BUILDING A DECK

Maplewood

BUILDING DEPARTMENT
(651)249-2300
www.MaplewoodMN.gov

This handout is intended only as a guide and is based in part on the 2020 Minnesota Residential Code, Maplewood City ordinances, 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. For specific questions regarding code requirements, refer to the applicable codes or contact your local Building Department.

BUILDING PERMITS

Building permits are required for decks with the following exception: freestanding decks, regardless of size, if they are not more than 30 inches above adjacent grade. Freestanding decks do not require footings that extend below the frost depth. Decks built without a permit still need to meet zoning requirements and meet building code.
Building permits are not required for ground level patios made of concrete or pavers.

Building permits can be obtained from the Building Department by filling out an application and submitting your building plans and site plan. Building permits are typically processed within 7 business days of receiving a complete set of plans.

PERMIT EXPIRATION

If you suspend work on your deck for more than 180 days after permit issuance or your last inspection, your permit will expire. If unforeseen circumstances delay construction, contact the Building Department ***before*** your permit expires.

PLANS

It is very important that your plans depict exactly how your deck will be built. Plans must be neat and complete. Plans are reviewed for code compliance and a copy is returned to the applicant with notes to identify required corrections. ***PLEASE REVIEW THE PLANS WHEN THEY ARE RETURNED TO YOU SO THAT YOU WILL BE AWARE OF ANY CORRECTIONS NEEDED.*** Approved plans shall be on site at time of all inspections. You may wish to retain a copy of your approved plans, permits, and inspection record cards for any future needs.

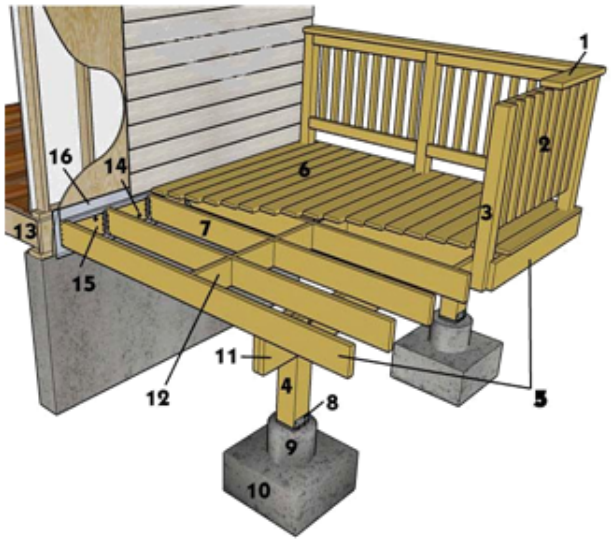
INSPECTIONS

1. Call 1 day in advance.
2. Have address, permit number, and type of inspection (ex. footing) ready.
3. Let scheduler know time frame am, pm or anytime.
4. Footing Inspection - Holes dug, loose material/water removed. ***Plans and record card must be onsite.***
5. Framing inspection and anchoring is required on decks low to the ground before decking is placed.
6. Final Inspection - All work complete and all stairs, handrails, and guards in place. ***Plans and record card must be onsite. Installation instructions for composite decking must be on site.***
7. If work is approved, the inspector will sign the record card and you may proceed with the next step.
8. If corrections are noted, a correction notice will be left on the site.

Please do not hesitate to call the Building Department at (651) 249-2300 if you have questions. If necessary, we will be happy to meet with you on the site to help resolve any concerns or problems.

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. ½" BOLTS
15. LEDGER BOARD
16. FLASHING



THINK YOU MIGHT ENCLOSE YOUR DECK IN THE FUTURE?

Deck plans are approved on the assumption that the deck will be used only as a deck for the life of the structure. Because footing sizes, setbacks, structural supports, and a host of other deck components are different for enclosed spaces than they are for decks, it is important that you indicate on your plans the desire to convert the deck at a future date. You should then design your deck to carry future loads and meet setbacks and other rules.

ZONING REGULATIONS

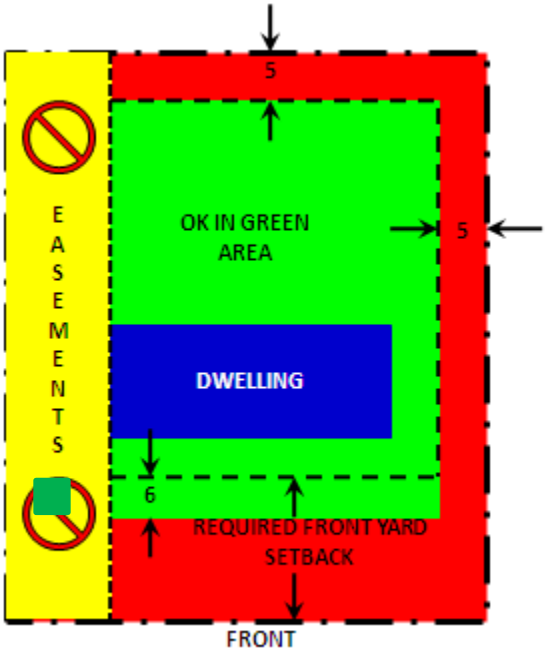
Decks are permitted as an addition to a single family dwelling. Decks must be at least five feet from the side and rear lot line. Decks in front yard must be at least 30 feet from the front lot line or no closer then adjacent house setbacks. Setbacks are checked as a part of the plan review and again at the time of the footing inspection. ***Easements, wetland buffers and other lot restrictions may require greater setbacks than permitted by the zoning ordinance.*** The most restrictive setback applies. ***Questions regarding zoning regulations should be directed to the Planning Office at 651-249-2300.***

SURVEY MARKER EXAMPLES

SETBACKS

(Exception: Wetlands & Shoreline

- Deck can never be in easement.
- Decks may be 5' from rear and side lot lines and 30' from front lot line or no closer than adjacent house.
- Decks with roofs must meet the setback requirements for a dwelling.



Call Gopher State One Call for utility locations at least two working days before you dig. 1-800-252-1166 or 651-454-0002.

MATERIALS

LUMBER

All wood used in deck construction must be pressure treated lumber or wood that is naturally resistant to decay such as redwood or cedar.

