City of Republic—Community Development

Rafter Spans with Ceiling Attached

Revision Date: January 2017

2012 IRC Table R802.5.1(2) - Rafter Spans for Common Lumber Species

Roof Live Load = 20 psf, Ceiling Attached to Rafters, L/Δ = 240

Rafter Spacing (inches)	Species and Grade		Dead Load = 10 psf					Dead Load = 20 psf				
			2 x 4	2 x 6	2 x 8	2 x 10	2 x 12	2 x 4	2 x 6	2 x 8	2 x 10	2 x 12
			Maximum Rafter Spans[a]									
			Ft.-in.	Ft.-in.	Ft.-in.	Ft.-in.	Ft.-in.	Ft.-in.	Ft.-in.	Ft.-in.	Ft.-in.	Ft.-in.
12	Douglas Fir-Larch	SS	10-5	16-4	21-7	Note b	Note b	10-5	16-4	21-7	Note b	Note b
		#1	10-0	15-9	21-10	Note b	Note b	10-0	15-4	19-5	23-9	Note b
		#2	9-10	15-6	20-5	25-8	Note b	9-10	14-4	18-2	22-3	25-9
		#3	8-7	12-6	15-10	19-5	22-6	7-5	10-10	13-9	16-9	19-6
	Hem-Fir	SS	9-10	15-6	20-5	Note b	Note b	9-10	15-6	20-5	Note b	Note b
		#1	9-8	15-2	19-11	25-5	Note b	9-8	14-11	18-11	23-2	Note b
		#2	9-2	14-5	19-0	24-3	Note b	9-2	14-2	17-11	21-11	25-5
		#3	8-7	12-6	15-10	19-5	22-6	7-5	10-10	13-9	16-9	19-6
	Southern Pine	SS	10-3	16-1	21-2	Note b	Note b	10-3	16-1	21-2	Note b	Note b
		#1	10-0	15-9	20-10	Note b	Note b	10-0	15-9	20-10	25-10	Note b
		#2	9-10	15-6	20-5	Note b	Note b	9-10	15-1	19-5	23-2	Note b
		#3	9-1	13-6	17-2	20-3	24-1	7-11	11-8	14-10	17-6	20-11
	Spruce-Pine-Fir	SS	9-8	15-2	19-11	25-5	Note b	9-8	15-2	19-11	25-5	Note b
		#1	9-5	14-9	19-6	24-10	Note b	9-5	14-4	18-2	22-3	25-9
		#2	9-5	14-9	19-6	24-10	Note b	9-5	14-4	18-2	22-3	25-9
		#3	8-7	12-6	15-10	19-5	22-6	7-5	10-10	13-9	16-9	19-6

2012 IRC Table R802.5.1(2) - Rafter Spans for Common Lumber Species (Continued)

Roof Live Load = 20 psf, Ceiling Attached to Rafters, L/Δ = 240

Rafter Spacing (inches)	Species and Grade		Dead Load = 10 psf					Dead Load = 20 psf				
			2 x 4	2 x 6	2 x 8	2 x 10	2 x 12	2 x 4	2 x 6	2 x 8	2 x 10	2 x 12
			Maximum Rafter Spans[a]									
			Ft.-in.	Ft.-in.	Ft.-in.	Ft.-in.	Ft.-in.	Ft.-in.	Ft.-in.	Ft.-in.	Ft.-in.	Ft.-in.
16	Douglas Fir-Larch	SS	9-6	14-11	19-7	25-0	Note b	9-6	14-11	19-7	24-9	Note b
		#1	9-1	14-4	18-11	23-9	Note b	9-1	13-3	16-10	20-7	23-10
		#2	8-11	14-1	18-2	22-3	25-9	8-6	12-5	15-9	19-3	22-4
		#3	7-5	10-10	13-9	16-9	19-6	6-5	9-5	11-11	14-6	16-10
	Hem-Fir	SS	8-11	14-1	18-6	23-8	Note b	8-11	14-1	18-6	23-8	Note b
		#1	8-9	13-9	18-1	23-1	Note b	8-9	12-11	16-5	20-0	23-3
		#2	8-4	13-1	17-3	21-11	25-5	8-4	12-3	15-6	18-11	22-0
		#3	7-5	10-10	13-9	16-9	19-6	6-5	9-5	11-11	14-6	16-10
	Southern Pine	SS	9-4	14-7	19-3	24-7	Note b	9-4	14-7	19-3	24-7	Note b
		#1	9-1	14-4	18-11	24-1	Note b	9-1	14-4	18-10	22-4	Note b
		#2	8-11	14-1	18-6	23-2	Note b	8-11	13-0	16-10	20-1	23-7
		#3	7-11	11-8	14-10	17-6	20-11	6-10	10-1	12-10	15-2	18-1
	Spruce-Pine-Fir	SS	8-9	13-9	18-1	23-1	Note b	8-9	13-9	18-1	23-0	Note b
		#1	8-7	13-5	17-9	22-3	25-9	8-6	12-5	15-9	19-3	22-4
		#2	8-7	13-5	17-9	22-3	25-9	8-6	12-5	15-9	19-3	22-4
		#3	7-5	10-10	13-9	16-9	19-6	6-5	9-5	11-11	14-6	16-10

