

4. Width. The width of the ladder shall be a minimum of 20 inches wide and a maximum of 30 inches wide.

5. Handrails. a. Handrails shall be required for ladders with pitches less than 65°.

b. Handrails shall be located at least 30 inches, but not more than 34 inches, above the nosing of the treads.

c. Open handrails shall be provided with intermediate rails or an ornamental pattern such that a sphere with a diameter larger than 9 inches cannot pass through.

d. The clearance between the handrail and the wall surface shall be at least 1½ inches.

e. Handrails shall be designed and constructed to withstand a 200 pound load applied in any direction.

6. Clearances. a. The ladder shall have a minimum clearance of at least 15 inches on either side of the center of the tread.

b. The edge of the tread nearest to the wall should be separated from the wall by at least 7 inches.

c. A passage way clearance of at least 30 inches parallel to the slope of a 90° ladder shall be provided. A passage way clearance of at least 36 inches parallel to the slope of a 75° ladder shall be provided. Clearances for intermediate pitches shall vary between these 2 limits in proportion to the slope.

d. For ladders with less than a 75° pitch the vertical clearance above any tread or rung to an overhead obstruction shall be at least 6 feet 4 inches measured from the leading edge of the tread or rung.

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80; r. and recr. Register, February, 1985, No. 350, eff. 3-1-85.

**ILHR 21.05 Light and ventilation. (1) NATURAL LIGHT.** All habitable rooms shall be provided with natural light by means of glazed openings. The area of the glazed openings shall be at least 8% of the net floor area, except under the following circumstances:

(a) *Exception.* Habitable rooms, other than bedrooms, located in basements need not be provided with natural light.

(b) *Exception.* Natural light may be obtained from adjoining areas through glazed openings, louvers or other approved methods. Door openings into adjoining areas may not be used to satisfy this requirement.

(2) **VENTILATION.** (a) *Natural ventilation.* Natural ventilation shall be provided to all habitable rooms, kitchens and bathrooms by means of openable exterior doors or windows. The net area of the openable exterior doors or windows shall be at least 3.5% of the net floor area of the room. Mechanical ventilation may be provided in lieu of openable exterior doors or windows provided the system is capable of providing at least one air change per hour.

(b) *Exhaust ventilation.* All exhaust ventilation shall terminate outside the building.

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(3) **COLD-SIDE VENTING.** Cold-side venting of insulation shall be provided at roof/attic, flat-roof/ceiling and sloping-roof/ceiling assemblies. Ventilation shall be provided at the rate of one square foot of free ventilating area for each 300 square feet of area. At least 50% of the vents shall be located at the soffit area.

**Note:** Example: The venting area required for a 1500 square foot dwelling is  $1500 \text{ sq. ft.} \times 1/300 = 5 \text{ sq. ft.}$

(4) **CRAWL SPACE VENTING.** Unheated crawl spaces shall be provided with a concrete slab, roll roofing or plastic film vapor barrier and a minimum of 2 ventilators located at opposite sides of the crawl space. Ventilation shall be provided at the rate of one square foot of free ventilating area for each 1500 square feet of area.

(5) **SAFETY GLASS.** Glass in entrance and exit doors, sliding glass doors, storm doors, bathtub enclosures, shower doors, and fixed glass panels immediately adjacent to doors shall be safety glass.

**History:** Cr. Register, November, 1979, No. 287, eff. 6-1-80; r. and recr. (1) and (2), Register, February, 1985, No. 350, eff. 3-1-85.

**ILHR 21.06 Ceiling height.** All habitable rooms, kitchens, hallways, bathrooms and corridors shall have a ceiling height of at least 7 feet. Habitable rooms may have ceiling heights of less than 7 feet provided at least 50% of the room's floor area has a ceiling height of at least 7 feet. Beams and girders or other projections shall not project more than 8 inches below the required ceiling height.

**History:** Cr. Register, November, 1979, No. 287, eff. 6-1-80; r. and recr. Register, February, 1985, No. 350, eff. 3-1-85.

**ILHR 21.07 Attic and crawl space access.** (1) **ATTIC.** Attics shall be provided with an access opening of at least 14 by 24 inches, accessible from inside the structure.

(2) **CRAWL SPACE.** Crawl spaces shall be provided with an access opening of at least 14 by 24 inches.

