Residential Decks

1 & 2 Family Dwellings and Townhouses

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. For specific questions regarding code requirements, refer to the applicable codes or contact **the City of Winona Inspections Department at (507)457-8231.**

Building Permit Requirements:

- Building permits are required for all decks that are more than 30" above adjacent grade or attached to a structure having frost footings. A permit is also required if the deck is part of an accessible route.

Zoning Requirements:

- Decks must also meet the City's land use and setback requirements as stated in the Unified Development Code. Supply a drawing(s) similar to Page 5 of this handout "Site Plan Example"

Plan Review & Inspections:

- Along with a completed permit application, the applicant must supply all information required in this handout. Plans will be reviewed by the Building Inspections Department for code compliance and returned in a reasonable amount of time. Construction must not begin until the code compliant plans are on site and a permit card is hung in a visible location.

Design Considerations:

- All fasteners shall be hot-dipped galvanized, stainless steel or other approved for use with preservative treated lumber.
- All lumber in direct contact with the ground must be rated as "ground contact" lumber.
- Flashing at ledger board connections shall be corrosion-resistant metal of nominal thickness not less than 0.019 inch or *approved* non-metallic material that is compatible with the substrate of the structure and the decking materials. Aluminum and galvanized metal will only be allowed if there is a barrier between the treated lumber and the flashing material.
- Plastic composite exterior deck boards, stair treads, guards and handrails shall comply with the requirements of ASTM D7032 and Section R507 of the 2020 Minnesota IRC.
- Mechanical connectors, e.g., joist hangers or post anchors, shall be stainless steel or galvanized with 2.0 ounces of zinc per square foot (total both sides) (ASTM A653 G-185 coating).

Required inspections will include, but are not limited to:

Footing: When holes are dug and forms are set **BEFORE** any concrete is poured. The inspector will check the depth of the footing and its width at the base. They may also check the location of the footings for compliance with the zoning ordinance.

Framing: When all framing, blocking, bracing and flashing is in place and prior to covering the construction so it will be accessible for inspection. The inspection MAY be done at the time of a final inspection if **ALL** parts of the framing are visible and easily accessible. The inspector will check the size and spacing of joists, beams and columns, the attachment to the dwelling including flashing, the type and locations of fasteners and any other item deemed necessary.

Final: When deck is completed and grading (if any is required) is finished. The inspector will check the type of decking, stairs, railings, and landings.

DECK JOIST AND BEAM SIZE AND SPACING GUIDE

TABLE R507.5 Deck Beam Span Lengths [a,b,g] (feet-inches)

SPECIES[c]	SIZE[d]	DECK JOIST SPAN LESS THAN OR EQUAL TO: (feet)						
		6	8	10	12	14	16	18
Southern pine	1 – 2 × 6	4-11	4-0	3-7	3-3	3-0	2-10	2-8
	1 – 2 × 8	5-11	5-1	4-7	4-2	2-10	3-7	3-5
	1 – 2 × 10	7-0	6-0	5-5	4-11	4-7	4-3	4-0
	1 – 2 × 12	8-3	7-1	6-4	5-10	5-5	5-0	4-9
	2 – 2 × 6	6-11	5-11	5-4	4-10	4-6	4-3	4-0
	2 – 2 × 8	8-9	7-7	6-9	6-2	5-9	5-4	5-0
	2 – 2 × 10	10-4	9-0	8-0	7-4	6-9	6-4	6-0
	2 – 2 × 12	12-2	10-7	9-5	8-7	8-0	7-6	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

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. Live load = 40 psf, dead load = 10 psf, L/Δ = 360 at main span, L/Δ = 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.
g. Beam cantilevers are limited to the adjacent beam's span divided by 4.

TABLE R507.7 Joist Spacing for Decking

DECKING MATERIAL TYPE AND 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 rad.
a. Maximum angle of 45 degrees from perpendicular for wood deck boards.

TABLE R507.6 Deck Joist Spans for Common Lumber Species (feet-inches)

SPECIES[a]	SIZE	ALLOWABLE JOIST SPAN[b]			MAXIMUM CANTILEVER[c, f]		
		SPACING OF DECK JOISTS (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	1-3	1-4	1-6
	2 × 8	13-1	11-10	9-8	2-1	2-3	2-5
	2 × 10	16-2	14-0	11-5	3-4	3-6	2-10
	2 × 12	18-0	16-6	13-6	4-6	4-2	3-4

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. Live load = 40 psf, dead load = 10 psf, L/Δ = 360 at main span, L/Δ = 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.
g. Beam cantilevers are limited to the adjacent beam's span divided by 4.

