City of Chaska Residential Deck Handout

Steps to Complete Deck Permit Application

1. Provide a completed residential deck building permit application.
2. Provide a deck floor plan drawn to scale.
   A. Show the perimeter of the deck, include stairway if applicable, provide all dimensions.
   B. Provide footing post/locations.
   C. Show the house line where the deck attaches to house, indicate bump outs and cantilevers.
   D. Provide beam location, indicate beam cantilever if any. Indicate if the beam will be a flush beam or dropped beam (see figure 507.5)
   E. Provide length and direction of joists.
3. Submit a certificate of survey, site plan or other approved diagram that shows property lines, the home and proposed deck location.

Code Requirement Summary based on the 2020 MN State Residential Code

*This is a summary of code requirements, for specific code requirements see the **2020 MN State Residential code.** **The 2020 MN State Residential Code can be viewed online at the Department of labor and Industries website.***

Wood Framed Decks shall be in accordance to **Section R507.1 of the 2020 MN State Residential Code.** For decks using materials and conditions not prescribed in this section refer to Section R301.

1. **Structural Engineering** may be required depending on the specifics of your proposed project (hot tubs, possibly a future porch).

2. **Wood Materials** are required to be #2 grade or better, naturally durable wood or wood that is treated in accordance with AWPA UI-16.

AWPA Use Categories (listed on tag)

UC3A	Exterior above ground, rapid water runoff.	Open porch floors
UC3B	Exterior above ground, poor water runoff.	Deck rail (UC3B or higher), Deck boards (UC3B or higher) Above ground joists and beams (UC3B or higher), Above ground stairs (UC3B or higher).
UC4A	Ground contact, general use.	Deck posts (UC4A or higher), Ground contact joists and beams (UC4A or higher), Ground contact ledger (UC4A or higher), Ground contact stairs (UC4A or higher).
UC4B	Ground contact, heavy duty.	
UC4C	Ground contact, extreme duty.	

Cuts, notches, and drill holes in preservative treated wood need to be field treated.

3. **Plastic Composite** deck boards, stair treads, guards, and handrails are required to comply with ASTM 07032 and be identified as meeting all of the ASTM D7032 standards. (listed on tag)

Plastic composite deck boards, stair treads, guards, and handrails are required to have a flame spread index of less than 200 when tested in accordance to ASTM E84 or UL723.

Plastic composite deck boards, stair treads, guards, and handrails are required to be installed in accordance to this code and the manufacturer's instructions.

4. **Fasteners and Connectors** made of metal, shall be compliant with R317.3 and Table R507.2.3.

   Flashing shall be corrosion-resistant metal or approved non-metallic material that is compatible with the structure and the decking materials.

5. **Footings** or other approved structural system shall be designed to accommodate all loads from the structure. All footings shall have minimum depth of 42". The minimum size for concrete footings will be sized based on tributary area, soil bearing capacity, and in accordance with table R507.3.1.

6. **Deck Posts** for single level wood framed decks with beams that are sized in accordance with Table R507.5 shall be sized in accordance with table R507.4. Where posts bear on concrete footings lateral restraint shall be provided by a manufactured connector or 12" minimum post embedment (12" post embedment may not meet uplift requirements).

7. **Deck Beam** maximum span shall be in accordance with table R507.5. Beam plies shall be fastened with 2 rows of 10D nails at 16" on center along each edge. Beams shall be allowed to cantilever past the post 1/4 the allowable beam span.

   Deck Beam Bearing shall not be less than 11/2" for wood or metal and not less than 3" on concrete.
   Deck Beam Splices shall be directly over a post.
   Deck Beam Connections to Supports shall be in accordance with figures R507.5.1(1) and R507.5.1(2)
   Deck Beam Connection to Joists can be made with 3-8D threaded toenails (2 on one side 1 on other), an approved metal fastener (such as a hurricane clip), or a joist hanger.

8. **Deck Joist** maximum spans shall be in accordance with table R507.6. The maximum spacing for joists shall be limited by the decking materials in accordance with table R507.7. The maximum joist cantilever length is limited to 1/4 the joist span or the maximum cantilever length specified in table R507.6 (whichever is less). Lateral restraint at joist ends and bearing locations shall be provided. Blocking at bearing locations shall not be less than 60% of joist depth, at rims no less than 3-10D nails or 3" screws.

9. **Decking** shall be spaced no more than the maximum allowed in table R507.7 Wood decking shall be attached to the joists with 2-8D threaded nails or two #8 wood screws. Other approved fastener systems shall be installed in accordance with the manufacturer instructions.

10. **Vertical and Lateral Support.** Where supported by attachment to exterior wall decks are required to be positively anchored to the building. Vertical loads shall be transferred to (house) band joists through (deck) ledgers.