**History:** Cr. Register, November, 1979, No. 287, eff. 6-1-80.

**ILHR 21.08 Firestopping, draftstopping and fire separation.** (1) **FIRE-STOPPING LOCATIONS.** Firestopping shall be provided in the following locations:

(a) In concealed spaces of walls and partitions, including furred spaces, at the ceiling and floor levels;

(b) At all interconnections between concealed vertical and horizontal spaces such as occur at soffits, drop ceilings and cove ceilings; and

(c) In concealed spaces between stair stringers at the top and bottom of the run.

(2) **FIRESTOPPING MATERIALS.** Firestopping shall consist of 2-inches nominal lumber or 2 thicknesses of one inch nominal lumber or one thickness of ¾-inch plywood with joints backed by ¾-inch plywood. Gypsum wallboard, mineral wool insulation or other noncombustible material may also be used for firestopping.

Register, February, 1985, No. 350  
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2. Prevent attaching combustible furring and sheathing to the masonry exterior.

(e) All spaces between the masonry and the framing shall be draft stopped.

History: Cr. Register, February, 1985, No. 350, eff. 3-1-85.

**ILHR 21.31 Factory-built fireplace stoves.** Factory-built fireplace stoves, consisting of a free-standing chamber assembly, shall be tested and listed by a nationally recognized testing laboratory. The assembly shall be erected and maintained in accordance with the listing.

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.

**ILHR 21.32 Factory built fireplaces.** Factory-built fireplaces consisting of a fire chamber assembly, one or more chimney sections, a roof assembly and other parts shall be tested and listed by a nationally recognized testing laboratory.

(1) **FIREPLACE ASSEMBLY AND MAINTENANCE.** The fireplace assembly shall be erected and maintained in accordance with the conditions of the listing.

(2) **DISTANCE FROM COMBUSTIBLES.** Portions of the manufactured chimney extending through combustible floors or roof/ceiling assemblies shall be installed in accordance with the distances listed on the chimney in order to prevent contact with combustible materials.

(3) **HEARTH EXTENSIONS.** Hearth extensions of not less than ¾-inch thick hollow metal, stone, tile or other approved material shall be provided. The minimum dimensions of the hearth shall be based upon the size of the fireplace opening as specified in Table 21.32-1.

TABLE 21.32-1  
HEARTH DIMENSIONS

Fireplace Opening (sq. ft.)	Extension from Firebox (inches)	
	Side	Front
Less than 6 6 or Greater	8	16
	12	20

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80; renum. from Ind 21.30 and r. and recr. (3), Register, February, 1985, No. 350, eff. 3-1-85.

**TABLE R-1**  
**FLAT OR SLOPED RAFTERS**  
**Supporting Drywall Ceiling**  
(Flat roof or cathedral ceiling with no attic space)  
Live Load - 20 lb. per sq. ft.

**DESIGN CRITERIA:**

Strength - 15 lbs. per sq. ft. dead load plus 20

lbs. per sq. ft. live load determines required  
fiber stress.

Deflection - For 20 lbs. per sq. ft. live load.

Limited to span in inches divided by 240.

RAFTER SIZE SPACING (IN) (IN)		Extreme Fiber Stress in Bending, "F <sub>b</sub> " (psi).										
		300	400	500	600	700	800	900	1000	1100	1200	1300
2x6	12,0	6-7 0.12	7-7 0.19	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
	13,7	6-2 0.12	7-1 0.18	7-11 0.25	8-8 0.33	9-5 0.41	10-0 0.50	10-8 0.60	11-3 0.70	11-9 0.81	12-4 0.92	12-10 1.04
	16,0	5-8 0.11	6-7 0.16	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
	19,2	5-2 0.10	6-0 0.15	6-9 0.21	7-4 0.27	7-11 0.35	8-6 0.42	9-0 0.51	9-6 0.59	9-11 0.68	10-5 0.78	10-10 0.88
	24,0	4-8 0.09	5-4 0.13	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
2x8	12,0	8-8 0.12	10-0 0.19	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
	13,7	8-1 0.12	9-4 0.18	10-6 0.25	11-6 0.33	12-5 0.41	13-3 0.50	14-0 0.60	14-10 0.70	15-6 0.81	16-3 0.92	16-10 1.04
	16,0	7-6 0.11	8-8 0.16	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
	19,2	6-10 0.10	7-11 0.15	8-10 0.21	9-8 0.27	10-6 0.35	11-2 0.42	11-10 0.51	12-6 0.59	13-1 0.68	13-8 0.78	14-3 0.88
	24,0	6-2 0.09	7-1 0.13	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

