AMERICAN
WOOD COUNCIL

2021 IRC Deck Codes

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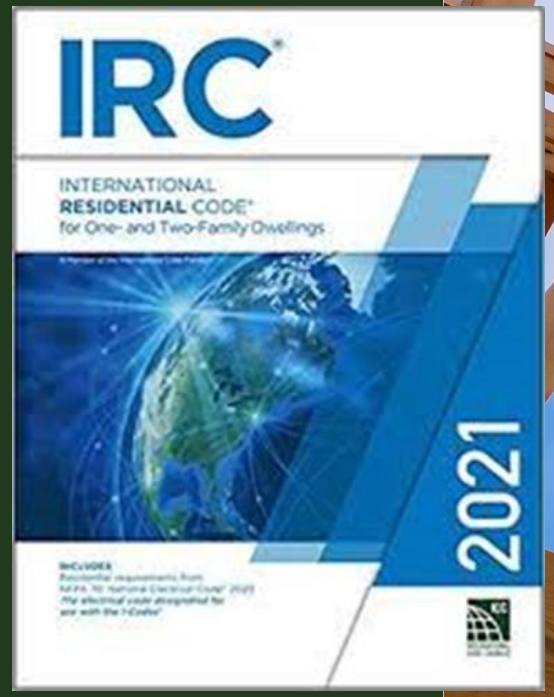

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Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

Course Description

This presentation introduces basic design and construction methods for single-story residential wood decks focusing on the significant changes to the 2021 International Residential Code (IRC). The vertical and lateral load paths of conventional residential decks, as well as other general information about decks is also included. Specific design guidance includes convenient span tables for joists and beams and tables of post sizing limitations and connection methods.

Learning Objectives

01 Load Paths

Identify vertical and lateral load paths of conventional residential decks

02 Footings

Identify minimum footing size and materials per IRC

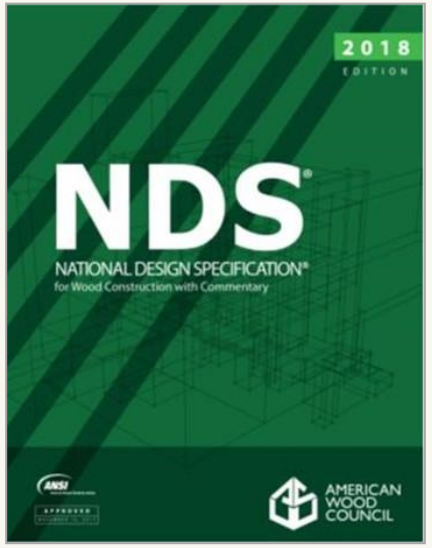
03 Beams and Joist Spans

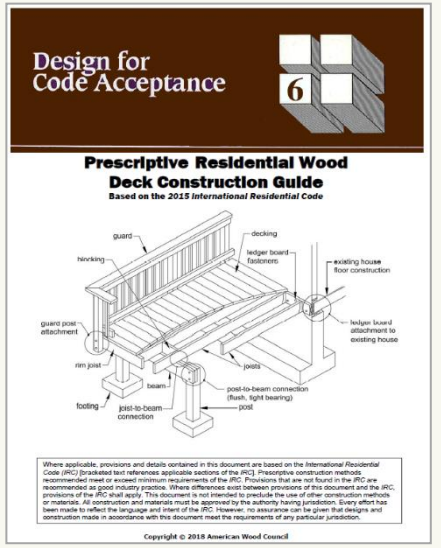
Determine appropriate beams and joist span lengths using IRC provisions

04 Lateral Connections

Determine lateral connection options for the deck to existing dwelling based on IRC requirements

CODES AND STANDARDS





General Code Requirements

GENERAL REQUIREMENTS (EXISTING)

R102.7 Existing structures. The legal occupancy of any structure existing on the date of adoption of this code shall be permitted to continue without change, except as is specifically covered in this code, the *International Property Maintenance Code* or the *International Fire Code*, or as is deemed necessary by the *building official* for the general safety and welfare of the occupants and public.

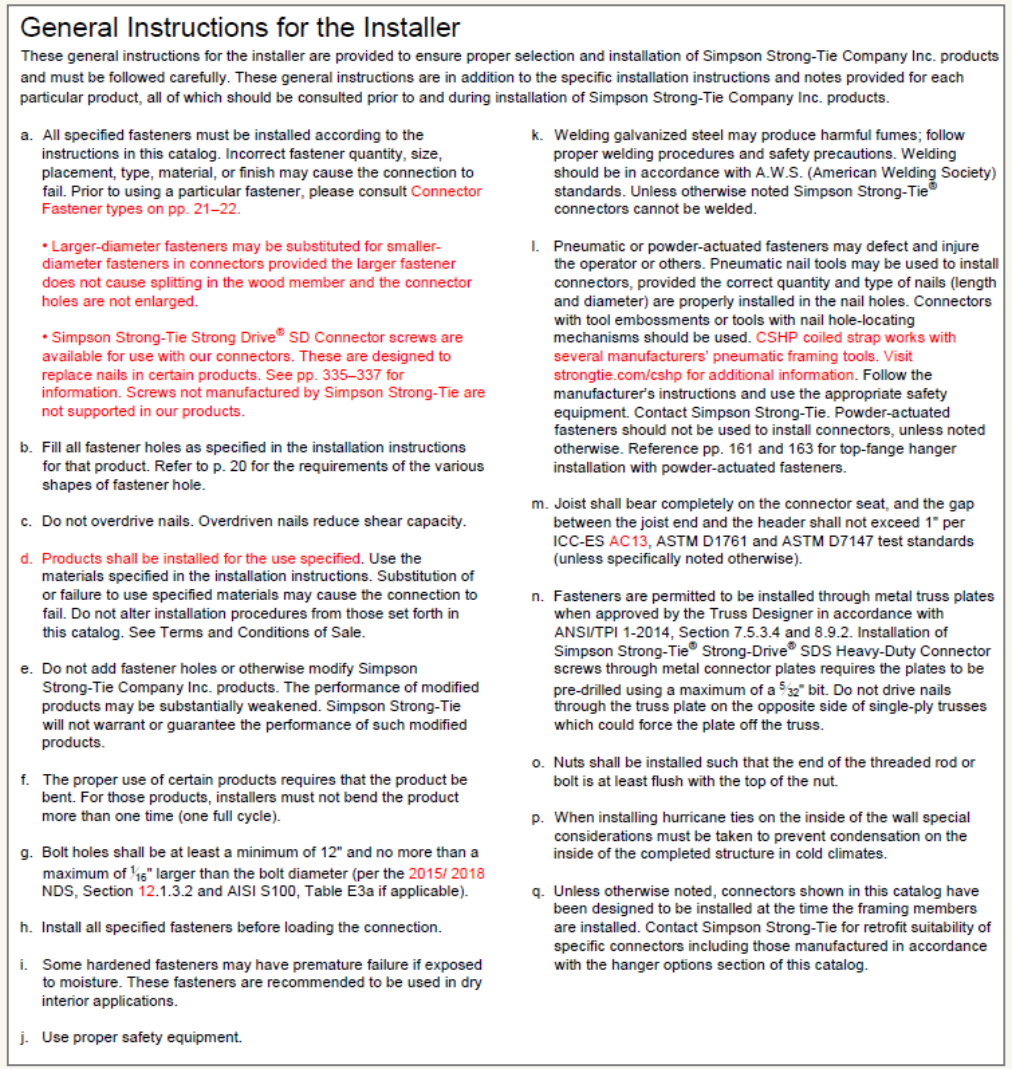
GENERAL REQUIREMENTS (REVISED)

R102.7.1 Additions, alterations or repairs. Additions, alterations, or repairs to any structure shall conform to the requirements for a new structure without requiring the existing structure to comply with the requirements of this code unless otherwise stated. Additions, alterations, repairs and relocations shall not cause an existing structure to become less compliant with the provisions of this code than the existing building was prior to the addition, alteration or repair.

GENERAL REQUIREMENTS

GENERAL REQUIREMENTS (EXISTING)

R106.1.2 Manufacturer's installation instructions. Manufacturer's installation instructions, as required by this code, shall be available on the jobsite at the time of inspection.



