

Building permits

Required for any deck attached to a structure or any detached deck more than 30 inches above grade.

Setbacks

Decks not higher than 5 feet above grade at any point may encroach 10 feet into the required front setback, 5 feet into the required side setback and 20 feet into the required rear setback, **provided** that a front setback of at least 20 feet, a side setback of at least 5 feet and a rear setback of at least 10 feet is maintained.

Decks higher than 5 feet above grade at any point may encroach 5 feet into the required front setback and 10 feet into the required rear setback, **provided** that a front setback of at least 25 feet and a rear setback of at least 20 feet is maintained. Such decks are permitted in the side yard if the setback of at least 10 feet is maintained. Encroachment into public easements of record requires written approval from the Public Works Department.

Frost footings/foundations

Required for any deck attached to a dwelling, porch or garage that has frost footings. The minimum depth to the base of the footing is 42 inches. Approved pin foundations are acceptable. Pin foundations are not permitted to support screen porches, 3-season porches or other attached habitable spaces. Footings adjacent to retaining walls/ window wells to have 42" minimum from wall to bottom of footing be at least as deep as adjacent wall.

Total load

All decks shall be designed to support a total load of 50 pounds per square foot (40 pounds live load plus 10 pounds dead load).

Guards/guardrails

Required on all decks or stairs more than 30 inches above grade or a lower deck. See page four for illustration. **Exception:** On an open stairway, the triangular opening formed by the riser, tread and bottom element of a guardrail must be sized so that a six inch sphere cannot pass through.

The top rail must support a 200 pound lateral load. Infill area must withstand a horizontally applied normal load of 50 pounds on an area equal to one square foot.

Cantilevers: Overhanging joists and beams

Refer to table on page two for allowable cantilever spans. Joists and beams shall not overhang support posts by more than adjacent beam's span divided by 4. Additional tributary area to shall be accounted for in footing sizing.

Framing details

Header beams and joists that frame into ledgers or beams shall be supported by approved framing anchors such as joist hangers.

Flashing

All connections between deck and dwelling shall be weatherproof. Cuts in exterior finish shall be flashed.

Nails and screws

Use only stainless steel, high strength aluminum or hot-dipped galvanized.

Wood required

All exposed wood is required to be approved wood with natural resistance to decay (redwood, cedar, etc.) or approved treated wood. This includes posts, beams, joists, decking and railings.

Any composite or plastic decking materials must be approved by Building and Inspection prior to installation.

Stairs

Minimum width is 36 inches. Maximum rise is 7-3/4 inches, minimum rise is 4 inches. Minimum run is 10 inches. Largest tread width or riser height shall not exceed the smallest by more than 3/8 inch. Maximum 4 inch opening at risers greater than 30 inches above grade. See *Single-Family Stairways/Guards*.

Illumination

All exterior stairways shall be illuminated at the landing to the stairway. Illumination shall be controlled from inside the dwelling **or** automatically activated.

Handrails

The top shall be placed not less than 34 inches or more than 38 inches above the nosing of the treads. Stairways having four or more risers shall have at least one handrail with handrail ends returned or terminated in posts. Circular hand grips shall be between 1-1/4 inches to 2 inches in cross-sectional dimension or the shape shall provide an equivalent gripping surface. See *Single-Family Stairways/Guards*.

Special design note

Some designs may not be appropriate if a screen porch or 3-season porch on the deck platform is a future consideration. Porch and deck setbacks are not the same.

Inspections

Footings inspection required before pouring concrete.

Framing inspection required prior to decking if joists are less than 24 inches off the ground.

Final inspection of completed work required.

JOIST SPAN a, e, f

Based on No. 2 or better Southern pine lumber (also known as Southern Yellow Pine) – See MNRC Section 507, Table R507.6 for other lumber species.

Design Load = 40 lb/sqft Live Load + 10lb/sqft Dead Load = 50lb/sqft Total Load, Deflection = L/360

Ratio of back span to cantilever span = 4:1 minimum.

A full-depth rim joist is required at cantilever end of joist.