TABLE R507.4 - DECK POST HEIGHT

DECK POST HEIGHT	MAXIMUM HEIGHT [a,b] (FT – IN)
4 X 4	6-9[c]
4 X 6	8
6 X 6	14
8 X 8	14

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

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.

MINIMUM FOOTING SIZE FOR DECKS

LIVE LOAD[b] (psf)	TRIBUTARY AREA (sq. ft.)	LOAD BEARING VALUE OF SOILS [a, c, d] psf											
		1500[e]			2000[e]			2500[e]			3000[e]		
		Side of a square footing	Diameter of a round footing	Thickness (inches)	Side of a square footing	Diameter of a round footing	Thickness (inches)	Side of a square footing	Diameter of a round footing	Thickness (inches)	Side of a square footing	Diameter of a round footing	Thickness (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 square foot = 0.0929 m2, 1 pound per square foot = 0.0479 kPa. a. Interpolation permitted, extrapolation not permitted.

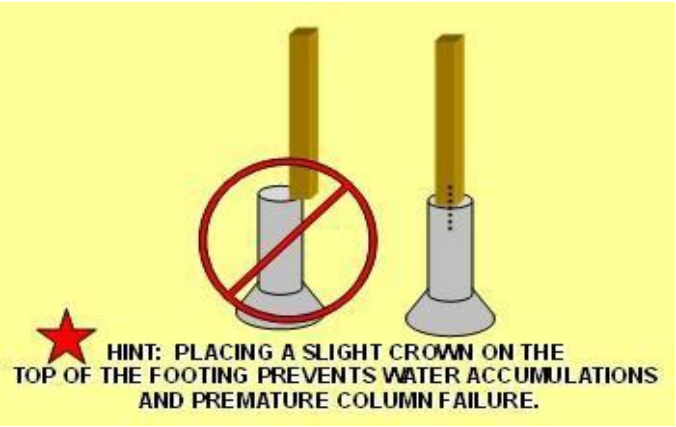
b. Live load = 40 psf, dead load = 10 psf.

c. Assumes minimum square footing to be 12 inches x 12 inches x 6 inches for 6 x 6 post.

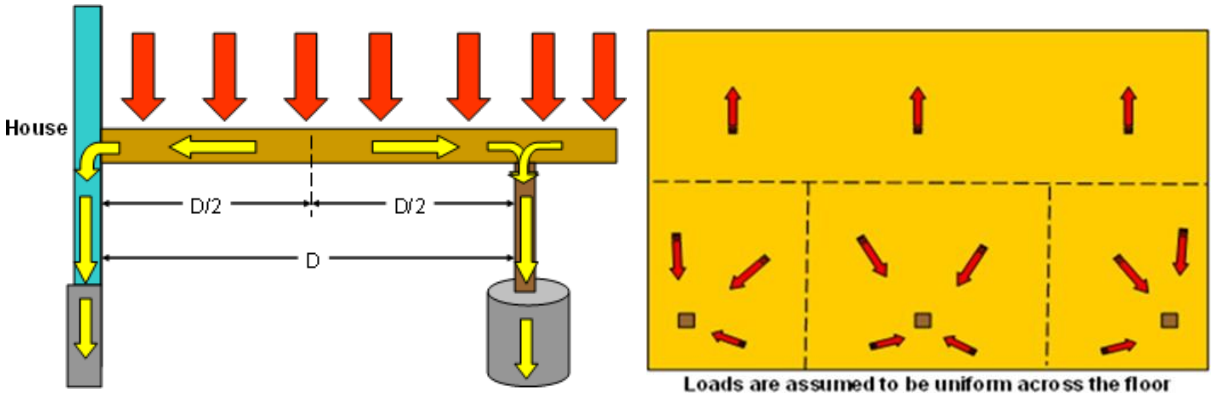
d. If the support is a brick or CMU pier, the footing shall have a minimum 2-inch projection on all sides.

e. Area, in square feet, of deck surface supported by post and footings.

