Right-Sizing Deck Beams

New code tables and adjustments for cantilevered joists dial in beam spans

by Mike Guertin

If you're using the beam sizing tables in older versions of the International Residential Code (IRC), you're probably oversizing your deck beams. In this article, I'll focus on how to read the new maximum deck beam span tables in the 2021 IRC, and explain how to use the code's new "joist span factors" table to determine the "effective deck joist span length" so you can get the greatest span out of a beam (don't worry, it'll all make sense shortly). I'll refer to my previous article, "Right-Size Your Deck Joists" (*JLC*, Mar/23), which contains information about measuring joist span. That article also explains the differences between dead, live, and snow loads, which are the different loads the code tables are adapted for.

A Work in Progress

The 2015 IRC simplified sizing deck beams with the introduction of Table R507.6 "Deck Beam Span Length." That table presented the maximum spans for a series of multi-ply, built-up-dimensional-lumber beams from a double 2x6 through a triple 2x12, with beam spans based on the span of the deck joists from the ledger to the beam. Joist span is a proxy for the tributary area of deck that is supported by a beam and—in turn—the load on the beam.

In the 2018 edition of the IRC, more beam options were added to the southern pine species group: single-ply 2x6, 2x8, 2x10, and 2x12 beams. While most deck builders don't think of a single two-by as a "beam," singles can indeed act as beams and may be a good option, especially for small decks and landings (see "Single-Ply Beam Solution," jlconline.com, February 11, 2019).

Limitations. One of the problems with the 2015 and 2018 IRC beam tables is that they can be applied only to decks with up to 10-psf dead loads and 40-psf live loads. Anyone building decks in areas with a snow load greater than 40 psf can't use the tables to accurately size beams.

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Navigating the Maximum Deck Beam Span Table in the 2021 IRC

Maximum beam span lengths are controlled by three factors: species of wood; size of beam (depth and number of plies); and span of deck joists

Span tables for decks with live loads greater than 40 psf (tables R507.5(2) for 50 psf, R507.5(3) for 60 psf, and R507.5(4) for 70 psf snow loads) not shown in this article

TABLE R507.5(1)
MAXIMUM DECK BEAM SPAN—40 PSF LIVE LOAD[c]

BEAM SPECIES[d]	BEAM SIZE[e]	EFFECTIVE DECK JOIST SPAN LENGTH[a, i, j] (feet)						
		6	8	10	12	14	16	18
		MAXIMUM DECK BEAM SPAN LENGTH (feet-inches)[a, b, f]						
Southern pine	1 – 2 × 6	4-7	4-0	3-7	3-3	3-0	2-10	2-8
	1 – 2 × 8	5-11	5-1	4-7	4-2	3-10	3-7	3-5
	1 – 2 × 10	7-0	6-0	5-5	4-11	4-7	4-3	4-0
	1 – 2 × 12	8-3	7-1	6-4	5-10	5-5	5-0	4-9
	2 – 2 × 6	6-11	5-11	5-4	4-10	4-6	4-3	4-0
	2 – 2 × 8	8-9	7-7	6-9	6-2	5-9	5-4	5-0
	2 – 2 × 10	10-4	9-0	8-0	7-4	6-9	6-4	
	2 – 2 × 12	12-2	10-7	9-5	8-7	8-0	7-5	
	3 – 2 × 6	8-6	7-5	6-8	6-1	5-8	5-3	
	3 – 2 × 8	10-11	9-6	8-6	7-9	7-2	6-8	
	3 – 2 × 10	13-0	11-2	10-0	9-2	8-6	7-11	
	3 – 2 × 12	15-3	13-3	11-10	10-9	10-0	9-4	
Douglas fir-larch[g] Hem-fir[g] Spruce-pine-fir	1 – 2 × 6	4-1	3-6	3-0	2-8	2-5	2-3	
	1 – 2 × 8	5-6	4-8	4-0	3-6	3-2	2-11	2-9
	1 – 2 × 10	6-8	5-10	5-1	4-6	4-1	3-9	3-6
	1 – 2 × 12	7-9	6-9	6-0	5-6	5-0	3-9	3-6
	1 – 2 × 8	5-4	4-7	4-1	3-7	3-3	3-0	2-10
	1 – 2 × 10	6-6	5-7	5-0	4-7	4-2	3-10	3-7
	1 – 2 × 12	7-6	6-6	5-10	5-4	4-11	4-7	4-4
	2 – 2 × 6	6-2	5-4	4-10	4-5	4-0	3-8	3-4
Redwood[h] Western cedars[h] Ponderosa pine[h] Red pine[h]	2 – 2 × 8	7-10	6-10	6-1	5-7	5-2	4-10	
	2 – 2 × 10	9-7	8-4	7-5	6-9	6-3	5-10	
	2 – 2 × 12	11-1	9-8	8-7	7-10	7-3	6-10	
	3 – 2 × 6	7-8	6-9	6-0	5-6	5-1	4-9	
	3 – 2 × 8	9-10						
	3 – 2 × 10	12-0						
	3 – 2 × 12	13-11						