ENG = Cantilevered span shall be engineered

Deck joist maximum span between supports

Deck joist max cantilever span with 4:1 min back span

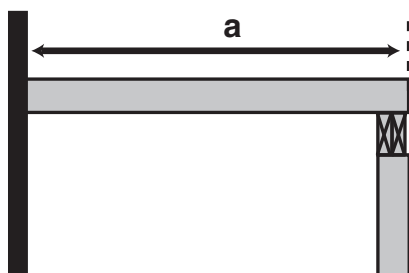
	12" OC	16" OC	24" OC
2x6	9'-11"	9'-0"	7'-7"
2x8	13'-1"	11'-10"	9'-8"
2x10	16'-2"	14'-0"	11'-5"
2x12	18'-0"	16'-6"	13'-6"

	12" OC	16" OC	24" OC
2x6	1'-3"	1'-4"	1'-6"
2x8	2'-1"	2'-3"	2'-5"
2x10	3'-4"	3'-6"	2'-10"
2x12	4'-6"	4'-2"	3'-4"

Sample calculations for using JOIST SPAN table and BEAM AND FOOTING SIZES table:

Case I (simple span):

Solution: Refer to tables for joist, beam and footing size requirements.

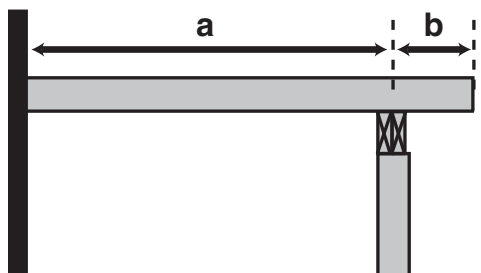


Example: a = 12 feet; Post spacing = 8 feet

Use the **JOIST SPAN** table to find the acceptable joist sizes for a 12 foot span: 2x8s at 12 inches O.C. or 2x10s at 16 inches O.C. are acceptable. Use the **BEAM AND FOOTING SIZES** table and find the 8 foot post spacing column. With a 12 foot deck span, the beam may be three 2x10s. Depending on the type of soil, the footing diameter at the base must be a minimum of 12 inches or 11 inches for the corner post and 17 inches or 15 inches for all intermediate posts.

Case II (cantilever joists):

Solution: Use "a" to determine joist size and "a" + "2b" to determine the footing sizes. The length of "b" is restricted by both the length of "a" and the size of the joists. Refer to the table above for the maximum allowable cantilever length of "b". Remember, a 4:1 minimum ratio of joist span to cantilever length is required to be maintained.



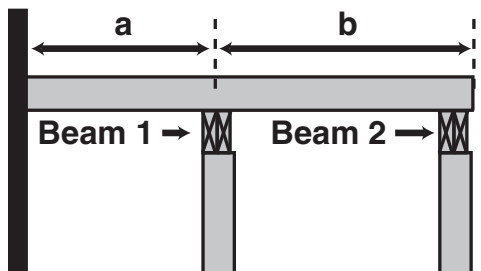
Example: a = 8 feet, b = 2 feet, Post spacing = 10 feet

Refer to the **JOIST SPAN** table. For an 8 foot joist span, 2x6s at 16 inches O.C is acceptable. For sizing the beam, use a joist length of 8 feet and a post spacing of 10 feet. The **BEAM AND FOOTING SIZES** table indicates that the beam may be three 2x10s. To size the footings, add 2x the cantilever distance to the joist span (8' joist span plus 2x 2' cant = 12' lookup in table). Do the same for post spacing distance for the corner footings if there is a beam cantilever (none in this example). Depending on the type of soil, the footing diameter at the base must be a minimum of 14 inches* or 12 inches* for the corner post and 19 inches* or 17 inches* for all intermediate posts.

Case III (multiple supports):

Solution: Use "a" or "b", whichever is greater, to determine joist size. Use "a" + "b" to determine the size of Beam 1 and the post footing size for the posts supporting Beam 1.

Use joist length "b" to determine both the size of Beam 2 and the post footing size for the posts supporting Beam 2.