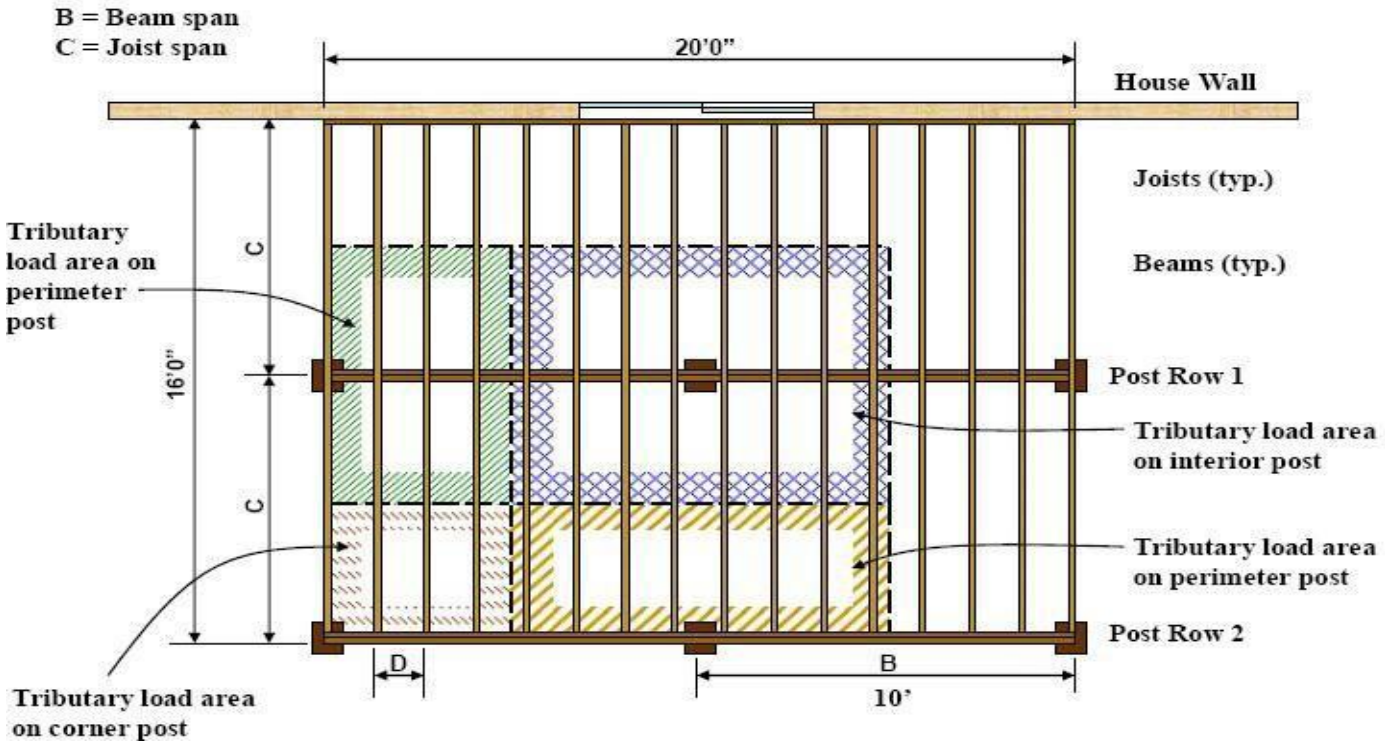
***Note:** Post must be centered on or in footing