Three beam species groups instead of two. Single-ply beam options added to each group, not just Southern pine.

Rows omitted for space considerations

Columns under "Effective Deck Joist Span Length" heading are spans in 2-foot increments from 6'-0" to 18'-0". Measurements listed in field are the "Maximum Deck Beam Span Length" for a given joist span and its corresponding beam size.

The new tables explicitly permit interpolation of beam spans based on joist spans that fall between the "Effective Deck Joist Span Length" columns.

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound = 0.454 kg.

a. Interpolation permitted. Extrapolation not permitted.
b. Beams supporting a single span of joists with or without cantilever.
c. Dead load = 10 psf, $L/\Delta = 360$ at main span, $L/\Delta = 180$ at cantilever. Snow load is not assumed to be concurrent with live loa
d. No. 2 grade, wet service factor included.
e. Beam depth shall be equal to or greater than the depth of intersecting joist for a flush beam connection.
f. Beam cantilevers are limited to the adjacent beam's span divided by 4.
g. Includes incising factor.
h. Incising factor not included.
i. Deck joist span as shown in Figure R507.5.
j. For calculation of effective deck joist span, the actual joist span length shall be multiplied by the joist span factor in accordance with Table R507.5(5).

Beam span lengths listed in field of table are based on joist span plus maximum cantilever listed in joist span table (Table R507.6 "Maximum Deck Joist Spans"). If deck design has a flush rim beam without any cantilever (or if cantilever is less than the maximum cantilever allowed), then new Table R507.5(5) "Joist Span Factors for Calculating Effective Deck Joist Span" (see page 9) can be used to right-size beams and span greater distances between posts. See examples 1, 2, and 3 on pages 14 and 15 showing how the cantilever distance influences the beam span.

Figure 1. The 2021 version of the IRC's deck-beam-sizing table (R507.5) incorporates a number of changes to the 2015 and 2018 versions, including having values for three species groups—the 2015 and 2018 IRC beam tables grouped all species other than southern pine into a single category. It also adds tables for 50-psf, 60-psf, and 70-psf snow loads. But perhaps the biggest change is the addition of the term "Effective" to qualify "Deck Joist Span Length" (see "Solving Effective Deck Joist Span Length Problem" on page 12 for an explanation of its impact). Along with the changes highlighted above, the new tables explicitly permit interpolation of beam spans based on joist spans that fall between the lengths provided in the "Effective Deck Joist Span Length" columns.

Another issue is that interpolation isn't explicitly permitted between field values in the 2015 and 2018 tables. That means that when the actual joist span falls between two joist-span columns, you have to round up to the next longest joist span, resulting in a shorter beam span than is structurally necessary for a given size beam.

In addition, those beam tables address only two species groups: southern pine in one group and everything else in the other. Grouping pressure-treated Doug-fir, hem-fir, and SPF; redwood; western cedars; ponderosa pine; and red pine all in the same category penalizes the stronger species in the group by limiting the beam spans to those of the weaker species.

Finally, the beam tables in both the 2015 and 2018 IRC presume that the deck is designed with a dropped beam and the maximum joist cantilever allowed. This results in oversizing beams, sometimes substantially, when a deck design has a shorter cantilever or no cantilever at all, as when you're framing a deck with a flush rim beam.