General Instructions for the Installer

These general instructions for the installer are provided to ensure proper selection and installation of Simpson Strong-Tie Company Inc. products and must be followed carefully. These general instructions are in addition to the specific installation instructions and notes provided for each particular product, all of which should be consulted prior to and during installation of Simpson Strong-Tie Company Inc. products.

a. All specified fasteners must be installed according to the instructions in this catalog. Incorrect fastener quantity, size, placement, type, material, or finish may cause the connection to fail. Prior to using a particular fastener, please consult Connector Fastener types on pp. 21–22.

• Larger-diameter fasteners may be substituted for smaller-diameter fasteners in connectors provided the larger fastener does not cause splitting in the wood member and the connector holes are not enlarged.

• Simpson Strong-Tie Strong Drive® SD Connector screws are available for use with our connectors. These are designed to replace nails in certain products. See pp. 335–337 for information. Screws not manufactured by Simpson Strong-Tie are not supported in our products.

b. Fill all fastener holes as specified in the installation instructions for that product. Refer to p. 20 for the requirements of the various shapes of fastener hole.

c. Do not overdrive nails. Overdriven nails reduce shear capacity.

d. Products shall be installed for the use specified. Use the materials specified in the installation instructions. Substitution of or failure to use specified materials may cause the connection to fail. Do not alter installation procedures from those set forth in this catalog. See Terms and Conditions of Sale.

e. Do not add fastener holes or otherwise modify Simpson Strong-Tie Company Inc. products. The performance of modified products may be substantially weakened. Simpson Strong-Tie will not warrant or guarantee the performance of such modified products.

f. The proper use of certain products requires that the product be bent. For those products, installers must not bend the product more than one time (one full cycle).

g. Bolt holes shall be at least a minimum of 12" and no more than a maximum of $\frac{1}{16}$" larger than the bolt diameter (per the 2015/ 2018 NDS, Section 12.1.3.2 and AISI S100, Table E3a if applicable).

h. Install all specified fasteners before loading the connection.

i. Some hardened fasteners may have premature failure if exposed to moisture. These fasteners are recommended to be used in dry interior applications.

j. Use proper safety equipment.

k. Welding galvanized steel may produce harmful fumes; follow proper welding procedures and safety precautions. Welding should be in accordance with A.W.S. (American Welding Society) standards. Unless otherwise noted Simpson Strong-Tie® connectors cannot be welded.

l. Pneumatic or powder-actuated fasteners may defect and injure the operator or others. Pneumatic nail tools may be used to install connectors, provided the correct quantity and type of nails (length and diameter) are properly installed in the nail holes. Connectors with tool embossments or tools with nail hole-locating mechanisms should be used. CSHP coiled strap works with several manufacturers' pneumatic framing tools. Visit strongtie.com/cshp for additional information. Follow the manufacturer's instructions and use the appropriate safety equipment. Contact Simpson Strong-Tie. Powder-actuated fasteners should not be used to install connectors, unless noted otherwise. Reference pp. 161 and 163 for top-fange hanger installation with powder-actuated fasteners.

m. Joist shall bear completely on the connector seat, and the gap between the joist end and the header shall not exceed 1" per ICC-ES AC13, ASTM D1761 and ASTM D7147 test standards (unless specifically noted otherwise).

n. Fasteners are permitted to be installed through metal truss plates when approved by the Truss Designer in accordance with ANSI/TPI 1-2014, Section 7.5.3.4 and 8.9.2. Installation of Simpson Strong-Tie® Strong-Drive® SDS Heavy-Duty Connector screws through metal connector plates requires the plates to be pre-drilled using a maximum of a $\frac{5}{32}$" bit. Do not drive nails through the truss plate on the opposite side of single-ply trusses which could force the plate off the truss.

o. Nuts shall be installed such that the end of the threaded rod or bolt is at least flush with the top of the nut.

p. When installing hurricane ties on the inside of the wall special considerations must be taken to prevent condensation on the inside of the completed structure in cold climates.

q. Unless otherwise noted, connectors shown in this catalog have been designed to be installed at the time the framing members are installed. Contact Simpson Strong-Tie for retrofit suitability of specific connectors including those manufactured in accordance with the hanger options section of this catalog.

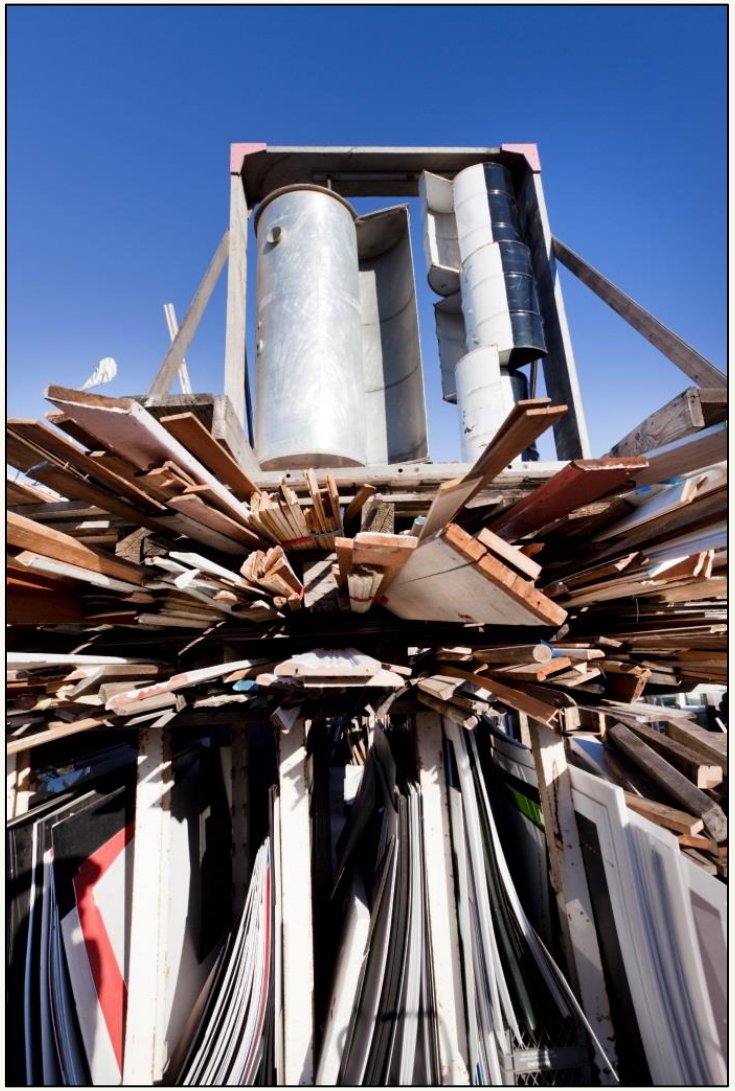
GENERAL REQUIREMENTS (EXISTING)

R105.2 Work exempt from permit. *Permits* shall not be required for the following:

Item 10 – Decks not exceeding 200 square feet in area, that are not more than 30 inches above *grade* at any point, are not attached to a dwelling and do not serve the exit door required by Section R311.4.

GENERAL REQUIREMENTS (EXISTING)

R104.9.1 Used materials. Used materials, *equipment* and devices shall not be reused unless *approved* by the *building official*.



GENERAL REQUIREMENTS (EXISTING)

R104.11 Alternative materials, design and methods of construction. The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code. The *building official* shall have the authority to approve an alternative material, design or method of construction upon application of the *owner* or owner's authorized agent. The *building official* shall first find that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, not less than the equivalent of that prescribed in this code in quality, strength, effectiveness, fire resistance, durability and safety. Compliance with the specific performance-based provisions of the International Codes shall be an alternative to the specific requirements of this code. Where the alternative material, design or method of construction is not *approved*, the *building official* shall respond in writing, stating the reasons why the alternative was not *approved*.