2012 IRC Table R802.5.1(2) - Rafter Spans for Common Lumber Species (Continued)

Roof Live Load = 20 psf, Ceiling Attached to Rafters, L/Δ = 240

Rafter Spacing (inches)	Species and Grade		Dead Load = 10 psf					Dead Load = 20 psf				
			2 x 4	2 x 6	2 x 8	2 x 10	2 x 12	2 x 4	2 x 6	2 x 8	2 x 10	2 x 12
			Maximum Rafter Spans[a]									
			Ft.-in.	Ft.-in.	Ft.-in.	Ft.-in.	Ft.-in.	Ft.-in.	Ft.-in.	Ft.-in.	Ft.-in.	Ft.-in.
19.2	Douglas Fir-Larch	SS	8-11	14-0	18-5	23-7	Note b	8-11	14-0	18-5	22-7	Note b
		#1	8-7	13-6	17-9	21-8	25-2	8-4	12-2	15-4	18-9	21-9
		#2	8-5	13-1	16-7	20-3	23-6	7-9	11-4	14-4	17-7	20-4
		#3	6-9	9-11	12-7	15-4	17-9	5-10	8-7	10-10	13-3	15-5
	Hem-Fir	SS	8-5	13-3	17-5	22-3	Note b	8-5	13-3	17-5	22-3	25-9
		#1	8-3	12-11	17-1	21-1	24-6	8-1	11-10	15-0	18-4	21-3
		#2	7-10	12-4	16-3	20-0	23-2	7-8	11-2	14-2	17-4	20-1
		#3	6-9	9-11	12-7	15-4	17-9	5-10	8-7	10-10	13-3	15-5
	Southern Pine	SS	8-9	13-9	18-1	23-1	Note b	8-9	13-9	18-1	23-1	Note b
		#1	8-7	13-6	17-9	22-8	Note b	8-7	13-6	17-2	20-5	24-4
		#2	8-5	13-3	17-5	21-2	24-10	8-4	11-11	15-4	18-4	21-6
		#3	7-3	10-8	13-7	16-0	19-1	6-3	9-3	11-9	13-10	16-6
	Spruce-Pine-Fir	SS	8-3	12-11	17-1	21-9	Note b	8-3	12-11	17-1	21-0	24-4
		#1	8-1	12-8	16-7	20-3	23-6	7-9	11-4	14-4	17-7	20-4
		#2	8-1	12-8	16-7	20-3	23-6	7-9	11-4	14-4	17-7	20-4
		#3	6-9	9-11	12-7	15-4	17-9	5-10	8-7	10-10	13-3	15-5

2012 IRC Table R802.5.1(2) - Rafter Spans for Common Lumber Species (Continued)

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Rafter Spacing (inches)	Species and Grade		Dead Load = 10 psf					Dead Load = 20 psf				
			2 x 4	2 x 6	2 x 8	2 x 10	2 x 12	2 x 4	2 x 6	2 x 8	2 x 10	2 x 12
			Maximum Rafter Spans[a]									
			Ft.-in.	Ft.-in.	Ft.-in.	Ft.-in.	Ft.-in.	Ft.-in.	Ft.-in.	Ft.-in.	Ft.-in.	Ft.-in.
24	Douglas Fir-Larch	SS	8-3	13-0	17-2	21-10	Note b	8-3	13-0	16-7	20-3	23-5
		#1	8-0	12-6	15-10	19-5	22-6	7-5	10-10	13-9	16-9	19-6
		#2	7-10	11-9	14-10	18-2	21-0	6-11	10-2	12-10	15-8	18-3
		#3	6-1	8-10	11-3	13-8	15-11	5-3	7-8	9-9	11-10	13-9
	Hem-Fir	SS	7-10	12-3	16-2	20-8	25-1	7-10	12-3	16-2	19-10	23-0
		#1	7-8	12-0	15-6	18-11	21-11	7-3	10-7	13-5	16-4	19-0
		#2	7-3	11-5	14-8	17-10	20-9	6-10	10-0	12-8	15-6	17-11
		#3	6-1	8-10	11-3	13-8	15-11	5-3	7-8	9-9	11-10	13-9
	Southern Pine	SS	8-1	12-9	16-10	21-6	Note b	8-1	12-9	16-10	21-6	Note b
		#1	8-0	12-6	16-6	21-1	25-2	8-0	12-3	15-4	18-3	21-9
		#2	7-10	12-3	15-10	18-11	22-2	7-5	10-8	13-9	16-5	19-3
		#3	6-5	9-6	12-1	14-4	17-1	5-7	8-3	10-6	12-5	14-9
	Spruce-Pine-Fir	SS	7-8	12-0	15-10	20-2	24-7	7-8	12-0	15-4	18-9	21-9
		#1	7-6	11-9	14-10	18-2	21-0	6-11	10-2	12-10	15-8	18-3
		#2	7-6	11-9	14-10	18-2	21-0	6-11	10-2	12-10	15-8	18-3
		#3	6-1	8-10	11-3	13-8	15-11	5-3	7-8	9-9	11-10	13-9