2x10	12.0	11-1 0.12	12-9 0.19	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
	13.7	10-4 0.12	11-11 0.18	13-4 0.25	14-8 0.33	15-10 0.41	16-11 0.50	17-11 0.60	18-11 0.70	19-10 0.81	20-8 0.92	21-6 1.04
	16.0	9-7 0.11	11-1 0.16	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
	19.2	8-9 0.10	10-1 0.15	11-3 0.21	12-4 0.27	13-4 0.35	14-3 0.42	15-2 0.51	15-11 0.59	16-9 0.68	17-6 0.78	18-2 0.88
	24.0	7-10 0.09	9-0 0.13	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
2x12	12.0	13-5 0.12	15-6 0.19	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
	13.7	12-7 0.12	14-6 0.18	16-3 0.25	17-9 0.33	19-3 0.41	20-6 0.50	21-9 0.60	23-0 0.70	24-1 0.81	25-2 0.92	26-2 1.04
	16.0	11-8 0.11	13-5 0.16	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
	19.2	10-8 0.10	12-3 0.15	13-9 0.21	15-0 0.27	16-3 0.35	17-4 0.42	18-5 0.51	19-5 0.59	20-4 0.68	21-3 0.78	22-2 0.88
	24.0	9-6 0.09	11-0 0.13	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

Note: The required modulus of elasticity, "E", in 1,000,000 pounds per square inch is shown below each span.

TABLE R-1 (cont.)

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

Extreme Fiber Stress in Bending, "F <sub>b</sub> " (psi).											RAFTER SPACING SIZE (IN)	
1400	1500	1600	1700	1800	1900	2000	2100	2200	2400	2700		
14-2 1.24	14-8 1.37	15-2 1.51	15-8 1.66	16-1 1.81	16-7 1.96	17-0 2.12	17-5 2.28	17-10 2.44				12.0
13-3 1.16	13-9 1.29	14-2 1.42	14-8 1.55	15-1 1.69	15-6 1.83	15-11 1.98	16-3 2.13	16-8 2.28	17-5 2.60			13.7
12-4 1.07	12-9 1.19	13-2 1.31	13-7 1.44	13-11 1.56	14-4 1.70	14-8 1.83	15-1 1.97	15-5 2.11	16-1 2.41			16.0
11-3 0.98	11-7 1.09	12-0 1.20	12-4 1.31	12-9 1.43	13-1 1.55	13-5 1.67	13-9 1.80	14-1 1.93	14-8 2.20			19.2
10-0 0.88	10-5 0.97	10-9 1.07	11-1 1.17	11-5 1.28	11-8 1.39	12-0 1.50	12-4 1.61	12-7 1.73	13-2 1.97	13-11 2.35		24.0
18-9 1.24	19-5 1.37	20-0 1.51	20-8 1.66	21-3 1.81	21-10 1.96	22-4 2.12	22-11 2.28	23-6 2.44				12.0
17-6 1.16	18-2 1.29	18-9 1.42	19-4 1.55	19-10 1.69	20-5 1.83	20-11 1.98	21-5 2.13	21-11 2.28	22-11 2.60			13.7
16-3 1.07	16-9 1.19	17-4 1.31	17-10 1.44	18-5 1.56	18-11 1.70	19-5 1.83	19-10 1.97	20-4 2.11	21-3 2.41			16.0
14-10 0.98	15-4 1.09	15-10 1.20	16-4 1.31	16-9 1.43	17-3 1.55	17-8 1.67	18-2 1.80	18-7 1.93	19-5 2.20			19.2
13-3 0.88	13-8 0.97	14-2 1.07	14-7 1.17	15-0 1.28	15-5 1.39	15-10 1.50	16-3 1.61	16-7 1.73	17-4 1.97	18-5 2.35		24.0