Understanding Load Paths



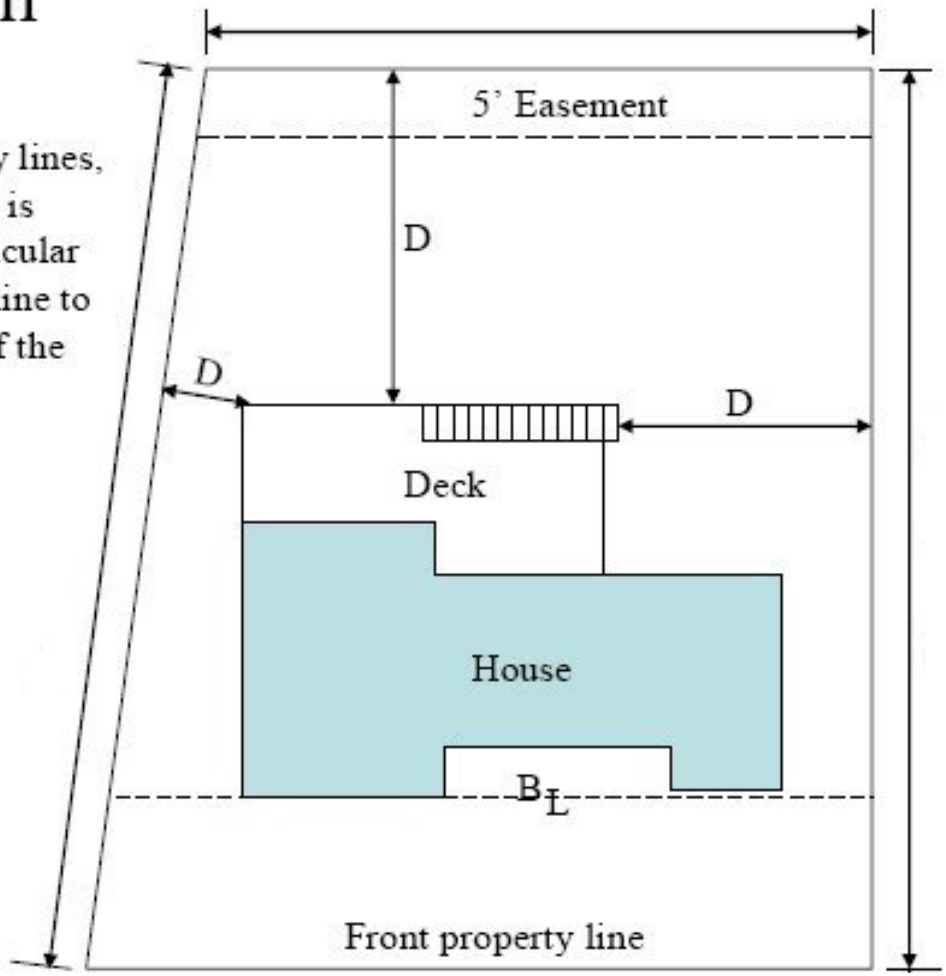
Tributary load area for posts



Site Plan

On angled property lines, the dimension "D" is measured perpendicular from the property line to the nearest point of the structure