Note: Check sources for availability of lumber in lengths greater than 20 feet.

a. The tabulated rafter spans assume that ceiling joists are located at the bottom of the attic space or that some other method of resisting the outward push of the rafters on the bearing walls, such as rafter ties, is provided at that location. When ceiling joists or rafter ties are located higher in the attic space, the rafter spans shall be multiplied by the factors given below: Where:

Hc = Height of ceiling joists or rafter ties measured vertically above the top of the rafter support walls.
Hr = Height of roof ridge measured vertically above the top of the rafter support walls.

b. Span exceeds 26 feet in length.

H_C/H_R	RAFTER SPAN ADJUSTMENT FACTOR
1/3	0.67
1/4	0.76
1/5	0.83
1/6	0.90
1/7.5 or less	1.00

Commentary: Adjustment factors in note a, are limited to cases where the ceiling joists or rafter ties are in the lower third of the attic space. When the ceiling joist or rafter ties are located higher in the attic space, lateral deflection of the rafter below the rafter ties can become excessive and require additional engineering analysis.

Allowable rafter Spans (R802.5): Spans for rafters shall be in accordance with Tables R802.5.1(1) and R802.5.1(2). For other grades and species and for other loading conditions, refer to the AF&PA Span Tables for Joists and Rafters. The span of each rafter shall be measured along the horizontal projection of the rafter.
Commentary: Tables R802.5.1(1) and (2) list allowable rafter spans for common lumber sizes, species and grades based on the spacing and design loads. These tables provide rafter spans for dead loads of 10 and 20 psf. The weight of the rafter is included in the 10 or 20 psf dead load.

Purlins (R802.5.1): Installation of purlins to reduce the span of rafters is permitted as shown in Figure R802.5.1. Purlins shall be sized no less than the required size of the rafters that they support. Purlins shall be continuous and shall be supported by 2-inch by 4-inch braces installed to bearing walls at a slope not less than 45 degrees from the horizontal. The braces shall be spaced not more than 4 feet on center and the unbraced length of braces shall not exceed 8 feet.
Commentary: This section contains specific instructions for the installation of purlins that will provide intermediate support for the rafters and thus reduce the rafter span. The purlins must be at least the same size as the rafters which they support. The rafters must bear on the purlin to provide proper support for the rafters. See Figure R802.5.1(1) for an example of typical installation of purlins.