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23-11 1.24	24-9 1.37	25-6 1.51	26-4 1.66	27-1 1.81	27-10 1.96	28-7 2.12	29-3 2.28	29-11 2.44			12.0	2x10
22-4 1.16	23-2 1.29	23-11 1.42	24-7 1.55	25-4 1.69	26-0 1.83	26-8 1.98	27-4 2.13	28-0 2.28	29-3 2.60		13.7	
20-8 1.07	21-5 1.19	22-1 1.31	22-10 1.44	23-5 1.56	24-1 1.70	24-9 1.83	25-4 1.97	25-11 2.11	27-1 2.41		16.0	
18-11 0.98	19-7 1.09	20-2 1.20	20-10 1.31	21-5 1.43	22-0 1.55	22-7 1.67	23-2 1.80	23-8 1.93	24-9 2.20		19.2	
16-11 0.88	17-6 0.97	18-1 1.07	18-7 1.17	19-2 1.28	19-8 1.39	20-2 1.50	20-8 1.61	21-2 1.73	22-1 1.97	23-5 2.35	24.0	
29-1 1.24	30-1 1.37	31-1 1.51	32-0 1.66	32-11 1.81	33-10 1.96	34-9 2.12	35-7 2.28	36-5 2.44			12.0	
27-2 1.16	28-2 1.29	29-1 1.42	29-11 1.55	30-10 1.69	31-8 1.83	32-6 1.98	33-3 2.13	34-1 2.28	35-7 2.60		13.7	
25-2 1.07	26-0 1.19	26-11 1.31	27-9 1.44	28-6 1.56	29-4 1.70	30-1 1.83	30-10 1.97	31-6 2.11	32-11 2.41		16.0	
23-0 0.98	23-9 1.09	24-7 1.20	25-4 1.31	26-0 1.43	26-9 1.55	27-5 1.67	28-2 1.80	28-9 1.93	30-1 2.20		19.2	
20-6 0.88	21-3 0.97	21-11 1.07	22-8 1.17	23-3 1.28	23-11 1.39	24-7 1.50	25-2 1.61	25-9 1.73	26-11 1.97	28-6 2.35	24.0	

Note: The required modulus of elasticity, "E", in 1,000,000 pounds per square inch is shown below each span.

TABLE R-4  
**FLAT OR SLOPED RAFTERS**  
 Supporting Plaster Ceiling  
 (Flat roof or cathedral ceiling with no attic space)  
 Live Load - 20 lb. per sq. ft.

**DESIGN CRITERIA:**

Strength - 15 lbs. per sq. ft. dead load plus 20  
 lbs. per sq. ft. live load determines required  
 fiber stress.

Deflection - For 20 lbs. per sq. ft. live load.  
 Limited to span in inches divided by 360.

RAFTER SIZE SPACING (IN)	RAFTER SIZE SPACING (IN)	Extreme Fiber Stress in Bending, "F <sub>b</sub> " (psi).									
		300	400	500	600	700	800	900	1000	1100	1200
2x6	12.0	6-7 0.18	7-7 0.28	8-6 0.40	9-4 0.52	10-0 0.66	10-9 0.80	11-5 0.96	12-0 1.12	12-7 1.29	13-2 1.48
	13.7	6-2 0.17	7-1 0.27	7-11 0.37	8-8 0.49	9-5 0.61	10-0 0.75	10-8 0.90	11-3 1.05	11-9 1.21	12-4 1.38
	16.0	5-8 0.16	6-7 0.25	7-4 0.34	8-1 0.45	8-8 0.57	9-4 0.70	9-10 0.83	10-5 0.97	10-11 1.12	11-5 1.28
	19.2	5-2 0.15	6-0 0.22	6-9 0.31	7-4 0.41	7-11 0.52	8-6 0.63	9-0 0.76	9-6 0.89	9-11 1.02	10-5 1.17
	24.0	4-8 0.13	5-4 0.20	6-0 0.28	6-7 0.37	7-1 0.46	7-7 0.57	8-1 0.68	8-6 0.79	8-11 0.92	9-4 1.04
		12.0	8-8 0.18	10-0 0.28	11-2 0.40	12-3 0.52	13-3 0.66	14-2 0.80	15-0 0.96	15-10 1.12	16-7 1.29
2x8	13.7	8-1 0.17	9-4 0.27	10-6 0.37	11-6 0.49	12-5 0.61	13-3 0.75	14-0 0.90	14-10 1.05	15-6 1.21	16-3 1.38
	16.0	7-6 0.16	8-8 0.25	9-8 0.34	10-7 0.45	11-6 0.57	12-3 0.70	13-0 0.83	13-8 0.97	14-4 1.12	15-0 1.28
	19.2	6-10 0.15	7-11 0.22	8-10 0.31	9-8 0.41	10-6 0.52	11-2 0.63	11-10 0.76	12-6 0.89	13-1 1.02	13-8 1.17
	24.0	6-2 0.13	7-1 0.20	7-11 0.28	8-8 0.37	9-4 0.46	10-0 0.57	10-7 0.68	11-2 0.79	11-9 0.92	12-3 1.04