Wood used above ground, in contact with the ground, or below ground requires different degrees of treatment. Check the labels of the material you are buying to determine where it can be used. ***Because some preservative treatments are very corrosive, make sure that any fasteners or metal connectors used in the construction of your deck are approved by the manufacturer for use with treated wood***

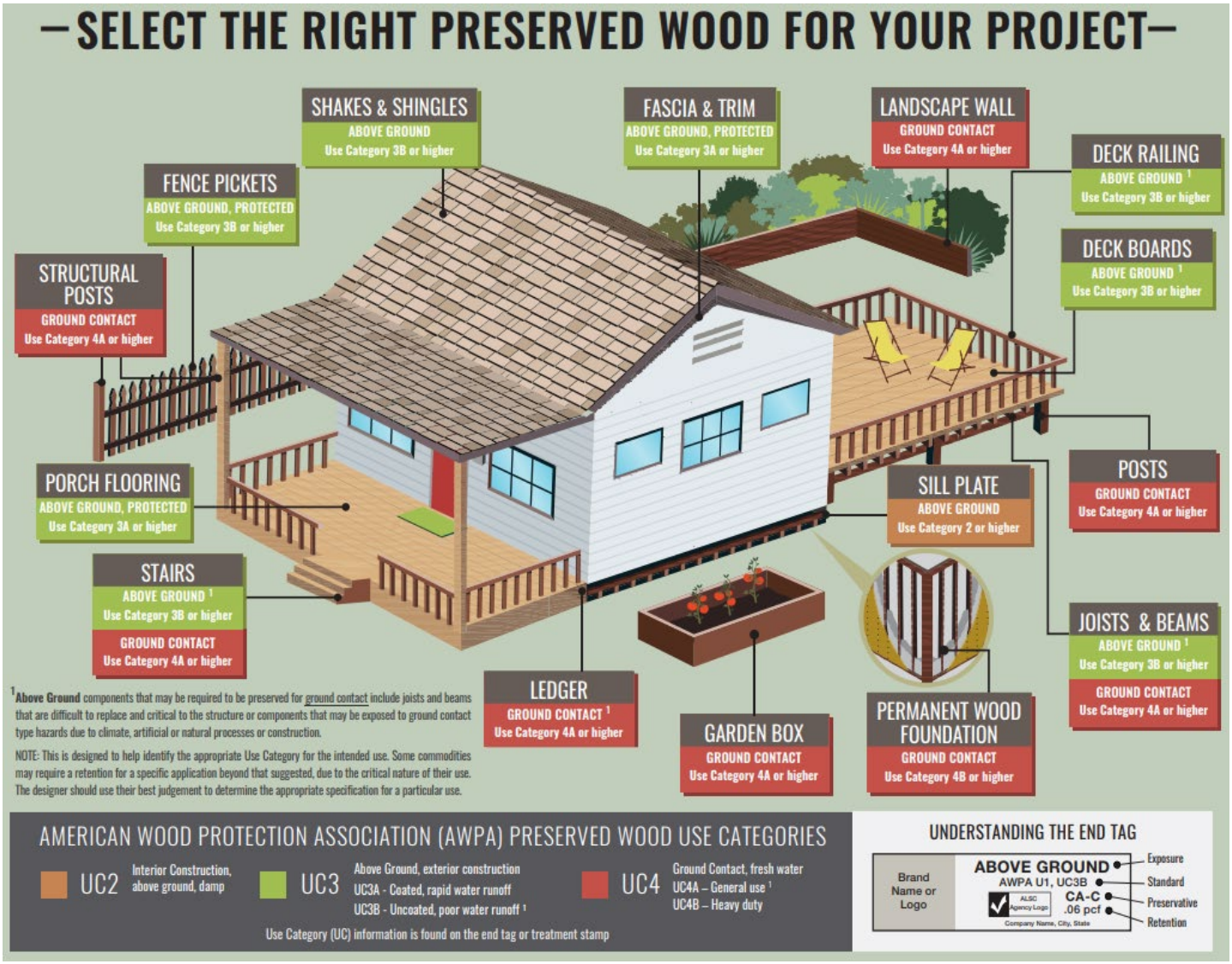


Image provided by https://awpa.com/images/standards/ResidentialInfographic2016.PDF

FASTENERS AND CONNECTORS

Fasteners must be hot-dipped galvanized, stainless steel, silicon bronze, copper or equivalent. Wood decking shall be attached to each member with not less than 2-8d threaded nails or 2-No. 8 wood screws; other approved decking fastener systems shall be installed per the manufacturer's specifications. Lag screws ½" and larger need to be pre drilled. Use washers under the nut and head of bolts.

DECKING

Materials commonly used for decking include standard dimension lumber (either 2X4 or 2X6), 5/4 radius-edged decking, or a composite decking product. ***Composite decking products may be used only when meeting ASTM D7032 or when approved by the Building Department***. Approval is based on the material carrying an ICC Evaluation Services Report. Decking without a report will not be approved. Ask the decking supplier to provide you with a copy of the research report. ***Caution – some manufactured deck products are approved for decking but not for stair treads. In some cases where manufactured decking is approved for stairs, the spacing of supports may be significantly reduced compared to use on the deck itself. Read the research report for further information.***

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]
$1\frac{1}{4}$-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.

FOOTINGS

- Footing size is based off of tributary area in sq. ft. Please see below figure showing load path and tributary area when determining square footage.
- Follow table 507.3.1 to determine the minimum footing size required. 1500psf soil load bearing value is the default value unless proven otherwise.
- Tributary area is always rounded up when following the table.
- Footing must extend at least **42 inches below grade (frost line).**
- The bottom of post footings may be “belled” to achieve the desired minimum bearing area. Rebar is recommended. Center the column on the footing secured by a pin or connector. Using a fiberboard tube will allow elevation of the top of the footing above finished grade to provide protection of the wood post.

TABLE R507.3.1
MINIMUM FOOTING SIZE FOR DECKS

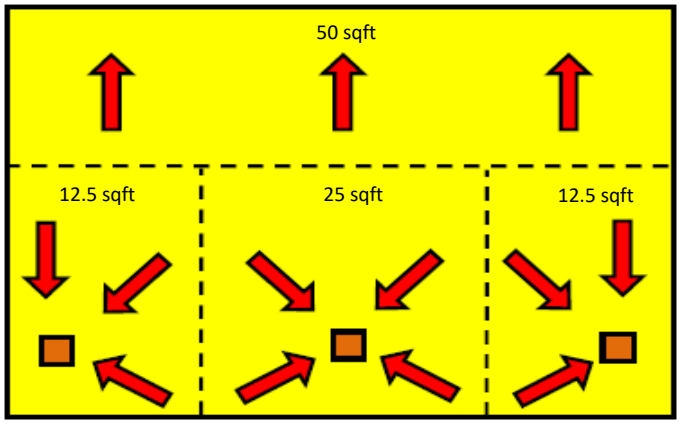
LIVE LOAD[b] (psf)	TRIBUTARY AREA (sq. ft.)	LOAD BEARING VALUE OF SOILS [a, c, d] (psf)								
		1500[e]			2000[e]			2500[e]		
		Side of a square footing (inches)	Diameter of a round footing (inches)	Thickness (inches)	Side of a square footing (inches)	Diameter of a round footing (inches)	Thickness (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
	40	14	16	6	12	14	6	12	14	6
	60	17	19	6	15	17	6	13	15	6
	80	20	22	7	17	19	6	15	17	6
	100	22	25	8	19	21	6	17	19	6
	120	24	27	9	21	23	7	19	21	6
	140	26	29	10	22	25	8	20	23	7
	160	28	31	11	24	27	9	21	24	8

For SI: 1 inch = 25.4 mm, 1 square foot = 0.0929 m^2, 1 pound per square foot = 0.0479 kPa.

