



DECK / PORCH / RAMP HANDOUT

630 Florence Avenue PO Box 890, Owatonna, MN 55060

Building Inspections Department

phone: 507-444-7475 | fax: 507-444-7479 | www.co.steele.mn.us

This handout is intended only as a guide and is based in part on the 2020 Minnesota State Building Code, with amendments section R507 Exterior Decks and good building practice. While every attempt has been made to ensure the correctness of this handout, no guarantees are made to its accuracy or completeness. Responsibility for compliance with applicable codes and ordinances falls on the owner or contractor.

DECK SECTION:

WHEN IS A DECK PERMIT REQUIRED?

One- and Two-Family Residential Deck

A permit is required for all decks & deck repair (decking & guardrails) with the following exceptions:

- Free-standing decks that meet all the following criteria:
 - The joists bear directly on precast concrete pier blocks at grade without support by beams or posts.
 - The area of the deck does not exceed 200 square feet
 - The walk line surface is not more than 20 inches above grade at any point within 36 inches measured horizontally from the edge
 - Freestanding deck that is not adjacent to an entry or exit from a dwelling.
- It is still important to consider zoning ordinances and/or homeowners association requirements prior to constructing a free-standing deck.

Manufactured Home Deck

Manufactured homes require a building permit for all decks

REQUIREMENTS

- a. A completed and signed building permit application form.
- b. A copy of the Certificate of Survey or site plan drawn to scale, showing property lines, existing buildings and the proposed structure location with distances to the property lines.
- c. **Structurally engineered plans are required when deck is supporting a hot tub / spa.**
- d. Two copies of building plans. All structural must be sized and properly spaced to support all loads. The following may be used in designing your deck. If there are any overhead wires in the vicinity of your proposed deck, contact the state electrical inspector for required clearances. The following items must be included with the deck plans:

USE THIS HANDOUT TO CONFIRM PROPOSED SIZES, SPANS, AND SPACINGS ARE CODE COMPLIANT.

- | | |
|------------------------------------|--|
| a. All dimensions drawn to scale | h. Size, direction and spacing of joists |
| b. Size and depth of footings | i. Elevation plan with height and guard design |
| c. Size and spacing of posts | j. Type, size, and direction of decking |
| d. Size of beams and headers | k. Type and size of all materials used |
| e. Stair location (if applicable) | l. Cantilevered floor system specs |
| f. Size of ledger and band joists | |
| g. Lateral load connection details | |

The deck plans must replicate the proposed deck, exactly. Plan review for code compliance is completed prior to permit issuance.



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NOTE: Plans created at home centers are seldom acceptable for plan review. They are often lacking information, and they often increase the time it takes to process the permit. The deck may be required to be freestanding – the details in this handout explain the freestanding deck requirements.

Use the following samples, examples and tables help with your design.

PERMIT PROCESS AND FEES

Please allow 3-7 business days for the application and submittal documents to be reviewed for building and zoning code compliance, and a permit to be issued. This process may be delayed if the plans are incomplete. You will be notified when your permit is ready to be picked up and paid for.

The permit fee for a deck, porch, or ramp is based on the valuation.

Before digging, call **Gopher State One Call at 811 or 651-454-0002** to locate utilities 48 hours in advance.

REQUIRED INSPECTIONS

Please call 507-444-7475 a minimum of 24 hours in advance to schedule inspections.

Inspections are scheduled Monday thru Friday, 8:00 am until 4:30 pm.

1. Footing

After holes are dug, loose dirt and water removed and prior to placing concrete.

2. Framing

If the bottom of the deck framing is less than 36 inches to grade, the framing needs to be inspected before installing the decking.

3. Final

Final building inspection after the work is completed.

The Building Code used for construction is the 2020 Minnesota Residential Code with amendments

Section R507 Exterior Decks

For more deck information not found in this handout go to:

And <https://www.revisor.mn.gov/rules/1309.0507/>



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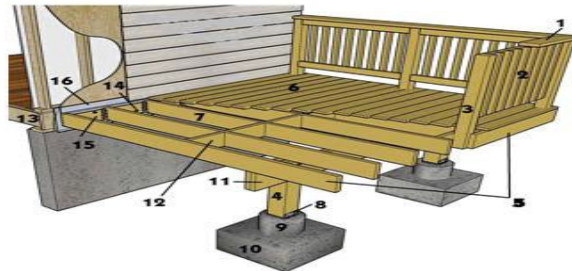
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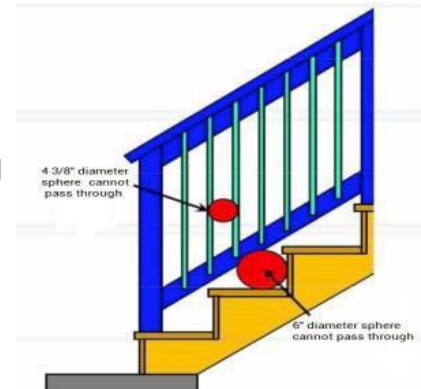
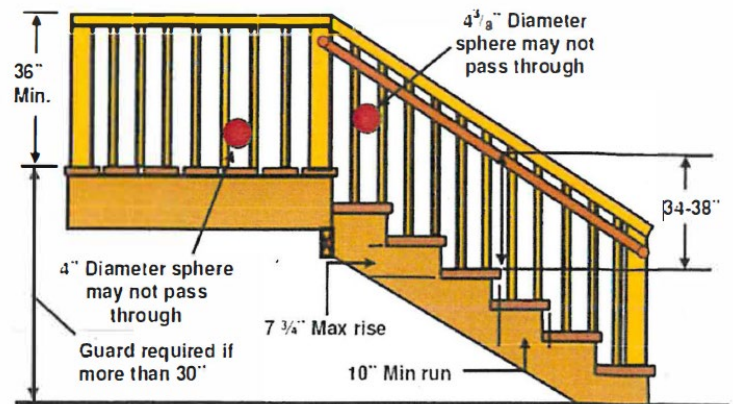
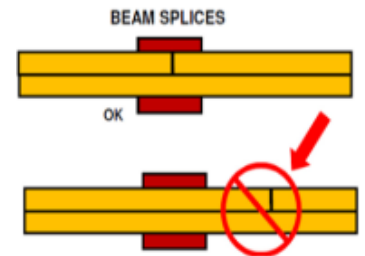
TERMINOLOGY

1. RAIL TOP CAP
2. BALLUSTERS
3. RAIL POST
4. SUPPORT POST
5. RIM OR BAND JOIST
6. DECKING
7. JOISTS
8. POST BASE CONNECTOR
9. PIER
10. FOOTING
11. DROP BEAM
12. BLOCKING
13. HOUSE JOIST
14. 1/2" BOLTS
15. LEDGER BOARD
16. FLASHING



GENERAL REQUIREMENTS

- The bottom of the footing must be a minimum 42" below undisturbed soil; measured either vertically or horizontally. Augured footings shall have smooth forms installed prior to the footing inspection.
- Beam splices must be directly over posts, minimum of 1½" bearing.
- Deck ledger board must be greater than or equal to the deck joists and not greater than the depth of the existing rim/band joist it will be fastened to. The ledger must be secured and attached to the structure per table R507.2 and R507.2.1 within this handout.
- Joist hangers are required wherever joists do not have at least 1½" of bearing. (Exceptions: cantilevered ends.)
- Hot-dipped galvanized or stainless-steel connectors are required for footing to post, post to beam, and beam to joist connections, and joist to ledger.
- Guards are required on all decks more than 30" above grade. Guards must be 36" minimum in height. Open guards must have intermediate rails or an ornamental pattern that a 4" sphere cannot pass through. Guards must be able to withstand 200 lbs. of applied pressure.
- Stairways must be 36" between guards for the full length of the stairway.
- The maximum rise is 7 ¾", the minimum run is 10". Treads, risers and nosings shall be consistent within 3/8". Open risers on stairs with a total rise greater than 30" is not permitted to allow the passage of a 4" diameter sphere. A nosing not less than ¾ inch or greater than 1 ¼" shall be provided on stairways. Spiral stairs are to comply with **Section R311.7.9.1. ***
- Stairways require a guard not less than 34" in height from the nose of the treads. Open guards shall have intermediate rails or an ornamental pattern such that a sphere 4 3/8" in diameter cannot pass through. The