    Deck Ledger shall be a minimum of a 2x8 lumber and **shall not support the weight of beams or girders** (beams and girders shall be let in).
    Band Joist shall be a minimum of 2X solid sawn lumber, or 9 1/2" Douglas fir laminated veneer lumber. Band joists shall bear fully on the primary structure and be capable of supporting all loads.

Deck Ledger to Band Joist Fasteners shall be in accordance with tables R507.9.1.3(1} and installed in accordance with table R507.9.1.3{2} and figures R507.9.1.3(1)and R507.9.1.3{2}

Lateral Load Connections when installed in accordance with figure R507.9.2(2) shall be in 4 locations evenly distributed across the length of the deck (750# Capacity minimum).

Decks shall not be hung from the cantilever of building floor system. All fasteners shall be corrosion resistant.

11. **Stairways** shall have a minimum width of 36". The largest tread depth or riser height shall not exceed the smallest by more than 3/8". The opening at the riser shall not allow the passage of a 4" sphere. A means to illuminate all exterior stairways shall be provided. A light source in the immediate area at the top of the stairway or landing is required.

Maximum rise shall be 7 ¾"
Minimum run shall be 10" with a nosing projection of ¾" - 1 ¼"
Exc. A nosing projection is not required where the thread depth is not less than 11"

12. **Guard Rails** shall be provided where the walking surface of a deck is more than 30" measured vertically to the floor or grade below.

Guard Rail Height shall be 36" measured vertically from the adjacent walking surface to the top of guard rail.
Exceptions: 1. Guard rails on the open sides of stairways shall be no less than 34" measured vertically from the nose of the stair treads to the top of the guard rail:
Opening Limitations shall not allow the passage of a 4" diameter sphere.
Exceptions: 1. The triangular openings at the side of a stairway shall not allow the passage of a 6" sphere. 2. Guards on the open sides of stairs shall not allow passage of a 4 3/8" sphere.

13. **Handrails** shall be continuous and returned at each end to the wall or newel. The surface of the handrail shall be smooth with no sharp edges. The cross section of round type I handrails shall not be less than 11/4" or more than 2", if not round, the handrail shall have a perimeter of not less than 4" and no more than 6 1/4" with a cross section of less than 2 1/4".

Handrail Height is measured vertically from the top of the handrail to the nose of the stair treads, the height shall not be less than 34" or more than 38".
Handrail Clearance between the inside of the handrail and the adjacent surfaces shall be no less than 11/2".

Required Inspections

Footings: after forms and reinforcing is in place, prior to pouring concrete.
Framing: prior to decking being installed when deck is less than 36" above grade.
Final: inspection is required.

TABLE R507.2.3
FASTENER AND CONNECTOR SPECIFICATIONS FOR DECKS[a, b]

ITEM	MATERIAL	MINIMUM FINISH/COATING	ALTERNATE FINISH/COATING[e]
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 diameter and less) or mechanically galvanized per ASTM B695, Class 55 or 410 stainless steel	Stainless steel, silicon bronze or copper
Metal connectors	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.

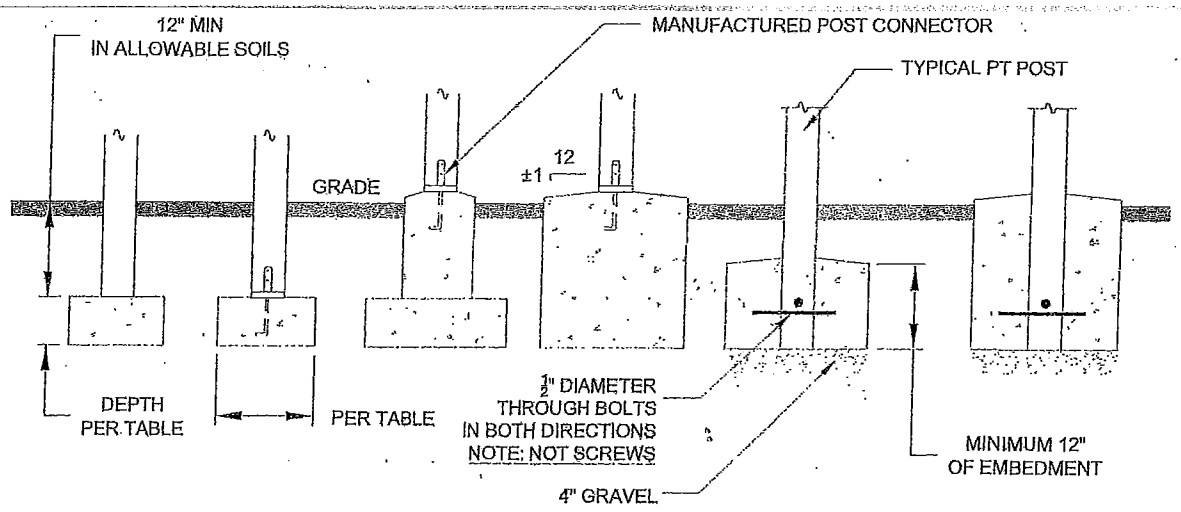
a. Equivalent materials, coatings and finishes shall be permitted.

b. Fasteners and connectors exposed to salt water or located within 300 feet of a salt water 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.



