CITY OF BATH, MAINE

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DECKS

Below are requirements from the International Residential Code for building decks.

Be aware that the current code requires that beams must be supported by the posts they sit on, and cannot be bolted, lagged, nailed, or screwed to the side of the post unless the design is stamped by an architect or engineer, or are fastened using ICC approved hardware.

Be aware that **posts have to set on manufactured fittings**, and have to be fastened to the footing to provide lateral restraint.

Be aware that carriage bolts are no longer acceptable for fastening structural members together. All bolted connections require hex head bolts, nuts, and washers.

Be aware that if you want to screw the ledger to the house instead of using the bolting/lagging method prescribed in the Code, it has to be done per the fastener manufacturer's instructions, that specify the size, number, and spacing of the screws to be deemed equivalent to the fastening specified in section R 507.2.3. The fastener manufacturer's website has tables that give the specs.

Deck beams must be sized end constructed per section 507.6. Note the bearing requirement in R 507.7. Joists and beams must bear on at least 1.5" of wood or metal. Nailing or screwing joist ends to the header or band sill is not adequate by itself.

The code requirements below will help you build the deck once, correctly.

R507.1 Decks. Wood-framed decks shall be in accordance with this section or Section R301 for materials and conditions not prescribed herein. Where supported by attachment to an exterior wall, decks shall be positively anchored to the primary structure and designed for both vertical and lateral loads.

Such attachment shall not be accomplished by the use of toenails or nails subject to withdrawal. Where positive connection to the primary building structure cannot be verified during inspection, decks shall be self-supporting. For decks with cantilevered framing members connections to exterior walls or other framing members shall be designed and constructed to resist uplift resulting from the full live load specified in Table R30 1.5 acting on the cantilevered portion of the deck.

R507.2 Deck ledger connection to band joist. Deck ledger connections to band joists shall be in accordance with this section, Tables R507.2 and R507.2.1, and Figures R507.2.1(I) and R507.2. 1(2). For other grades, species, connection details and loading conditions, deck ledger connections shall be designed in accordance with Section R301.

R507.2.1 Ledger details. Deck ledgers installed in accordance with Section R507.2 shall be a minimum 2-inch by 8-inch (51 nun by 203 mm) nominal, pressure-preservative-treated southern pine, incised pressure-preservative-treated Hem-fir, or approved, naturally durable, No. 2 grade or better lumber. Deck ledgers installed in accordance with Section R507.2 shall not support concentrated loads from beams or girders. Deck ledgers shall not be supported on stone or masonry veneer.

R507.2.2 Band joist details. Band joists attached by a ledger in accordance with Section R507.2 shall be a minimum 2-inch-nominal (51 mm), solid-sawn, spruce-pine-fir lumber or a minimum 1-inch by 9 1/2-inch (25 nun x 241 mm) dimensional, Douglas fir, laminated veneer lumber. Band joists attached by a ledger in accordance with Section R507.2 shall be fully supported by a wall or sill plate below.

R507.2.3 Ledger to band joist fastener details. Fasteners used in deck ledger connections in accordance with Table R507.2 shall be hot-dipped galvanized or stainless steel and shall be installed in accordance with Table R507.2.I and Figures R507.2.I(I) and R507.2.I(2).

R507.2.4 Deck lateral load connection. The lateral load connection required by Section R507. 1 shall be permitted to be in accordance with Figure R507.2.3(I) or R507.2.3(2). Where the lateral load connection is provided in accordance with Figure R507.2.3(I), hold-down tension devices shall be installed in not less than two locations per deck, within 24 inches of each end of the deck. Each device shall have an allowable stress design capacity of not less than 1,500 pounds (6672 N). Where the lateral load connections are provided in accordance with Figure R507.2.3(2), the hold-down tension devices shall be installed in not less than four locations per deck, and each device shall have an allowable stress design capacity of not less than four locations per deck, and each device shall have an allowable stress design capacity of not less than 750 pounds (3336 N).

TABLE R507.2
DECK LEDGER CONNECTION TO BAND JOIST'
(Deck live load = 40 psf, deck dead load = 10 psf, snow load ≤ 40 psf)

		JOIST SPAN								
Connection details	6' and less	6'1" to 8'	8'1" to 10'	10'1" to 12'	12'1" to 14'	14'1" to 16'	16'1" to 18'			
		On-center spacing of fasteners ^{d, e}								
¹ / ₂ inch diameter lag screw with ¹ / ₂ inch maximum sheathing ^{c, d}	30	23	18	15	13	11	10			
¹ / ₂ inch diameter bolt with ¹ / ₂ inch maximum sheathing ^d	36	36	34	29	24	21	19			
¹ /₂ inch diameter bolt with 1 inch maximum sheathing ^e	36	36	29	24	21	18	16			

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

- a. Ledgers shall be flashed in accordance with Section R703.4 to prevent water from contacting the house band joist.
- b. Snow load shall not be assumed to act concurrently with live load.
- c. The tip of the lag screw shall fully extend beyond the inside face of the band joist.
- d. Sheathing shall be wood structural panel or solid sawn lumber.
- e. Sheathing shall be permitted to be wood structural panel, gypsum board, fiberboard, lumber or foam sheathing. Up to 1/2-inch thickness of stacked washers shall be permitted to substitute for up to 1/2 inch of allowable sheathing thickness where combined with wood structural panel or lumber sheathing.