Expanded 2021 IRC beam tables. Some of the shortcomings that are outlined above are addressed in the beam tables in the 2021 IRC, making it possible to size beams more precisely to use lumber efficiently and to minimize the number of footings. The improvements include:

- Three new beam span tables for snow loads greater than 40 psf.
- Three beam species groups instead of just two.
- A series of rows for single-ply beams added to each species group (not just for southern pine).
- Interpolation is explicitly permitted and can be used to refine the beam span when a joist span length falls between the columns listed on the beam table.
- A new adjustment table alleviates oversizing beams on decks that don't have the maximum joist cantilever.

TABLE R507.5(5)
JOIST SPAN FACTORS FOR CALCULATING EFFECTIVE DECK JOIST SPAN
[for use with Note j in Tables R507.5(1), R507.5(2), R507.5(3), and R507.5(4)]

C/J[a]	JOIST SPAN FACTOR
0 (no cantilever)	0.66
1/12 (0.083)	0.72
1/10 (0.10)	0.80
1/8 (0.125)	0.84
1/6 (0.167)	0.90
1/4 (0.250)	1.00

For SI: 1 foot = 304.8 mm

a. C = actual joist cantilever length (feet): J = actual joist span length (length)

Multiply actual joist span by "Joist Span Factor" to determine the "Effective Deck Joist Span Length". See table on page 8.

Figure 2. A new addition to the 2021 IRC Table R507.5(5) can be used to fine-tune beam size when there is a flush rim beam or when the cantilever is less than allowed.

Navigating the Maximum Deck Beam Span Table

Table R507.5(1) "Maximum Deck Beam Span - 40 PSF Live Load" in the 2021 IRC applies to decks built for 40-psf live loads and is similar to the tables in the previous codes (**Figure 1**). Now, with new tables for 50-psf, 60-psf, and 70-psf snow loads, deck builders in high snowfall regions around the Great Lakes, northern New England, and mountain areas can size beams without consulting an engineer or working through the engineering calculations themselves. The tables are numbered and titled successively: Table R507.5(2) "Maximum Deck Beam Span - 50 PSF Snow Load," and so on for 60-psf and 70-psf snow loads. As logic would reason, the increase in snow load results in shorter maximum deck beam spans in the corresponding table.

In this article, I'll use the 40-psf table for beam-sizing examples, but the same process would apply using the other three tables.

Maximum beam span. The maximum beam span lengths listed in the field of the beam table are controlled by three factors: the species of wood, the size of the beam (depth and number of plies), and the span of the deck joists. Though it may seem odd to factor in the joist span for deck beams, the joist span is a simple proxy for the tributary load that is borne by the beam. These factors become the rows and columns that feed into the field of the table where the beam span lengths are listed.

Effective joist span length. The major column, "Deck Joist Span," in the previous versions of the beam table was retitled "Effective Deck Joist Span Length" in the 2021 IRC. The change may seem minor, but the new title corresponds to a new table, R507.5(5) "Joist Span Factors for Calculating Effective Deck Joist Span" (**Figure 2**).

As in previous code versions, the beam span lengths listed in the field of the table are based on the joist span plus the maximum cantilever listed in Table R507.6 "Maximum Deck Joist Spans," which was the focus of my article, mentioned earlier, in the March issue.

When you size a beam directly from the joist spans listed on the table, the beam will support the maximum span of a given joist depth and the maximum joist cantilever allowed. But if your deck design has a flush rim beam without any cantilever, or if the cantilever is less

than the maximum allowed, then you can employ the new "joist span factors for calculating effective deck joist span" to right-size the beam for your deck design and span greater distances between posts.

Shown on pages 14 and 15 are three examples to demonstrate how the cantilever distance influences the beam span. To keep things simple, snow loads for these examples are less than 40 psf, so I'll use Table R507.5(1).

Navigating Table R507.5(5) "Joist Span Factors for Calculating Effective Deck Joist Span"

Table R507.5(5) (see again Figure 2) is the engine behind the effective deck joist span length. It's a workaround used in conjunction with the beam tables that adjusts for the lighter load a beam has on it when there is no joist cantilever or when a joist cantilever is shorter than the maximum allowed.