NOTE:
POSTS MUST BE CENTERED ON OR IN FOOTING

For SI: 1 inch = 25.4 mm.

FIGURE R507.3
DECK POSTS TO DECK FOOTING CONNECTION

TABLE R507.3.1
MINIMUM FOOTING SIZE FOR DECKS

LIVE LOAD[b] (psf)	TRIBUTARY AREA (sq. ft.)	LOAD BEARING VALUE OF SOILS[a, b, c] (psf)											
		1500			2000			2500			≥ 3000		
		Side of a square footing (inches)	Diameter of a round footing (inches)	Thickness (inches)	Side of a square footing (inches)	Diameter of a round footing (inches)	Thickness (inches)	Side of a square footing (inches)	Diameter of a round footing (inches)	Thickness (inches)	Side of a square footing (inches)	Diameter of a round footing (inches)	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 m^2, 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.

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
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 x 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. 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 R507.6
DECK JOIST SPANS FOR COMMON LUMBER SPECIES (ft. - in.)

SPECIES[a]	SIZE	ALLOWABLE JOIST SPAN[b] SPACING OF DECK JOISTS (inches)			MAXIMUM CANTILEVER[c, f] 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
Douglas fir-larch[d], hem-fir[d] spruce-pine-fir[d],	2 × 6	9-6	8-8	7-2	1-2	1-3	1-5
	2 × 8	12-6	11-1	9-1	1-11	2-1	2-3
	2 × 10	15-8	13-7	11-1	3-1	3-5	2-9
	2 × 12	18-0	15-9	12-10	4-6	3-11	3-3
Redwood, western cedars, ponderosa pine[e], red pine[e]	2 × 6	8-10	8-0	7-0	1-0	1-1	1-2
	2 × 8	11-8	10-7	8-8	1-8	1-10	2-0
	2 × 10	14-11	13-0	10-7	2-8	2-10	2-8
	2 × 12	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.

a. No. 2 grade with wet service factor.

b. Live load = 40 psf, dead load = 10 psf, L/Δ = 360.

c. 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 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.

TABLE R507.4
DECK POST HEIGHT[a]

DECK POST SIZE	MAXIMUM HEIGHT[a, b] (feet-inches)
4 × 4	6-9[c]
4 × 6	8
6 × 6	14
8 × 8	14

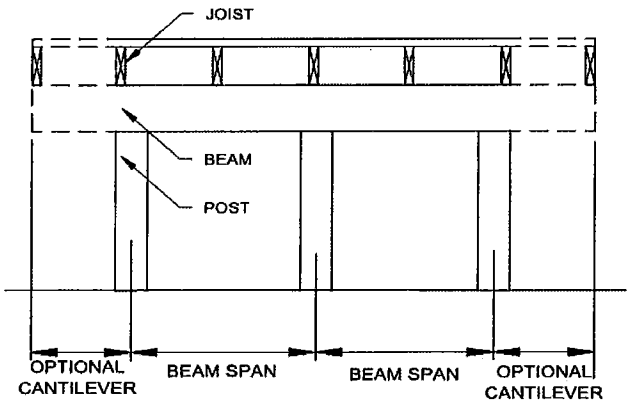
For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa.

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.

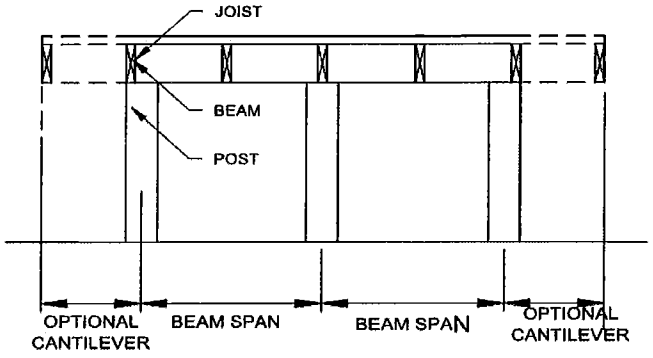
b. Based on 40 psf live load.

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.