TABLE R507.2.1 PLACEMENT OF LAG SCREWS AND BOLTS IN DECK LEDGERS AND BAND JOISTS

MINIMUM END AND EDGE DISTANCES AND SPACING BETWEEN ROWS								
	TOP EDGE BOTTOM EDGE ENDS ROW SPACING							
Ledger ^a	2 inches ^d	3/4 inch	2 inches ^b	1 5/8 inches ^b				
Band Joist ^c	3/4	2 inches	2 inches ^b	1 5/8 inches ^b				

For SI: 1 inch = 25.4 mm.

- a. Lag screws or bolts shall be staggered from the top to the bottom along the horizontal run of the deck ledger in accordance with Figure R507.2.1 (I).
- b. Maximum 5 inches.
- c. For engineered rim joists. the manufacturer's recommendations shall govern.

d. The minimum distance from bottom row of lag screws or bolts to the top edge of the ledger shall be in accordance with Figure R507.2.I(I).



FIGURE R507.2.1(2) PLACEMENT OF LAG SCREWS AND BOLTS IN BAND JOISTS



For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

FIGURE R507.2.3(2) DECK ATTACHMENT FOR LATERAL LOADS

R507.3 Plastic composite deck boards, stair treads, guards, or handrails. Plastic composite exterior deck boards, stair treads, guards and handrails shall comply with the requirements of ASTM D 7032 and the requirements of Section 507.3.

R507.3.1 Labeling. Plastic composite deck boards and stair treads, or their packaging, shall bear a label that indicates compliance to ASTM D 7032 and includes the allowable load and maximum allowable span determined in accordance with ASTM D 7032. Plastic or composite handrails and guards, or their packaging, shall bear a label that indicates compliance to ASTM D 7032 and includes the allowable span determined in accordance with ASTM D 7032.

R507.3.2 Flame spread index. Plastic composite deck boards, stair treads, guards, and handrails shall exhibit a flame spread index not exceeding 200 when tested in accordance with ASTM E 84 or UL 723 with the test specimen remaining in place during testing.

Exception: Plastic composites determined to be non-combustible.

R507.3.3 Decay resistance. Plastic composite deck boards, stair treads, guards, and handrails containing wood, cellulosic or other biodegradable materials shall be decay resistant in accordance with ASTM D 7032.

R507.3.4 Termite resistance. Where required by Section 318, Plastic composite deck boards, stair treads, guards, and handrails containing wood, cellulosic or other biodegradable materials shall be termite resistant in accordance with ASTM D 7032

R507.3.5 Installation of plastic composites. Plastic composite deck boards, stair treads, guards, and handrails shall be installed in accordance with this code and the manufacturer's instructions.

R507.4 Decking. Maximum allowable spacing for joists supporting decking shall be in accordance with Table R507.4. Wood decking shall be attached to each supporting member with not less than (2) 8d threaded nails or (2) No. 8 wood screws.

R507.5. Deck joists. Maximum allowable spans for wood deck joists, as shown in Figure R507.5, shall be in accordance with Table R507.6. Deck joists shall be permitted to cantilever not greater than one-fourth of the actual, adjacent joist span.

R507.5.1 Lateral restraint at supports. Joist ends and bearing locations shall be provided with lateral restraint to prevent rotation. Where lateral restraint is provided by joist hangers or blocking between joists, their depth shall equal not less than 60 percent of the joist depth. Where lateral restraint is provided by rim joists, they shall be secured to the end of each joist with not less than (3) 10d (3-inch x 0.128-inch) nails or (3) No. 10 x 3-inch (76mm) long wood screws.