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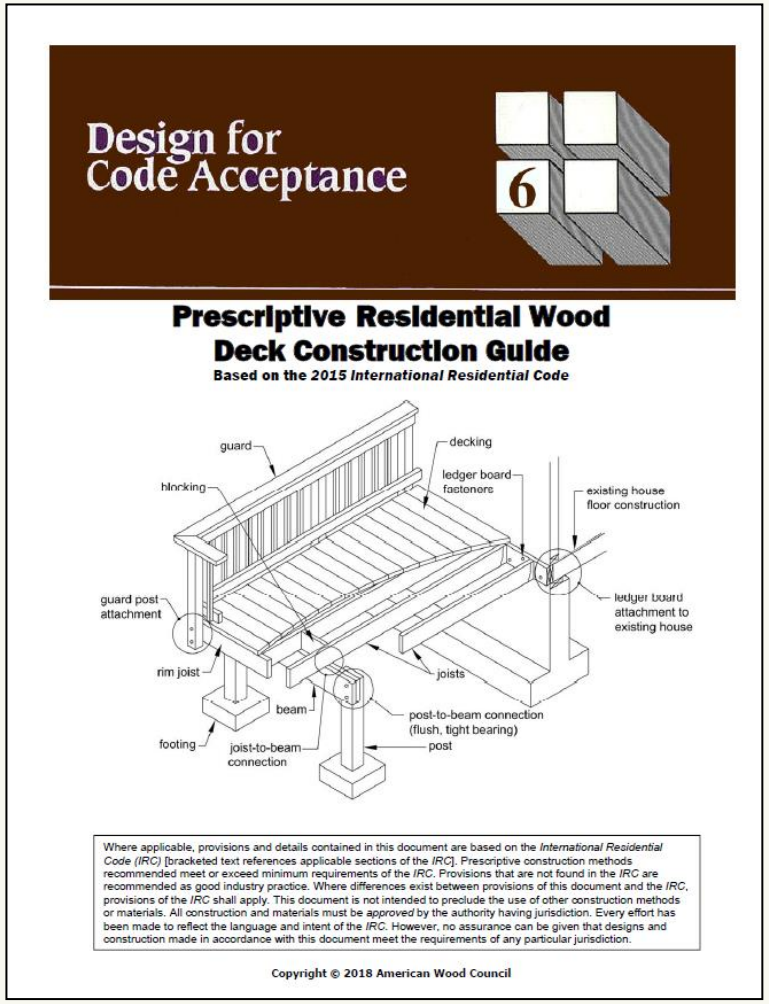
GENERAL REQUIREMENTS

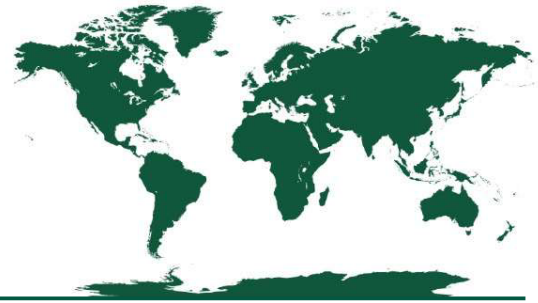
Per R104.11, other standards can be used to design a deck. Although not specifically referenced in the IRC, the DCA-6 deck design guideline from the American Wood Council can be used to design a deck when approved by the building official.

Additional documents may be available in some regions.



EVALUATION REPORTS (EXISTING)

ICC EVALUATION SERVICE®



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ICC-ES Evaluation Report
ESR-2240

Reissued January 2023
Revised May 2023
This report is subject to renewal May 2024.

DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES
Section: 06 05 73.33—Preservative Wood Treatment

REPORT HOLDER:

KOPPERS PERFORMANCE CHEMICALS

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2021, 2018, 2015, 2012 and 2009 *International Building Code®* (IBC)
- 2021, 2018, 2015, 2012 and 2009 *International*

Load Paths

DECK DESIGN

R301.2.1 Wind design.

R301.2.2 Seismic provisions.

R301.2.3 Snow loads.

R301.4 Dead loads.

R301.5 Live loads.

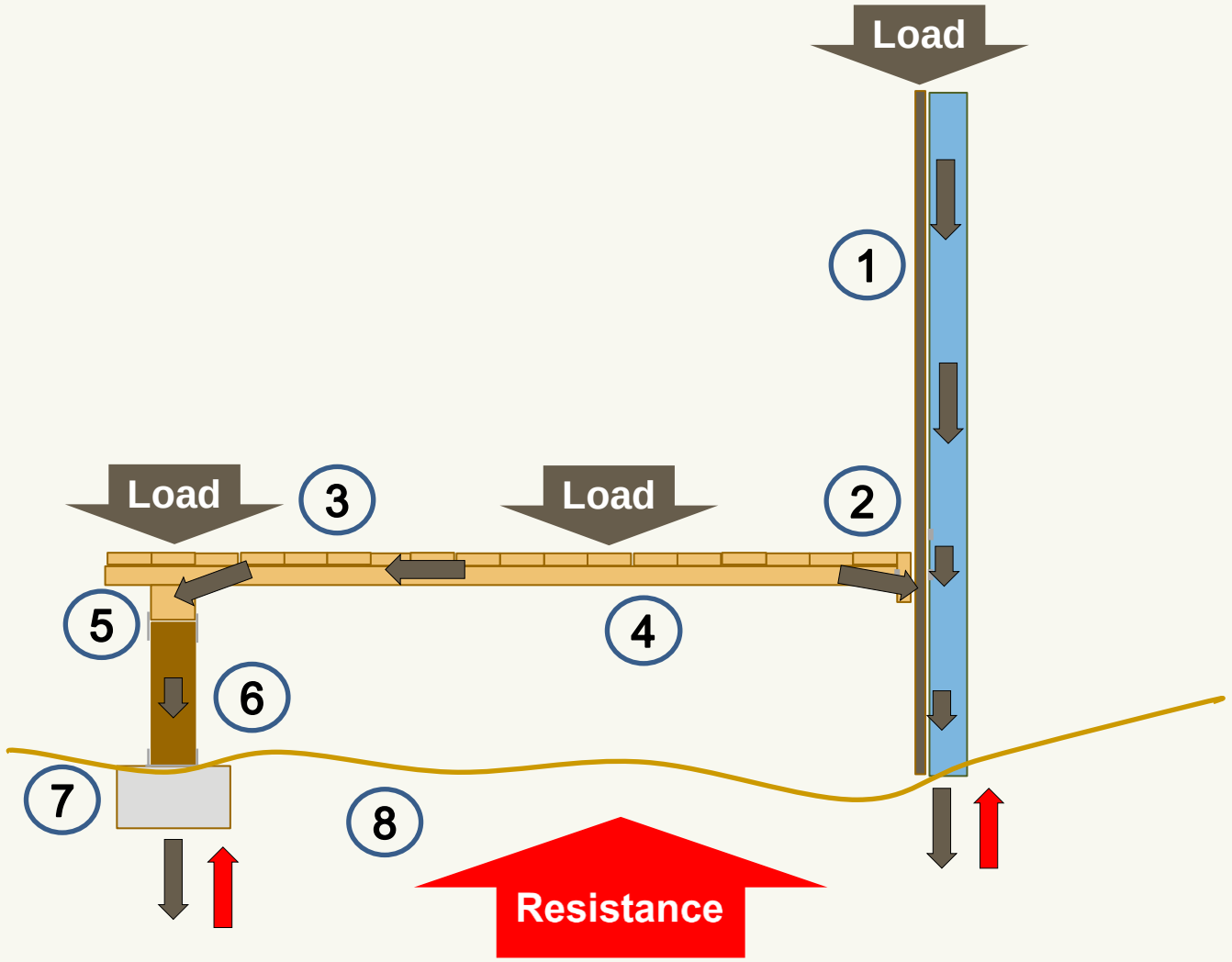
R301.7 Deflection.