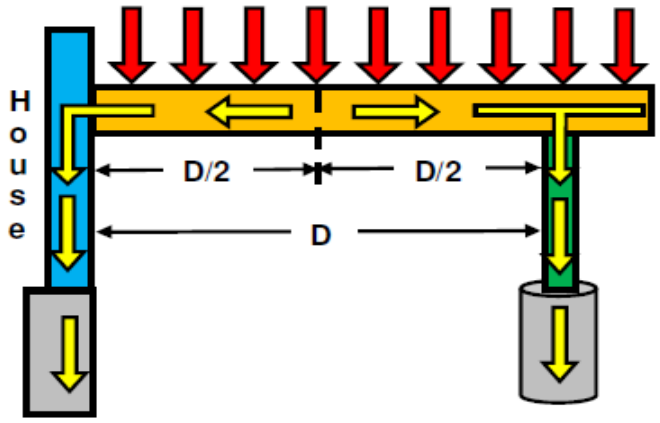
a. Interpolation permitted, extrapolation not permitted.
b. Live load = 40 psf, dead load = 10 psf.
c. Assumes minimum square footing to be 12 inches x 12 inches x 6 inches for 6 x 6 post.
d. If the support is a brick or CMU pier, the footing shall have a minimum 2-inch projection on all sides.
e. Area,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

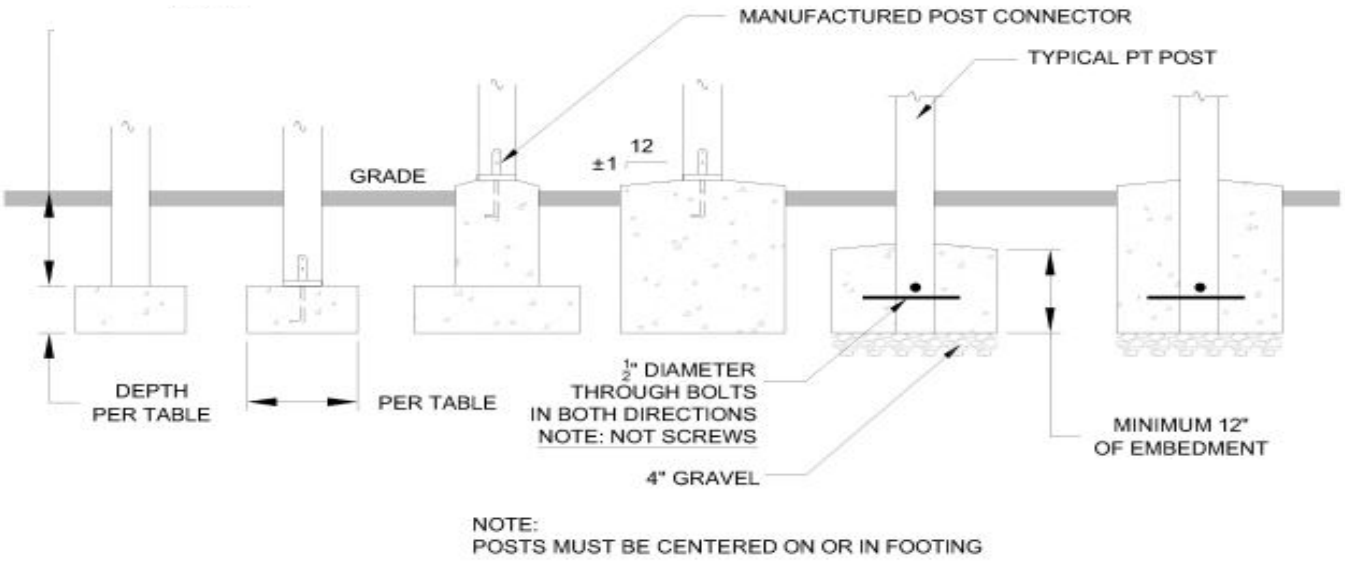
Tributary Area
10’ x 10’ Deck

UNDERSTANDING LOAD PATHS



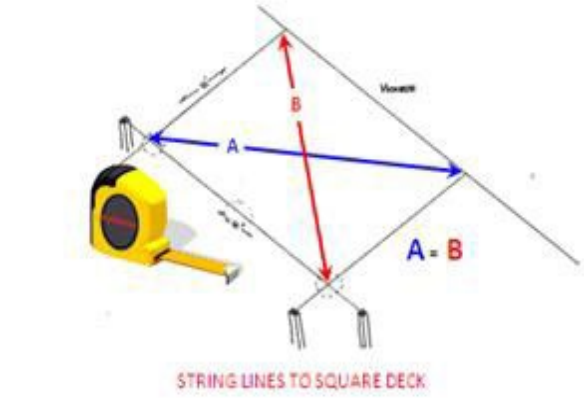
Loads are assumed to be uniform across the floor



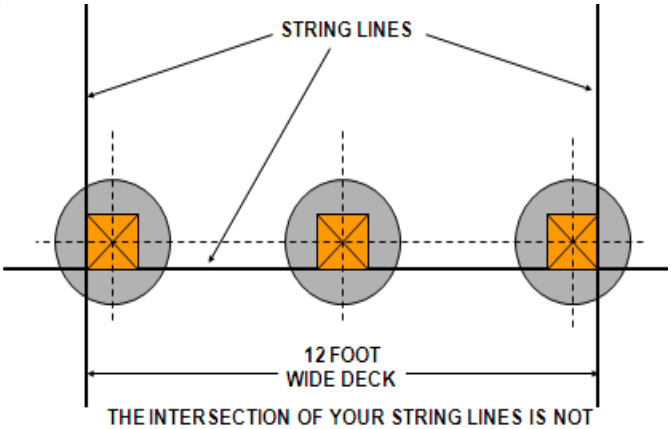


NOTE:
POSTS MUST BE CENTERED ON OR IN FOOTING

WHERE DO I PUT MY FOOTINGS?