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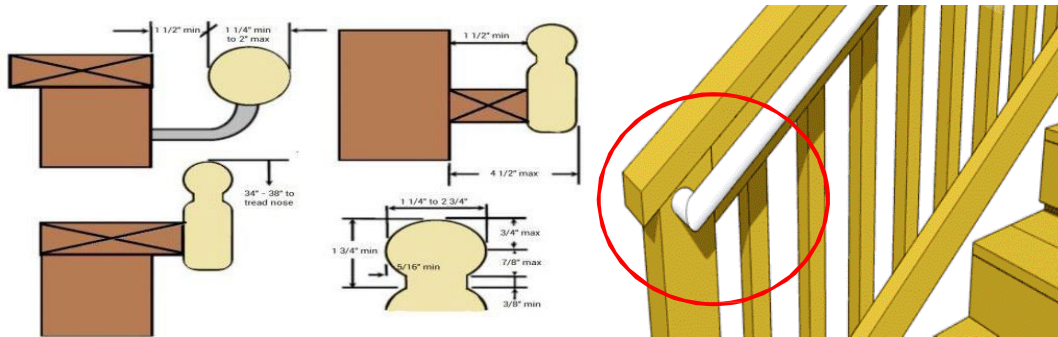
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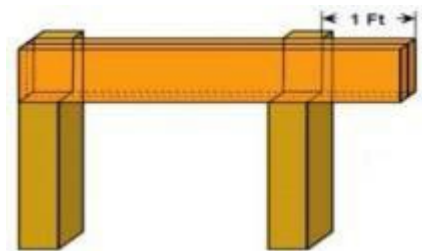
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triangular openings formed by the riser, tread and bottom rail of guards shall be such that a sphere 6" in diameter cannot pass through.

- If span of stair stringers will exceed 7 feet additional support shall be provided. Include details in plan submittal.
- If total height of the deck is 12 feet or greater an intermediate landing shall be installed.
- Landings shall be the width of the stairs and not less than 36 inches in the direction of travel.
- If there are windows located less than 36" above the walking surface of the stairs or landings see the safety glazing handout for requirements.
- Handrails are required on stairs with four or more risers.
- Handrails must have a continuous graspable surface and be 34" to 38" above the tread nosing and run the full length of the stairs with ends returned. Handrails shall have a space of not less than 1½" between the handrail and the wall or guard. The handrails shall be not less than 1¼" or more than 2" in diameter



- Structural members of exterior decks must be cedar, redwood, treated wood or an approved composite material.
- Hangers, connectors and fasteners used in conjunction with ACQ treated lumber are required to be ACQ compatible.
- Special designs or engineering may be required for a 3-season porch or if spas/whirlpool tubs will be placed/located on decks.
- Revised plan review fees shall be incurred in the event an additional plan review becomes necessary due to revised building plans.
- Alternative footing designs, such as Diamond Pier footings, will be evaluated on an individual basis.
- **4x4"** posts (when used for rails and guards) may only be notched a maximum of 7/8 of an inch.
- **6x6"** posts (when used for rails and guards) may be notched up to ½ of the thickness of the post.
- Joists may only be cantilevered a maximum of 2 feet. Beams may only be cantilevered a maximum of 1 foot.
- Decks cannot bear on cantilevered floors. Additional framing will be required.
- Floor joist spacing shall be determined by the type and orientation of decking. For all manufactured/composite deck materials, provide evaluation/testing report from the International Code Council or other approved agency.
- Electrical service lines over or within 3' horizontally of the deck or stairs must have a minimum 10' vertical clearance.





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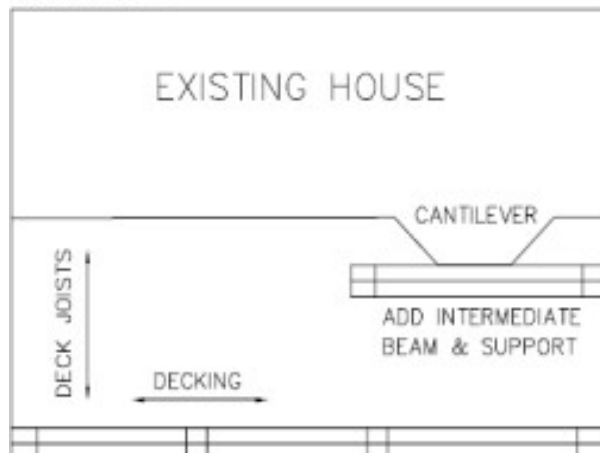
Cantilevered Floor of Existing Dwelling

Unless the cantilevered floor system is specifically designed to support the load of the deck, the deck cannot be attached to the cantilevered floor. If you are unable to provide approval and design specifications from floor system manufacturer or a structural engineer, the deck shall be self-supporting (see this handout for self-supporting deck details)

Many house designs have cantilevered (extensions) from the main structure and which typically contain patio doors for future deck additions. The reinforcement selected will be based on the type of floor framing member presently in the house. The illustrations below show two possible solutions for providing such reinforcement.

Attachment to cantilever prohibited without approval

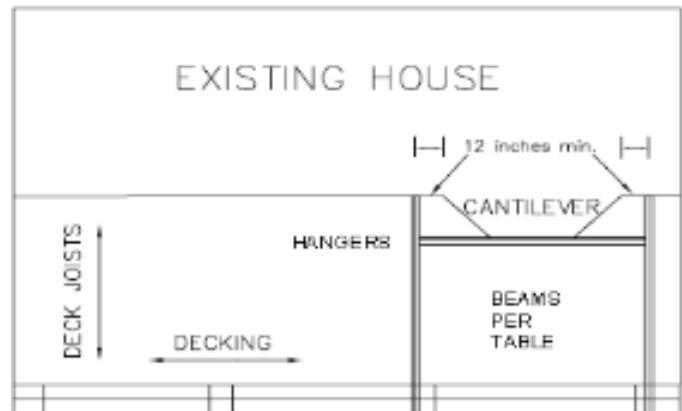
EXAMPLE 1



Example 1

Add an intermediate beam, supports and footings. Size the beam and footing to support load.

EXAMPLE 2



Example 2

Size beams per table (included in this handout). Provide adequate hangers from all connections.