The left column of Table R507.5(5) is a series of fractions. The column is labeled "C/J," with C being the actual joist cantilever length and J being the actual joist span length.

The right-hand column lists joist span factors. These are the numbers you multiply the *actual* joist span by to determine the *effective* deck joist span length on the beam table. You'll notice that most of the joist span factors are numbers less than 1. So when you multiply the actual joist span length by a number less than 1, the resulting effective deck joist span length measurement will be shorter. When that measurement is applied to the beam table, it will result in a greater beam span than you get when you use the actual joist span length.

It'll make your head spin the first few times you use it. I found the trick is to avoid confusing the decimal values in the left and right columns.

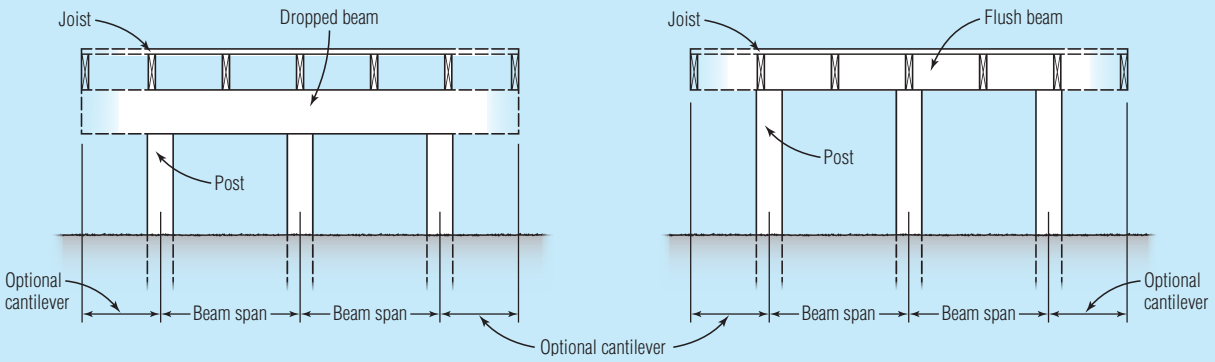
On page 12, you'll find an example of the steps involved in solving an "Effective Deck Joist Span Length" problem. The deck will be built with 2x10 SYP deck joists with a 14-foot span between the beam and ledger, and a 1-foot-1 1/2-inch cantilever (the fact that the joists are 2x10 SYP is irrelevant to the calculation) (**Figure 3**).

After determining the joist span factor and calculating the effective deck joist span length following step 1, refer to the beam span table to find the maximum beam span allowed. In this example, the effective joist span length is 10 feet 15/16 inches, which I rounded up to 10 feet 1 inch.

Unless you're lucky, the effective joist span calculated won't match one of the column lengths listed, in which case you have a few options. The simplest is to round up to the column with the next longer length, in this case from 10 feet 1 inch to 12 feet, then read the maximum deck beam span length associated with the beam size you're planning. For double 2x10 southern pine beams in this example, that measurement is 7 feet 4 inches, as shown (Option A in Figure 3).

Interpolation. If you want a more

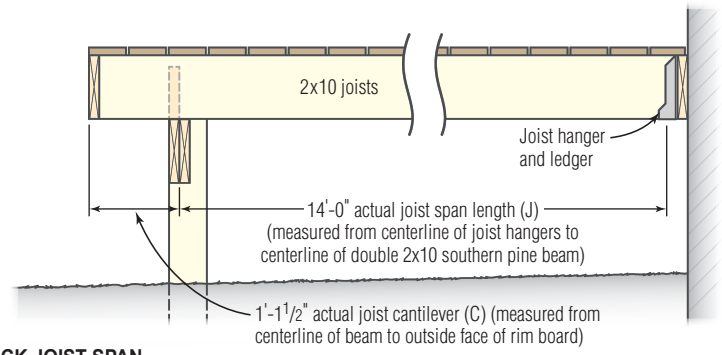
Don't Forget About the Allowable Beam Cantilever



Many deck builders don't realize that beams can cantilever beyond the end posts. The maximum cantilever distance is one-quarter of the beam span between the end post and its neighbor post. Beam span is measured between the centers of support columns or posts. For example, the maximum cantilever of a beam with an adjacent span of 8 feet 7 inches would be 8 feet 7 inches ÷ 4 = 2 feet 1 ¾ inches. The cantilever span is measured from the center of the post to the outside end. Sometimes, cantilevering the beam at the ends of a deck will allow you to eliminate a footing and post compared with installing footings at the ends of a beam.

