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Exterior Deck Construction Based on the 2015 Michigan Residential Code

The following information is provided as a guideline for the construction of residential decks for compliance with the 2015 Michigan Residential Code.

The spans listed in the charts below are for decks constructed to the residential code requirements of a 40 pound per square foot live load and a 10 pound per square foot dead load. When constructed following these guidelines, your deck should meet the Michigan Residential Code minimum load requirements for decks. Decks being constructed to support Hot Tubs will need to be adequately constructed to support not only the normal deck loads, but also the tub and the water in it. Balconies are required to be constructed for a 40 pound live load, so the spans shown in this information can not be used for a hot tub deck or balcony construction. Cantilevered decks and/or balconies have additional requirements that may not be covered in this handout. Deck footings and framing that also supports roof load will require additional review to verify that the construction will be capable of supporting deck and roof loads.

Footings: Footing size will vary depending on the size of the deck, and the amount of load placed on each footing pad. Minimum footing depth, in most cases, is required to be down to frost depth, which is 42", and the concrete footing pad must be at least 8" thick. Footings for decks may be poured concrete or precast footings, but must be adequately sized for the loads placed on the footings. Self supporting decks, not attached to the building, are exempt from frost protection requirements.

Beams & Posts: Beam and post sizes will vary, depending on the post spacing, the joist spans, and the type and grade of material used. See the information below for beam and post size information.

Joists: Deck joist size and spacing also vary, depending on the size of the deck. Deck joist spacing may also be determined by the deck surface materials. The manufacturers of some deck materials, such as composite decking, have maximum spans for their materials. Others have recommended maximum spacing for deck joists. Spacing joists further than the recommended spacing will result in a deck surface that will have a lot of up and down movement in it. If the deck joists are not supported from underneath by a support beam, joist hangers are required at the ends of the joists. Joist hangers adequately sized for the deck joists must be used and fastened as per the hanger manufacturer's specifications. See the joist span table for further information.

Stairs & Guardrails: Stairs constructed as part of the deck system are required to meet building code requirements for rise, run and stair width, as well as guardrail and handrail requirements. The maximum rise allowed in a set of residential stairs is 8.25", with all risers required to be equal in height. The minimum tread run is 9", measured from rise to rise with a 1" nosing added for a minimum tread depth of 10". Stairs are required to have a minimum width of 36". Guardrails are required on decks and stairs where the walking surface of the deck or stairs exceeds 30" from the finish grade below. The minimum guardrail height is 36", measured vertically from the walking surface of the deck, or on stairs, 34", measured vertically from the nose of the treads. If stairs are constructed with open risers, the vertical opening between treads may not exceed 4". Graspable handrails are required on all stairs with 4 or more risers. For further information on guard and handrails, contact the building dept.

Fastening of materials: The building code requires that all fasteners used in pressure treated materials be either galvanized, stainless steel or other approved materials. This includes nails, screws and bolts. Joist hangers are required on all deck joists that are not supported from underneath by a beam or ledger board. Joist hangers are required to be of an approved type for use with preservative treated material. Deck beams are required to be secured to the posts by bolting. The same is true for the band joist at the deck/wall connection. Table R507.2.1 provides the maximum spacing requirements for minimum ½ inch diameter lag or thru bolts. If the beam is supported from underneath by the posts, then adequate mechanical fasteners, or gusset plates, need to be provided, to ensure that the posts and beams are properly connected together.

Flashing: Code compliant flashing is required at deck/wall intersections. Aluminum, copper or galvanized flashing are the most common materials used at this intersection. The flashing must lap over the band joist, attached to the wall, and then extend up the wall, behind the siding to prevent moisture from entering behind the band joist. Housewrap or other siding underlayment materials, should overlap the flashing material, to shed any moisture out over the flashing. Flashing material, too, must be of a type that will not corrode when in contact with preservative treated material.