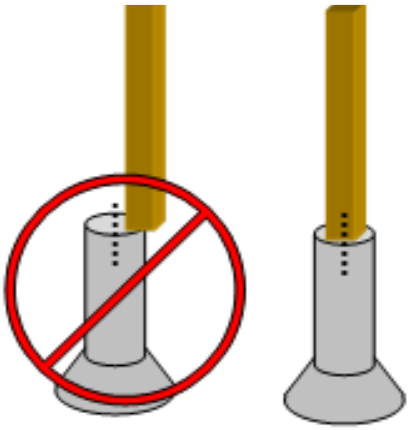


STRING LINES TO SQUARE DECK

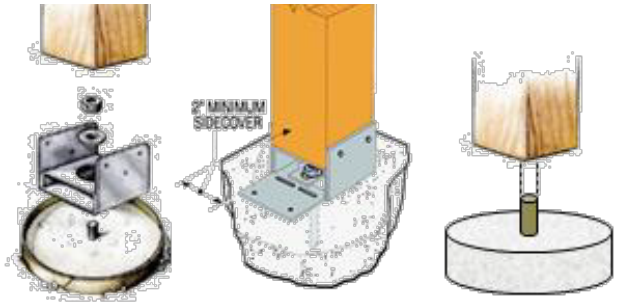


THE INTERSECTION OF YOUR STRING LINES IS NOT THE CENTER OF THE FOOTING. ADJUST ACCORDING TO THE LOCATION AND SIZE OF YOUR COLUMN.

The required area of the column must fully bear on the footing



Anchoring Post Base



DECK FRAMING

Ledger

- *The ledger must be a minimum **2 X 8** pressure treated or naturally durable No. 2 grade or better lumber.*
- *Deck ledgers shall not support beams or girders*
- *Ledger flashing is required, and must be of corrosion-resistant metal or approved nonmetallic material*
- *Fasteners used in ledger connections shall be hot-dipped galvanized or stainless steel*
- *Lag screws ½" or larger must be pre drilled to avoid splitting*

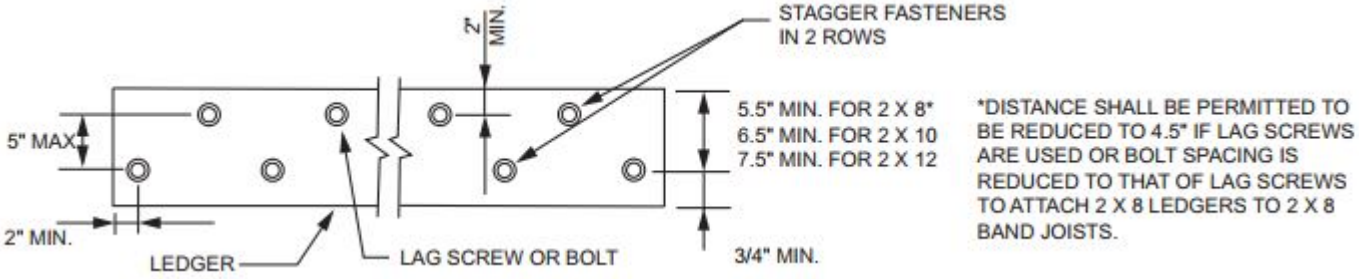


TABLE R507.9.1.3(1)

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

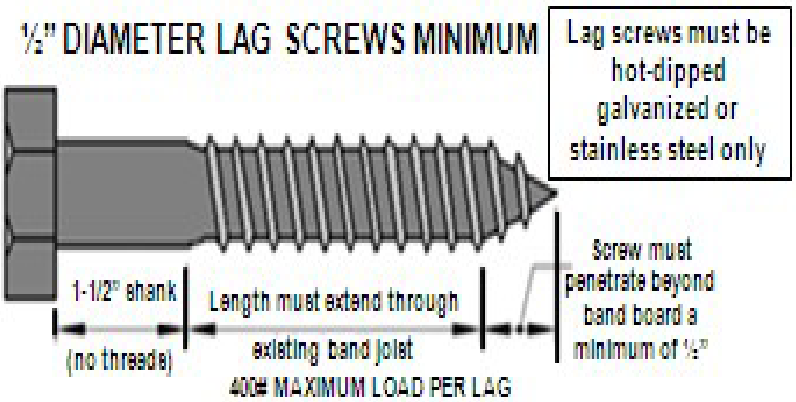
For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa.

a. Ledgers shall be flashed in accordance with Section R703.4 to prevent water from contacting the house band joist.

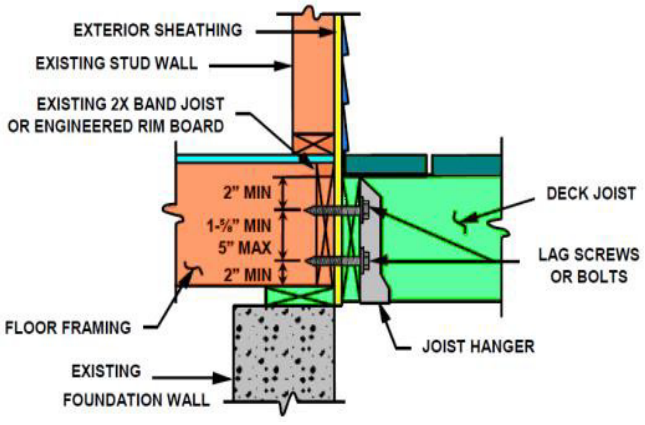
b. The tip of the lag screw shall fully extend beyond the inside face of the band joist.

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.