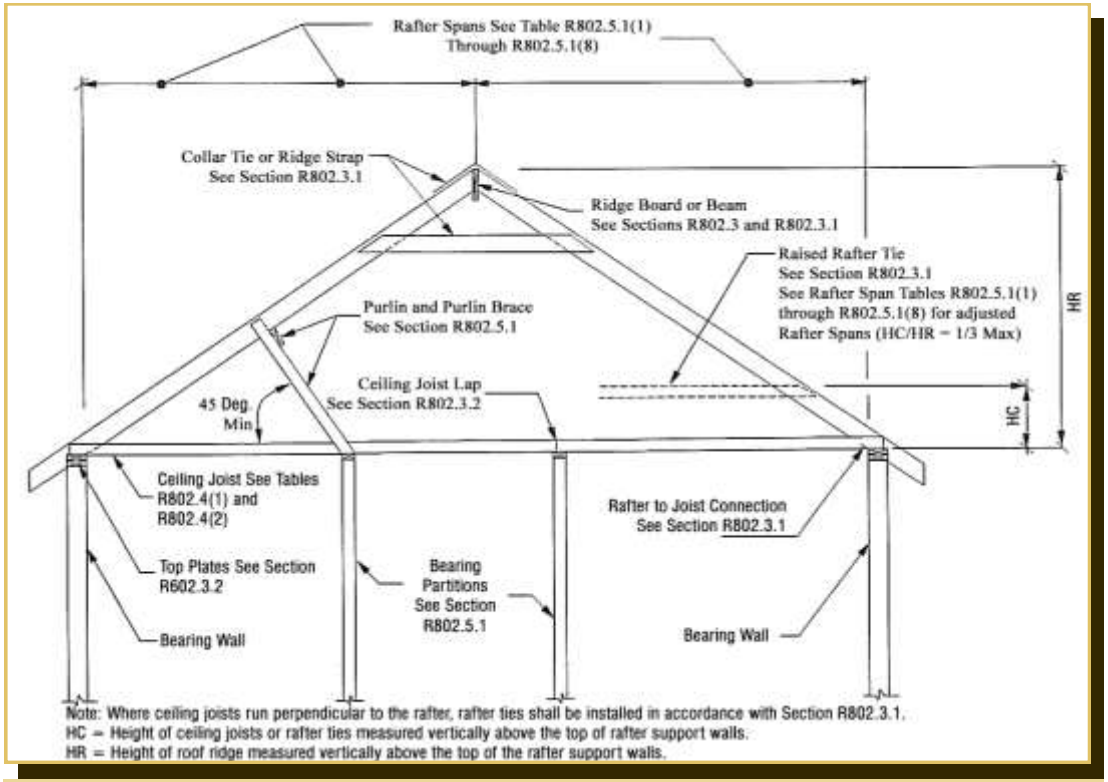

Figure R802.5.1—Braced Rafter Construction

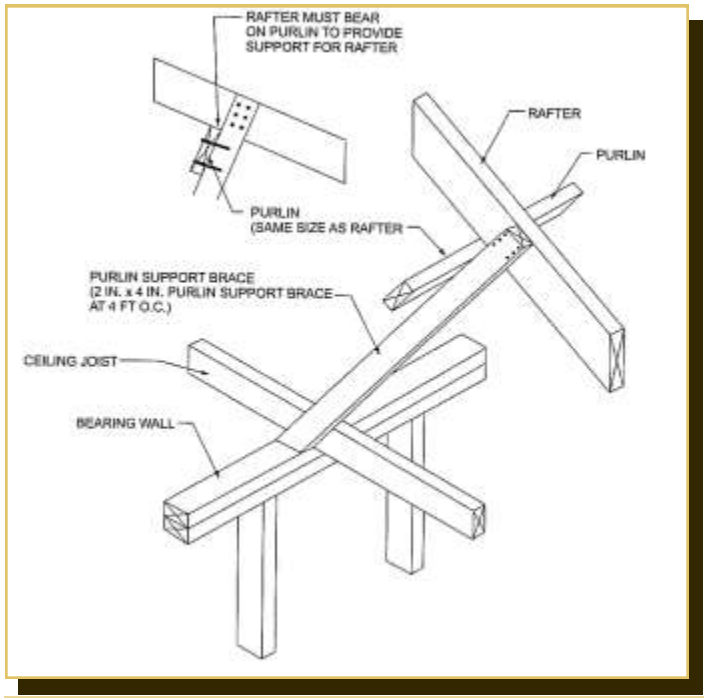

Figure R802.5.1(1) - Example of Purlin Installation

Bearing (R802.6): The ends of each rafter or ceiling joist shall have not less than 1 $^{1}/_{2}$ inches of bearing on wood or metal and not less than 3 inches on masonry or concrete. The bearing on masonry or concrete shall be direct, or a sill plate of 2 inch minimum nominal thickness shall be provided under the rafter or ceiling joist. The sill plate shall provide a minimum nominal bearing of 48 square inches.

Finished ceiling material (R802.6.1): If the finished ceiling material is installed on the ceiling prior to the attachment of the ceiling to the walls, such as in construction at a factory, a compression strip of the same thickness as the finish ceiling material shall be installed directly above the top plate of bearing walls if the compressive strength of the finish ceiling is less than the loads it will be required to withstand. The compressive strip shall cover the entire length of such top plate and shall be at least one half the width of the top plate. It shall be of material capable of transmitting the loads transferred through it.
Commentary: In prefabricated (panelized) construction where the finished ceiling material is attached to the roof assembly before it is attached to the walls, care must be taken to provide a compression strip to line up with the top plate of the supporting walls in order to have an adequate bearing surface.

City of Republic

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The Community Development Department is made up of five full-time employees including a Department Director, Administrative Assistant, Principal Planner, Building Inspector, and Code Compliance Official. Our office is located at 204 North Main Street. The goal of the department is to serve the citizens of Republic through pursuance, guidance, and assistance in the development of the City. This is accomplished through marketing and strategic planning accompanied by oversight and enforcement of the City's Building Codes, Zoning Codes and Subdivision Regulations.

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Community Development Department

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