DROPPED BEAM

FIGURE R507.5
TYPICAL DECK JOIST SPANS



FLUSH BEAM

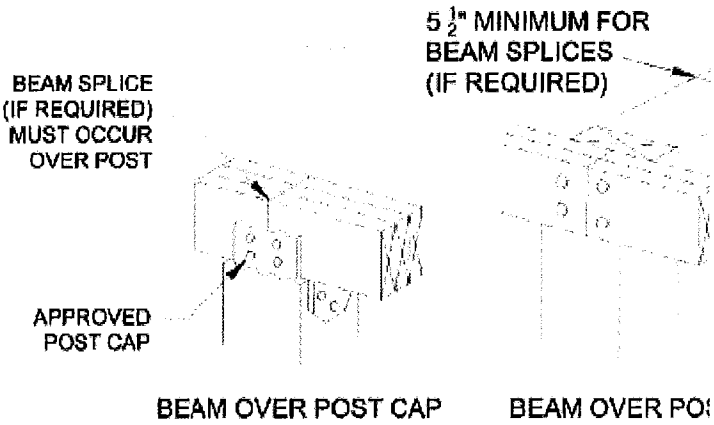


FIGURE R507.5.1(1)
DECK BEAM TO DECK POST

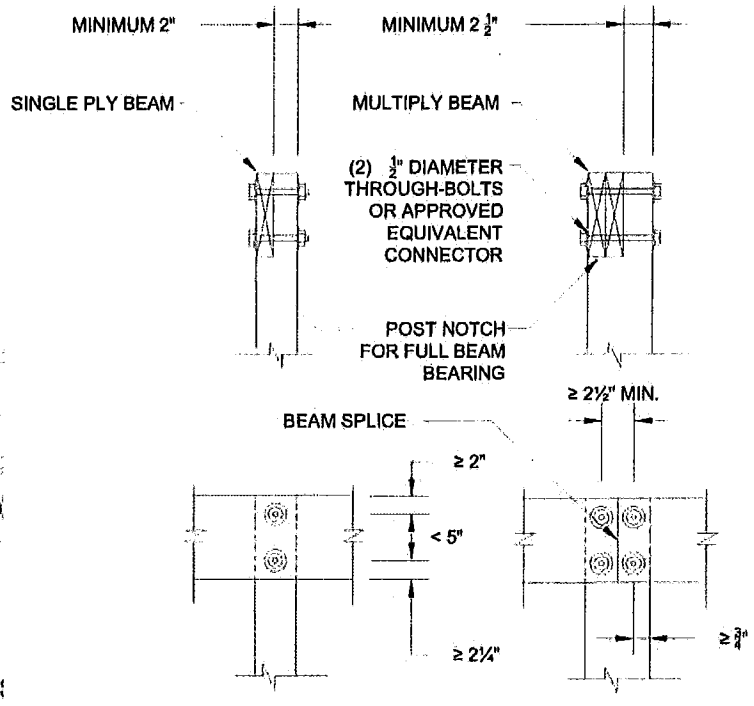
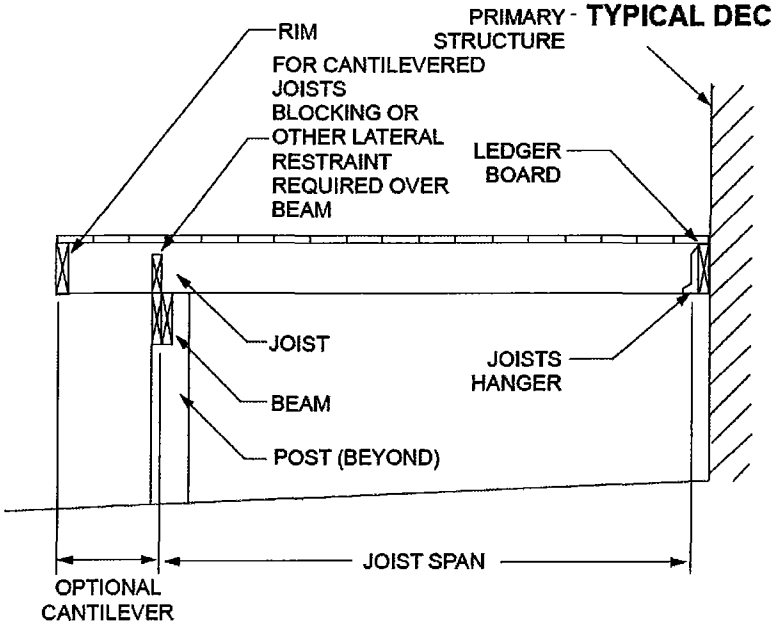
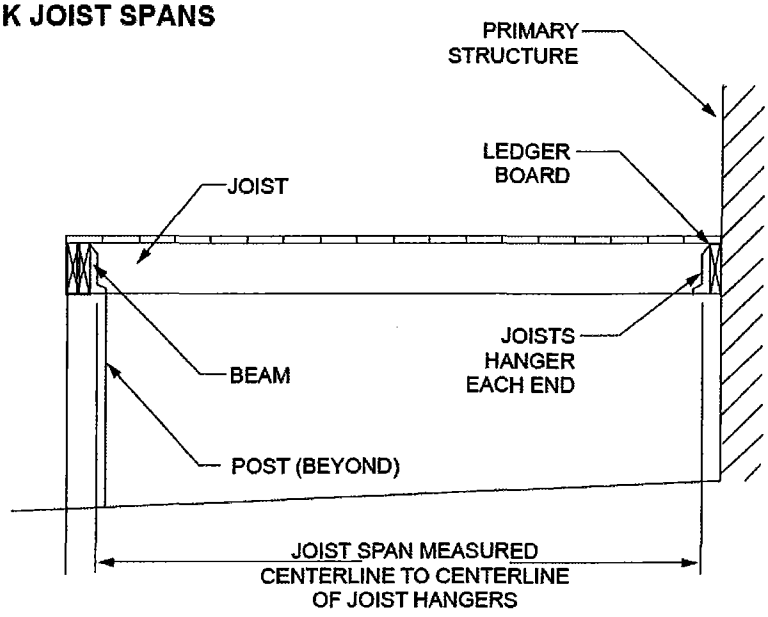