Example: a = 6 feet, b = 7 feet, Post spacing = 8 feet

Joist size is determined by using the longest span joist (7 feet). The **JOIST SPAN** table indicates that 2x6s at 24" O.C. would be adequate for this span.

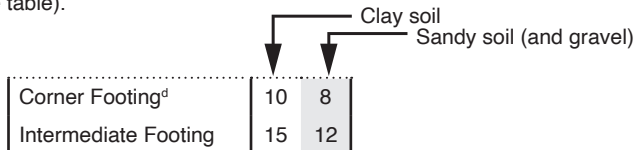
For Beam 1 and footings, use a joist length of 13 feet (6 feet + 7 feet) and a post spacing of 8 feet. The **BEAM AND FOOTING SIZES** table indicates that the beam may be three 2x10s. Depending on the type of soil, the footing diameters for Beam 1 posts shall be 13 inches or 11 inches for the corner (outside) post and 18 inches or 16 inches for all intermediate posts. For Beam 2 and footings use a joist length of 7 feet and post spacing of 8 feet. The beam may be two 2x8s. Depending on the type of soil, the footing diameters for Beam 2 shall be 9 inches or 8 inches for the corner posts, and 13 inches or 12 inches for all intermediate posts.

BEAM AND FOOTING SIZES ^{a, e, f}

Based on No. 2 or better Southern pine lumber (also known as Southern Yellow Pine) – See MNRC Section 507, Table R507.5 for other lumber species.