TABLE R301.5
MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS (in pounds per square foot)

USE	UNIFORM LOAD (psf)	CONCENTRATED LOAD (lb)
Uninhabitable attics without storage[b]	10	—
Uninhabitable attics with limited storage[b, g]	20	—
Habitable attics and attics served with fixed stairs	30	—
Balconies (exterior) and decks[e]	40	—
Fire escapes	40	—
Guards	—	200[h, i]
Guard in-fill components[f]	—	50[h]
Handrail[d]	—	200[h]
Passenger vehicle garages[a]	50[a]	2,000[h]
Areas other than sleeping areas	40	—
Sleeping areas	30	—
Stairs	40[c]	300[c]

LOAD PATH

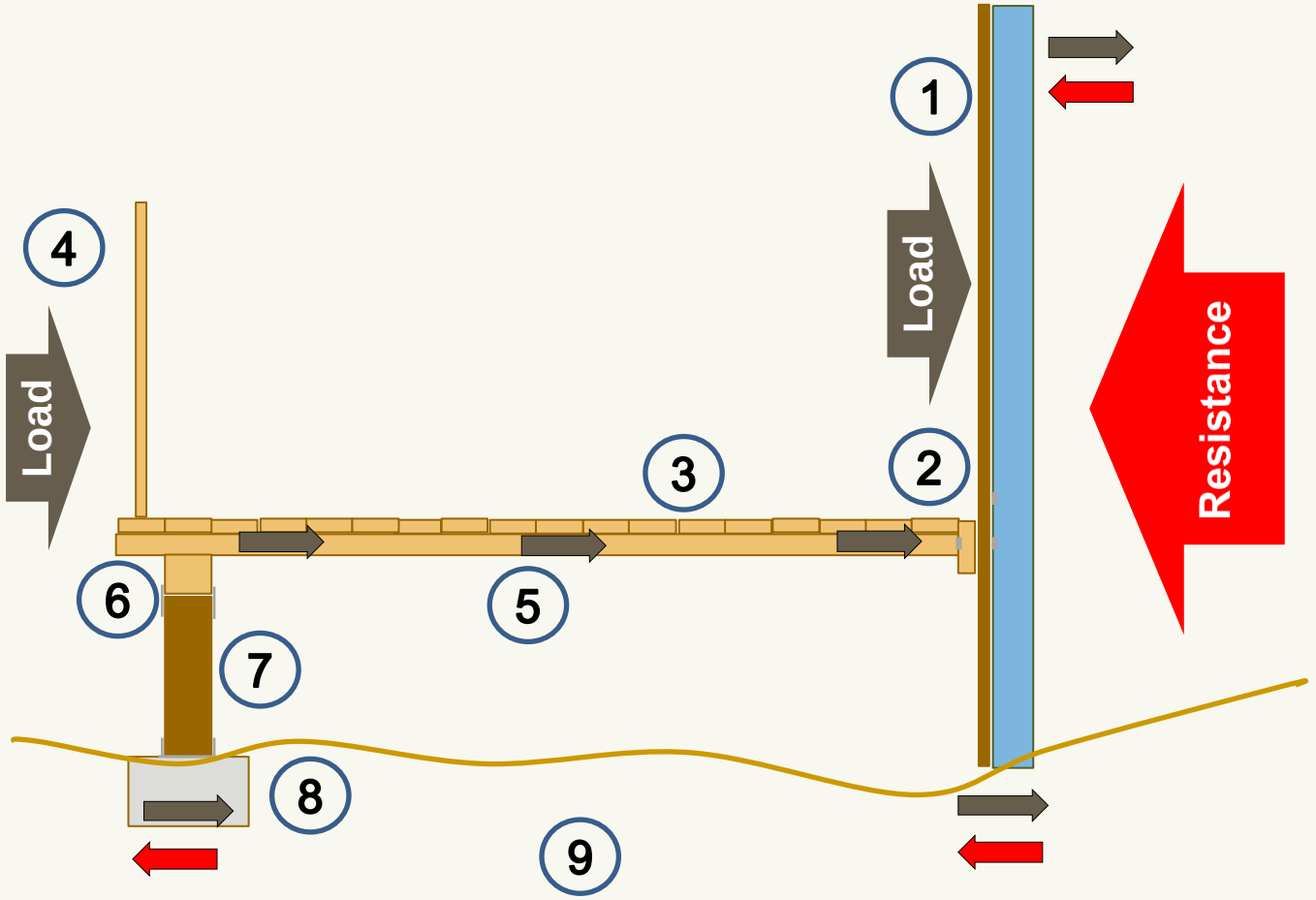
Vertical (Gravity) Load Path



1. Wall
2. Ledger
3. Decking
4. Joist
5. Beam
6. Post
7. Foundation
8. Ground

LOAD PATH

Lateral (Sideways) Load Path



1. Wall
2. Ledger
3. Decking
4. Guard
5. Joist
6. Beam
7. Post
8. Foundation
9. Ground

Deck Requirements

R507 EXTERIOR WOOD DECKS

R507.1 DECKS

- Exterior wood-framed decks only may use R507.
- For other decks refer to Section R301 for engineered design.
- Decks shall be designed for live load in R301.5 or snow load in Table R301.2, whichever is greater.

DECK DESIGN

Engineered design – R301.1.3

A deck may be designed by accepted engineering practice. In that case, the requirements of Section R507 do not need to be followed.

Engineered design is required for any deck that does not meet the limitations of R507.

R507.2 MATERIALS

R507.2.1 Wood materials

R507.2.2 Plastic composite deck boards, stair treads, guards or handrails.

R507.2.3 Fasteners and connections

R507.2.4 Flashing

R507.2.5 Alternate materials

R507.2.1 WOOD MATERIALS

R507.2.1 Wood materials.

- Wood materials shall be preservative-treated or naturally durable as per R317 and R318.

- All wood materials shall be No. 2 or better grade, preservative-treated or naturally durable.

PROTECTION FROM DECAY

R317.1 Location required. Protection of wood and wood-based products from decay shall be provided in the following locations by the use of *naturally durable wood* or wood that is preservative-treated in accordance with AWPA U1.

PROTECTION FROM DECAY

8. Portions of wood structural members that form the structural supports of buildings, balconies, porches or similar permanent building appurtenances where those members are exposed to the weather without adequate protection from a roof, eave, overhang or other covering that would prevent moisture or water accumulation on the surface or at joints between members.

PROTECTION FROM DECAY

Exception. Sawn lumber used in buildings located in a geographical region where experience has demonstrated that climatic conditions preclude the need to use naturally durable or preservative-treated wood where the structure is exposed to the weather.

PROTECTION FROM TERMITES

R318.1 Subterranean termite control methods. In areas subject to damage from termites as indicated by Table R301.2, protection shall be by one, or a combination, of the following methods:

1. Chemical termiticide treatment in accordance with R318.2.
2. Termite-baiting system installed and maintained in accordance with the *label*.
3. Pressure-preservative-treated wood in accordance with the provisions of R317.1.
4. Naturally durable termite-resistant wood.
5. Physical barriers in accordance with R318.3 and used in locations as specified in R317.1
6. Cold-formed steel framing in accordance with Sections R505.2.1 and R603.2.1.

DECK MATERIALS

Preservative-treated lumber

- Shall be preservative-treated in accordance with AWPA U1, as required by R317.1.
- Helps protect wood from decay and termites.
- Field cut ends, notches and drilled holes shall be treated in accordance with AWPA M4 as required by R317.1.1.

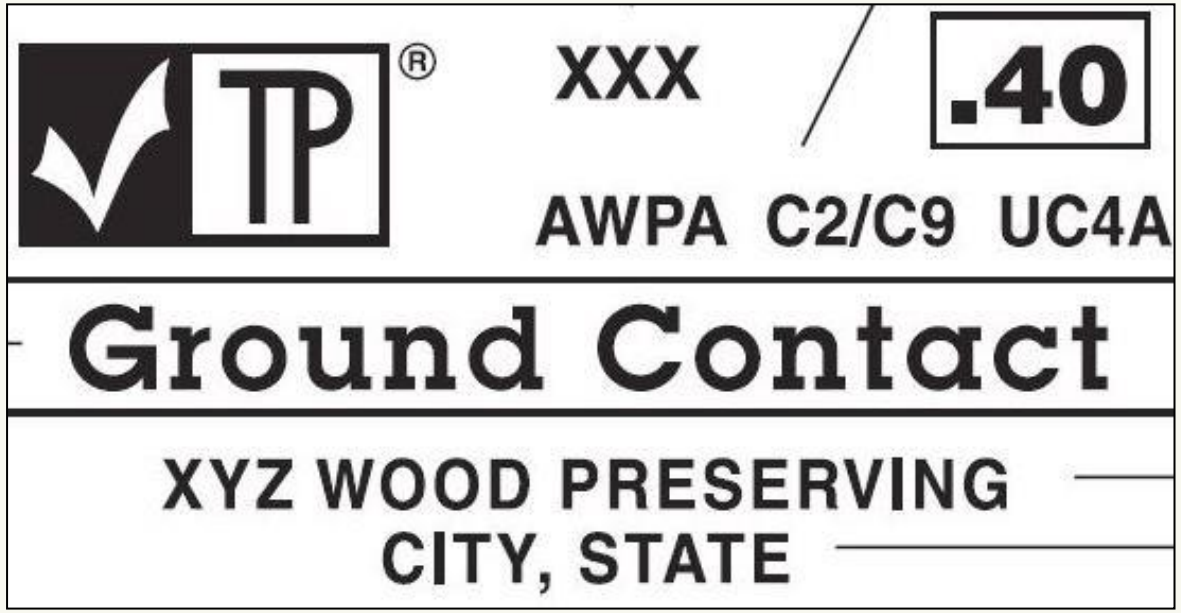
Photo Courtesy of BB&S Treated Lumber of New England