2x10	12.0	11-1 0.18	12-9 0.28	14-3 0.40	15-8 0.52	16-11 0.66	18-1 0.80	19-2 0.96	20-2 1.12	21-2 1.29	22-1 1.48
	13.7	10-4 0.17	11-11 0.27	13-4 0.37	14-8 0.49	15-10 0.61	16-11 0.75	17-11 0.90	18-11 1.05	19-10 1.21	20-8 1.38
	16.0	9-7 0.16	11-1 0.25	12-4 0.34	13-6 0.45	14-8 0.57	15-8 0.70	16-7 0.83	17-6 0.97	18-4 1.12	19-2 1.28
	19.2	8-9 0.15	10-1 0.22	11-3 0.31	12-4 0.41	13-4 0.52	14-3 0.63	15-2 0.76	15-11 0.89	16-9 1.02	17-6 1.17
	24.0	7-10 0.13	9-0 0.20	10-1 0.28	11-1 0.37	11-11 0.46	12-9 0.57	13-6 0.68	14-3 0.79	15-0 0.92	15-8 1.04
		12.0	13-5 0.18	15-6 0.28	17-4 0.40	19-0 0.52	20-6 0.66	21-11 0.80	23-3 0.96	24-7 1.12	25-9 1.29
2x12	13.7	12-7 0.17	14-6 0.27	16-3 0.37	17-9 0.49	19-3 0.61	20-6 0.75	21-9 0.90	23-0 1.05	24-1 1.21	25-2 1.38
	16.0	11-8 0.16	13-5 0.25	15-0 0.34	16-6 0.45	17-9 0.57	19-0 0.70	20-2 0.83	21-3 0.97	22-4 1.12	23-3 1.28
	19.2	10-8 0.15	12-3 0.22	13-9 0.31	15-0 0.41	16-3 0.52	17-4 0.63	18-5 0.76	19-5 0.89	20-4 1.02	21-3 1.17
	24.0	9-6 0.13	11-0 0.20	12-3 0.28	13-5 0.37	14-6 0.46	15-6 0.57	16-6 0.68	17-4 0.79	18-2 0.92	19-0 1.04
		12.0	13-5 0.18	15-6 0.28	17-4 0.40	19-0 0.52	20-6 0.66	21-11 0.80	23-3 0.96	24-7 1.12	25-9 1.29

Note: The required modulus of elasticity, "E", in 1,000,000 pounds per square inch is shown below each span.

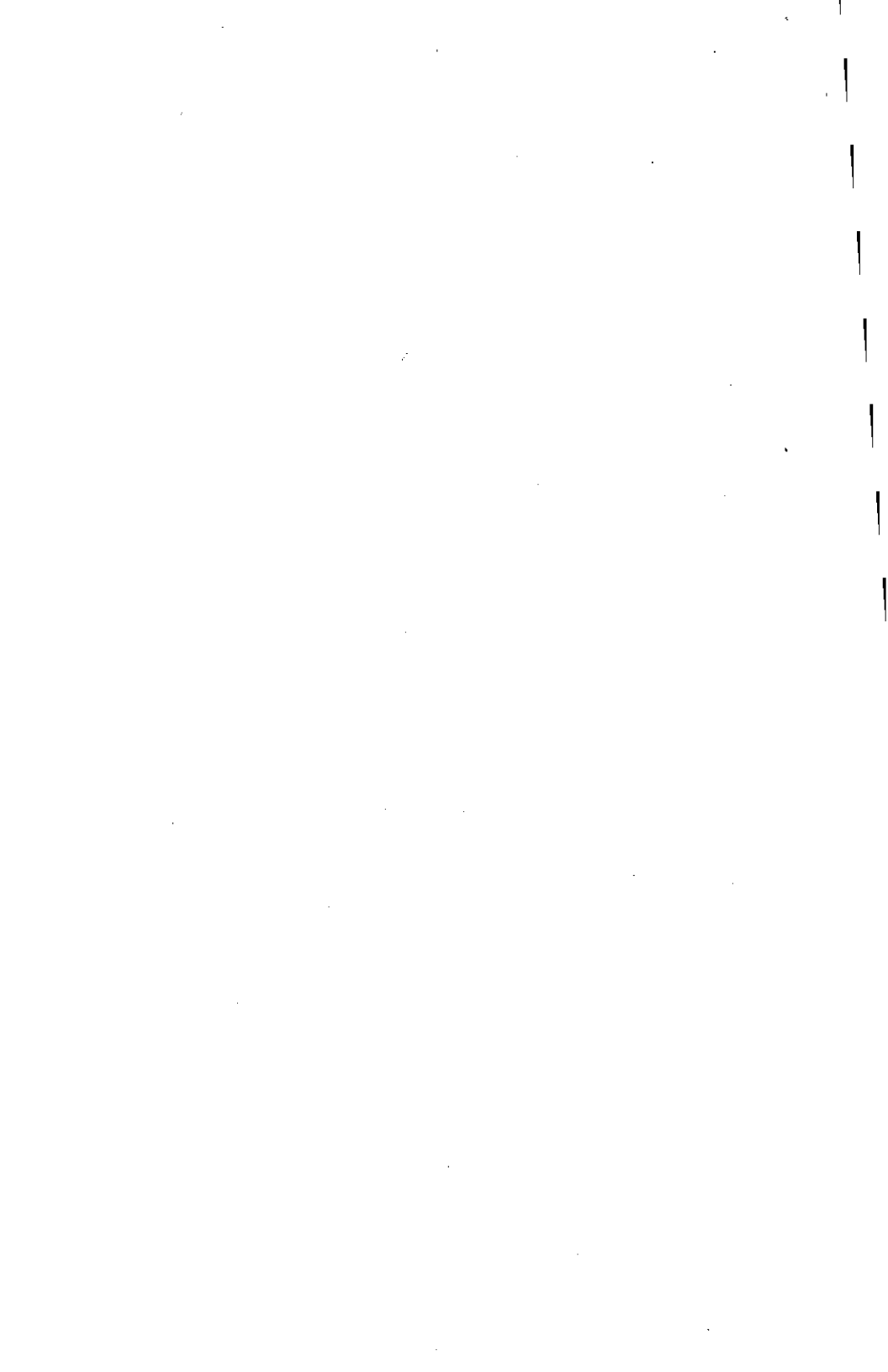
TABLE R-4 (cont.)