FIGURE R507.5.1(2)
NOTCHED POST-TO-BEAM CONNECTION

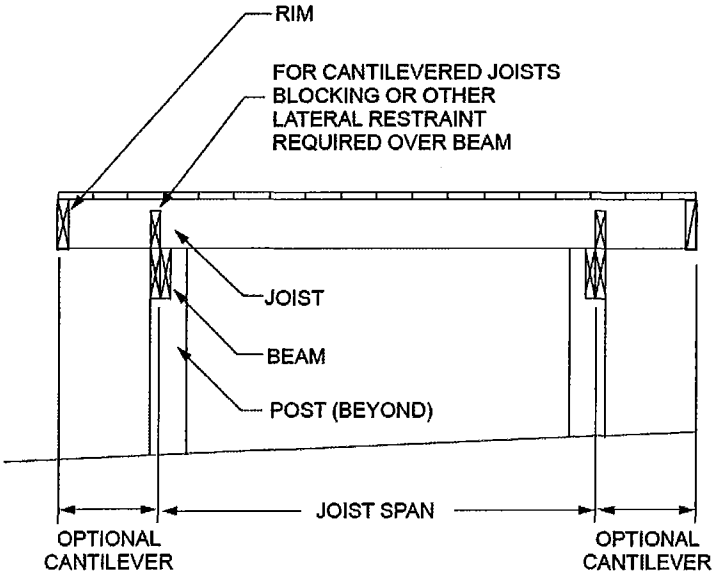
FIGURE R507.6
TYPICAL DECK JOIST SPANS



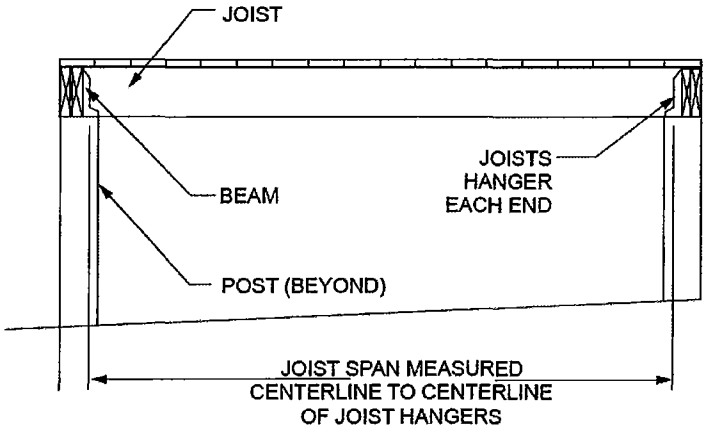
CANTILEVERED JOISTS WITH DROPPED BEAM



JOISTS WITH FLUSH BEAM



JOISTS ON FREE-STANDING DECK WITH DROPPED BEAM



JOISTS ON FREE-STANDING DECK WITH FLUSH BEAM

TABLE R507.7
MAXIMUM 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 R507.9.1.3(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.

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.