Solving Effective Deck Joist Span Length Problem

Deck design calls for a deck with a 40 psf live load, 2x10 southern pine joists with an actual joist span length (J) of 14'-0" and a joist cantilever of 1'-1 1/2" (which is less than the maximum allowable.)



1a. Span factor. Determine joist span factor by dividing 1'-1 1/2" (C) by 14'-0" (J), which results in a value of 0.0804. In this case, the result doesn't match a value in column C/J, so round up to the next higher value, 1/12 (0.083), and read across the row to the joist span factor of 0.72.

TABLE R507.5(5)
JOIST SPAN FACTORS FOR CALCULATING EFFECTIVE DECK JOIST SPAN

C/J[a]	JOIST SPAN FACTOR
0 (no cantilever)	0.66
1/12 (0.083)	0.72
1/10 (0.10)	0.80
1/8 (0.125)	0.84
1/6 (0.167)	0.90
1/4 (0.250)	1.00

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1b. Span factor. Multiply the actual joist span (14'-0") by the joist span factor (0.72) and the result is the effective deck joist span length (10'-1").

2. Option A: Rounding up. The effective joist span 10'-1" falls between the 10' and 12' joist length columns on Table R507.5(1). Round the effective joist span (10'-1") up to the next longer joist span column (12') and beam span listed for a double 2x10 (7'-4").

TABLE R507.5(1)
MAXIMUM DECK BEAM SPAN—40 PSF LIVE LOAD[c]

BEAM SPECIES[d]	BEAM SIZE[e]	EFFECTIVE DECK JOIST SPAN LENGTH[a, i, j] (feet)					
		6	8	10	12	14	16
		MAXIMUM DECK BEAM SPAN LENGTH (feet-inches)[a, b, f]					
Southern pine	1 – 2 × 6	4-7	4-0	3-7	3-3	3-0	2-10
	1 – 2 × 8	5-11	5-1	4-7	4-2	3-10	3-7
	1 – 2 × 10	7-0	6-0	5-5	4-11	4-7	4-3
	1 – 2 × 12	8-3	7-1	6-4	5-10	5-5	5-0
	2 – 2 × 6	6-11	5-11	5-4	4-10	4-6	4-3
	2 – 2 × 8	8-9	7-7	6-9	6-2	5-9	5-4
	2 – 2 × 10	10-4	9-0	8-0	7-4	6-9	6-4
	2 – 2 × 12	12-2	10-7	9-5	8-7	8-0	7-5
	3 – 2 × 6	8-6	7-5	6-8	6-1	5-8	5-3

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2. Option B: Analog interpolation is a quick way to refine the beam span closer to what is needed for the effective joist span. Round the effective joist span (10'-1") up to the next foot length (11') which is halfway between the 10' and 12' joist span columns. Then split the beam length halfway between the spans listed (8'-0" and 7'-4"). The result is a beam span of 7'-8".

2. Option C: Calculated interpolation refines the beam span precisely to what is required for an effective joist span of 10'-1". In this case, the maximum beam span is 7'-11 11/16". See "Interpolation Formula," right.

Interpolation Formula

$$\text{Interpolated maximum beam span} = \text{Max. beam span, 12-foot column (7'-4")} + \left(\text{Next longer joist span column (12'-0")} - \text{Effective joist span (10'-1")}\right) \times \frac{\left(\text{Max. beam span, 10-foot column (8'-0")} - \text{Max. beam span, 12-foot column (7'-4")}\right)}{\left(\text{Next longer joist span column (12'-0")} - \text{Next shorter joist span column (10'-0")}\right)}$$

$$\text{Interpolated max. beam span} = 7'\text{-}4" + (12'\text{-}0" - 10'\text{-}1") \times \frac{(8'\text{-}0" - 7'\text{-}4")}{(12'\text{-}0" - 10'\text{-}0")}$$

$$7'\text{-}4" + (1'\text{-}11") \times \frac{(8")}{(24")} = 7'\text{-}4" + (1'\text{-}11") \times (.3333") = 7'\text{-}4" + 7\,11/16" = 7'\text{-}11\,11/16" \text{ interpolated max. beam span}$$