MATERIAL TYPE AND	MAXIMUM ON-CENTER JOIST SPACING						
NORMAL SIZE	Perpendicular to joist	Diagonal to joist ^a					
1 ¼ inch thick wood	16 inches	12 inches					
2 inch thick wood	24 inches	16 inches					
Plastic composite	In accordance with Section R507.3	In accordance with Section R507.3					

TABLE R507.4 MAXIMUM JOIST SPACING

For 51: 1 inch = 25.4 mm, 1 foot = 304.8 mm, I degree 0.01745 rad.

a. Maximum angle of 45 degrees from perpendicular for wood deck boards

	DEAM	EFFECTIVE DECK JOIST SPAN LENGTH (feet)						
BEAM SPECIES ^d	BEAN	6	8	10	12	14	16	18
	SIZE	MA	XIMUM DE	CK BEAN	I SPAN LE	NGTH (fee	et-inches) ^a	a, b, f
	1 – 2 x 6	4-6	3-11	3-6	3-2	2-11	2-9	2-7
	1 – 2 x 8	5-9	4-11	4-5	4-0	3-9	3-6	3-3
	1 – 2 x 10	6-9	5-10	5-3	4-9	4-5	4-2	3-11
	1 – 2 x 12	8-0	6-11	6-2	5-8	5-3	4-11	4-7
	2 - 2 x 6	6-8	5-9	5-2	4-9	4-4	4-1	3-10
Southorn ning	2 - 2 x 8	8-6	7-4	6-7	6-0	5-7	5-2	4-11
Southern pine	2 - 2 x 10	10-1	8-9	7-10	7-1	6-7	6-2	5-10
	2 - 2 x 12	11-11	10-3	9-2	8-5	7-9	7-3	6-10
	3 – 2 x 6	7-11	7-2	6-6	5-11	5-6	5-1	4-10
	3 – 2 x 8	10-5	9-3	8-3	7-6	6-11	6-6	6-2
	3 – 2 x 10	12-8	10-11	9-9	8-11	8-3	7-9	7-3
	3 – 2 x 12	14-11	12-11	11-6	10-6	9-9	9-1	8-7
	1 – 2 x 6	4-0	3-5	2-11	2-7	2-4	2-2	2-0
	1 – 2 x 8	5-4	4-7	3-11	3-5	3-1	2-10	2-8
	1 – 2 x 10	6-7	5-8	4-11	4-5	4-0	3-8	3-5
	1 – 2 x 12	7-7	6-7	5-11	5-4	4-10	4-6	4-2
Develop for levels	2 - 2 x 6	6-0	5-2	4-7	4-2	3-10	3-5	3-2
Douglas fir-larch ⁹ ,	2 - 2 x 8	8-0	6-11	6-2	5-8	5-0	4-7	4-2
	2 - 2 x 10	9-9	8-5	7-7	6-11	6-4	5-10	5-4
Spruce-pine-fir ⁹	2 - 2 x 12	11-4	9-10	8-9	8-0	7-5	6-11	6-6
	3 - 2 x 6	7-6	6-6	5-9	5-3	4-11	4-7	4-4
	3 - 2 x 8	10-0	8-8	7-9	7-1	6-6	6-1	5-8
	3 - 2 x 10	12-3	010-7	9-6	8-8	8-0	7-6	7-0
	3 - 2 x 12	14-3	12-4	11-0	10-1	9-4	8-9	8-3
	1 – 2 x 6	4-1	3-6	3-0	2-8	2-5	2-3	2-1
	1 – 2 x 8	5-2	4-6	4-0	3-6	3-2	2-11	2-9
	1 – 2 x 10	6-4	5-6	4-11	4-6	4-1	3-9	3-6
	1 – 2 x 12	7-4	6-4	5-8	5-2	4-10	4-6	4-3
Redwood,	2 - 2 x 6	6-1	5-3	4-8	4-4	3-11	3-6	3-3
Western cedars,	2 - 2 x 8	7-8	6-8	5-11	5-5	5-0	4-8	4-3
Ponderosa pine ^e ,	2 - 2 x 10	9-5	8-2	7-3	6-8	6-2	5-9	5-5
Red pine ^e	2 - 2 x 12	10-11	9-5	8-5	7-8	7-2	6-8	6-3
	3 – 2 x 6	7-1	6-5	5-11	5-5	5-0	4-8	4-5
	3 – 2 x 8	9-4	8-4	7-5	6-10	6-4	5-11	5-7
	3 – 2 x 10	11-9	10-2	9-1	8-4	7-8	7-2	6-9
	3 – 2 x 12	13-8	11-10	10-7	9-8	8-11	8-4	7-10

TABLE R507.5(2) MAXIMUM DECK BEAM SPAN - 50 PSF GROUND SNOW LOAD^c

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

- a. Interpolation allowed. Extrapolation is not allowed.
- b. Beams supporting a single span of joist with or without cantilever.
- c. Dead load = 10 psf, $L\Delta$ = 360 at main span, $L\Delta$ = 180 at cantilever. Snow load not assumed to be concurrent with the live load.
- 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 joist span, the actual joist span length shall be multiplied by the joist span factor in accordance with Table R507.5(5).