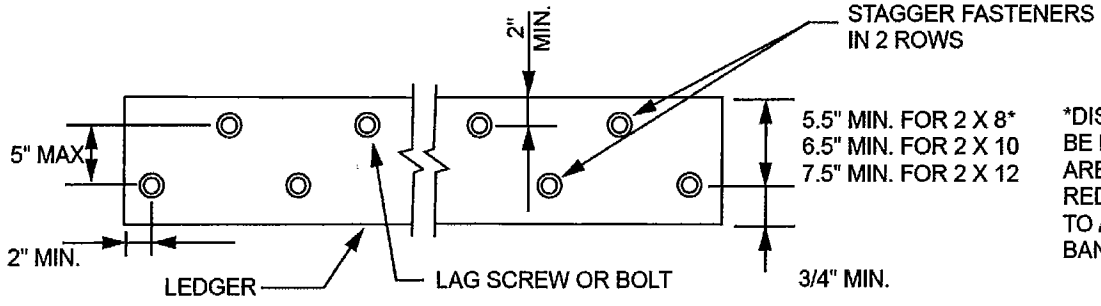
a. Lag screws or bolts shall be staggered from the top to the bottom along the horizontal run of the deck ledger in accordance with Figure R507.9.1.3(1).

b. Maximum 5 inches.

c. For engineered rim joists, the manufacturer's recommendations shall govern.

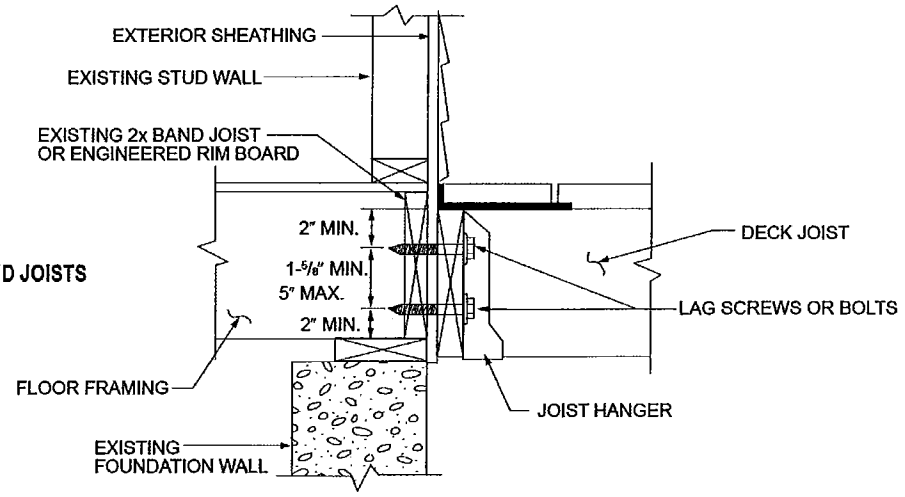
d. The minimum distance from bottom row of lag screws or bolts to the top edge of the ledger shall be in accordance with Figure R507.9.1.3(1).

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



For SI: 1 inch = 25.4 mm.

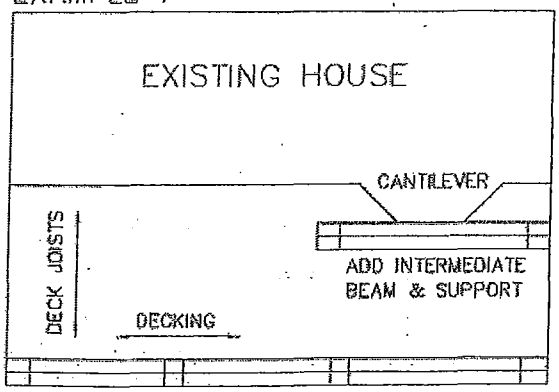
FIGURE R507.9.1.3(2)
PLACEMENT OF LAG SCREWS AND BOLTS IN BAND JOISTS



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. We have diagrammed two possible solutions for providing such reinforcement.

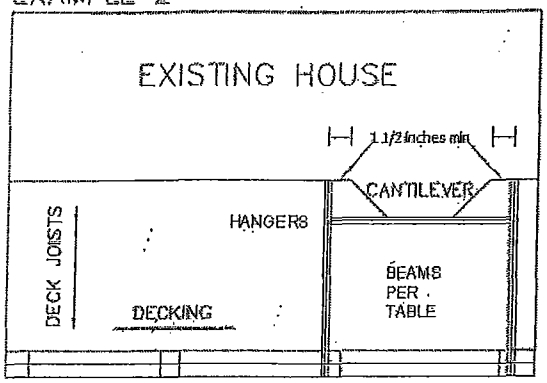
Decks cannot bear on cantilevered floors. Additional framing will be required.

EXAMPLE 1



Example 1
Add an intermediate beam, supports and footings. Size beam and footings.