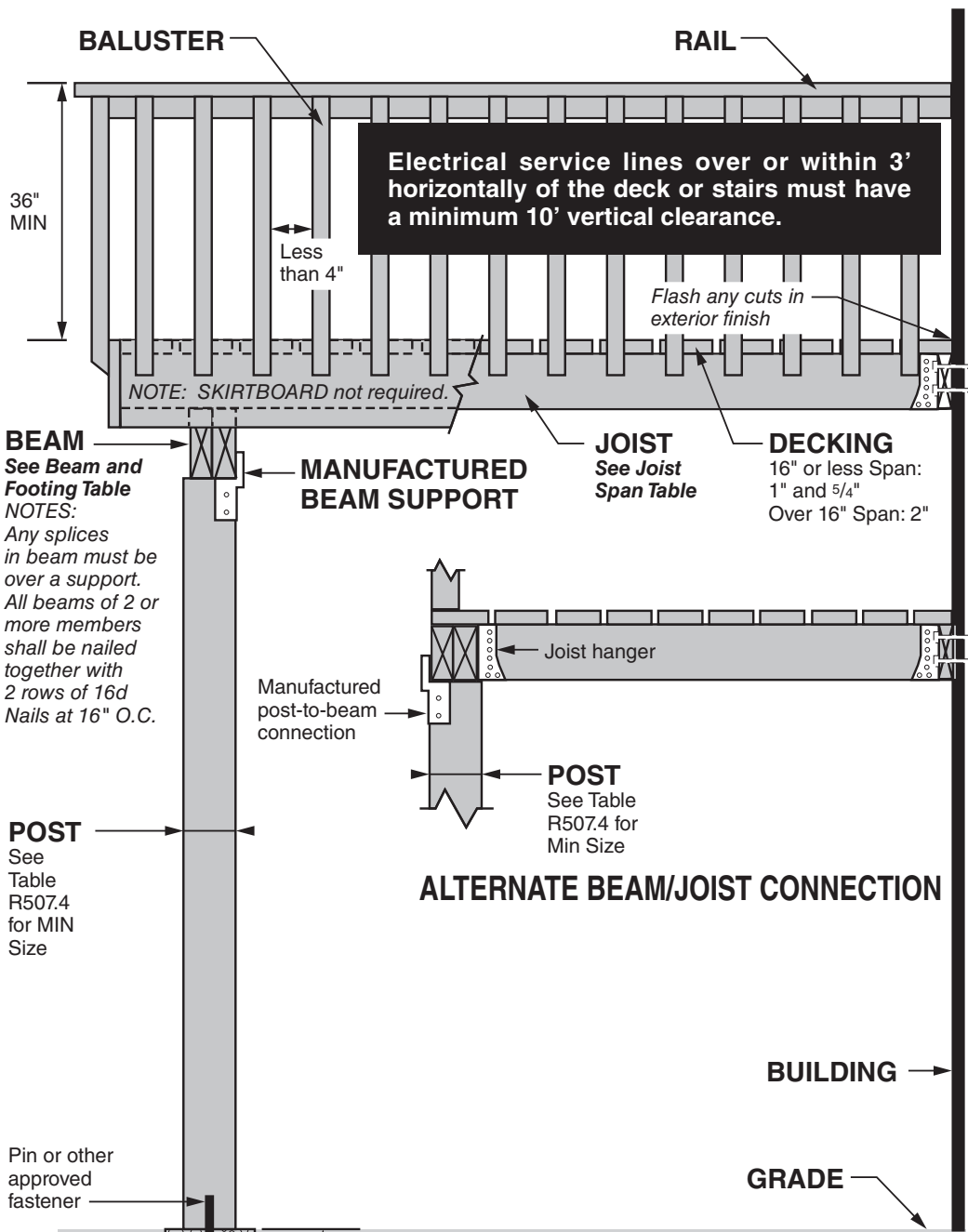
		Post spacing												
		4'	5'	6'	7'	8'	9'	10'	11'	12'	13'	14'		
Joist Length ^g	6'	Beam Size	2-2x6	2-2x6	2-2x6	2-2x8	2-2x8	2-2x10 ^b	2-2x10 ^b	3-2x10 ^c	3-2x10 ^c	3-2x10	3-2x12	
		Corner Footing ^d	8 8	8 8	8 8	8 8	9 8	9 8	10 9	10 9	10 9	10 10	11 10	11 10
		Intermediate Footing ^d	9 8	10 8	10 9	11 9	12 11	13 12	14 12	14 12	14 13	15 13	15 14	16 14
	7'	Beam Size	2-2x6	2-2x6	2-2x6	2-2x8	2-2x8	2-2x10 ^b	2-2x12	3-2x10 ^c	3-2x10	3-2x10	3-2x12	3-2x12
		Corner Footing ^d	8 8	8 8	8 8	9 9	9 8	10 9	10 9	11 10	11 10	11 10	12 10	12 11
		Intermediate Footing ^d	9 8	10 9	11 10	12 11	13 12	14 12	15 13	15 14	16 14	16 14	17 15	17 15
	8'	Beam Size	2-2x6	2-2x6	2-2x8	2-2x8	2-2x10 ^b	2-2x10 ^b	3-2x10 ^c	3-2x10	3-2x10	3-2x12	3-2x12	Eng Bm ^h
		Corner Footing ^d	8 8	8 8	9 8	9 8	10 9	10 10	11 11	12 10	12 10	12 11	13 11	13 12
		Intermediate Footing ^d	10 9	11 10	12 11	13 12	14 12	15 13	16 14	16 15	16 15	17 15	18 16	18 16
	9'	Beam Size	2-2x6	2-2x6	2-2x8	2-2x8	2-2x10 ^b	3-2x8	3-2x10 ^c	3-2x10	3-2x12	3-2x12	Eng Bm ^h	Eng Bm ^h
		Corner Footing ^d	8 8	8 8	9 8	10 9	10 9	11 10	12 11	12 11	12 11	13 12	13 12	14 12
		Intermediate Footing ^d	10 9	12 11	13 12	14 12	15 13	16 14	17 15	17 15	17 16	18 16	19 17	20 17
	10'	Beam Size	2-2x6	2-2x6	2-2x8	2-2x10 ^b	2-2x10 ^b	3-2x10 ^c	3-2x10	3-2x12	3-2x12	Eng Bm ^h	Eng Bm ^h	Eng Bm ^h
		Corner Footing ^d	8 8	9 8	10 9	10 9	11 10	12 11	12 11	13 12	13 12	14 12	14 13	15 13
		Intermediate Footing ^d	11 10	12 11	14 12	15 13	16 13	17 15	17 16	18 16	18 16	19 17	20 18	21 18
	11'	Beam Size	2-2x6	2-2x6	2-2x8	2-2x10 ^b	2-2x10	3-2x10 ^c	3-2x12	3-2x12	3-2x12	Eng Bm ^h	Eng Bm ^h	Eng Bm ^h
		Corner Footing ^d	8 8	9 8	10 9	11 10	12 10	12 11	13 12	14 12	14 12	14 13	15 13	15 14
		Intermediate Footing ^d	12 10	13 12	14 13	15 14	16 15	17 16	18 16	19 17	20 18	20 18	21 19	22 19
12'	Beam Size	2-2x6	2-2x8	2-2x8	2-2x10 ^b	3-2x10 ^c	3-2x10	3-2x12	3-2x12	Eng Bm ^h	Eng Bm ^h	Eng Bm ^h	Eng Bm ^h	