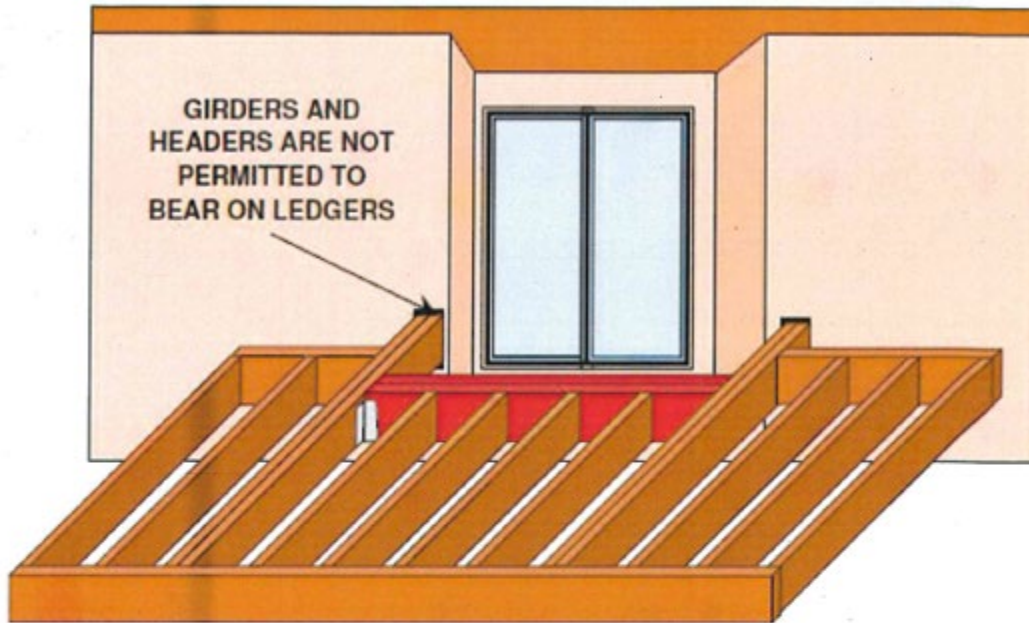


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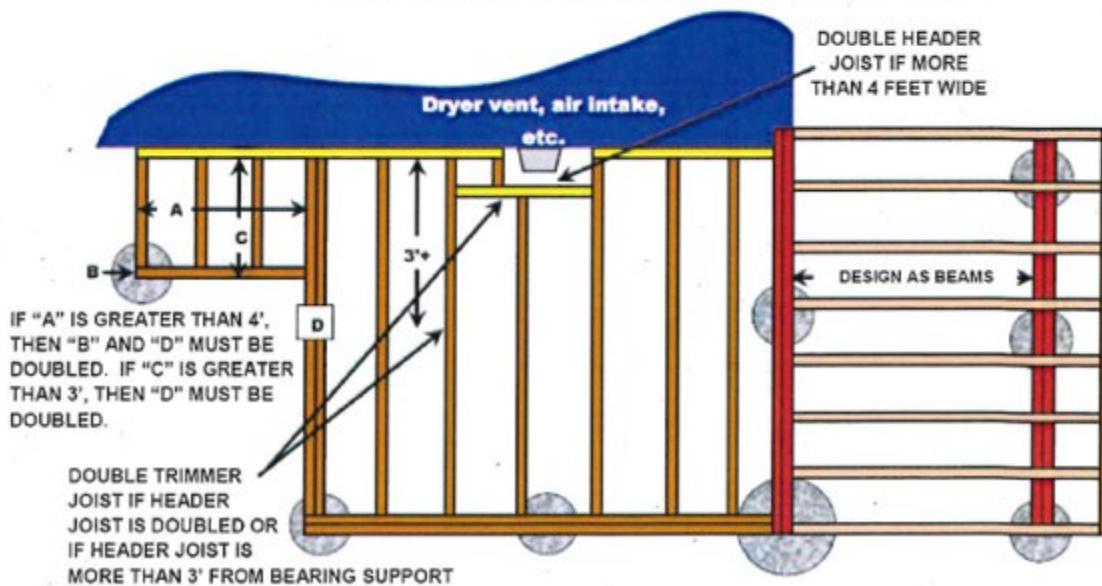
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HOUSE CANTILEVERS



SPECIAL FLOOR FRAMING DETAILS





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DECK LEDGER – VERTICAL AND LATERAL LOAD REQUIREMENTS

Important notice: If positive connection cannot be met and verified by inspection – the deck shall be self-supporting (see this handout for self-supporting deck details). R507.9.1.1*

Ledger Details. Deck ledgers shall be a minimum of 2-inch by 8-inch nominal pressure-preserve-treated Southern pine, incised pressure-preservative-treated Hem-Fir, or approved, naturally durable, No. 2 grade or better lumber. Deck ledgers shall not be supported on stone or masonry veneer. Deck ledgers shall not be smaller than the depth of the deck joists.

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 using 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 R301.5 acting on the cantilevered portion of the deck.

TABLE R301.5 MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS (in pounds per square foot)	
USE	LIVE LOAD
Balconies (exterior) and decks ^o	40
See Section R507.1* for decks attached to exterior walls.	

R507.2 Deck ledger connection to band joist details. Band Joists supporting a ledger shall be a minimum of 2-inch nominal solid-sawn spruce-pine-fir or better lumber or a minimum 1-inch by 9-1/2-inch dimensional Douglas fir or better, laminated veneer lumber. Band joists shall fully bear on the primary structure capable of supporting all required loads.

Ledger Board

The maximum gap between the face of the ledger board and face of the wall sheathing shall be 1/2 inch. Lag screws and bolts shall be staggered in accordance with Section R507.2.3* / Table R507.2.3 and section R317.3 *

Deck ledger shall be minimum 2 × 8 pressure-preservative-treated No. 2 grade lumber, or other approved materials as established by standard engineering practice.

When solid-sawn pressure-preservative-treated deck ledgers are attached to a minimum 1-inch-thick engineered wood product (structural composite lumber, laminated veneer lumber or wood structural panel band joist), the ledger attachment shall be designed in accordance with accepted engineering practice.

A minimum 1 × 9 1/2 Douglas Fir laminated veneer lumber rimboard shall be permitted in lieu of the 2-inch nominal band joist.

Wood structural panel sheathing, gypsum board sheathing or foam sheathing not exceeding 1 inch in thickness shall be permitted. The maximum distance between the face of the ledger board and the face of the band joist shall be 1 inch.

R507.2 Deck Ledger Connection to band joist. For decks supporting a total design load of 50 pounds per square foot (2394 Pa) [40 pounds per square foot (1915 Pa) live load plus 10 pounds per square foot (479 Pa) dead load], the connection between a deck ledger of pressure- preservative- treated Southern Pine, incised pressure-preservative-treated Hem-Fir or approved decay-resistant species, and a 2-inch (51 mm) nominal lumber band joist bearing on a sill plate or wall plate shall be constructed with 1/2 -inch (12.7 mm) lag screws or bolts with washers in accordance with Table R507.9.1.3(1). Lag screws, bolts and washers shall be hot-dipped galvanized or stainless steel.



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TABLE R507.2.3
FASTENER AND CONNECTOR SPECIFICATIONS FOR DECKS^{a,b}
 (Deck live load = 40 psf, deck dead load = 10 psf, snow load ≤ 40psf)

ITEM	MATERIAL	MINIMUM FINISH/COATING	ALTERNATE FINISH/COATING
Nails and timber rivets	In accordance with ASTM F1667	Hot-dipped galvanized per ASTM A153	Stainless steel, silicon bronze or copper
Bolts ^c Lag screws ^d (Including nuts and washers)	In accordance with ASTM A307 (bolts), ASTM A563 (nuts), ASTM F844 (washers)	Hot-dipped galvanized per ASTM A153, Class C (Class D for 3/8-inch <u>diameter</u> and less) or mechanically galvanized per ASTM B695, Class 55 or 410 stainless steel	Stainless steel, silicon bronze or copper
Metal connector	Per manufacturer's specification	ASTM A653 type G185 zinc coated galvanized steel or post hot-dipped galvanized per ASTM A123 providing a minimum average coating weight of 2.0 oz./ft ² (total both sides)	Stainless steel

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

- a. Equivalent materials, coatings and finishes shall be permitted.
- b. Fasteners and connectors exposed to saltwater or located within 300 feet of a saltwater shoreline shall be stainless steel.
- c. Holes for bolts shall be drilled a minimum 1/32 inch and a maximum 1/16 inch larger than the bolt.
- d. Lag screws 1/2 inch and larger shall be predrilled to avoid wood splitting per the National Design Specification (NDS) for Wood Construction.
- e. Stainless-steel-driven fasteners shall be in accordance with ASTM F1667.

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

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 a 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 1/2 inch maximum sheathing ^d	36	36	29	24	21	18	16

For SI: 1 inch = 24.4 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. 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.



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TABLE R507.9.1.3(2)				
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 inch	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 R507.9.1.3(1).

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 R507.9.1.3(1).

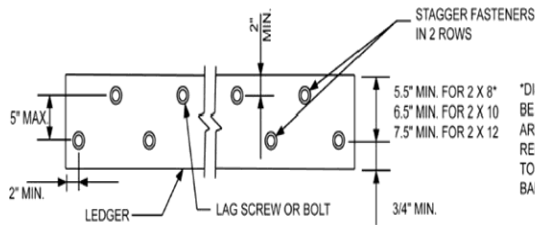


Figure R507.9.1.3(1)

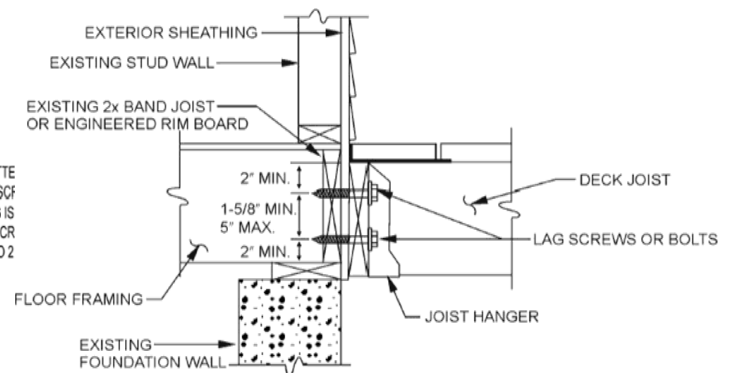


Figure R507.9.1.3(2)

