-8 1.56	18-2 1.71
	16	8-7 0.24	9-4 0.31	10-1 0.39	10-10 0.48	11-6 0.57	12-1 0.67	12-8 0.77	13-3 0.88	13-9 0.99	14-4 1.10	14-10 1.22	15-3 1.35	15-9 1.48
	24	7-0 0.19	7-8 0.25	8-3 0.32	8-10 0.39	9-4 0.46	9-10 0.54	10-4 0.63	10-10 0.72	11-3 0.81	11-8 0.90	12-1 1.00	12-6 1.10	12-10 1.21
2 x 10	12	12-7 0.27	13-9 0.36	14-11 0.45	15-11 0.55	16-11 0.66	17-10 0.77	18-8 0.89	19-6 1.01	20-4 1.14	21-1 1.28	21-10 1.41	22-6 1.56	23-3 1.71
	16	10-11 0.24	11-11 0.31	12-11 0.39	13-9 0.48	14-8 0.57	15-5 0.67	16-2 0.77	16-11 0.88	17-7 0.99	18-3 1.10	18-11 1.22	19-6 1.35	20-1 1.48
	24	8-11 0.19	9-9 0.25	10-6 0.32	11-3 0.39	11-11 0.46	12-7 0.54	13-2 0.63	13-9 0.72	14-4 0.81	14-11 0.90	15-5 1.00	15-11 1.10	16-5 1.21
2 x 12	12	15-4 0.27	16-9 0.36	18-1 0.45	19-4 0.55	20-6 0.66	21-8 0.77	22-8 0.89	23-9 1.01	24-8 1.14	25-7 1.28	26-6 1.41	27-5 1.56	28-3 1.71
	16	13-3 0.24	14-6 0.31	15-8 0.39	16-9 0.48	17-9 0.57	18-9 0.67	19-8 0.77	20-6 0.88	21-5 0.99	22-2 1.10	23-0 1.22	23-9 1.35	24-5 1.48
	24	10-10 0.19	11-10 0.25	12-10 0.32	13-8 0.39	14-6 0.46	15-4 0.54	16-1 0.63	16-9 0.72	17-5 0.81	18-1 0.90	18-9 1.00	19-4 1.10	20-0 1.21

NOTE: The required modulus of elasticity, E , in 1,000,000 psi is shown below each span.

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