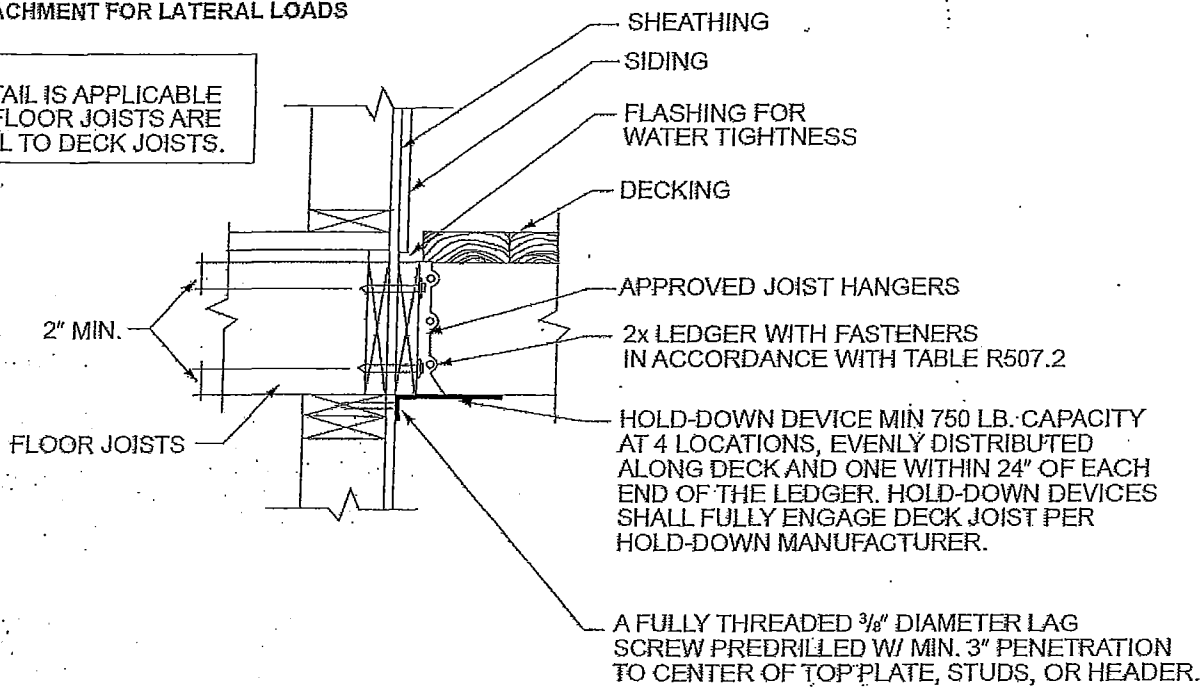
EXAMPLE 2



Example 2
Size beams per handout. Provide adequate hangers from all connections. Design center beam per chart. Also lag bolt to cantilever ledger board.

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

NOTE:
THIS DETAIL IS APPLICABLE WHERE FLOOR JOISTS ARE PARALLEL TO DECK JOISTS.



Joist-to-Beam Detail.