FIGURES R507.9.1.3(1 & 2): PLACEMENT OF LAG SCREWS & BOLTS IN LEDGERS

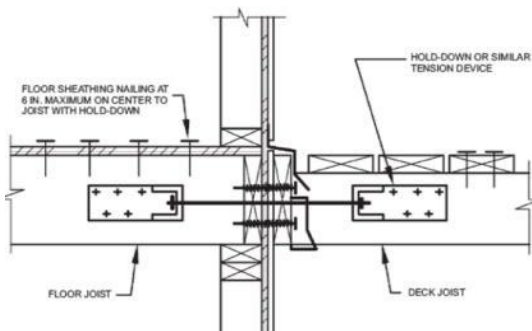


Figure R507.9.2(1)



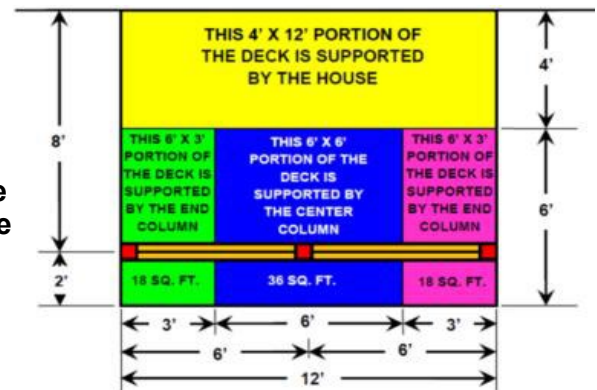
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Fasteners used to attach a ledger other than the prescribed $\frac{1}{2}$ " lag screws or $\frac{1}{2}$ " thru bolts must be tested, listed & installed to the manufacturer's written instructions.

The illustration is an example of 10' x 12' deck where the deck joist cantilever past the beam a maximum of 2'. Use the dimensions for your project to determine the minimum requirements for footings and framing elements.



JOIST SIZING

Joists shall be the same size or smaller than the ledger. Joists must bear on a beam, ledger strip, or joist hangers. Joist hangers must be installed in accordance with the manufacturer's recommendations. Fill all nail holes in joist hangers. Note: Maximum spans for decking on stairs is often less than the span permitted on the deck.

The joist length is 10'. Table R507.6 lists the allowable spans for various species of lumber. The most common lumber used is treated Southern pine. We will figure the joist spacing as 16" on center. In this case 2 x 8 will work. We will assume that the decking material is wood (either treated or cedar) 1-1/4" thick. Looking at Table R507.7 we see that the decking run perpendicular to the joists at 16" on center works. If the decking is run at an angle to the joist, the joist spacing would have to be 12" on center.

BEAM SIZING AND POST SPACING

Now that we have determined what we need for joist size and spacing, let us figure the required size beam and post spacing by looking at the deck plan shown above by looking at figure R507.5 and table R507.5. Again, the wood species is treated Southern pine. Our drawing shows a 10' joist span and posts spaced at 6'. Looking at table R507.5, we look down the 10' joist span column to find a number that is greater than or equal to 6'. In this case, we see that 1- 2"x12" or 2- 2"x8" will work.

Note: If you are doing a flush beam instead of a dropped beam, the beam depth needs to be at a minimum the same depth as the joists.

The reason that a 2x6 joist does not work for the span calculations on the previous page is that a 2x6 cannot cantilever more than 1'-4" and the drawing shows a 2' cantilever.

If the joist span is close to being maxed out based on spacing, you may not be happy with the deck performance. Example: "the deck feels bouncy" consider changing the joist spacing (16" on center to 12" on center). Or consider changing the joist size. (2"x8" to 2"x10")



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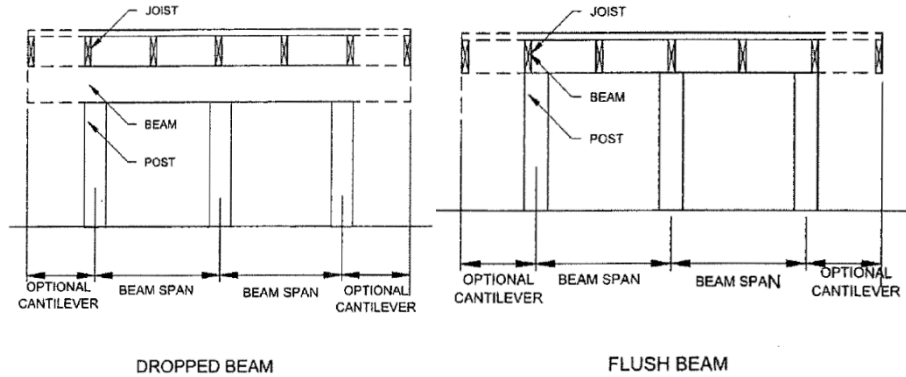


Figure 507.5 – Typical Deck Joist spans

Table R507.5 DECK BEAM SPAN LENGTHS ^{a,b,g} (ft.-in.)								
Species ^c	Size ^d	Deck Joist Span less than or equal to: (feet)						
		6'	8'	10'	12'	14'	16'	18'
Southern Pine	1-2x6	4-11	4-0	3-7	3-3	3-0	2-10	2-8
	1-2x8	5-11	5-1	4-7	4-2	2-10	3-7	3-5
	1-2x10	7-0	6-0	5-5	4-11	4-7	4-3	4-0
	1-2x12	8-3	7-1	6-4	5-10	5-5	5-0	4-9
	2-2x6	6-11	5-11	5-4	4-10	4-6	4-3	4-0
	2-2x8	8-9	7-7	6-9	6-2	5-9	5-4	5-0
	2-2x10	10-4	9-0	8-0	7-4	6-9	6-4	6-0
	2-2x12	12-2	10-7	9-5	8-7	8-0	7-6	7-0
	3-2x6	8-2	7-5	6-8	6-1	5-8	5-3	5-0
	3-2x8	10-10	9-6	8-6	7-9	7-2	6-8	6-4
	3-2x10	13-0	11-3	10-0	9-2	8-6	7-11	7-6
Douglas fir-larch ^e , hem-fir ^e , spruce-pine-fir ^e , redwood, western cedars, ponderosa pine ^f , red pine ^f	3-2x12	15-3	13-3	11-10	10-9	10-0	9-4	8-10
	3x6 or 2-2x6	5-5	4-8	4-2	3-10	3-6	3-1	2-9
	3x8 or 2-2x8	6-10	5-11	5-4	4-10	4-6	4-1	3-8
	3x10 or 2-2x10	8-4	7-3	6-6	5-11	5-6	5-1	4-8
	3x12 or 2-2x12	9-8	8-5	7-6	6-10	6-4	5-11	5-7
	4x6	6-5	5-6	4-11	4-6	4-2	3-11	3-8
	4x8	8-5	7-3	6-6	5-11	5-6	5-2	4-10
	4x10	9-11	8-7	7-8	7-0	6-6	6-1	5-8
	4x12	11-5	9-11	8-10	8-1	7-6	7-0	6-7
	3-2x6	7-4	6-8	6-0	5-6	5-1	4-9	4-6
	3-2x8	9-8	8-6	7-7	6-11	6-5	6-0	5-8
	3-2x10	12-0	10-5	9-4	8-6	7-10	7-4	6-11
	3-2x12	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 lb. per sq. ft. = 0.0479 kPa, 1 lb = 0.454 kg.

- Ground snow load, live load = 40 psf, dead load = 10 psf, $L/\Delta = 360$ at main span, $L/\Delta = 180$ at cantilever with 220-pound point load applied at the end.
- Beams supporting deck joists from one side only.
- No. 2 grade, wet service factor.
- Beam depth shall be greater than or equal to depth of joists= with a flush beam condition.
- Includes incising factor.
- Northern species. Incising factor not included.
- Beam cantilevers are limited to the adjacent beam's span divided by 4.



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Table R507.6
Deck Joist Spans for Common Lumber Species (ft.-in.)