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 (0.87)	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 use with note j in table R507.5(2)]

For SI: 1 foot = 304.8 mm

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



FIGURE R507.5 TYPICAL DECK JOIST SPANS

R507.6 Deck Beams. Maximum allowable spans for wood deck beams, as shown in Figure R507.6, shall be in accordance with Table R507.5(2). Beam plies shall be fastened with two rows of 10d (3-inch X 0.128-inch) nails minimum at 16 (406 mm) on center along each edge. Beams shall be permitted to cantilever at each end up to one-fourth of the actual beam span. Splices of multispan beams shall be located at interior post locations.

LOAD ^a	DAD ^a JOIST JOIST			ALLOWABLE JOIST SPAN ^{b, c} (feet-inches)				MAXIMUM CANTILEVER ^{d, f} (feet-inches)						
(psf)	SPECIES ^b	SIZE	joist	span (in	ches)			jo	ist bae (fe	ck spa et)	n ^g			
			12	16	24	4	6	8	10	12	14	16	18	
		2 x 6	9-2	8-4	7-4	1-0	1-6	1-5	NP	NP	NP	NP	NP	
		2 x 8	12-1	11-0	9-5	1-0	1-6	2-0	2-5	2-3	NP	NP	NP	
50	Southern pine	2 x 10	15-5	13-9	11-3	1-0	1-6	2-0	2-6	3-0	3-1	NP	NP	
ground		2 x 12	18-0	16-2	13-2	1-0	1-6	2-0	2-6	3-0	3-6	3-10	3-10	
snow		2 x 6	8-10	8-0	6-8	1-0	1-6	1-4	NP	NP	NP	NP	NP	
ioau	Douglas fir-larch ^e	2 x 8	11-7	10-7	8-11	1-0	1-6	2-0	2-3	NP	NP	NP	NP	
	Spruce-pine-fir ^e	2 x 10	14-10	13-3	10-10	1-0	1-6	2-0	2-6	3-0	3-0	NP	NP	
		2 x 12	17-9	15-5	12-7	1-0	1-6	2-0	2-6	3-0	3-6	3-8	NP	

TABLE R507.6 MAXIMUM DECK JOIST SPANS

Redwood	2 x 6	8-3	7-6	6-6	1-0	1-4	1-1	NP	NP	NP	NP	NP
Western cedar ^f	2 x 8	10-10	9-10	8-6	1-0	1-6	2-0	1-11	NP	NP	NP	NP
Poderosa pine ^f	2 x 10	13-10	12-7	10-5	1-0	1-6	2-0	2-6	2-9	NP	NP	NP
Red pille	2 x 12	16-10	14-9	12-1	1-0	1-6	2-0	2-6	3-0	3-5	3-5	NP

TABLE R507.6 MAXIMUM DECK JOIST SPANS (continued)

For SI: 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, I pound = 0.454 kg. NP = Not Permitted

- a. Dead load = 10 psf. Snow load not assumed to be concurrent with live load.
- b. No. 2 grade, wet service factor included.
- c. $L\Delta = 360$ at main span.
- d. $L\Delta$ = 180 at cantilever with a 220-pound point load applied at the end.
- e. Includes incising factor.
- f. Incising factor not included.
- g. Interpolation allowed. Extrapolation is not allowed.





R507.7 Deck joist and deck beam bearing. The ends of joist and beam shall have not less than 1 ½ inches (38 mm) of bearing on wood or metal and not less than 3 inches (76 mm) on concrete or masonry for the entire width of the beam. Joist framing into the side of a ledger board or beam shall be supported by approved joist hangers. Joists bearing on a beam shall be connected to the beam to resist lateral displacement.

R507.7.1 Deck post to deck beam. Deck beams shall be attached to deck posts in accordance with Figure R507.7.1 or by other equivalent means capable to resist lateral displacement. Manufactured post-to-beam connectors shall be sized for the post and beam sizes. All bolts shall have washers under the head and nut.

Exception: Where deck beams bear directly on footings in accordance with Section R507.8.1.



For SI: 1 inch = 25.4 mm.

FIGURE R507.7.1 DECK BEAM TO DECK POST

R507.8 Deck posts. For single-level wood-framed decks with beams sized in accordance with Table R507.6, deck post size shall be in accordance with Table R507.8.

TABLE R507.8 DECK POST HEIGHT ^a							
DECK POST SIZE MAXIMUM HEIGHT ^a							
4 x 4	8'						
4 x 6	8'						
6 x 6	14'						

For SI: 1 foot 304.8 mm.

a. Measured to the underside of the beam

R507.8.1 Deck post to deck footing. Posts shall bear on footings in accordance with Section R403 and Figure R507.8.1. Posts shall be restrained to prevent lateral displacement at the bottom support. Such lateral restraint shall be provided by manufactured connectors installed in accordance with Section R507 and the manufacturers' instructions or a minimum post embedment of 12 inches (305 mm) in surrounding soils or concrete piers.



FIGURE R507.8.1 TYPICAL DECK POSTS TO DECK FOOTINGS

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