Figure 3. Sizing beams for a given length of deck joist is a multistep process. First, you must determine the effective joist span length following steps 1A and 1B above, and then refer to the appropriate section of Table R507.5 to round up (Option A), perform a quick analog interpolation (Option B), or mathematically calculate the interpolation (Option C) to find the maximum deck beam span.

precise measurement of the beam span, you can interpolate between deck-beam-span values that fall between the next lower and next higher columns associated with the effective deck joist span length you came up with. In this example, again, you would be using the 10- and 12-foot joist-span columns.

In cases where the effective joist span falls less than halfway between the 10-foot and 12-foot joist-span columns, you can perform an analog interpolation (Option B in Figure 3). This is a bit like rounding up, but rounding up to a column that could be in the table if it were graduated in 1-foot increments instead of 2-foot increments. An analog interpolation could even divide the values between the two joist-span columns by quarters rather than halves pretty easily.

In this example, the effective joist span (10 feet 1 inch) is rounded up to the next foot length (11 feet), which is halfway between the 10- and 12-foot joist-span columns. Then split the beam length halfway between the spans listed (8 feet 0 inches and 7 feet 4 inches). The result is a beam span of 7 feet 8 inches.

For the mathematically inclined, you can actually calculate the interpolated value following the formula in the example shown here (Option C in Figure 3). In this case, the calculated maximum beam span is 7 feet 11 $^{11}/_{16}$ inches.

As you can see, the difference between the estimated maximum beam span (7 feet 4 inches), the analog interpolation of the beam span (7 feet 8 inches), and the calculated interpolation of the beam span (7 feet 11 $^{11}/_{16}$ inches) isn't huge. But the ability to eke out a few extra inches of span (and to be able to explain to your inspector how you did it) could make a difference in your next project. ❖

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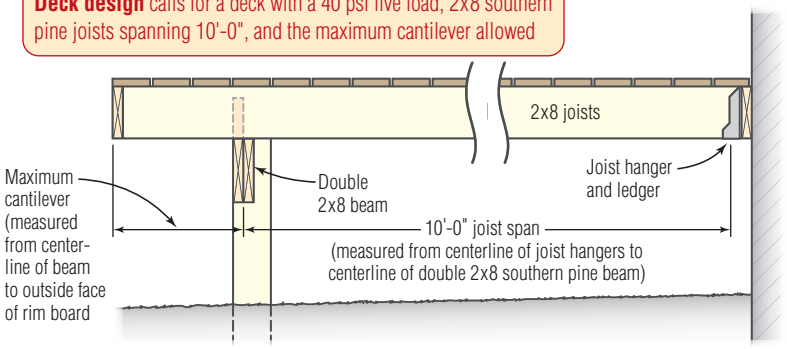
Example 1: Sizing Beam Spans For Decks With Maximum Joist Cantilevers

Deck design calls for a deck with a 40 psf live load, 2x8 southern pine joists spanning 10'-0", and the maximum cantilever allowed



1. Maximum joist cantilever. Locate on Table R507.6. Under 40 psf live load and southern pine, follow the 2x8 joist size row to the 10' column to find a 2'-6" cantilever.

TABLE R507.6 MAXIMUM DECK JOIST SPANS

LOAD[a] (psf)	JOIST SPECIES[b]	JOIST SIZE	ALLOWABLE JOIST SPAN[b, c] (feet-inches)			MAXIMUM CANTILEVER[d,f] (feet-inches)							
			Joist spacing (inches)			Joist back span[g] (feet)							
			12	16	24	4	6	8	10	12	14	16	18
40 live load	Southern pine	2 × 6	9-11	9-0	7-7	1-0	1-6	1-5	NP	NP	NP	NP	NP
		2 × 8	13-1	11-10	9-8	1-0	1-6	2-0	2-6	2-3	NP	NP	NP
		2 × 10	16-2	14-0	11-5	1-0	1-6	2-0	2-6	3-0	3-4	3-4	NP
		2 × 12	18-0	16-6	13-6	1-0	1-6	2-0	2-6	3-0	3-6	4-0	4-1
	Douglas fir-larch[e]	2 × 6	9-6	8-4	6-10	1-0	1-6	1-4	NP	NP	NP	NP	NP
		2 × 8	12-6	11-1	9-1	1-0	1-6	2-0	2-3	2-0	NP	NP	NP