Species ^a	Size	Allowable Joist Span ^b			Maximum Cantilever ^{c,f}		
		Spacing of Deck Joists (Inches)			Spacing of Deck Joists with Cantilevers (Inches)		
		12	16	24	12	16	24
Southern Pine	2X6	9-11	9-0	7-7	1-3	1-4	1-6
	2X8	13-1	11-10	9-8	2-1	2-3	2-5
	2X10	16-2	14-0	11-5	3-4	3-6	2-10
	2X12	18-0	16-6	13-6	4-6	4-2	3-4
Douglas fir-larch ^d , hem fir ^d , spruce-pine-fir ^d	2X6	9-6	8-8	7-2	1-2	1-3	1-5
	2X8	12-6	11-1	9-1	1-11	2-1	2-3
	2X10	15-8	13-7	11-1	3-1	3-5	2-9
	2X12	18-0	15-9	12-10	4-6	3-11	3-3
Redwood, Western cedars Ponderosa pine ^e , Red pine ^e	2X6	8-10	8-0	7-0	1-0	1-1	1-2
	2X8	11-8	10-7	8-8	1-8	1-10	2-0
	2X10	14-11	13-0	10-7	2-8	2-10	2-8
	2X12	17-5	15-1	12-4	3-10	3-9	3-1

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.

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

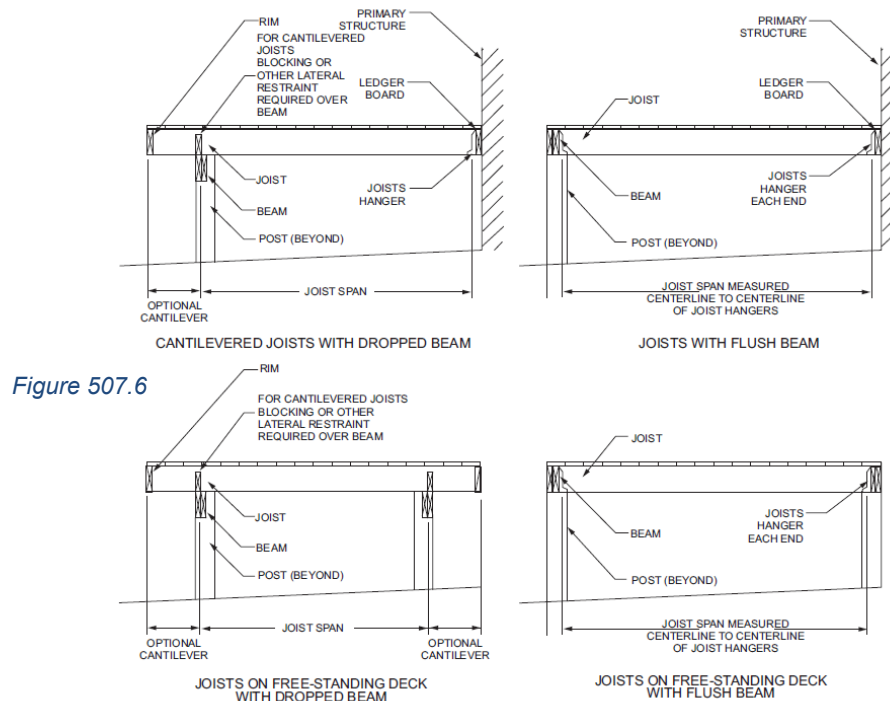


Figure 507.6



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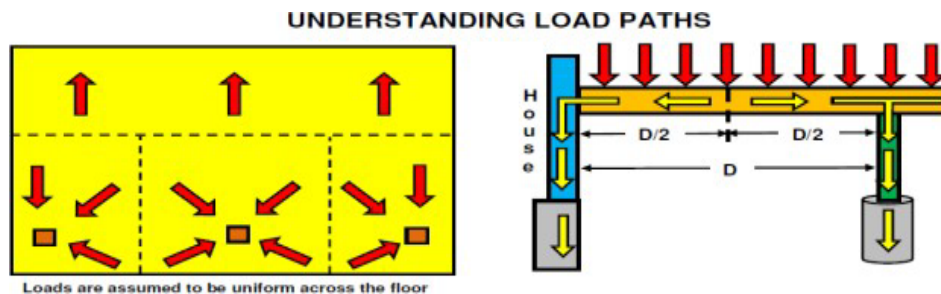
TABLE R507.7 MAXIMUM JOIST SPACING FOR DECKING		
DECKING MATERIAL TYPE & NOMINAL SIZE	MAXIMUM ON-CENTER JOIST SPACING	
	Decking perpendicular to joist	Decking Diagonal to Joist ^a
1 1/4-inch-thick wood	16 inches	12 inches
2-inch-thick wood	24 inches	16 inches
Plastic Composite	In accordance with Section R507.2	In accordance with Section R507.2

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 degree = 0.01745 r
 a. Maximum angle of 45 degrees from perpendicular for wood deck boards.

FOOTINGS

Use this section to calculate footing sizes
 MN IRC 2020 Table R507.2.3 (above)

When preparing the plans and details for your deck you must calculate and provide the details about the footing sizes. The first step in calculating footing sizes is to determine load at each footing. Use the following illustrations to understand how to calculate the sizes.



Minimum deck footings should be sized according to the following table. Footings must extend **at least 42 inches below grade** (frost line). Footing sizes are based on 1,000 PSF soil to account for potential soil conditions in Steele County

Determining footing size:

The footings are sized by determining the surface area of the deck that each post is supporting this is referred to as the *Tributary Area*. The type of soils in your area and loading on the deck will also play a part in the footing sizing.

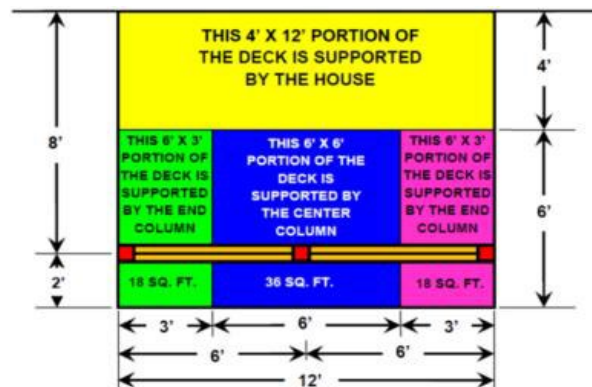
We will use our sample drawing for this again.

Yellow Section = Area 1

Green Section = Area 2

Blue Section = Area 3

Pink Section = Area 4



Start by dividing the joist span from the house to your beam in half. Since area 1 is fully supported by the house, no calculation is needed. Areas 2, 3, and 4, will be 4' plus the 2' cantilever or 6'.



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Let's divide the spacing between the posts by 2. That gives us 3' in area 2, 6' in area 3, and 3' in area 4.

Area 2: $3 \times 6 = 18$

Area 3: $6 \times 6 = 36$

Area 4: $3 \times 6 = 18$

We can now look at table R507.3.1 to determine the required footing size.

Area 2: $3 \times 6 = 18$ For 18, we use 20 so footing needs to be 12" square or 14" round

Area 3: $6 \times 6 = 36$ For 36, we need to use the 40 section which gives us 16" square or 19" round

Area 4: $3 \times 6 = 18$ For 18, we again use 20 so footing is 12" square or 14" round

*Footing sizes refer to the bottom diameter of a typical bell-shaped footing – 12" thickness.

Required footing sizes are determined by calculating the area of the deck supported by each footing. Loads shall be assumed to be equally shared between the supporting elements. **Don't overlook cantilevers; see "Understanding Load Paths" above.**

2020 MN Residential Code Section R403.1* – Footings shall be supported on undisturbed natural soil or engineered fill.

Any proposed construction of a deck, porch, or an addition may require soils corrections, or an engineer's soils report may be required to verify minimum bearing capacity of 1,500 PSF.

HOW TO DESIGN FOOTING FOR A DECK

1. **Concrete Footings** – The permit holder is responsible for the design size, but they cannot be a smaller diameter than listed in Table R507.3.1 below. In lieu of using this table, another option is to provide an engineer's soils report to verify minimum bearing capacity, and design them accordingly. Footings must still be set on sandy/suitable soils (no black organic type soils) or the footing inspection will fail. In some developments, the depth to suitable soil may be much deeper than the 42" frost depth. The footing inspection will fail if suitable soils cannot be verified, and soils corrections and/or deck footings must be designed by a licensed professional engineer.
2. **Helical piles (screw-pile)** – are permitted in accordance with manufacturer's instructions. These are long screw-like piles that can reach suitable soils without the need for soils corrections. Screw-piles must be installed by a certified contractor.