	Corner Footing ^d	9 8	10 9	10 9	11 10	12 11	13 12	14 12	14 13	15 13	15 13	15 14	16 14	
	Intermediate Footing ^d	12 11	14 12	15 13	16 14	17 15	18 16	19 17	20 18	21 19	21 19	22 19	23 20	
13'	Beam Size	2-2x6	2-2x8	2-2x10 ^b	2-2x10 ^b	3-2x10 ^c	3-2x12	3-2x12	3-2x12	Eng Bm ^h	Eng Bm ^h	Eng Bm ^h	Eng Bm ^h	
	Corner Footing ^d	9 8	10 9	11 10	12 11	13 11	13 12	14 13	15 13	15 13	15 14	16 14	17 15	
	Intermediate Footing ^d	13 11	14 13	15 14	17 15	18 16	19 17	20 18	21 19	22 19	22 19	23 20	24 21	
14'	Beam Size	2-2x6	2-2x8	2-2x10	3-2x8	3-2x10 ^c	3-2x12	3-2x12	3-2x12	Eng Bm ^h	Eng Bm ^h	Eng Bm ^h	Eng Bm ^h	
	Corner Footing ^d	9 8	10 9	11 10	12 11	13 12	14 12	15 13	15 14	16 14	16 14	17 15	17 15	
	Intermediate Footing ^d	13 12	15 13	16 14	17 15	18 16	20 17	21 18	22 19	23 20	23 20	24 21	24 22	
15'	Beam Size	2-2x6	2-2x8	2-2x10 ^b	3-2x10 ^c	3-2x10	3-2x12	3-2x12	Eng Bm ^h	Eng Bm ^h	Eng Bm ^h	Eng Bm ^h	Eng Bm ^h	
	Corner Footing ^d	10 9	11 10	12 11	13 11	14 12	14 13	15 14	16 14	16 14	17 15	17 15	18 16	
	Intermediate Footing ^d	14 12	15 14	17 15	18 16	19 17	20 18	21 19	22 20	23 21	23 21	24 22	25 22	
16'	Beam Size	2-2x6	2-2x8	2-2x10 ^b	3-2x10 ^c	3-2x12	3-2x12	3-2x12	Eng Bm ^h	Eng Bm ^h	Eng Bm ^h	Eng Bm ^h	Eng Bm ^h	
	Corner Footing ^d	10 9	11 10	12 11	13 12	14 12	15 13	16 14	16 15	17 15	17 15	18 16	18 16	
	Intermediate Footing ^d	14 12	16 14	17 15	18 16	20 18	21 19	22 20	23 20	24 21	24 21	25 22	26 23	
17'	Beam Size	2-2x6	2-2x8	2-2x10 ^b	3-2x10 ^c	3-2x12	3-2x12	3-2x12	Eng Bm ^h	Eng Bm ^h	Eng Bm ^h	Eng Bm ^h	Eng Bm ^h	
	Corner Footing ^d	11 9	12 10	13 11	14 12	15 13	16 14	17 14	17 15	18 16	18 16	19 16	19 17	
	Intermediate Footing ^d	15 13	17 14	18 16	19 17	20 18	22 19	23 21	24 22	25 22	25 22	26 23	27 24	
18'	Beam Size	2-2x6	2-2x8	2-2x10 ^b	3-2x10 ^c	3-2x12	Eng Bm ^h	Eng Bm ^h	Eng Bm ^h	Eng Bm ^h	Eng Bm ^h	Eng Bm ^h	Eng Bm ^h	
	Corner Footing ^d	11 9	12 11	13 12	14 13	15 13	16 14	17 15	18 16	19 16	19 16	19 17	20 17	
	Intermediate Footing ^d	15 13	17 15	18 16	20 17	21 19	23 20	24 21	25 22	26 23	26 23	27 24	28 24	