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2. Maximum beam span. Locate the maximum deck beam span length on Table R507.5(1). Under southern pine, follow the double 2x8 beam row to the 10' column to find the maximum span for the beam between posts is 6'-9".

TABLE R507.5(1)
MAXIMUM DECK BEAM SPAN—40 PSF LIVE LOAD[c]

BEAM SPECIES[d]	BEAM SIZE[e]	EFFECTIVE DECK JOIST SPAN LENGTH[a, i, j] (feet)						
		6	8	10	12	14	16	18
		MAXIMUM DECK BEAM SPAN LENGTH (feet-inches)[a, b, f]						
Southern pine	1 – 2 × 6	4-7	4-0	3-7	3-3	3-0	2-10	2-8
	1 – 2 × 8	5-11	5-1	4-7	4-2	3-10	3-7	3-5
	1 – 2 × 10	7-0	6-0	5-5	4-11	4-7	4-3	4-0
	1 – 2 × 12	8-3	7-1	6-4	5-10	5-5	5-0	4-9
	2 – 2 × 6	6-11	5-11	5-4	4-10	4-6	4-3	4-0
	2 – 2 × 8	8-9	7-7	6-9	6-2	5-9	5-4	5-0
	2 – 2 × 10	10-4	9-0	8-0	7-4	6-9	6-4	6-0
	2 – 2 × 12	12-2	10-7	9-5	8-7	8-0	7-5	7-0
	3 – 2 × 6	8-6	7-5	6-8	6-1	5-8	5-3	4-11

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Figure 4. When taking advantage of the maximum allowed cantilever for a given joist size, you can size the beam directly from the beam-sizing table without any adjustment. First, refer to Table R507.6 to find the maximum cantilever for your beam. Then look across the appropriate beam row to the "Effective Deck Joist Span Length" column to find the maximum beam span for your chosen joist span. In the example above, 2x8 joists spanning 10 feet with an additional 2-foot-6-inch cantilever would require a double 2x8 beam with a maximum span of 6 feet 9 inches between posts.

Example 2: Sizing Beam Spans for Decks Without Joist Cantilevers

Deck design calls for a deck with a 40 psf live load, 2x8 southern pine joists with an actual joist span length (J) of 10'-0", and no cantilever

1. Span factor. On Table R507.5(5), see that "0 (no cantilever)" has a joist span factor of 0.66. Multiply the actual joist span length (10'-0") by the joist span factor (0.66) to find the effective deck joist span length: 10'-0" x 0.66 = 6'-7 3/16".

2. Rounding up. The effective joist span 6'-7 3/16" falls between the 6' and 8' joist span length columns on Table R507.5(1). Round the effective joist span (6'-7 3/16") up to the next longer joist span column (8') and beam span listed for a double 2x8 (7'-7"). To fine-tune effective deck joist span length further, analog interpolate or do a full interpolation calculation as shown on page 12.

TABLE R507.5(5)
JOIST SPAN FACTORS FOR CALCULATING EFFECTIVE DECK JOIST SPAN

C/J[a]	JOIST SPAN FACTOR
0 (no cantilever)	0.66
1/12 (0.083)	0.72
1/10 (0.10)	0.80
1/8 (0.125)	0.84
1/6 (0.167)	0.90
1/4 (0.250)	1.00

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TABLE R507.5(1)
MAXIMUM DECK BEAM SPAN—40 PSF LIVE LOAD[c]