TABLE R507.3.1 MINIMUM FOOTING SIZE FOR DECKS													
LIVE OR GROUND SNOW LOAD	TRIBUTARY AREA (sq. ft.)	LOAD BEARING VALUE OF SOILS (psf)											
		1500°			2000°			2500°			≥3000°		
		Side of	Diameter	Thickness	Side of	Diameter	Thickness	Side of	Diameter	Thickness	Side of	Diameter	Thickness



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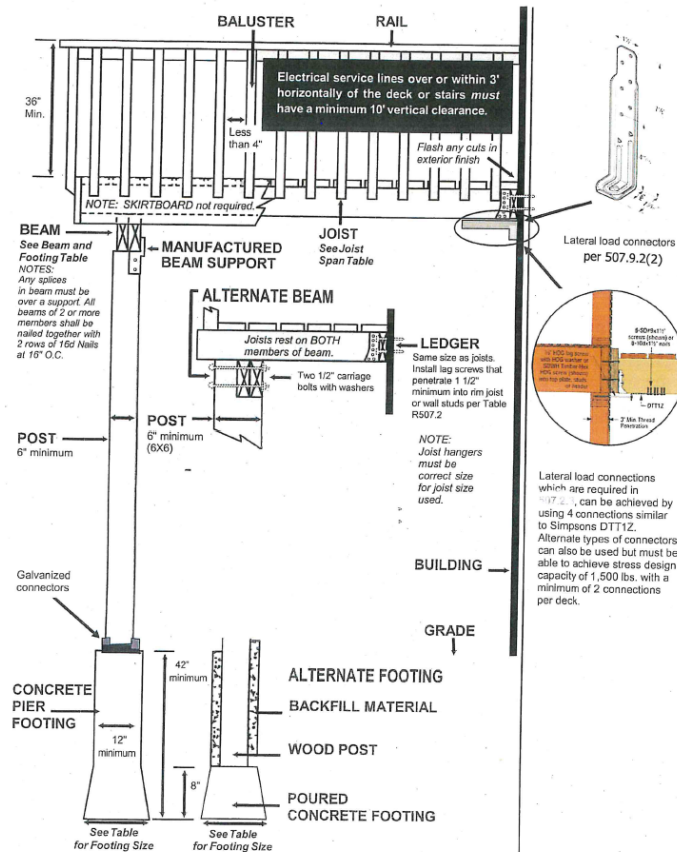
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(PSF)		a square footing (inches)	of a round footing (inches)	(inches)	a square footing (inches)	of a round footing (inches)	(inches)	a square footing (inches)	of a round footing (inches)	(inches)	a square footing (inches)	of a round footing (inches)	(inches)
40	20	12	14	6	12	14	6	12	14	6	12	14	6
	40	14	16	6	12	14	6	12	14	6	12	14	6
	60	17	19	6	15	17	6	13	15	6	12	14	6
	80	20	22	7	17	19	6	15	17	6	14	16	6
	100	22	25	8	19	21	6	17	19	6	15	17	6
	120	24	27	9	21	23	7	19	21	6	17	19	6
	140	26	29	10	22	25	8	20	23	7	18	21	6
	160	28	31	11	24	27	9	21	24	8	20	22	7

For SI: 1 inch = 25.4 mm, 1 foot = 0.0929 m², 1 lb. per sq. ft. = 0.0479 kPa

- Interpolation permitted; extrapolation not permitted.
- Live load = 40 psf, dead load = 10 psf.
- Assumes minimum square footing to be 12 inches x 12 inches x 6 inches for a 6x6 post.
- If the support is a brick or CMU pier, the footing shall have a minimum 2-inch projection on all sides.
- Area, in square feet, of deck surface supported by post and footings.



Stairs

Stairs must have a maximum rise of 7 ¾ inches and a minimum run of 10 inches measured as shown. The greatest riser height within any flight of stairs shall not exceed the smallest by more than 3/8 inch. The greatest tread depth within any flight of stairs shall not



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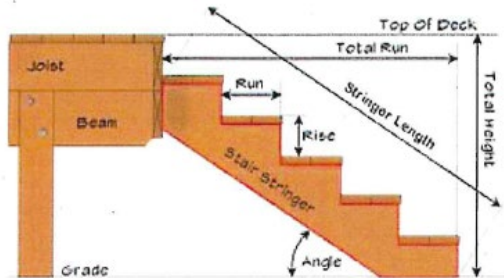
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exceed the smallest by more than 3/8 inch. Open risers are permitted provided that a 4" diameter sphere will not pass between treads.

Stairs must be a minimum of 36 inches wide above the handrail and 31 1/2 inches below the handrail.

Stair Terminology

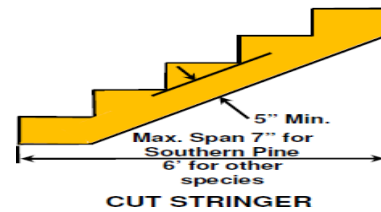


Stair Basics

- The maximum riser height is 7 3/4 inches
- The minimum tread run is 10 inches
- Treads and risers should be approximately equal with the largest not exceeding the smallest by more than 3/8 inch.

Example:

- Assume that H equals 37 inches
- Divide 37" by 7 3/4" ($37 \div 7 \frac{3}{4} = 4.8$)
- Rounding up to the next whole number gives the number of risers
- There will be 5 risers.
- Divided 37 by 5.





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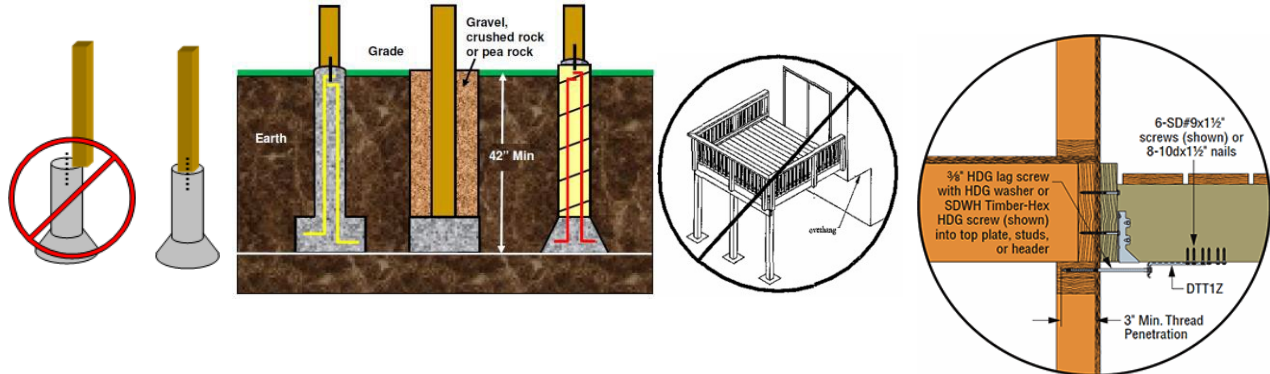
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POST

THE REQUIRED AREA OF THE COLUMN SHALL FULLY BEAR ON THE FOOTING



ALTERNATE METHODS FOR LATERAL SUPPORT

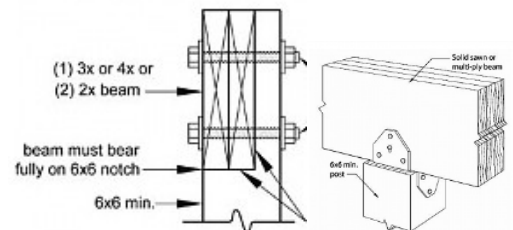
MECHANICAL CONNECTIONS

If the deck is freestanding or you are choosing an alternate method for lateral support, the details must be provided with your application for review. This handout contains information and examples of a few alternate design methods, but other methods may be approved. Whichever method is used, installation shall be per manufacturers and MN residential building code requirements.

Simpsons DTT1Z or similar as shown to right would require a minimum of 4 connections.

If this method is used, per code section R507.2.3 there shall be a minimum of 2 devices installed, and each device shall have an allowable stress design capacity of not less than 1500 pounds.

The hold-down tension device manufacturer prescribes alternate methods for attaching to engineered or manufactured wood floor systems and for achieving floor sheathing attachment where floor covering already in place.