PRESERVATIVE-TREATED LUMBER

R317.1.2 Ground contact. All wood in contact with the ground, embedded in concrete in direct contact with the ground or embedded in concrete exposed to the weather that supports permanent structures intended for human occupancy shall be approved pressure-preservative-treated wood suitable for ground contact use, except that untreated wood used entirely below groundwater level or continuously submerged in fresh water shall not be required to be pressure-preservative treated.

PRESERVATIVE-TREATED LUMBER

R317.2 Quality mark. Lumber and plywood required to be pressure-preservative treated shall bear the quality *mark* of an *approved* inspection agency that maintains continuing supervision, testing and inspection over quality of the product and that has been approved by an accreditation body that complies with requirements of the American Lumber Standards Commission treated wood program.

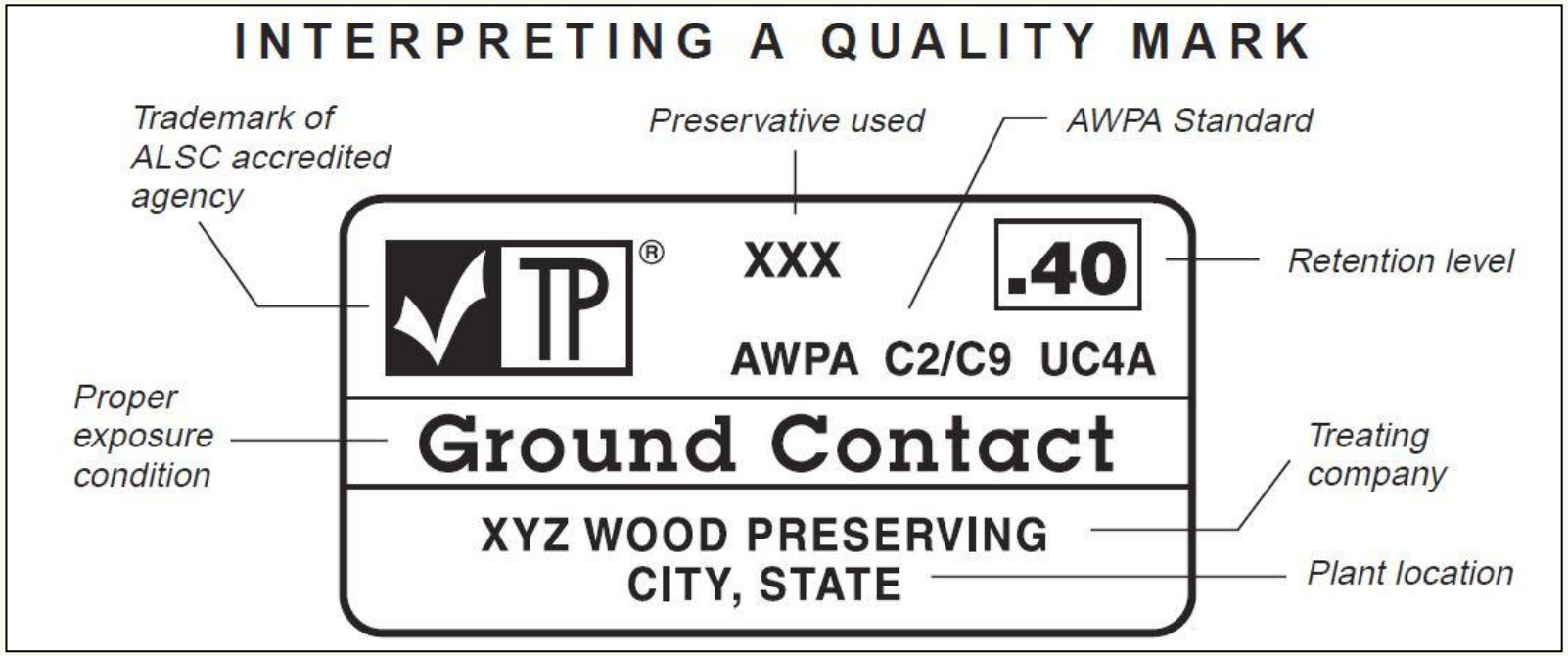


Example Quality Mark

PRESERVATIVE-TREATED LUMBER

Required information – R317.2.1

1. Identification of the treating plant.
2. Type of preservative.
3. The minimum preservative retention.
4. End use for which the product was treated.

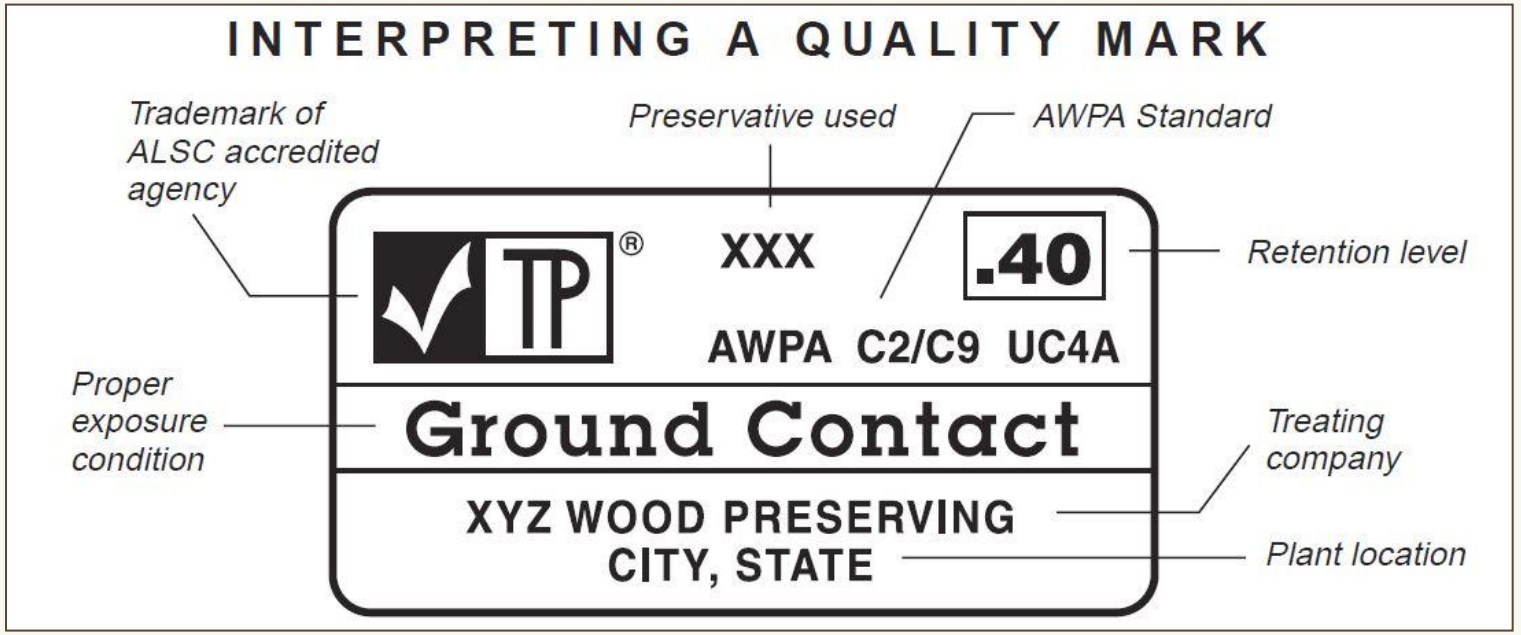


Example Quality Mark

PRESERVATIVE-TREATED LUMBER

Required information – R317.2.1

5. Standard to which the product was treated.
6. Identity of the *approved* inspection agency.
7. The designation "Dry," if applicable.