BEAM SPECIES[d]	BEAM SIZE[e]	EFFECTIVE DECK JOIST SPAN LENGTH[a, i, j] (feet)					
		6	8	10	12	14	16
		MAXIMUM DECK BEAM SPAN LENGTH (feet-inches)[a, b, f]					
Southern pine	1 – 2 × 6	4-7	4-0	3-7	3-3	3-0	2-10
	1 – 2 × 8	5-11	5-1	4-7	4-2	3-10	3-7
	1 – 2 × 10	7-0	6-0	5-5	4-11	4-7	4-3
	1 – 2 × 12	8-3	7-1	6-4	5-10	5-5	5-0
	2 – 2 × 6	6-11	5-11	5-4	4-10	4-6	4-3
	2 – 2 × 8	8-9	7-7	6-9	6-2	5-9	5-4
	2 – 2 × 10	10-4	9-0	8-0	7-4	6-9	6-4
	2 – 2 × 12	12-2	10-7	9-5	8-7	8-0	7-5
	3 – 2 × 6	8-6	7-5	6-8	6-1	5-8	5-3

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Example 3: Sizing Beam Spans for Decks With Shorter Than Maximum Joist Cantilevers

Deck design calls for a deck with a 40 psf live load, 2x8 southern pine joists with an actual joist span length (J) of 10'-0", and an actual joist cantilever shorter than the allowable maximum (9")

1. Span factor. Determine joist span factor by dividing 9" (C) by 10'-0" (J), which results in a factor of 0.075 (9" ÷ 10'-0" = 0.075). In this case, the result doesn't match a value in column C/J in Table R507.5(5), so round up to the next higher value, "1/12 (0.083)" row and read across to the joist span factor of 0.72. Multiply the actual joist span (10'-0") by the joist span factor (0.72) and the result is the effective deck joist span length (10'-0" x 0.72 = 7'-2 3/8").

2. Rounding up. The effective joist span 7'-2 3/8" falls between the 6' and 8' joist span length columns on Table R507.5(1). Round the effective joist span (7'-2 3/8") up to the next longer joist span column (8') and beam span listed for a double 2x8 (7'-7"). To finetune effective deck joist span length further, analog interpolate or do a full interpolation calculation as shown on page 12.

TABLE R507.5(5)
JOIST SPAN FACTORS FOR CALCULATING EFFECTIVE DECK JOIST SPAN

C/J[a]	JOIST SPAN FACTOR
0 (no cantilever)	0.66
1/12 (0.083)	0.72
1/10 (0.10)	0.80
1/8 (0.125)	0.84
1/6 (0.167)	0.90
1/4 (0.250)	1.00

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TABLE R507.5(1)
MAXIMUM DECK BEAM SPAN—40 PSF LIVE LOAD[c]

BEAM SPECIES[d]	BEAM SIZE[e]	EFFECTIVE DECK JOIST SPAN LENGTH[a, i, j] (feet)					
		6	8	10	12	14	16
		MAXIMUM DECK BEAM SPAN LENGTH (feet-inches)[a, b, f]					
Southern pine	1 – 2 × 6	4-7	4-0	3-7	3-3	3-0	2-10
	1 – 2 × 8	5-11	5-1	4-7	4-2	3-10	3-7
	1 – 2 × 10	7-0	6-0	5-5	4-11	4-7	4-3
	1 – 2 × 12	8-3	7-1	6-4	5-10	5-5	5-0
	2 – 2 × 6	6-11	5-11	5-4	4-10	4-6	4-3
	2 – 2 × 8	8-9	7-7	6-9	6-2	5-9	5-4
	2 – 2 × 10	10-4	9-0	8-0	7-4	6-9	6-4
	2 – 2 × 12	12-2	10-7	9-5	8-7	8-0	7-5
	3 – 2 × 6	8-6	7-5	6-8	6-1	5-8	5-3

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Figure 5. When there is no joist cantilever (Example 2), multiply the actual joist span (10 feet) by the joist span factor (0.66) from Table R507.5(5) to find the effective deck joist span length (6 feet 7 3/16 inches). On Table R507.5(1), this length falls between the 6- and 8-foot joist-span columns, so you'll need to round up to the 8-foot column, do a quick analog interpolation, or calculate the interpolation (as explained in Figure 3). When there is less than a maximum cantilever, divide the actual joist cantilever by the actual joist span, then refer to Table R507.5(5) to find the appropriate joist span factor to apply, as shown in Example 3. The effective deck joist span length can then be used to determine the beam span as described.