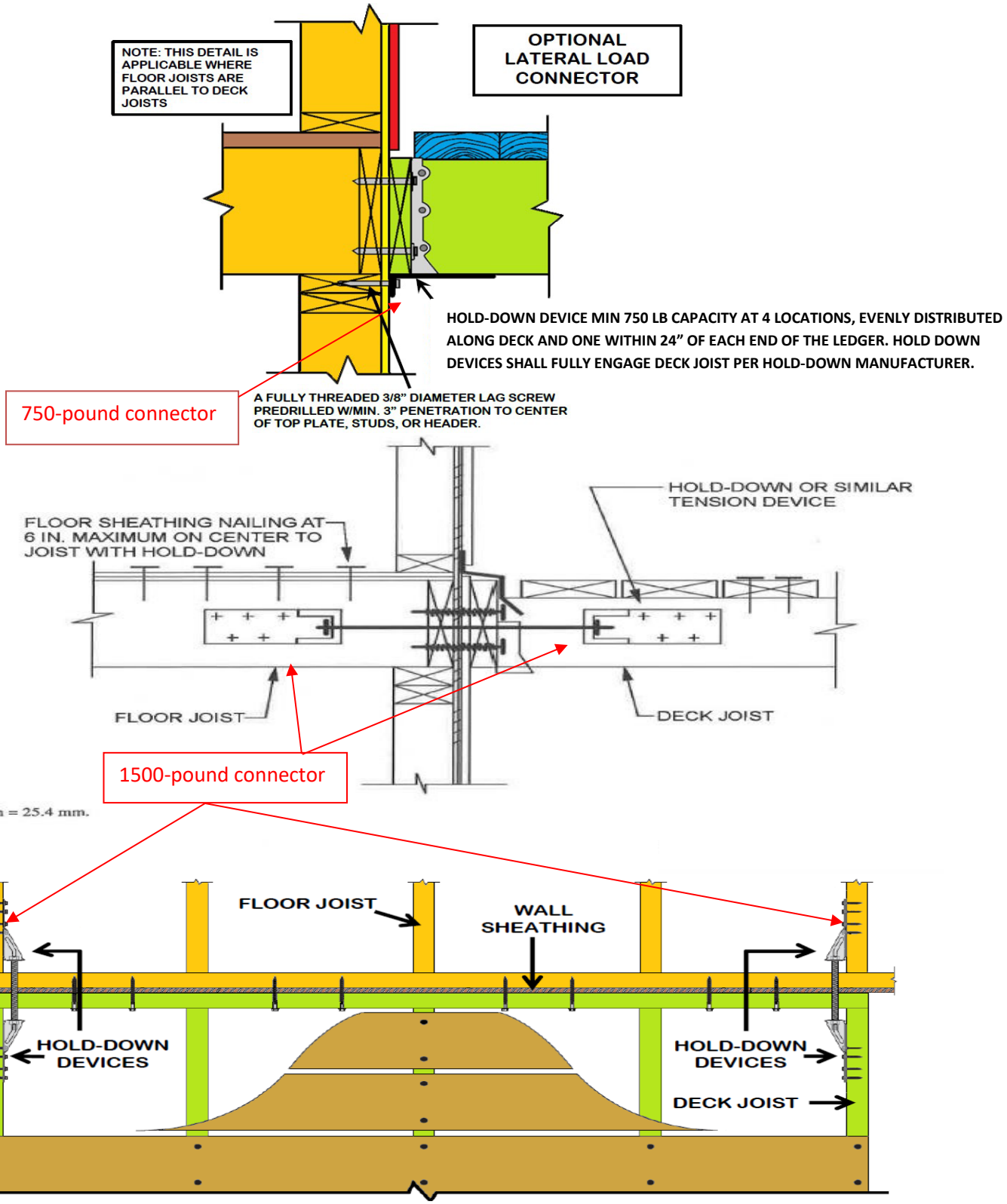


PLACEMENT OF LAG SCREWS AND BOLTS IN BAND JOISTS



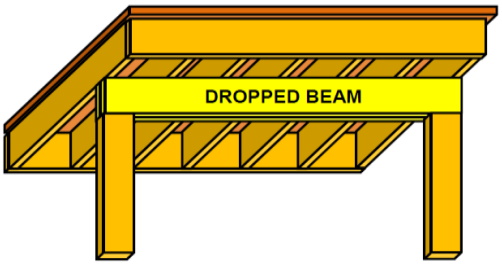
LATERAL LOAD CONNECTOR/TENSION TIES

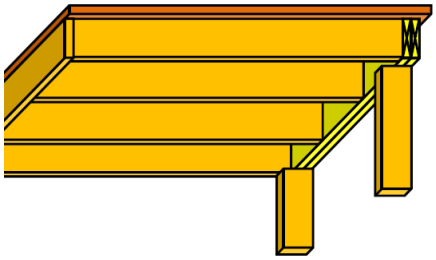
- Hold-down/ tension devices are required.
- Hold-down/tension ties designed for not less than **750 pounds** shall be installed in a minimum of **4 locations** evenly distributed along the deck and within 24” of deck ends.
- Hold-down/tension ties designed for not less than **1500 pounds** shall be installed in a minimum of **2 locations** within 24” of each deck end

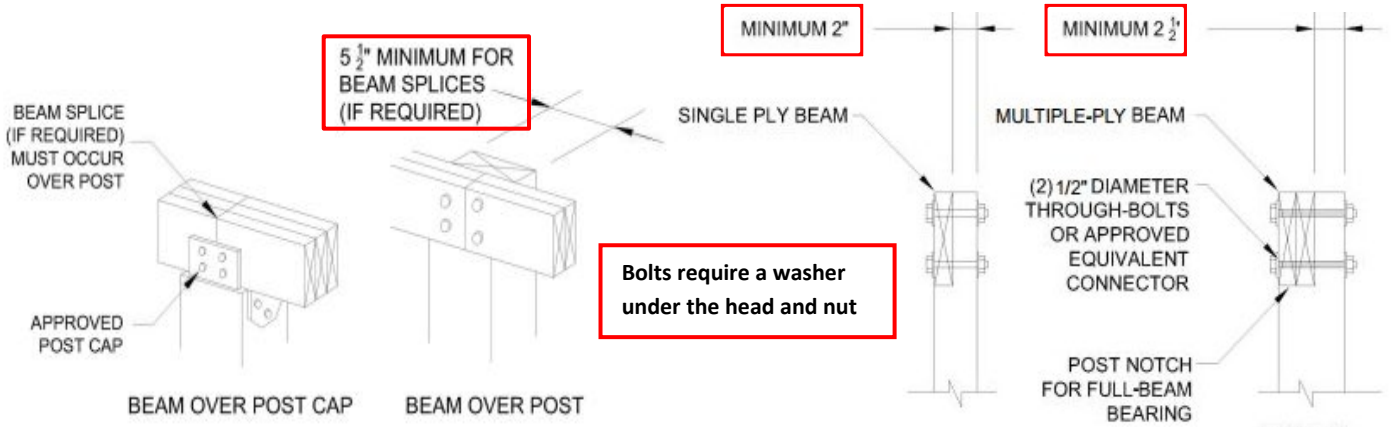


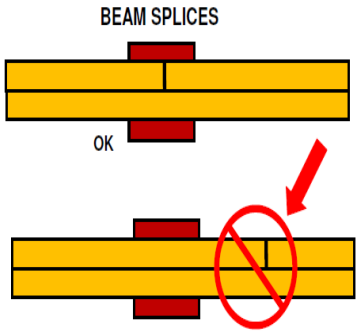
BEAMS and POSTS

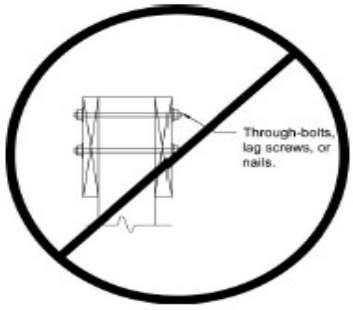
- The ends of deck beams must bear (the entire width of the beam) on not less than 1 ½" on wood or metal and not less than 3" of bearing on concrete or masonry.
- Multi-ply beams shall be fastened with 2 rows of 3" 10d nails at minimum, 16" on center along each edge.
- See next page for the Maximum Allowed Beam Spans Table R507.5.
- Beam connection to posts may be attached to a post by either notching the post (minimum 2" of post must remain for single ply beams and 2 ½ " of post must remain for multi-ply beams) or by utilizing an approved mechanical connector such as a post cap.
- Beam splices must bear over a post.
- 4x4 post are limited to a max height of 8 feet for one and two ply beams and limited to 6'9" for three ply or greater beams.