a. All footing sizes are the minimum diameters (in inches) of the footings/ supporting foundations for the support posts. The various footing diameters are listed for two soil types (see example below for use of the table).



- b. 3-2x8 may be substituted for these beams.
- c. 2-2x12 may be substituted for these beams.
- d. Minimum diameter of foundation for 6x6 posts is 10".

- e. When the joists extend (cantilevers) – adjust the spans for determining beams and footings by 2 times the cantilever distance (See "Case II" for example). If cantilever distance is more than 18", add an additional 1" to the footing dimensions.
- f. Maximum beam cantilever is limited to the adjacent beam's span divided by 4. Multiply beam cantilever length by 2 and add it to adjacent beam's span to find appropriate corner footing size (allowable beam span does not need to be adjusted).
- g. The joist length indicated is the clear span between supporting ledgers, beams, etc. Allowable cantilever distance can be in addition to this span.
- h. Engineered Beam required.



Ledgers

Ledgers shall be both at least the same size as the deck joists and a minimum of 2x8. Install lag screws that penetrate a minimum of 1 1/2" into rim joist or wall studs.

(See MNRC Table 507.9.1.3(1) on next page for required spacing).

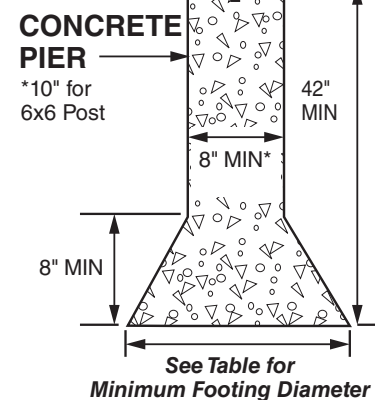
Note 1: Joist hangers must be correct size for joist size used. Fill all holes with approved joist hanger nails.

Note 2: Ledgers (decks) shall not be attached to brick, masonry, stone, hollow masonry or cantilevered portions of building.

Note 3: Ledgers that are attached to I-Joists, floor trusses or concrete block shall be reviewed and approved prior to permit issuance..

Note 4: Flashing shall be corrosion-resistant metal or approved non-metallic material.

Note 5: Lateral resistance devices shall be approved manufactured products. See further requirements on Page 5.

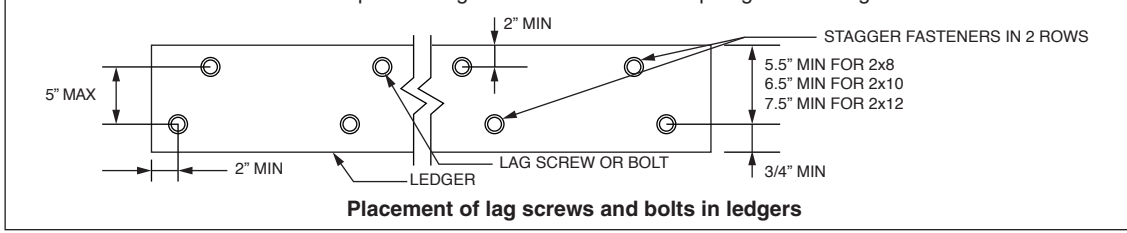


Footings adjacent to retaining walls/window wells to have 42" minimum from wall to bottom of footing be at least as deep as adjacent wall.

PLACEMENT OF LAG SCREWS AND BOLTS IN DECK LEDGERS AND BAND JOISTS/RIM 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 inch	2 inches	2 inches ^b	1 5/8 inches ^b

- Lag screws or bolts shall be staggered from the top to the bottom along the horizontal run of the deck ledger.
- Maximum 5".
- For engineered rim joists, the manufacturer's recommendations shall govern.
- The minimum distance from top row of lag screws or bolts to the top edge of the ledger.