Don't forget to show easements and building lines on your site plan



D = Distance to property lines

Show deck location with respect to house and lot lines

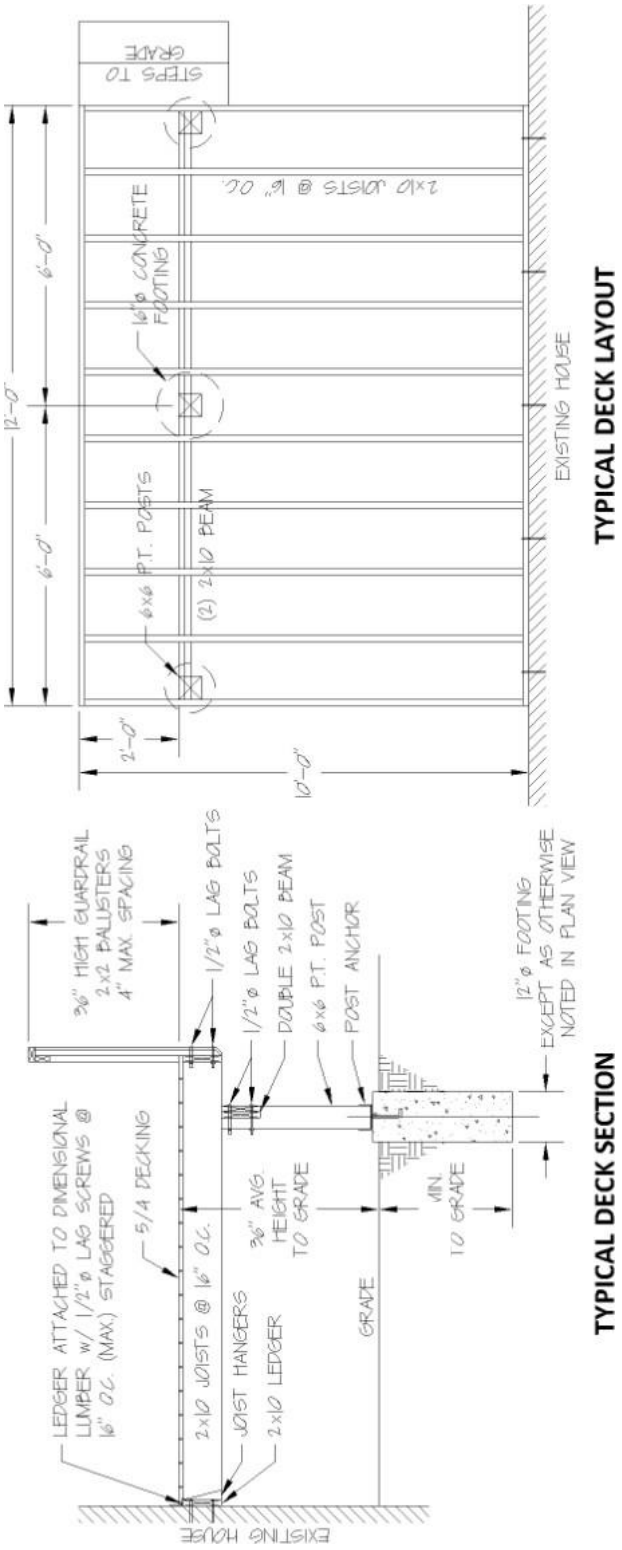
Show house on lot

Site Plan for (address):_____

Indicate North Direction

SAMPLE PLAN AND SECTION VIEW

Both are required to be submitted with the permit application



THIS IS AN EXAMPLE SKETCH ONLY. DO NOT USE THIS TO DESIGN YOUR DECK

Deck Plan and Elevation View: Drawing must include footing locations and sizes, post sizes and locations, joist sizes and lengths, beam sizes and lengths, decking direction and type, overall deck dimensions, location of stairs, height of deck surface from lowest grade level, depth of footings and all other information needed to construct the deck (see Typical Deck Layout drawing on pg. 8 for reference). *Attach additional sheets if needed.

Stair, Guardrail & Handrail Details: Drawing must include elevation view of stairs (see detail on pg. 12), height of guardrails (see Guardrail Detail Drawing Example pg. 11) connection detail to house (see Ledger Board to House Connection pg. 10) and any other information needed to construct the deck (see Typical Deck Elevation drawing on pg. 8 for reference).