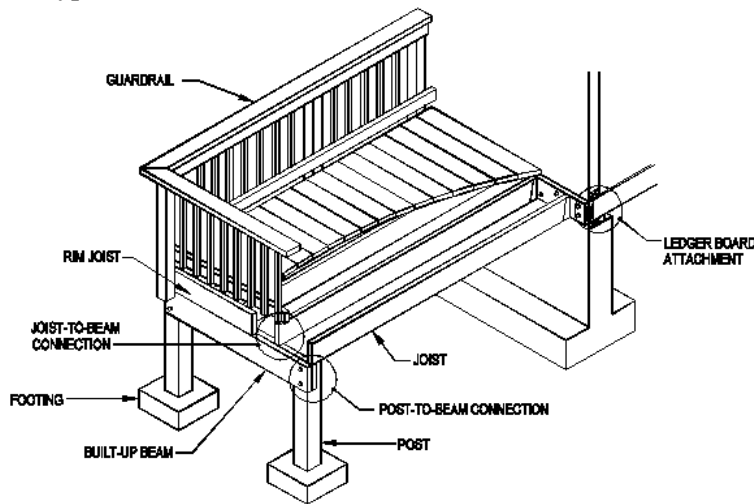
TABLE R507.5
DECK JOIST SPANS FOR COMMON LUMBER SPECIES^f (ft. - in.)

SPECIES ^a	SIZE	SPACING OF DECK JOISTS WITH NO CANTILEVER ^b (inches)			SPACING OF DECK JOISTS WITH CANTILEVERS ^c (inches)		
		12	16	24	12	16	24
Southern pine	2 × 6	9-11	9-0	7-7	6-8	6-8	6-8
	2 × 8	13-1	11-10	9-8	10-1	10-1	9-8
	2 × 10	16-2	14-0	11-5	14-6	14-0	11-5
	2 × 12	18-0	16-6	13-6	18-0	16-6	13-6
Douglas fir-larch ^d , hem-fir ^d , spruce-pine-fir ^d	2 × 6	9-6	8-8	7-2	6-3	6-3	6-3
	2 × 8	12-6	11-1	9-1	9-5	9-5	9-1
	2 × 10	15-8	13-7	11-1	13-7	13-7	11-1
	2 × 12	18-0	15-9	12-10	18-0	15-9	12-10
Redwood, western cedars, ponderosa pine ^e , red pine ^e	2 × 6	8-10	8-0	7-0	5-7	5-7	5-7
	2 × 8	11-8	10-7	8-8	8-6	8-6	8-6
	2 × 10	14-11	13-0	10-7	12-3	12-3	10-7
	2 × 12	17-5	15-1	12-4	16-5	15-1	12-4

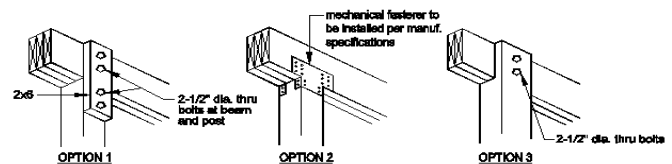
For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa, 1 pound = 0.454 kg.

- a. No. 2 grade with wet service factor.
- b. Ground snow load, live load = 40 psf, dead load = 10 psf, $L/\Delta = 360$.
- c. Ground snow load, live load = 40 psf, dead load = 10 psf, $L/\Delta = 360$ at main span, $L/\Delta = 180$ at cantilever with a 220-pound point load applied to end.
- d. Includes incising factor.
- e. Northern species with no incising factor
- f. Cantilevered spans not exceeding the nominal depth of the joist are permitted.

Typical Deck Construction



Typical Post / Beam Connections



Minimum Post Sizes

Many variables come into play when determining minimum post size. Post spacing, deck load and beam size can all play a part in what size posts may be required for a deck. Typically, decks up to 6 feet high, measured from the finish grade to

the deck surface, can be supported from 4"x4" posts, as long as the posts do not exceed 6' on center spacing and adequately sized and spaced beams are provided to support the deck. For decks up to 8 feet high from grade, with post spacing up to 8 feet on center, 4"x6" posts will typically be sufficient when adequately sized and spaced beams have been provided. For decks higher than 8 feet and post spacing exceeding 8 feet on center 6"x6" posts or larger may be required. As with any load being supported, the more load you have and the higher the load is from the ground, the larger the posts supporting that load need to be. If in doubt about post size, contact the building dept. for further information.