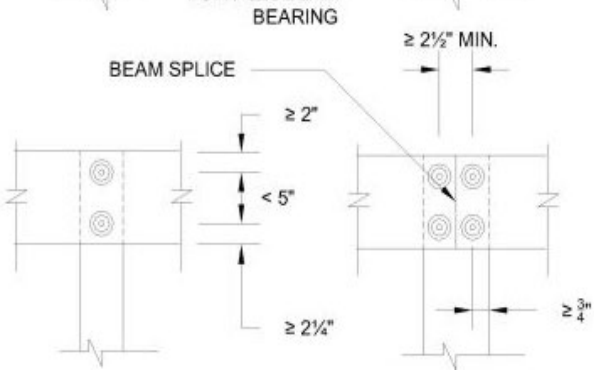


TABLE R507.5
DECK BEAM SPAN LENGTHS[a, b, g] (feet - inches)

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

TABLE R507.4
DECK POST HEIGHT[a]

DECK POST SIZE	MAXIMUM HEIGHT[a, b] (feet-inches)
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.

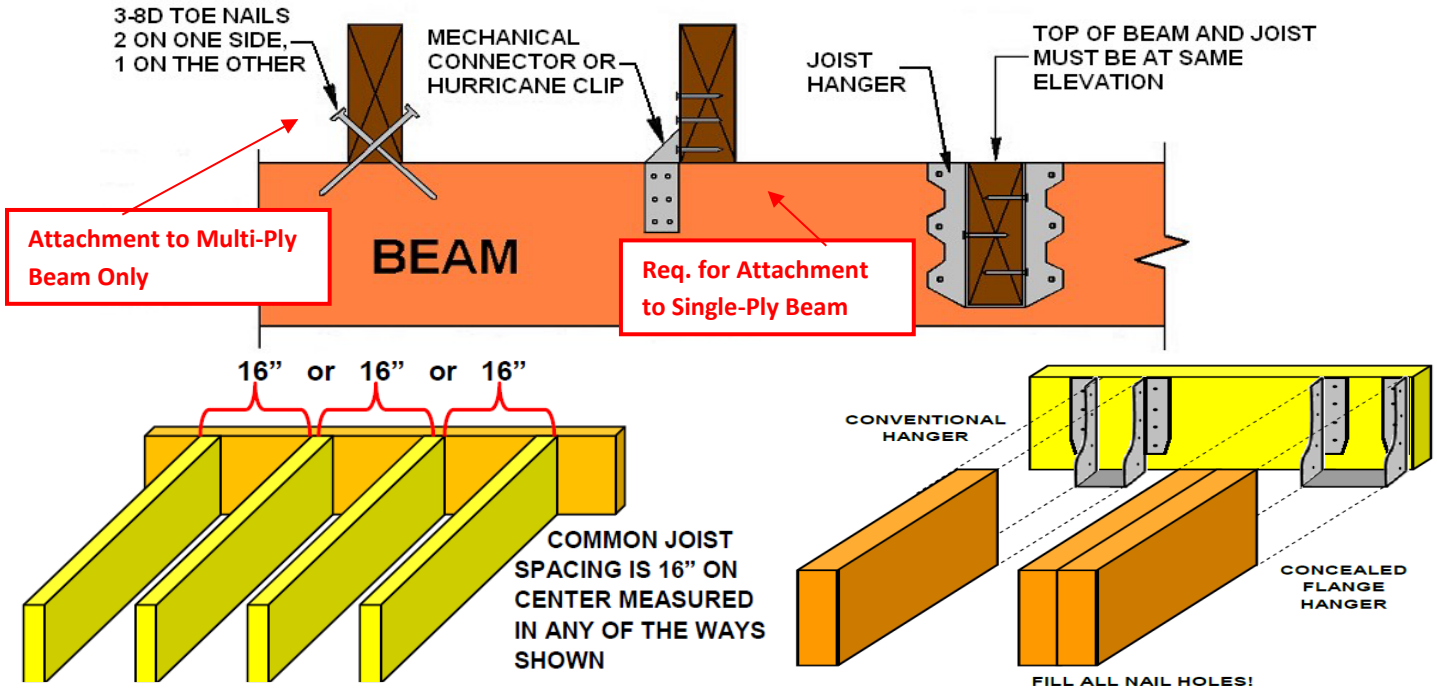
a. Measured to the underside of the beam.

b. Based on 40 psf live load.

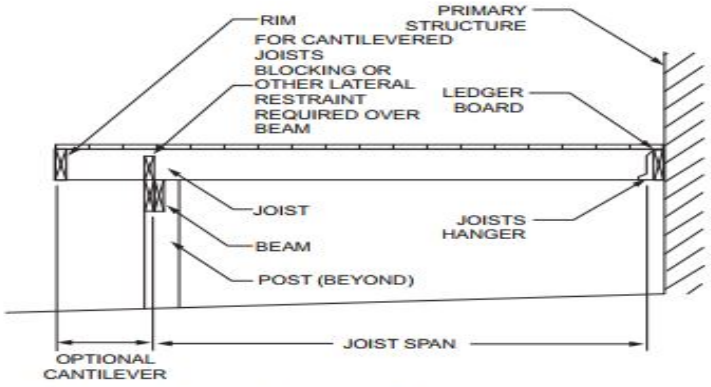
c. The maximum permitted height is 8 feet for one-ply and two-ply beams. The maximum permitted height for three-ply beams on post cap is 6 feet 9 inches.

Deck Joists

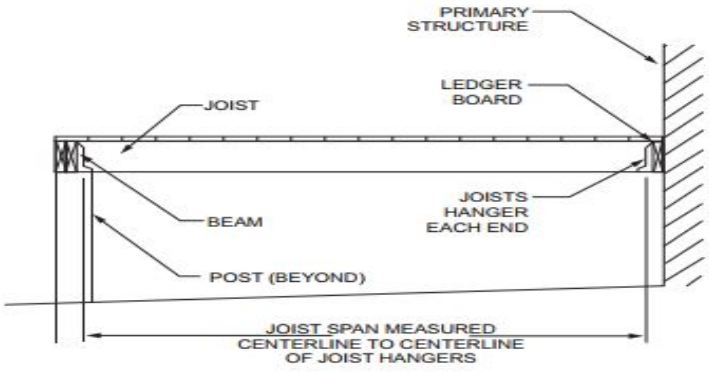
- The maximum joist spacing is limited by the decking materials used. **Be sure to check the manufacturers requirements for any composite decking and provide it to the city with the construction plans.**
- 16” o.c. spacing must be used with 5/4 decking or when 2x6 or 2x4 decking is used at a 45° angle. 12” o.c. spacing required when 5/4 decking is used at a 45° angle.