Post to Beam Connection Details

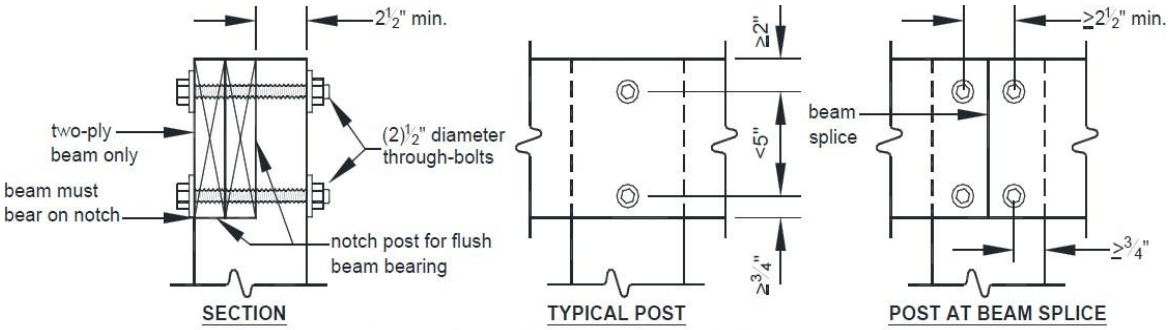


FIGURE 18: NOTCHED 6x6 POST-TO-BEAM CONNECTION

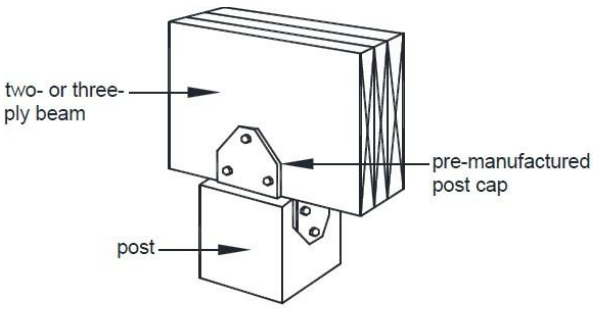


FIGURE 19: POST CAP CONNECTION

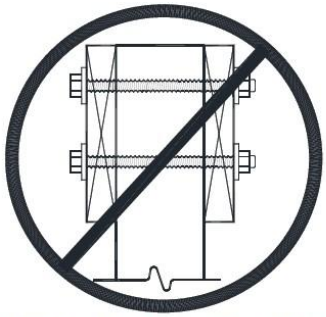


FIGURE 20: PROHIBITED CONNECTION

Ledger Board to House Connection EXAMPLE ONLY

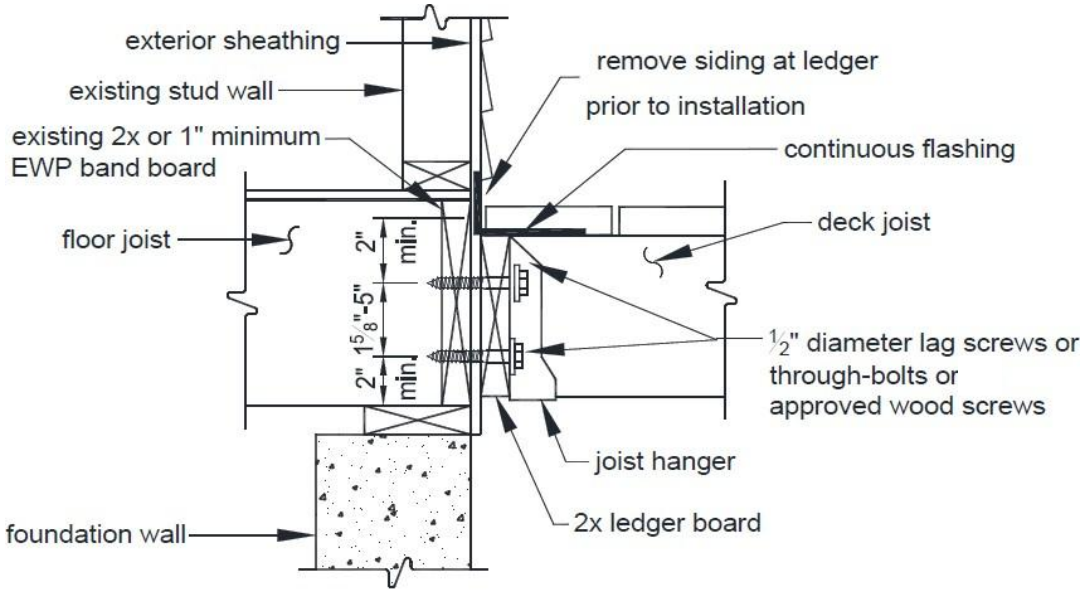


TABLE R507.9.1.3(1)
DECK LEDGER CONNECTION TO BAND JOIST[a]
(Deck live load = 40 psf, deck dead load = 10 psf

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

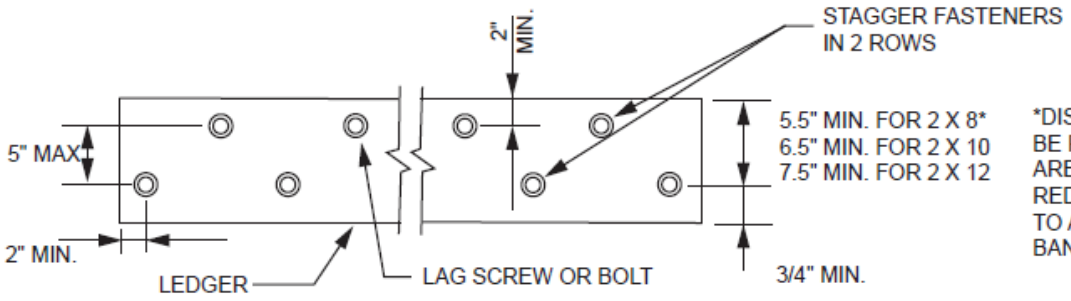
For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa.

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 wood structural panel or solid sawn lumber.

d. 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.



For SI: 1 inch = 25.4 mm.

FIGURE R507.9.1.3(1)
PLACEMENT OF LAG SCREWS AND BOLTS IN LEDGERS

Prohibited ledger attachments: The ledger board attachment conditions shown below are prohibited. In such cases, a free-standing deck or engineering design is required.