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

Extreme Fiber Stress in Bending, "F <sub>b</sub> " (psi).									RAFTER SPACING SIZE (IN) (IN)	
1300	1400	1500	1600	1700	1800	1900	2000	2100		
13-8 1.66	14-2 1.86	14-8 2.06	15-2 2.27	15-8 2.49					12.0	
12-10 1.56	13-3 1.74	13-9 1.93	14-2 2.12	14-8 2.33	15-1 2.54				13.7	
11-10 1.44	12-4 1.61	12-9 1.79	13-2 1.97	13-7 2.15	13-11 2.35	14-4 2.55			16.0	2x6
10-10 1.32	11-3 1.47	11-7 1.63	12-0 1.80	12-4 1.97	12-9 2.14	13-1 2.32	13-5 2.51		19.2	
9-8 1.18	10-0 1.31	10-5 1.46	10-9 1.61	11-1 1.76	11-5 1.92	11-8 2.08	12-0 2.24	12-4 2.41	24.0	
18-0 1.66	18-9 1.86	19-5 2.06	20-0 2.27	20-8 2.49					12.0	
16-10 1.56	17-6 1.74	18-2 1.93	18-9 2.12	19-4 2.33	19-10 2.54				13.7	
15-7 1.44	16-3 1.61	16-9 1.79	17-4 1.97	17-10 2.15	18-5 2.35	18-11 2.55			16.0	2x8
14-3 1.32	14-10 1.47	15-4 1.63	15-10 1.80	16-4 1.97	16-9 2.14	17-3 2.32	17-8 2.51		19.2	
12-9 1.18	13-3 1.31	13-8 1.46	14-2 1.61	14-7 1.76	15-0 1.92	15-5 2.08	15-10 2.24	16-3 2.41	24.0	

23-0 1.66	23-11 1.86	24-9 2.06	25-6 2.27	26-4 2.49						12.0	2x10
21-6 1.56	22-4 1.74	23-2 1.93	23-11 2.12	24-7 2.33	25-4 2.54					13.7	
19-11 1.44	20-8 1.61	21-5 1.79	22-1 1.97	22-10 2.15	23-5 2.35	24-1 2.55				16.0	
18-2 1.32	18-11 1.47	19-7 1.63	20-2 1.80	20-10 1.97	21-5 2.14	22-0 2.32	22-7 2.51			19.2	
16-3 1.18	16-11 1.31	17-6 1.46	18-1 1.61	18-7 1.76	19-2 1.92	19-8 2.08	20-2 2.24	20-8 2.41	24.0		
28-0 1.66	29-1 1.86	30-1 2.06	31-1 2.27	32-0 2.49						12.0	2x12
26-2 1.56	27-2 1.74	28-2 1.93	29-1 2.12	29-11 2.33	30-10 2.54					13.7	
24-3 1.44	25-2 1.61	26-0 1.79	26-11 1.97	27-9 2.15	28-6 2.35	29-4 2.55				16.0	
22-2 1.32	23-0 1.47	23-9 1.63	24-7 1.80	25-4 1.97	26-0 2.14	26-9 2.32	27-5 2.51			19.2	
19-10 1.18	20-6 1.31	21-3 1.46	21-11 1.61	22-8 1.76	23-3 1.92	23-11 2.08	24-7 2.24	25-2 2.41	24.0		