Example Quality Mark

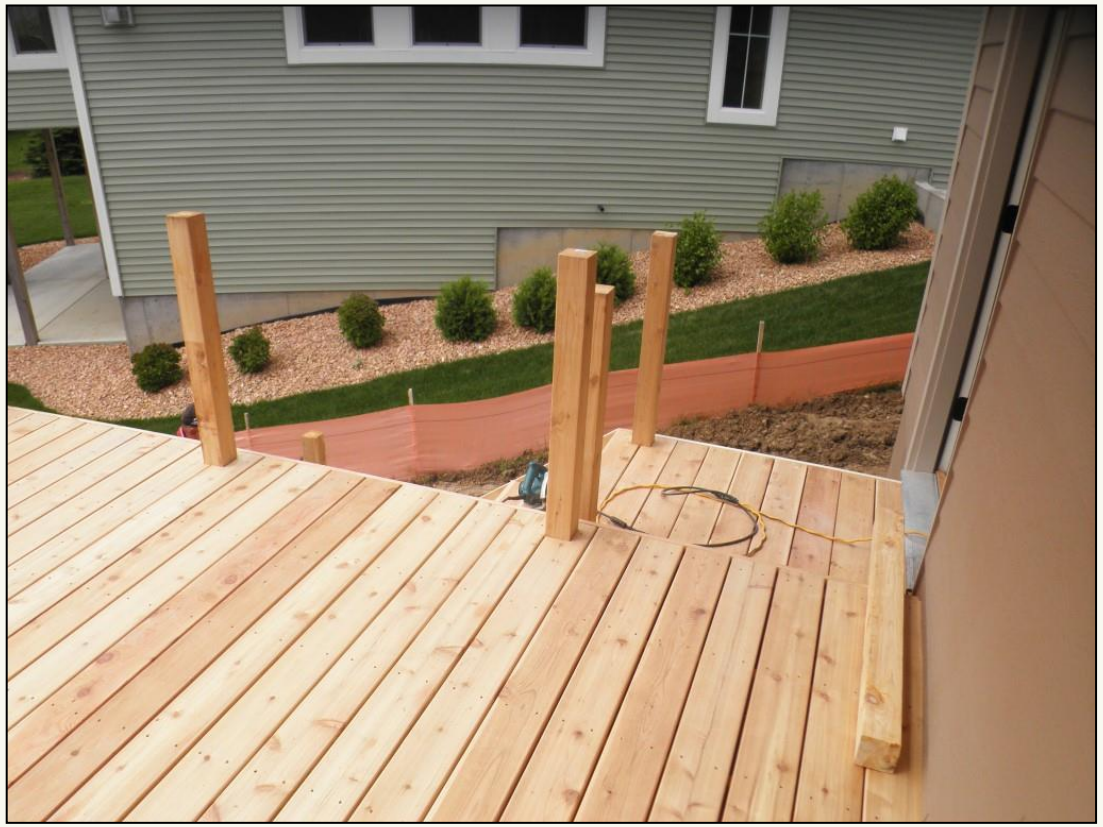
DECK MATERIALS

Naturally durable wood

- The heartwood of the following species with the exception that an occasional piece with corner sapwood is permitted if 90 percent or more of the width of each side on which it occurs is heartwood.

- Redwood, cedar, black locust or black walnut lumber are decay resistant.

- Alaska yellow cedar, redwood, Eastern red cedar, and Western red cedar are termite resistant.



ENGINEERED WOOD PRODUCTS

Engineered lumber – R507.2.1.1

Refers to R502 for code requirements
Layered wood products including:

- Glulam
- Laminated veneer lumber (LVL)
- Parallel strand lumber (PSL)
- Laminated strand lumber (LSL)
- Oriented strand lumber (OSL)
- CLT

DECK MATERIALS

Fasteners for preservative-treated wood – R507.2.3

Fasteners, including nuts and washers, shall be one of the following:

- Hot-dipped, zinc-coated galvanized steel
- Stainless steel
- Silicon bronze
- Copper

R507.3 FOOTINGS

R507.3 Footings. Decks shall be supported on concrete footings or other *approved* structural systems designed to accommodate all loads in accordance with Section R301. Deck footings shall be sized to carry the imposed loads from the deck structure to the ground as shown in Figure R507.3.

R507.3 FOOTINGS

Exceptions:

1. Footings shall not be required for free-standing decks consisting of joists directly supported on grade over their entire length.

2. Footings shall not be required for free-standing decks that meet all of the following criteria:

    2.1 The joists bear directly on precast concrete pier blocks at grade without support by beams or posts.

    2.2 The area of the deck does not exceed 200 sf.

    2.3 The walking surface is not more than 20 inches above grade at any point within 36 inches measured horizontally from the edge.

FOOTINGS DEPTH

R507.3.2 Minimum depth. Deck footings shall be placed not less than 12 inches below undisturbed ground surface.

R507.3.3 Frost protection. Where decks are attached to a frost protected structure, deck footings shall be protected from frost by one or more of the following methods:

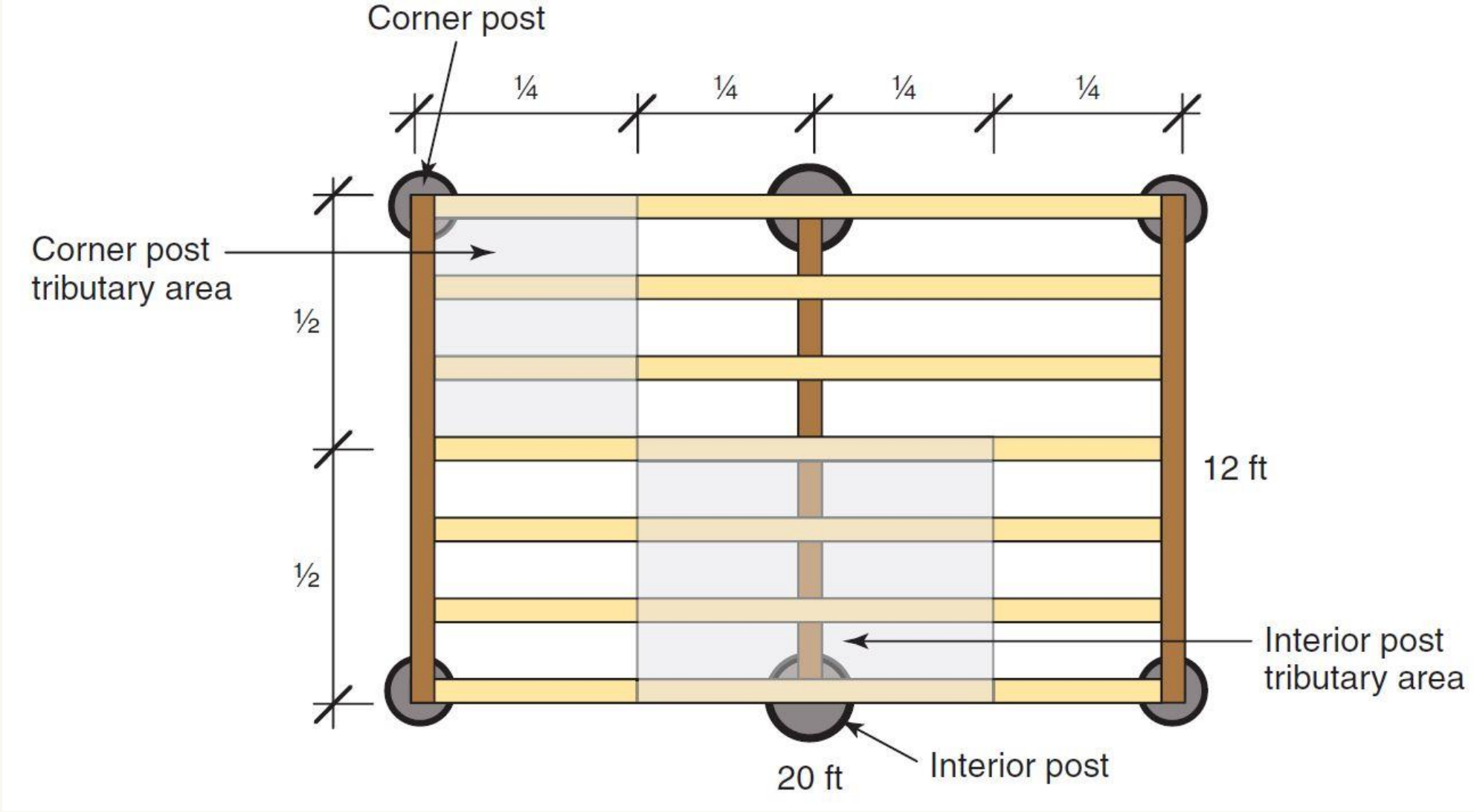
1. By extending below the frost line specified in Table R301.2(1).
2. By erecting on solid rock.
3. Other *approved* methods of frost protection.