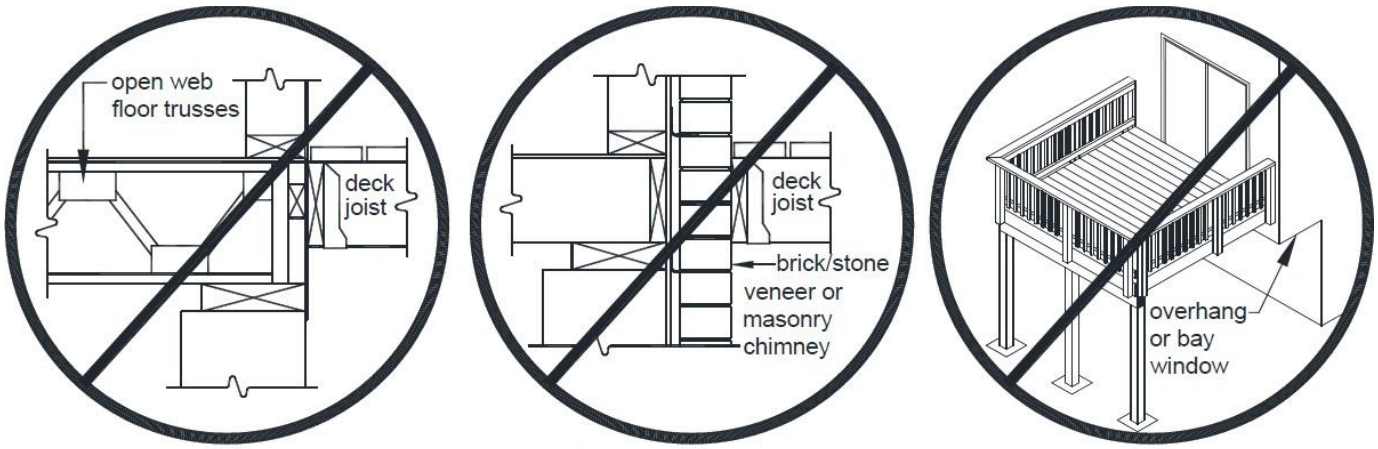
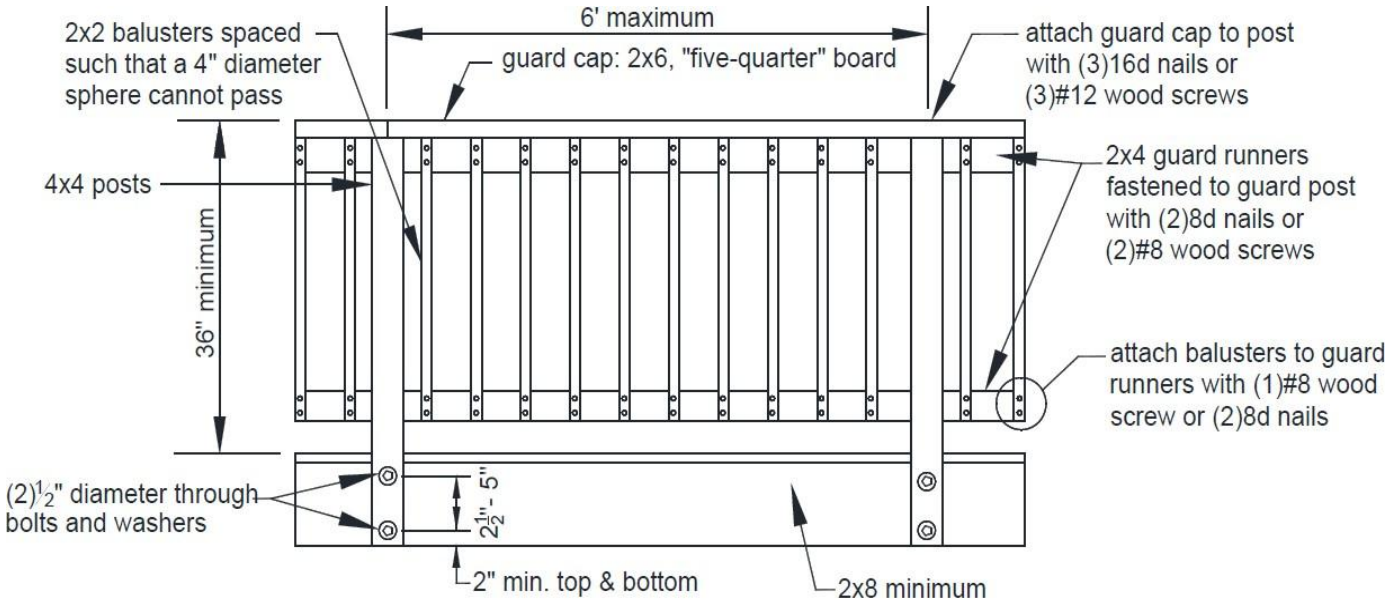
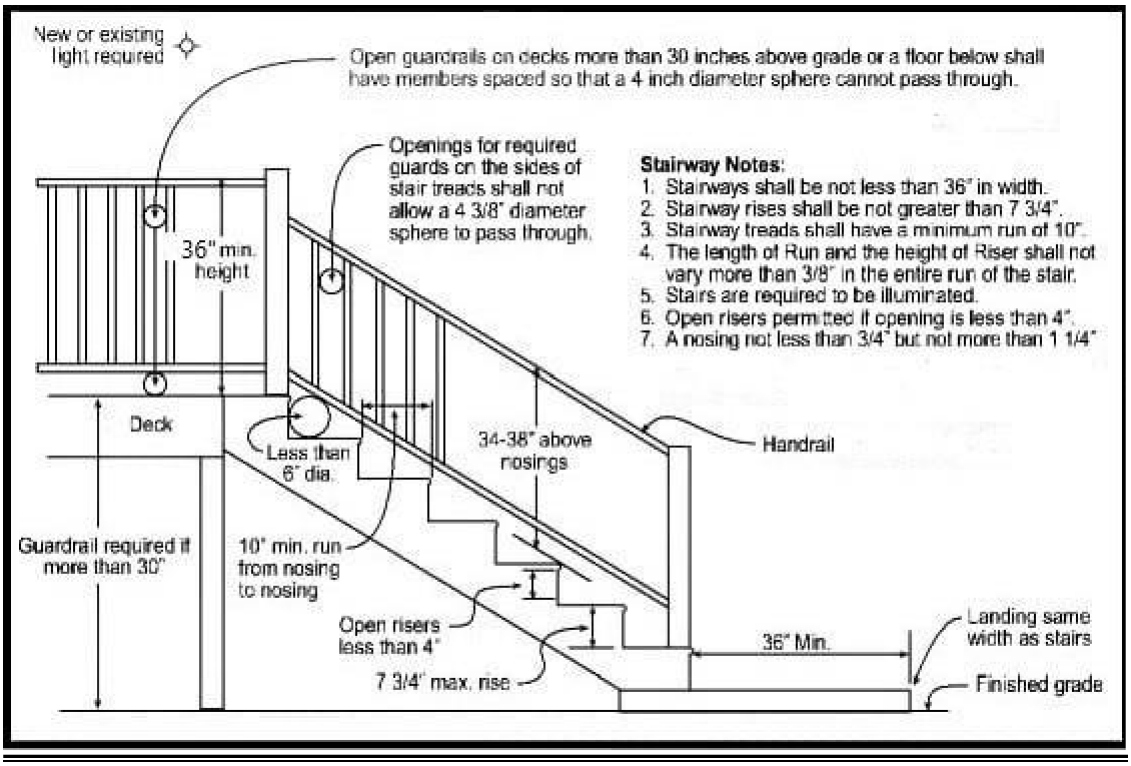