Note: The required modulus of elasticity, "E", in 1,000,000 pounds per square inch is shown below each span.



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analysis. The soil-bearing values of common soils may be determined through soil identification.

Note: The department will accept the soil-bearing values for the types of soil listed in the following table:

Type of soil	PSF
1. Wet, soft clay; very loose silt; silty clay.....	2,000
2. Loose, fine sand; medium clay; loose sandy clay soils.....	2,000
3. Stiff clay; firm inorganic silt.....	3,000
4. Medium (firm) sand; loose sandy gravel; firm sandy clay soils; hard dry clay.....	4,000
5. Dense sand and gravel; very compact mixture of clay, sand and gravel ...	6,000
6. Rock.....	12,000

(a) *Minimum soil-bearing values.* If the soil located directly under a footing or foundation overlies a layer of soil having a smaller allowable bearing value, the smaller soil-bearing value shall be used.

(b) *Unprepared fill material, organic material.* No footing or foundation shall be placed upon unprepared fill material, organic soil, alluvial soil or mud unless the load will be supported. When requested, soil data shall be provided.

Note: The decomposition of organic material in landfill sites established for the disposal of organic wastes may produce odorous, toxic and explosive concentrations of gas which may seep into buildings through storm sewers and similar underground utilities unless provisions are taken to release the gases to the atmosphere.

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.

**ILHR 21.16 Frost penetration.** Footings and foundations, including those for ramps and stoops, shall be placed below the frost penetration level, but in no case less than 48 inches below the ground. Footings shall not be placed over frozen material.

(1) **EXCEPTIONS.** (a) Floating slabs constructed on grade need not be installed below the minimum frost penetration line provided measures have been taken to prevent frost forces from damaging the structure.

(b) Grade beams need not be installed to the minimum frost penetration line provided measures are taken to prevent frost forces from damaging the structure.

(c) Stoops or ramps need not be installed below the minimum frost penetration level provided measures are taken to prevent frost forces from damaging the structure.

(d) Footings or foundations may bear directly on rock located less than 42 inches below grade. Prior to placement, the rock shall be cleaned of all earth. All clay in the crevices of the rock shall be removed to the level of frost penetration or 1-½ times the width of the rock crevice. Provisions shall be taken at grade to prevent rain water from collecting along the foundation wall of the building.

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80; am. (intro.), Register, February, 1985, No. 350, eff. 3-1-85.

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**ILHR 21.17 Drain tiles.** (1) **WHERE REQUIRED.** Drain tiles or pipe shall be provided around footings located in soils where ground water levels occur above the elevation of the footing.

(a) *Municipalities exercising jurisdiction.* Municipalities exercising jurisdiction under chs. ILHR 20 to 25 may determine the soil types, natural and seasonal groundwater levels for which drain tile is required.

(b) *All other areas.* Drain tiles shall be required whenever a soil test shows evidence of periodic or seasonal saturation at any depth less than 72 inches. When the on-site evaluation shows no evidence of saturation, drain tiles need not be installed. Under all other conditions, drain tiles shall be installed on each side of foundation walls at the footing level.

(2) **MATERIALS AND INSTALLATION REQUIREMENTS.** (a) Drain tiles or pipes used for foundation drainage shall be at least 3 inches inside diameter.

(b) Where individual tiles are used, they shall be laid with 1/8-inch open joints. Joints between the tiles shall be covered with a strip of sheathing paper or asphalt or tar saturated felt.

(c) The tile or pipe shall be placed upon at least 2 inches of washed rock and shall be covered with at least 12 inches of washed rock which meets the following criteria:

1. 90-100% of the rock must pass a 3/4-inch sieve; and
2. 20-25% of the rock must pass a 1/2-inch sieve.