TABLE R507.8
DECK POST HEIGHT^a

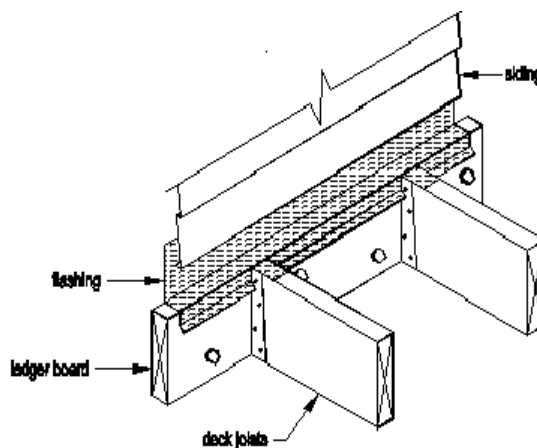
DECK POST SIZE	MAXIMUM HEIGHT ^a
4 × 4	8'
4 × 6	8'
6 × 6	14'

TABLE R507.2 FASTENER SPACING FOR A SOUTHERN PINE OR HEM-FIR DECK LEDGER AND A 2 INCH NOMINAL SOLID-SAWN SPRUCE-PINE-FIR BAND JOIST^{c, f, g} (Deck live load = 40 psf, deck dead load = 10 psf)

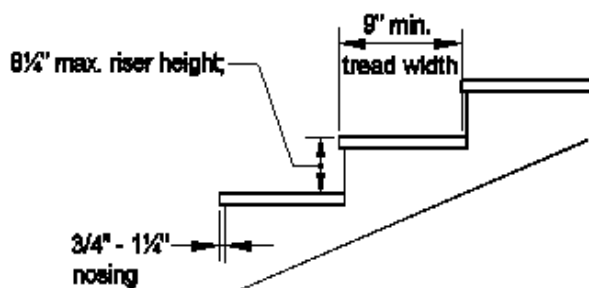
JOIST SPAN	6' and less	6'1" to 8'	8'1" to 10'	10'1" to 12'	12'1" to 14'	14'1" to 16'	16'1" to 18'
Connection details	On-center spacing of fasteners ^{d, e}						
1/2 inch diameter lag screw with 15/32 inch maximum sheathing ^a	30	23	18	15	13	11	10
1/2 inch diameter bolt with 15/32 inch maximum sheathing	36	36	34	29	24	21	19
1/2 inch diameter bolt with 15/32 inch maximum sheathing and 1/2 inch stacked washers ^{b, h}	36	36	29	24	21	18	16

Typical Deck Flashing Detail

As per the diagram shown, the flashing needs to be installed behind the siding, lapped over the top of the ledger or band board, so that all moisture is shed out over the front of the ledger or band board.



Typical Stair Detail



Stairs are required to have equal height risers for the entire length of the stair run. Riser height may not exceed 8.25 inches. The minimum run allowed is 9 inches.

This measurement may be taken from riser to riser or nose to nose of the treads. With the addition of the nosing, the typical stair tread usually has a minimum depth of about 10 inches.

**TABLE R507.4
MAXIMUM JOIST SPACING**

MATERIAL TYPE AND NOMINAL SIZE	MAXIMUM ON-CENTER JOIST SPACING	
	Perpendicular to joist	Diagonal to joist ^a
1 1/4-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

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

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

TABLE R507.6
DECK BEAM SPAN LENGTHS^{a, b} (ft. - in.)