Deck Posts

Deck post sizing requirements are in MRC Table R507.4 and are limited to single-level wood-framed decks when sizing the decks other structural components with MRC Table R507.5. The height of the post shown in MRC Table R507.4 is measured from the underside of the beam to the top of the footing. Deck posts are based on using a 40 psf live load for structural member size calculations. Metal connectors must be provided at the top and bottom of posts for lateral restraint.

**TABLE R507.4
DECK POST HEIGHT**

DECK POST SIZE	MAXIMUM HEIGHT ^{a,b} (feet-inches)
4X4	6-9 ^c
4X6	8
6X6	14
8X8	14

- a. Measured to the underside of the beam
- b. Based on 40 psf live load.
- c. The maximum permitted height is 8 feet for one-ply and two-ply beams. The maximum permitted height for three-ply beams on post cap is 6 feet 9 inches.

Deck Ledger Connection to Band Joist – Bolt and Lag Screw Spacing

TABLE R507.9.1.3(1)
DECK LEDGER CONNECTION TO BAND JOIST^a
(Deck live load=40 psf, deck dead load=10 psf)

CONNECTION DETAILS	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'
	On-center spacing of fasteners						
1/2-inch diameter lag screw with 1/2-inch maximum sheathing ^{b,c}	30	23	18	15	13	11	10
1/2-inch diameter bolt with 1/2-inch maximum sheathing ^c	36	36	34	29	24	21	19
1/2-inch diameter bolt with 1-inch maximum sheathing ^d	36	36	29	24	21	18	16

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

- a. Ledgers shall be flashed in accordance with Section R703.4 to prevent water from contacting the house band joist.
- b. The tip of the lag screw shall fully extend beyond the inside face of the band joist.
- c. 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 for up to 1/2-inch od allowable sheathing thickness where combined with wood structural panel or lumber sheathing.

Deck Lateral Load Connection

The building code requires that decks be designed for both vertical and lateral loads per MNRC R507.9.2.

MNRC Figure R507.2.3(2) (below) is **the most common option** for complying with the lateral load connection requirement on a deck with a ledger and joists perpendicular to the ledger. When installed per Figure R507.2.3(2); hold down tension devices shall be installed at no less than 4 locations per deck and the devices have a design capacity of at least 750 pounds. When installed per Figure 507.2.3(1); hold down tension devices shall be installed within 24" of each end of the deck and the devices have a design capacity of at least 1500 pounds.

Not all decks are designed to effectively use design shown in below figures, such as free standing decks and decks where joints meet ledger connection at an angle. Alternative designs can be accepted, such as the use of angle bracing or diagonal bracing.