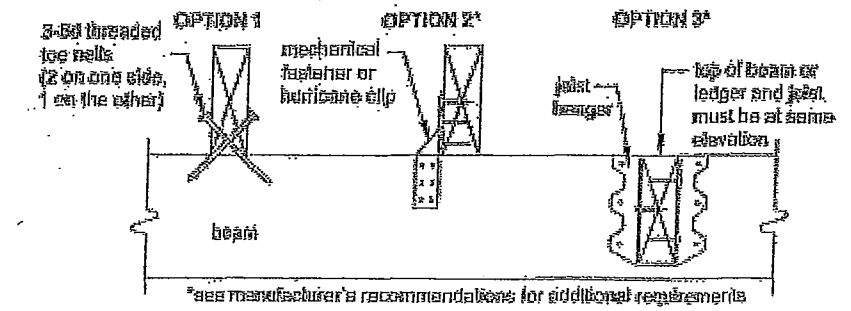


Figure 24, Example Guard Detail

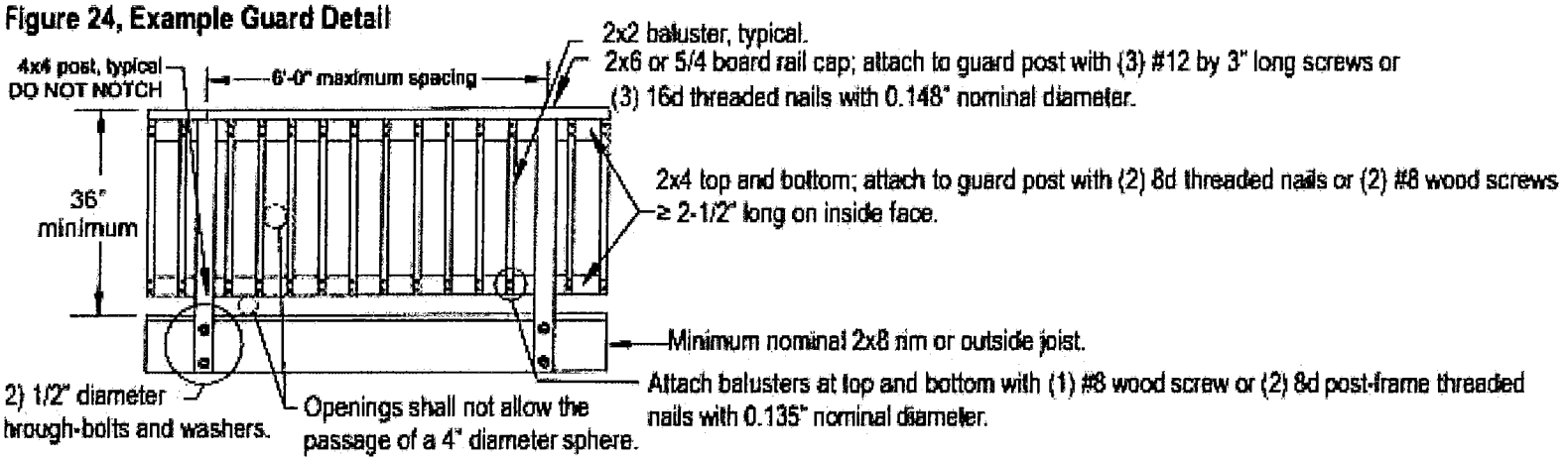
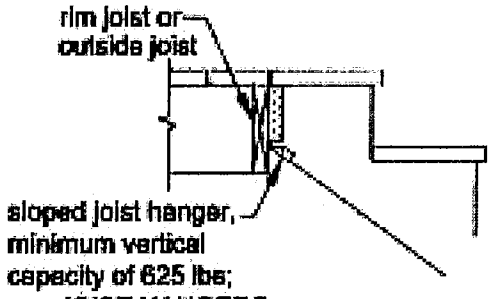


Figure 31. Stair Stringer Attachment Detail.



ATTACHMENT WITH HANGERS

Figure 30. Stair Guard Requirements.

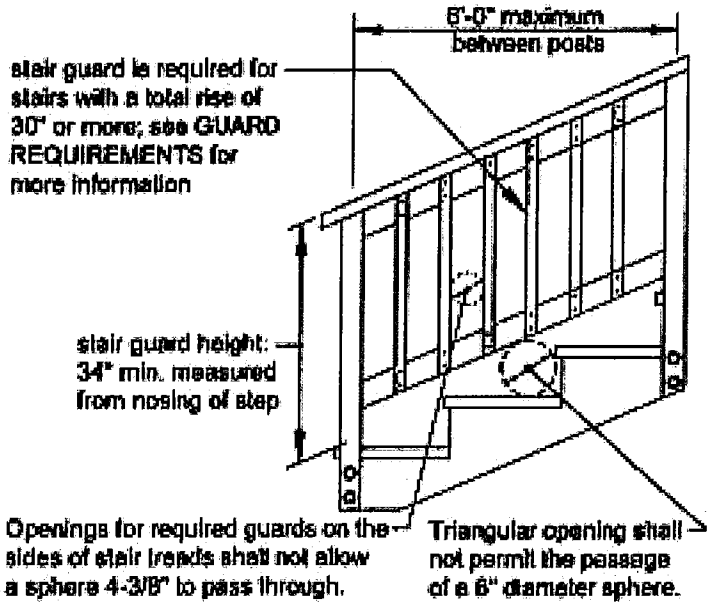


Figure 32A. Handrail Mounting Examples.

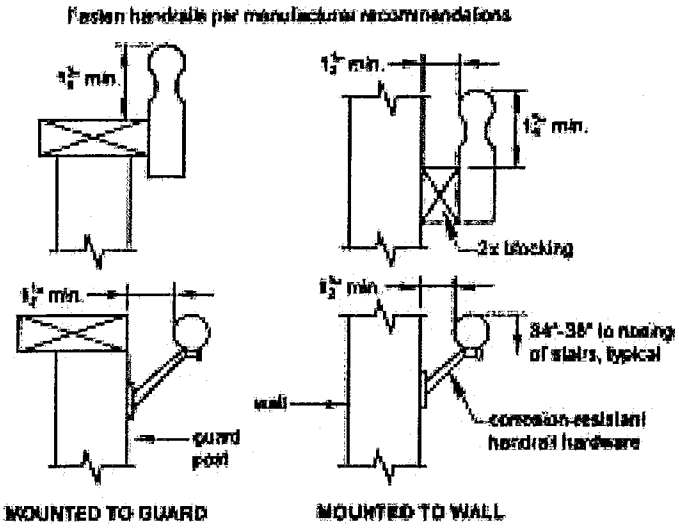


Figure 33. Miscellaneous Stair Requirements.