POSTS

		MAXIMUM POST HEIGHT IN FEET													
SPECIES	SIZE	SQUARE FEET OF DECK SUPPORTED													
		36	48	60	72	84	96	108	120	132	144	156	165	180	192
SOUTHERN PINE	4X4	10	10	10	9	9	8	8	7	7	6	6	6	6	6
	4X6	14	14	13	12	11	10	10	9	9	8	8	8	7	7
	6X6	17	17	17	17	17	17	17	17	16	16	15	14	13	13
REDWOOD CEDAR	4X4	10	10	9	8	7	7	6	6	5	4				
	4X6	14	13	12	11	10	9	8	8	7	7	7	6	6	5
	6X6	17	17	17	17	17	16	13	7						

Posts shall be rated for ground contact.



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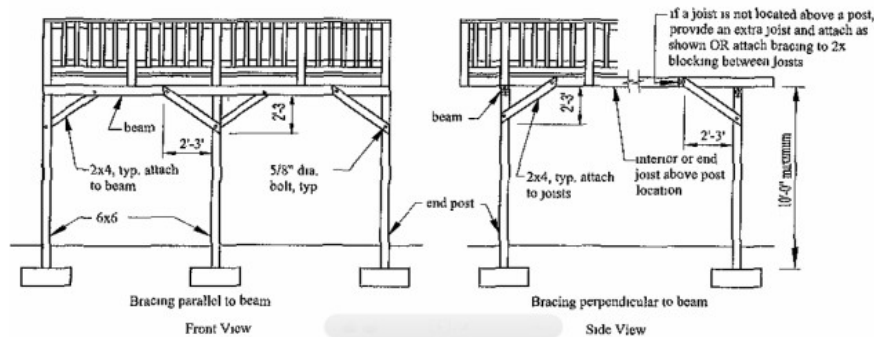
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DIAGONAL BRACING



The illustration above is one example of diagonal bracing that may be used as an alternate method of lateral bracing for all decks. Freestanding decks, regardless of height above ground, shall resist vertical loading, lateral loading and movement. One set of diagonal bracing shall be located between posts and beams or parallel to the house. Another set of diagonal bracing shall be located perpendicular to beams and house in the end spans. This bracing shall be bolted to the post and joist above the post location. If the joist spacing is such that a joist does not align over a post location an extra joist shall be added to facilitate connection of the diagonal bracing. A minimum of one 5/8" bolt shall be used at each connection between bracings posts, beams, and joists when 6x6 inches posts are used. The photo above shows the use of 2x4 bracing. The photo at right shows 6x6 bracing

EMBEDDING POSTS

Embedding the uncut treated posts in concrete can be used to provide lateral support. Important note: Due to expansion and contraction of the wood posts there is a potential for accelerated decay, therefore it is a less common method. If this method is chosen, provide specific design details with your deck plans and application (posts to be rated for ground contact use).

Placing the uncut treated post on a concrete footing pad a minimum of 42" below grade and embedding posts by packing dirt or rock back around the posts would require a specific design by a structural or soils engineer, or other alternate methods for lateral load protection.





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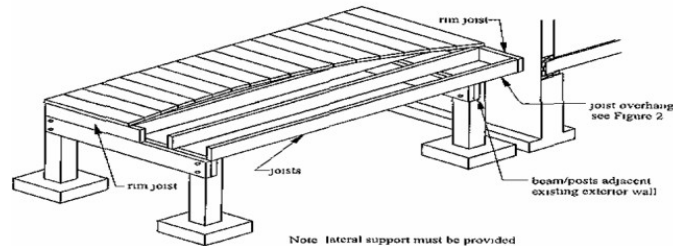
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FREESTANDING/SELF-SUPPORTING DECKS



Sometimes the house has limitations that make attaching a deck to it impossible or undesirable. The deck shall be freestanding/self-supporting when positive connections for vertical and lateral loads cannot be accomplished and inspected.

Freestanding/self-supporting decks shall also be designed for both vertical and lateral loads.

Freestanding decks less than 20" above grade, not attached to the house, and not serving a required exit does not require full frost footings or a building permit. Decks 20" or more above grade; shall have footings that extend below grade and bear on natural, undisturbed soils – but in no case less than 42". Footing located any closer than 5 feet from the foundation must be at the same level as the house footing.



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PORCH SECTION:

GENERAL CAUTIONS REGARDING PORCH CONSTRUCTION

If you are considering constructing an enclosed porch, on an existing deck, please be aware that you will likely need to make significant alterations to the framing and supports of your deck in order to support the additional weight of a porch unless your deck was originally designed for that purpose. If you are constructing your porch from scratch, you may be able to design your porch without those concerns.

It is common practice to use “concrete piers” or “post footings” to support enclosed porches. Be aware that these types of foundations are a significant compromise compared to continuous perimeter foundations. Pier foundations are more susceptible to independent movement that can result in shifting of the porch resulting in cracked or jammed windows and doors and cracked wall finishes. Also, piers are usually sized just large enough to support anticipated loads based on average soil conditions leaving little safety factor. If your home is located in an area with clay or unpredictable soils, you may wish to consult with a soils engineer to aid in designing your foundation.

Once porches are in place, homeowners with porches attached to homes with walkout basements sometimes wish to enclose the underside of the porch with screening or a combination of walls and screening. The following are just a few examples of problems that may arise if the area under the porch is enclosed. First, if walls are securely placed under the perimeter of the porch and on top of a patio slab below, there is a risk frost will move the slab enough to place pressure on the porch above potentially causing damage. Second, if the construction is supported from the porch above, additional and unanticipated weight placed on the porch foundation may cause settlement. There may also be concerns with egress windows and mechanical venting into the space. Again, if you anticipate these types of alterations in the future, plan your project accordingly.

REQUIREMENTS FOR PERMIT APPLICATION SUBMITTAL (PORCH)

1. A completed and signed, Residential Deck/Porch/Ramp Application and Worksheet.
2. A copy of your property survey showing the property lines, existing buildings, and location of the proposed porch – include distances to property lines.
3. Two sets of detailed plans must be included with permit application. Plans must include cross sections, floor plans, elevations, and a complete material list. For more information on plans, see the handout on Building Plans, and Additions. All details must be included on the plans including the following:
All dimensions drawn to scale
Size, direction and spacing of joists
Size and depth of footings
Elevation plan with height and guard design
Size and spacing of posts
Type and size of all materials used
Size / Specs of beams and headers
Cantilevered floor system specs
Stair location (if applicable)
Insulation type(s) and R-values
Size of ledger and band joists
4. Structurally engineered plans are required when porch is supporting a hot tub / spa.

PERMIT PROCESS AND FEES

Please allow 3-7 business days for the application and submittal documents to be reviewed for building and zoning code compliance, and a permit to be issued. This process may be delayed if



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the plans are incomplete. You will be notified when your permit is ready to be picked up and paid for.

The permit fee for a porch is based on the valuation.

INSPECTIONS

Permit, approved plans, inspection record card, and all inspection notices **shall be on site at all times**.

Scheduling Inspections:

- Please plan inspections at least 2 business days in advance. Longer delays may occur during periods of busy construction. Have address & permit number ready when scheduling.
- **Footing / Ledger Inspection** - Holes dug, loose material/water removed, prior to placing concrete – bottom of footing must be sandy original soil (no black organic soil, or fill).

The inspector must have access to the inside of the home at the final inspection, to verify proper attachment of deck to home.

- **Underfloor Framing / Mechanical Inspection** – This inspection is required when the clear space under the deck joists is less than 48" above grade.
- **Framing, Sheathing, Weather Barrier, Roofing Inspection:** electrical must be approved
- **Insulation Inspection**
- **Final Inspection** – When all work has been completed (building / mechanical / electrical) Permit holder or designee shall meet on site for final inspection.

Access to inside of home required if the ledger attachment did not pass at time of original footing / ledger inspection.

ENERGY CODE

The energy code does not currently apply to **screen porches**. Four season porches will need to meet all or a portion of the Energy Code requirements depending on how the porch is designed and built. There are a number of variables related to the energy code, below is a list of minimum Insulation values required:

Reminder – Better insulation means a lower number for U-factor and higher number for R values.