R507.3 DECK FOOTINGS

TABLE R507.3.1 MINIMUM FOOTING SIZE FOR DECKS

LIVE OR GROUND SNOW LOAD[b] (psf)	TRIBUTARY AREA (ft^2)	LOAD-BEARING VALUE OF SOILS[a, c, d] (psf)								
		1,500[e]			2,000[e]			≥ 3,000[e]		
		Side of a square footing (inches)	Diameter of a round footing (inches)	Thickness (inches)[f]	Side of a square footing (inches)	Diameter of a round footing (inches)	Thickness (inches)[f]	Side of a square footing (inches)	Diameter of a round footing (inches)	Thickness (inches)[f]
40	5	7	8	6	7	8	6	7	8	6
	20	10	12	6	9	9	6	7	8	6
	40	14	16	6	12	14	6	10	12	6
	60	17	19	6	15	17	6	12	14	6
	80	20	22	7	17	19	6	14	16	6
	100	22	25	8	19	21	6	15	17	6
	120	24	27	9	21	23	7	17	19	6
	140	26	29	10	22	25	8	18	21	6
	160	28	31	11	24	27	9	20	22	7

R507.3 DECK FOOTINGS



R507.3 DECK FOOTINGS

Tributary area – Corner post

Length is ¼ of total length = 20 ft × ¼ = 5 ft

Width is ½ of total width = 12 ft × ½ = 6 ft

Area = 5 ft × 6 ft = 30 ft^2

Tributary area – Interior post

Length is ½ of total length = 20 ft × ½ = 10 ft

Width is ½ of total width = 12 ft × ½ = 6 ft

Area = 10 ft × 6 ft = 60 ft^2

Footing size – Corner post

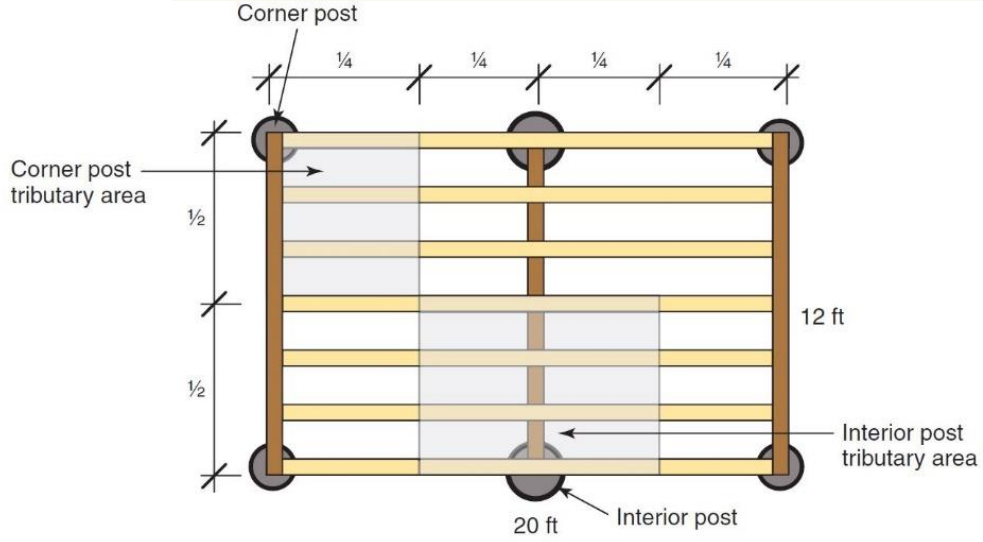
Min. 14 in. diameter

Min. 6 in. thick

Footing size – Interior post

Min. 17 in. diameter

Min. 6 in. thick



R507.4 DECK POSTS

TABLE R507.4
DECK POST HEIGHT

LOADS (psf)[b]	POST SPECIES[c]	POST SIZE[d]	TRIBUTARY AREA (ft^2)[g, h]							
			20	40	60	80	100	120	140	160
			MAXIMUM DECK POST HEIGHT[a] (feet-inches)							
40 live load	Southern pine	4 × 4	14-0	13-8	11-0	9-5	8-4	7-5	6-9	6-2
		4× 6	14-0	14-0	13-11	12-0	10-8	9-8	8-10	8-2
		6 × 6	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0
		8 × 8	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0
	Douglas fir[e] Hem-fir[e] Spruce-pine-fir[e]	4 × 4	14-0	13-6	10-10	9-3	8-0	7-0	6-2	5-3
		4 × 6	14-0	14-0	13-10	11-10	10-6	9-5	8-7	7-10
		6 × 6	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0
		8 × 8	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0
	Redwood[f] Western cedars[f] Ponderosa pine[f] Red pine[f]	4 × 4	14-0	13-2	10-3	8-1	5-8	NP	NP	NP
		4 × 6	14-0	14-0	13-6	11-4	9-9	8-4	6-9	4-7
		6 × 6	14-0	14-0	14-0	14-0	14-0	14-0	13-7	9-7
		8 × 8	14-0	14-0	14-0	14-0	14-0	14-0	14-0	14-0

R507.5 DECK BEAMS

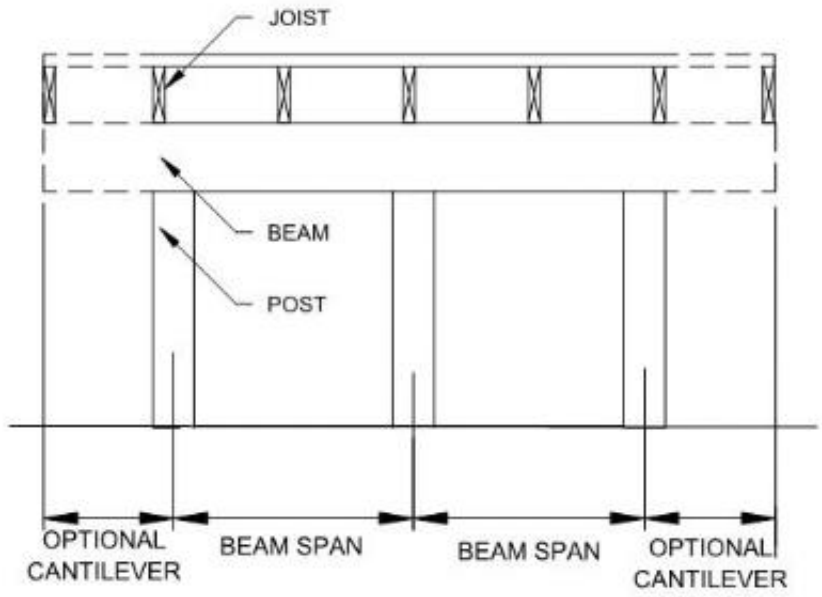
R507.5 Deck beams. Maximum allowable spans for wood deck beams as shown in Figure R507.5, shall be in accordance with Tables R507.5(1) through R507.5(4). Beam plies shall be fastened together with two rows of 10d nails minimum at 16” on center along each edge. Beams shall be permitted to cantilever at each end up to one-fourth of the actual beam span. Deck beams of other materials shall be permitted where designed in accordance with accepted engineered practices.