FIGURE 25: PROHIBITED LEDGER ATTACHMENTS

Guardrail and Handrail Detail Drawings EXAMPLE ONLY

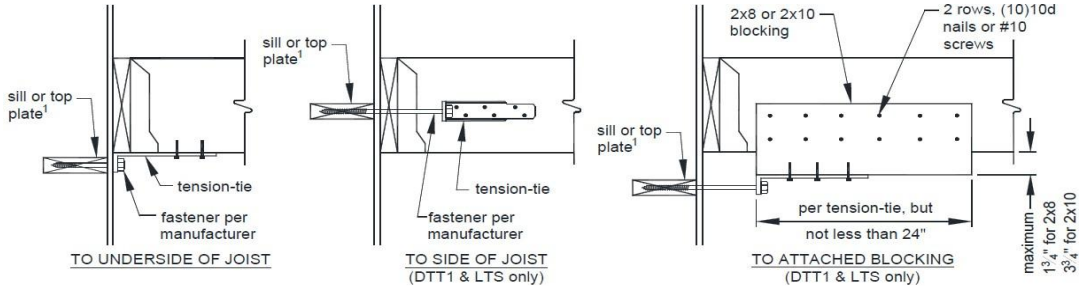




Lateral Load Connection

R507.9.2 Lateral connection. Lateral loads shall be transferred to the ground or to a structure capable of transmitting them to the ground. Where the lateral load connection is provided in accordance with Figure R007.9.2.(1), hold -down tension devices shall be installed in not less than two locations per deck, within 24" of each end of the deck. Each device shall have an allowable stress design capacity of not less than 1,500 pounds (6672N). Where the lateral load connections are provided in accordance with Figure 507.9.2(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 750 pounds (3336N).

* **Some examples of hold-down tension devices:**



[1]