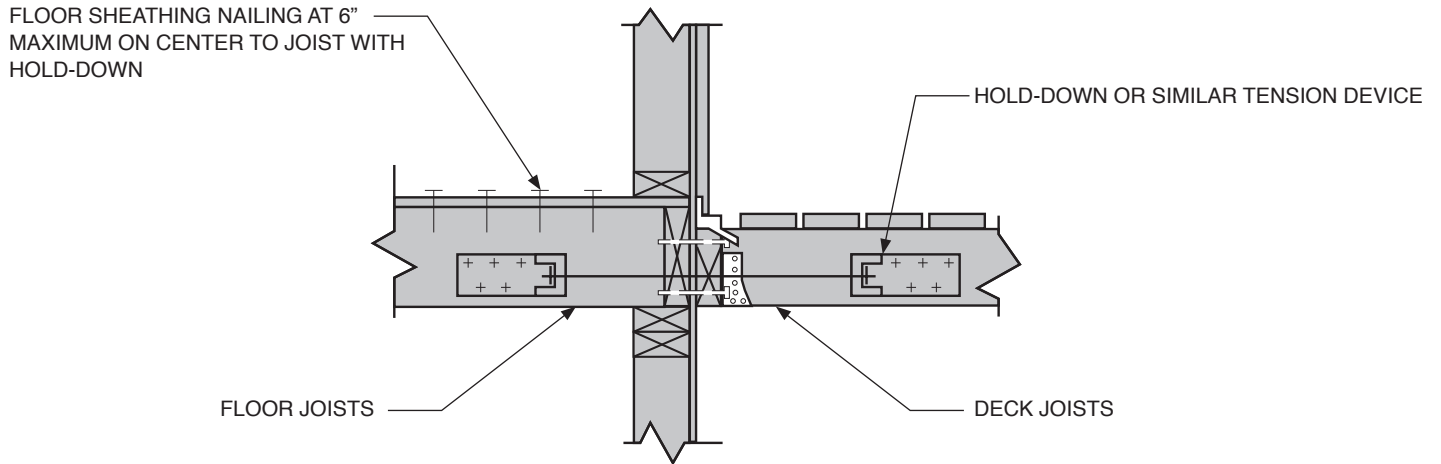


FIGURE R507.9.2(1)
DECK ATTACHMENT FOR LATERAL LOADS

NOTE: This detail is applicable where floor joists are parallel to deck joists.

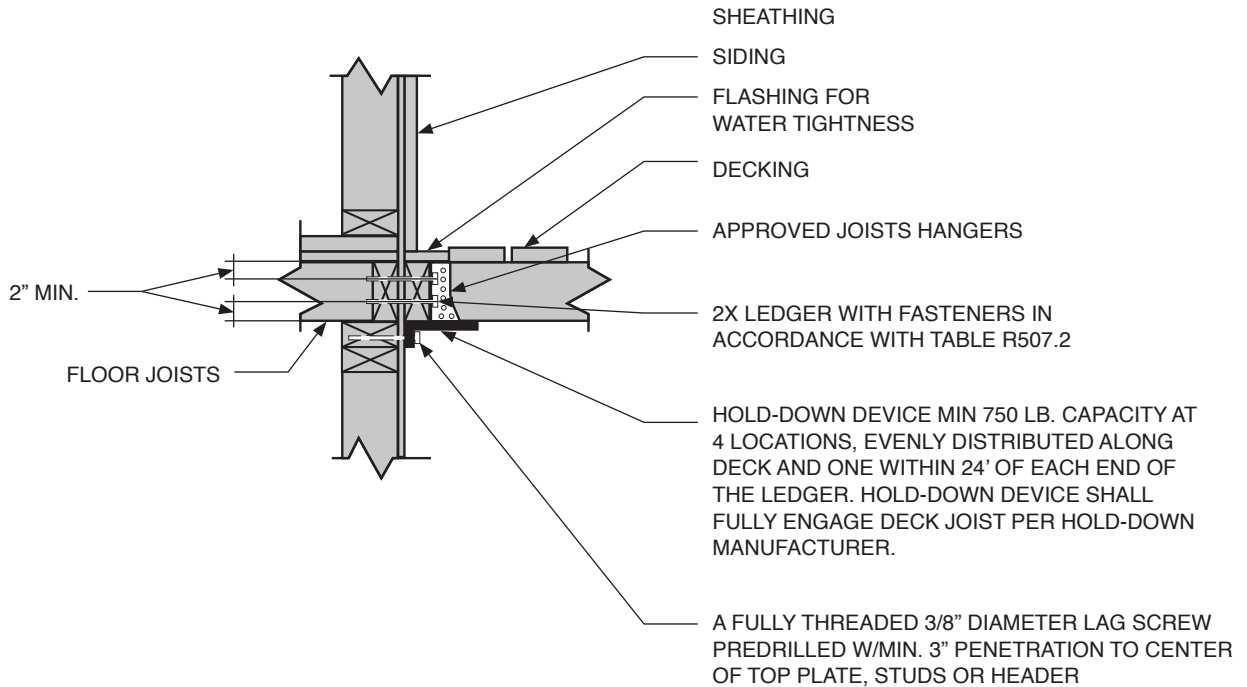


FIGURE R507.9.2(2)
DECK ATTACHMENT FOR LATERAL LOADS