- 1) Windows U-factor .32
- 2) Heat supply and return ducts R-8 with vapor barrier shall be held high enough to allow a minimum R-19 below the duct. Duct seams must be sealed w/ mastic or UL 181 tape.
- 3) Underfloor insulation R-30 shall be directly under floor
- 4) Ceiling insulation R-49 (proper venting required)
- 5) Vaulted Ceiling R-30 (proper venting required)
- 6) Wall insulation R-20

FOUNDATIONS

Porch designs must result in a framing system to transfer all loads to the ground. This includes roof dead loads, snow loads, wall loads, floor dead loads, and floor live loads. Your plans should include detailed information on the sizing of all framing members. If you need assistance determining the size of beams, columns, and footings, you may wish to consult with a structural engineer.

FRAMING

Columns and beams need to support roof as well as floor loads. The ledger board will almost always be insufficient to carry roof and wall loads in addition to floor loads. This means that the



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exterior wall of the home will need to be opened to allow beams to extend into the wall for support. Roof framing cannot be attached to fascia boards but must extend onto the top plate of the exterior wall.

SAFETY GLAZING

Porches often have many large windows. Windows adjacent to doors, including sliding patio doors and windows exceeding certain size limitations must have tempered or laminated glass. The Building Department has a handout on safety glazing to help identify locations where protection is required. If you have any questions regarding safety glazing, see the Safety glazing handout or contact the Building Department.

GUARDS/GUARDRAILS

Screen porch floors that are more than 30 inches above grade must have guard rails not less than 36 inches in height meeting guard requirements. Insect screening **is not** an acceptable substitute. The Building Department has a handout on Guards. To avoid installation of a guard, you may wish to start the screening 36 inches off the floor and have a solid wall below the screening. Or, you may construct the wall with balusters as a guard in accordance with the building code.

SIZING INDIVIDUAL PORCH FOOTINGS

The total area of the roof (including overhangs) and floor supported by a member must be used in sizing that member. Footing diameter is based on all accumulated loads. Following are several methods of constructing pier footings followed by a load path diagram. The following design loads are used:

- Roof loads – 60 psf
- Floor loads – 50 psf
- Wall loads – 64-88 plf (wall loads can vary depending on construction of the wall)

MINIMUM PORCH CIRCULAR FOOTING DESIGN – BOTTOM DIAMETER

Minimum deck footings should be sized according to the following table. Footings must extend **at least 42 inches below grade** (frost line). Footing sizes are based on 1,000 PSF soil to account for the potential soil conditions.

NOTE: This table should only be used as a guide. It is assumed that at a minimum, Plain Structural Concrete (2,500 PSI) will be used for footings sized herein. Soil types and bearing capacities must be verified at each site. Consult with the Building Department prior to using this table.

2020 MN Residential Code Section R403.1 – Footings shall be supported on undisturbed natural soil or engineered fill.

SOILS

Soils outside of these corrected pads may not be suitable for the construction of decks, porches, or home/garage additions. Any proposed construction of a deck, porch, or an addition may require soils corrections, or an engineer's soils report may be required to verify minimum bearing capacity of 1,500 PSF.



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Footing Diameter* (inches)	Area	Load Supported	Footing Thickness**
12"	0.79 sq. ft.	785 lbs	8"
14"	1.07 sq. ft.	1,069 lbs	8"
16"	1.40 sq. ft.	1,396 lbs	8"
18"	1.77 sq. ft.	1,767 lbs	8"
20"	2.18 sq. ft.	2,182 lbs	8"
22"	2.64 sq. ft.	2,640 lbs	10"
24"	3.14 sq. ft.	3,142 lbs	10"
25"	3.41 sq. ft.	3,409 lbs	10"
26"	3.69 sq. ft.	3,687 lbs	10"
27"	3.98 sq. ft.	3,976 lbs	10"
28"	4.28 sq. ft.	4,276 lbs	12"
29"	4.59 sq. ft.	4,587 lbs	12"
30"	4.91 sq. ft.	4,909 lbs	12"
31"	5.24 sq. ft.	5,241 lbs	12"
32"	5.59 sq. ft.	5,585 lbs	12"
33"	5.94 sq. ft.	5,940 lbs	12"
34"	6.31 sq. ft.	6,305 lbs	12"
35"	6.68 sq. ft.	6,681 lbs	12"
36"	7.07 sq. ft.	7,069 lbs	14"

*footing sizes refer to the bottom diameter of a typical bell-shaped footing
 **footing thickness refers to the depth of the concrete at the bottom of a typical bell footing

HOW TO DESIGN FOOTINGS FOR A PORCH

Note: Areas of known poor soils require soils corrections and/or porch footings must be designed by a licensed professional engineer prior to the issuance of the permit

1. **Concrete Footings** – The permit holder is responsible for the design size, but they cannot be a smaller diameter than listed in the Minimum Porch Circular Footing Design Table above. In lieu of using this table, another option is to provide an engineer's soils report to verify minimum bearing capacity, and design them accordingly.

Footings must still be set on sandy/suitable soils (no black organic type soils) or the footing inspection will fail. In some developments, the depth to suitable soil may be much deeper than the 42" frost depth. The footing inspection will fail if suitable soils cannot be verified, and soils corrections and/or deck footings must be designed by a licensed professional engineer.

2. **Helical piles (screw-pile)** are permitted in accordance with manufacturer's instructions. These are long screw-like piles that can reach suitable soils without the need for soils corrections. Screw-piles must be installed by a certified contractor.



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RAMP SECTION:

REQUIREMENTS FOR PERMIT APPLICATION SUBMITTAL (FREESTANDING RAMP)

1. A completed and signed, Residential Deck/Porch/Ramp Application and Worksheet.
2. A copy of your property survey showing the property lines, existing buildings, and location of the proposed ramp – include distances to property lines.
3. Two sets of detailed plans must be included with permit application. Plans must include an elevation plan and a complete materials list. All details must be included on the plans including the following:

All dimensions drawn to scale
Size, direction and spacing of joists
Guardrails / Handrails
Size and spacing of posts
Type and size of all materials used
Size of beams and headers
Footings / Supports / Anchoring
Edge curb or barrier

PERMIT PROCESS AND FEES

Please allow 5-7 business days for issuance of the permit. This process may be delayed if the plans are incomplete. You will be notified when your permit is ready to be picked up and paid for.

ACCESSIBLE RAMP - MINIMUM DESIGN STANDARDS

- 1:12 minimum slope (1:20 is the recommended ADA standard)
- Handrail required on both sides of the ramp and continuous the full length of the ramp.
- Landing w/ Change of Direction - a 5' diameter turning radius is required.
- Doorway Landing – a 5' diameter turning radius is required in front of the door.
- Door Threshold – ¾" maximum (1/2" maximum is recommended)
- Clear Width – 36" minimum and handrails shall not project into this 36" dimension.
- To prevent a wheel from going off the edge, a curb or a barrier is required along both sides of a ramp. A curb must be a minimum of 4" in height. A barrier must be constructed so that the barrier prevents the passage of a 4" diameter sphere within 4" of the ramp surface.
- Handrails where required shall be continuous of the full length of the ramp.
- Handrails shall terminate in newel posts or safety terminals.
- Handrails adjacent to a wall shall have a space of not less than 1 ½" between the wall and the handrails. See all requirements for guards & handrails in the deck section of this handout.
- Rise - the maximum rise between landings is 30"
- Landing w/ Change of Direction - a 5' diameter turning radius is required.
- Freestanding ramp posts must sit on a minimum 2x treated lumber or concrete pad. Freestanding ramps must be anchored to the ground to prevent wind uplift (screw anchors are typically used)

NON-ACCESSIBLE RAMP REQUIREMENTS

- 1:12 – slope, 1:8 permitted if longer slope is technically infeasible.
- A handrail is required on one side if the slope exceeds 1:12.
- Landings – minimum 3-foot-by-3-foot landing shall be provided at the top & bottom, where doors open onto ramps, and where ramps change direction.
- Clear Width – 36" minimum
- Handrails where required shall be continuous of the full length of the ramp.
- Handrails shall terminate in newel posts or safety terminals.
- Handrails adjacent to a wall shall have a space of not less than 1 ½" between the wall and the handrails. See all requirements for guards & handrails in the deck section of this handout.
- Rise - the maximum rise between landings is 30"



DECK / PORCH / RAMP HANDOUT

630 Florence Avenue PO Box 890, Owatonna, MN 55060

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Residential

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