(d) The basement slab shall be placed on at least 4 inches of gravel.

(e) Bleeder tiles shall be provided to connect the exterior footing drain tile to the interior footing tile and shall be placed in the footing such that the tiles are spaced at 8 foot intervals.

(f) The drain tiles or pipe shall be laid at a grade of not less than 1/8 inch per foot leading to the sump pit.

(3) **DRAIN TILE DISCHARGE.** Drain tiles shall be connected to a sump pit. The sump shall discharge to natural grade or be equipped with a pump to discharge water away from the dwelling via surface drainage channels.

(a) *Sumps.* 1. **Construction and installation.** The sump shall have a rim extending at least one inch above the floor immediately adjacent to the sump, except where the sump is installed in an exterior meter pit. The sump shall have a removable cover of sufficient strength for anticipated loads. The sump shall have a solid bottom.

2. **Location.** All sumps installed for the purpose of receiving clear water, basement or foundation drainage water shall be located at least 15 feet from any water well.

3. **Size.** The size of each clear water sump shall be as recommended by the sump pump manufacturer, but shall be not smaller than 18 inches in diameter and 24 inches in depth.

(b) *Sump pump systems.* 1. **Pump size.** The pump shall have a capacity appropriate for anticipated use.

2. Discharge piping. Where a sump discharges into a storm building drain or sewer, a free flow check valve shall be installed.

(4) SUMP DISCHARGE DISPOSAL. (a) *Storm sewer.* Storm water, surface water, groundwater and clear water wastes shall be drained to a storm sewer where available.

(b) *Other disposal methods.* 1. Where no storm sewer system is available or exists or is not adequate to receive the anticipated load, the storm water, surface water, groundwater and clear water wastes shall be discharged in accordance with local governmental requirements.

2. Where approved by the local governmental authority, storm water, surface water, groundwater and clear water wastes of the properties of one- and 2-family dwellings may be discharged onto flat areas, such as streets or lawns, so long as the water flows away from the buildings and does not create a nuisance.

(c) *Segregation of wastes.* 1. Storm and clear water wastes shall not discharge to any part of a sanitary drain system, nor shall sanitary wastes discharge to any part of a storm or clear water drain system; except the clear water wastes of a refrigerated drinking fountain, water heater relief valve or water softener may discharge to a sanitary drain system.

2. Storm water wastes and clear water wastes shall not be combined until discharging into the storm building drain.

Note: Subsections (3) (a) and (b) and (4) are excerpts from the state uniform plumbing code, s. ILHR 82.36.

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80; r. and recr. Register, February, 1985, No. 350, eff. 3-1-85.

## SUBCHAPTER V—FOUNDATIONS

**ILHR 21.18 Foundations.** Foundation walls shall be designed and constructed to support the vertical loads of the dwelling, lateral soil pressure, and other loads without exceeding the allowable stresses of the materials of which the foundations are constructed.

(1) **CONCRETE FOUNDATION WALLS.** Unless designed through structural analysis, the minimum thickness of concrete foundation walls shall be determined from Table 21.18-A, but in no case shall the thickness be less than the thickness of the wall it supports.

TABLE 21.18-A  
CONCRETE WALL THICKNESSES

Type of Concrete	Nominal Thickness (inches)	Maximum Height of Unbalanced Fill <sup>1</sup> for Material of Wall Being Supported (Wood frame - feet)
3000 psi	6	6.5
Unreinforced concrete	8	8
	10	9
	12 <sup>2</sup>	10
	14	11.5

<sup>1</sup>Unbalanced fill is the difference in elevation between the outside grade and the basement floor.

<sup>2</sup>The maximum height of unbalanced fill for a 12-inch thick plain concrete wall may be increased to 12 feet provided the wall is constructed of concrete with a minimum compressive value of 6,000 psi at 28 days.

(2) **MASONRY FOUNDATION WALLS.** Unless designed through structural analysis, the masonry foundation walls shall be constructed in accordance with the following requirements:

(a) *Unreinforced masonry wall, thickness.* The minimum thickness of unreinforced masonry foundation walls shall be determined by Table 21.18-B, but in no case shall the thickness be less than the thickness of the wall it supports.

(b) *Reinforced masonry wall, thickness.* Reinforced masonry walls shall be reinforced in accordance with the requirements of Tables 21.18-C and 21.18-D. In partially reinforced masonry walls, vertical reinforcement shall be provided on each side of any opening, at each wall corner, and at intervals indicated in the tables.