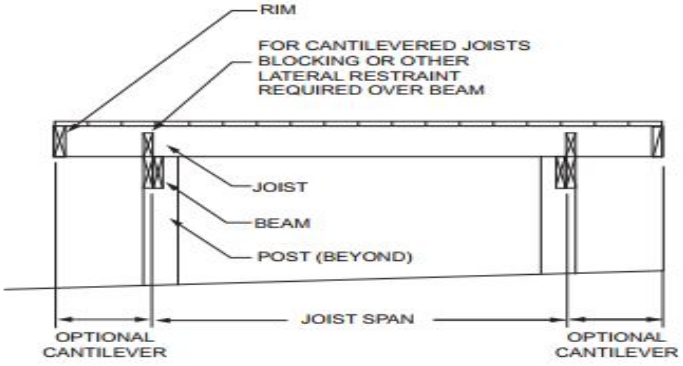
- Joists must bear on a beam, ledger strip, or joist hangers. Joist hangers must be installed in accordance with the manufacturer’s recommendations. Fill all nail holes in joist hangers.



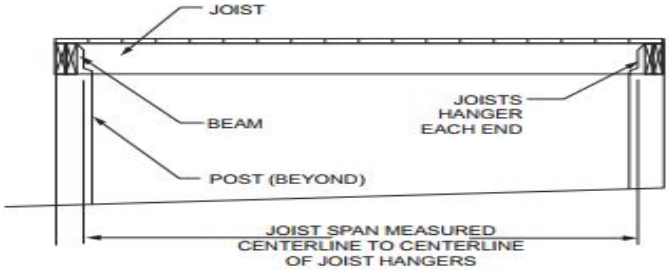
CANTILEVERED JOISTS WITH DROPPED BEAM



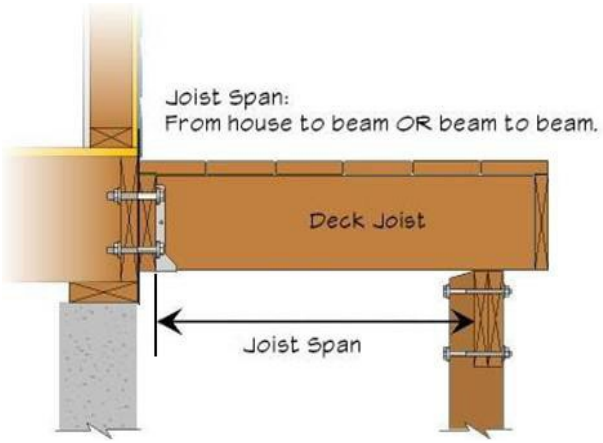
JOISTS WITH FLUSH BEAM



JOISTS ON FREE-STANDING DECK
WITH DROPPED BEAM



JOISTS ON FREE-STANDING DECK
WITH FLUSH BEAM



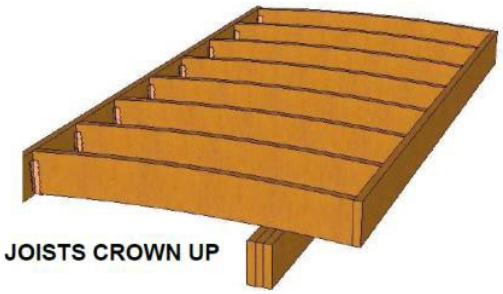
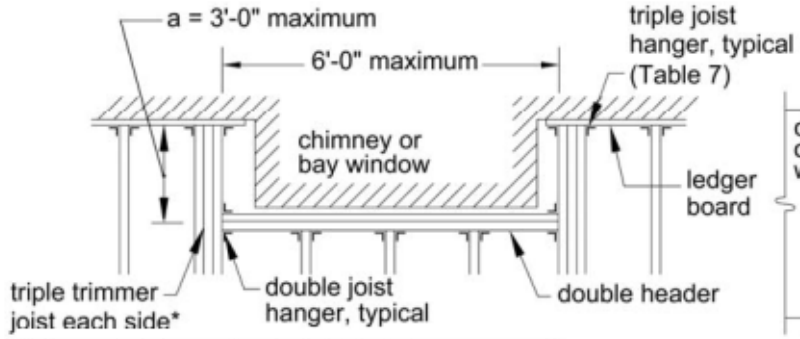


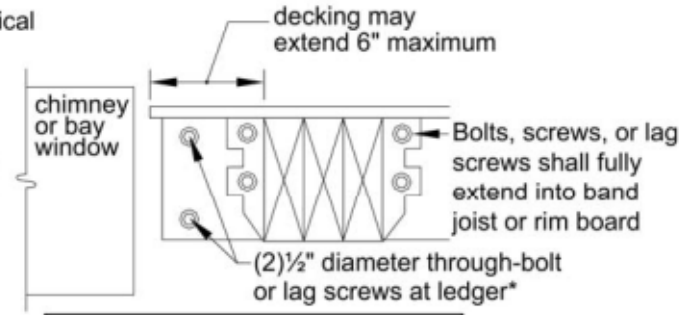
TABLE R507.6
DECK JOIST SPANS FOR COMMON LUMBER SPECIES (ft. - in.)

SPECIES[a]	SIZE	ALLOWABLE JOIST SPAN[b]			MAXIMUM CANTILEVER[c, f]		
		SPACING OF DECK JOISTS (inches)			SPACING OF DECK JOISTS WITH CANTILEVERS[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