SPECIES ^c	SIZE ^d	DECK JOIST SPAN LESS THAN OR EQUAL TO: (feet)						
		6	8	10	12	14	16	18
Southern pine	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	7-6	7-0
	3 - 2 × 6	8-2	7-5	6-8	6-1	5-8	5-3	5-0
	3 - 2 × 8	10-10	9-6	8-6	7-9	7-2	6-8	6-4
	3 - 2 × 10	13-0	11-3	10-0	9-2	8-6	7-11	7-6
	3 - 2 × 12	15-3	13-3	11-10	10-9	10-0	9-4	8-10
Douglas fir-larch ^e , hem-fir ^e , spruce-pine-fir ^e , redwood, western cedars, ponderosa pine ^f , red pine ^f	3 × 6 or 2 - 2 × 6	5-5	4-8	4-2	3-10	3-6	3-1	2-9
	3 × 8 or 2 - 2 × 8	6-10	5-11	5-4	4-10	4-6	4-1	3-8
	3 × 10 or 2 - 2 × 10	8-4	7-3	6-6	5-11	5-6	5-1	4-8
	3 × 12 or 2 - 2 × 12	9-8	8-5	7-6	6-10	6-4	5-11	5-7
	4 × 6	6-5	5-6	4-11	4-6	4-2	3-11	3-8
	4 × 8	8-5	7-3	6-6	5-11	5-6	5-2	4-10
	4 × 10	9-11	8-7	7-8	7-0	6-6	6-1	5-8
	4 × 12	11-5	9-11	8-10	8-1	7-6	7-0	6-7
	3 - 2 × 6	7-4	6-8	6-0	5-6	5-1	4-9	4-6
	3 - 2 × 8	9-8	8-6	7-7	6-11	6-5	6-0	5-8
	3 - 2 × 10	12-0	10-5	9-4	8-6	7-10	7-4	6-11
	3 - 2 × 12	13-11	12-1	10-9	9-10	9-1	8-6	8-1

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. Ground snow load, live load = 40 psf, dead load = 10 psf, $L/\Delta = 360$ at main span, $L/\Delta = 180$ at cantilever with a 220-pound point load applied at the end.

b. Beams supporting deck joists from one side only.

c. No. 2 grade, wet service factor.

d. Beam depth shall be greater than or equal to depth of joists with a flush beam condition.

e. Includes incising factor.

f. Northern species. Incising factor not included.

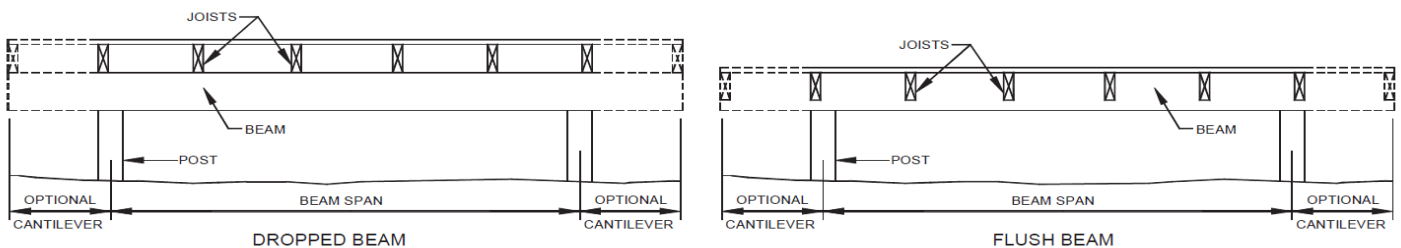


FIGURE R507.6
TYPICAL DECK BEAM SPANS

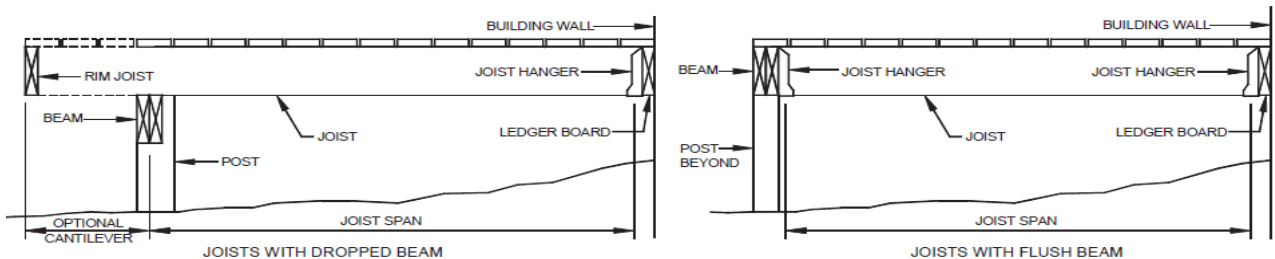


FIGURE R507.5
TYPICAL DECK JOIST SPANS