SPECIAL FLOOR FRAMING DETAILS
Framing around a cantilevered door or chimney



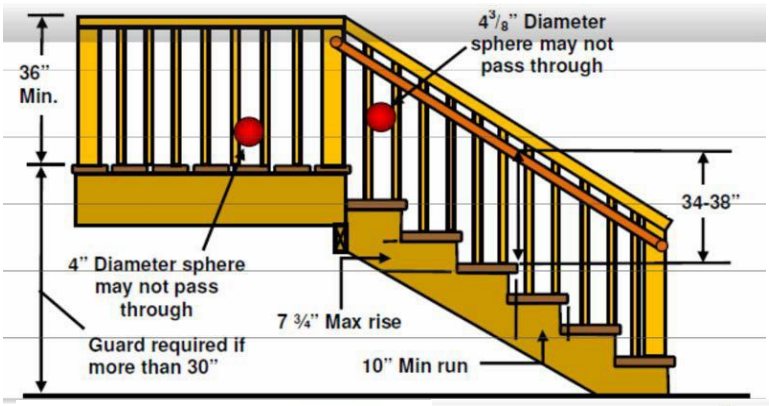
PLAN VIEW

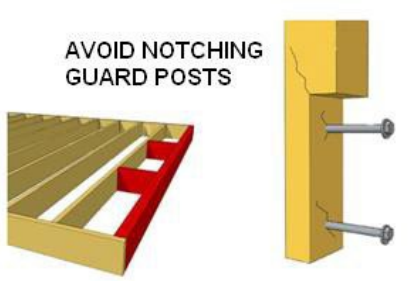


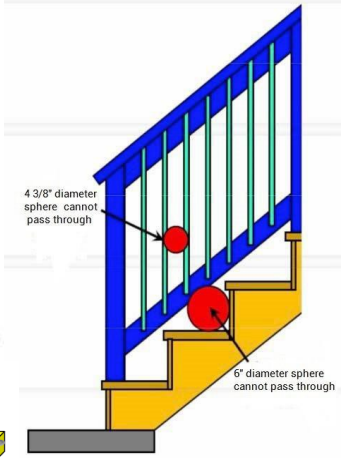
SECTION

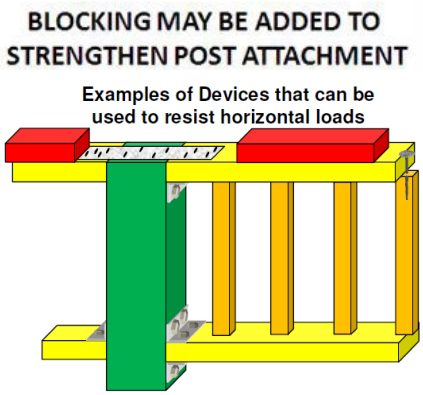
STAIRS, GUARDRAILS AND HANDRAILS

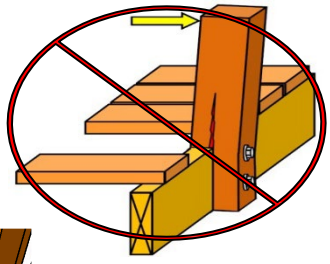
- Guards are required on all decks and stairs more than 30” above grade.
- Guards must be 36” minimum in height; 34” minimum at stairs. **Screens are not guards.**
- Guards must be able to withstand 200 lbs. of applied pressure.
- Openings in guards and open risers on stairs with a total rise greater than 30” cannot allow a 4” sphere to pass.
- Openings in guards at stairs cannot allow a 4 3/8” sphere to pass.
- The triangular openings formed by the riser, tread and bottom rail of guards shall be such that a sphere 6” in diameter cannot pass through.
- Stairways must be a minimum 36” between guards for the full length of the stairway.
- The maximum rise is 7 ¾”, the minimum run is 10”. Treads, risers, and nosing’s shall be consistent within 3/8”.
- A nosing not less than ¾ inch or greater than 1 ¼” shall be provided on stairways.
- A handrail is required on stairs with four or more risers.
- Handrails must have a continuous graspable surface, be 34” to 38” above the tread nosing and run the full length of the stairs with the 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.

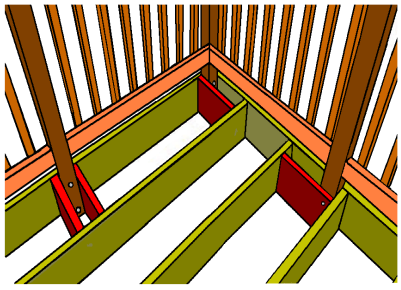


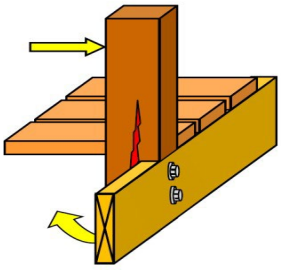


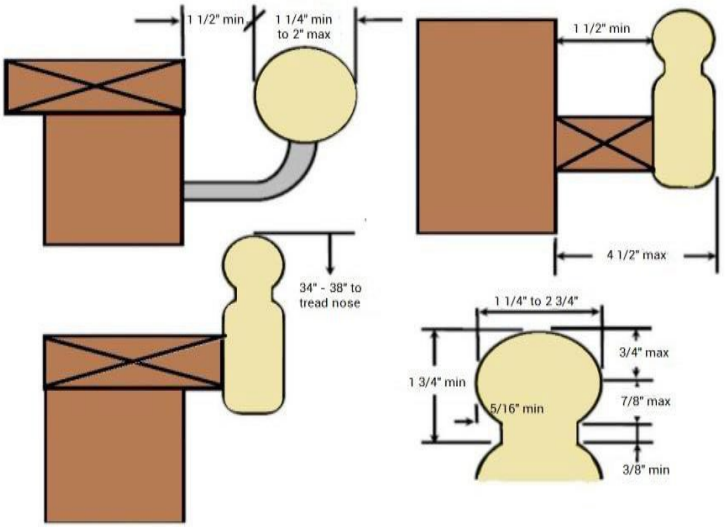


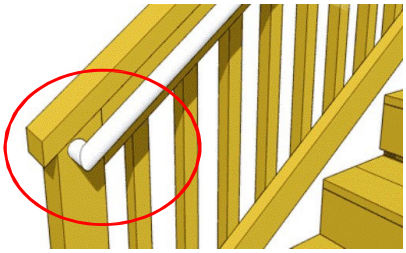












COMPOSITES AND OTHER DECK/RAILING PRODUCTS

Wood/plastic composites used for exterior deck boards, stair treads, handrails and guardrail systems must bear labels indicating compliance with ASTM D7031 or a current ICC Evaluation Services Report must be made available.

Wood/plastic composites complying with ASTM D7031 must be installed in accordance with the manufacturer's written installation instructions.

Wood/plastic composites having an ICC ES Report must be installed in accordance with the manufacturer's installation instructions and the report.

READ THE INSTRUCTIONS AND THE REPORTS CAREFULLY. ALL PRODUCTS HAVE SPECIFIC REQUIREMENTS FOR STAIR TREADS. SOME ARE LIMITED TO INSTALLATION PERPENDICULAR TO JOISTS ONLY.

PRODUCTS MADE OF ALUMINUM, STEEL, GLASS, OR ANY OTHER MAN MADE PRODUCT MAY BE USED IF THE MANUFACTURER HAS A RESEARCH REPORT FROM THE INTERNATIONAL CODE COUNCIL AND THE PRODUCT IS INSTALLED IN STRICT ACCORDANCE WITH THAT REPORT OR SITE SPECIFIC ENGINEERING IS PROVIDED.