TABLE R507.5 DECK BEAM SPAN

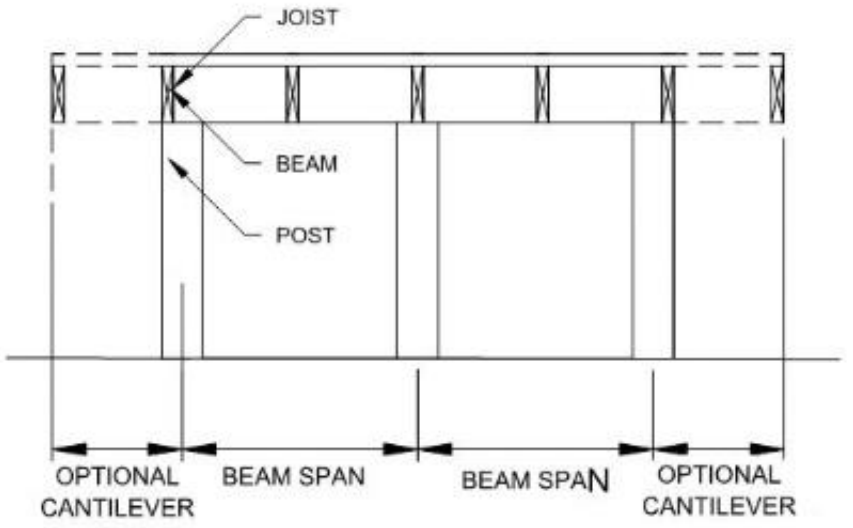
TABLE R507.5(1)
MAXIMUM DECK BEAM SPAN—40 PSF LIVE LOAD[c]

BEAM SPECIES[d]	BEAM SIZE[e]	EFFECTIVE DECK JOIST SPAN LENGTH[a, i, j] (feet)						
		6	8	10	12	14	16	18
		MAXIMUM DECK BEAM SPAN LENGTH (feet-inches)[a, b, f]						
Southern pine	1 – 2 × 6	4-7	4-0	3-7	3-3	3-0	2-10	2-8
	1 – 2 × 8	5-11	5-1	4-7	4-2	3-10	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	7-5	7-0
	3 – 2 × 6	8-6	7-5	6-8	6-1	5-8	5-3	4-11
	3 – 2 × 8	10-11	9-6	8-6	7-9	7-2	6-8	6-4
	3 – 2 × 10	13-0	11-2	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

TABLE R507.5 DECK BEAM SPAN



DROPPED BEAM



FLUSH BEAM

FIGURE R507.5 TYPICAL DECK JOIST SPANS

TABLE R507.5(1) THROUGH R507.5(4)

Footnote j. For calculation of effective joist span, the actual joist span length shall be multiplied by the joist span factor in accordance with Table R507.5(5).

TABLE R507.5(5)
JOIST SPAN FACTORS FOR CALCULATING EFFECTIVE DECK JOIST SPAN [for use with Note j in Tables R507.5(1), R507.5(2), R507.5(3) and R507.5(4)]

C/J[a]	JOIST SPAN FACTOR
0 (no cantilever)	0.66
1/12 (0.87)	0.72
1/10 (0.10)	0.80
1/8 (0.125)	0.84
1/6 (0.167)	0.90
1/4 (0.250)	1.00

For SI: 1 foot = 304.8 mm.

a. C = actual joist cantilever length (feet); J = actual joist span length (feet).

EFFECTIVE JOIST LENGTH EXAMPLE

Example: A deck has 2x8 southern yellow pine joists at 16″ o.c. with a joist span of 8′-0″ and a 1′-0″ cantilever. The joists are bearing on a southern yellow pine (2) 2x10 beam. What is the maximum beam span with a 40 psf LL?

To determine the Joist Span Factor, the C/J value is 1/8 or 0.125 (1′ cantilever divided by 8′ joist length). Therefore, the joists have a Joist Span Factor of 0.84 per Table R507.5(5).

That Joist Span Factor is multiplied by the actual joist span length to determine the effective joist span length. 8′ joist span x 0.84 = 6.72′ effective joist span.

Interpolating in Table R507.5(1) between 6′ and 8′ for 6.72′ will give a maximum beam span of 9.85′ or 9′-10″.

R507.5 DECK BEAMS

R507.5 Deck beams. Maximum allowable spans for wood deck beams as shown in Figure R507.5, shall be in accordance with Tables R507.5(1) through R507.5(4). Beam plies shall be fastened together with two rows of 10d nails minimum at 16” on center along each edge. Beams shall be permitted to cantilever at each end up to one-fourth of the actual beam span. Deck beams of other materials shall be permitted where designed in accordance with accepted engineered practices.

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R507.5 DECK BEAMS

R507.5.1 Deck beam bearing. The ends of the beams shall have not less than 1 ½ inches of bearing on wood or metal and not less than 3 inches of bearing on concrete or masonry for the entire width of the beam. Where multiple-span beams bear on intermediate posts, each ply must have full bearing on the post in accordance with Figures R507.5.1(1) and R507.5.1(2).

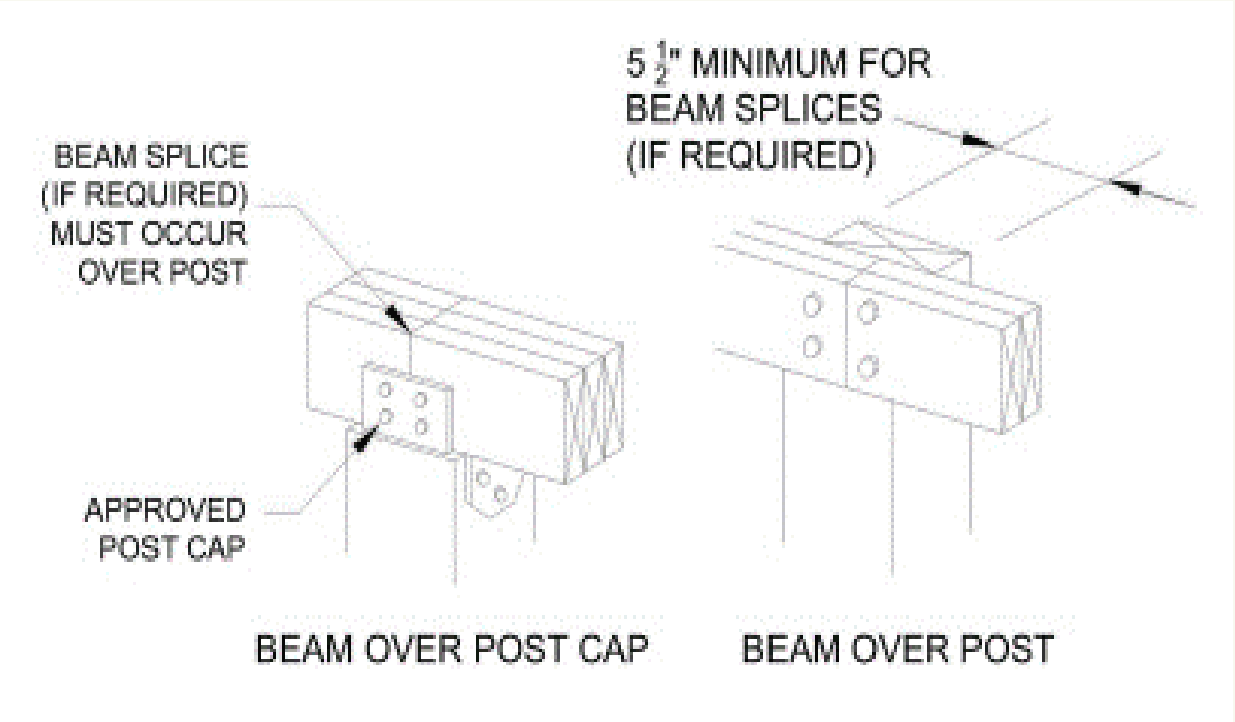


FIGURE R507.5.1(1) DECK BEAM TO DECK POST

R507.5 DECK BEAMS

R507.5.2 Deck beam connection to supports. Deck beams shall be attached to supports in a manner capable of transferring vertical loads and resisting horizontal displacement. Deck beam connections to wood posts shall be in accordance with Figures R507.5.1(1) and R507.5.1(2). Manufactured post-to-beam connectors shall be sized for the post and beam sizes. Bolts shall have washers under the head and nut.

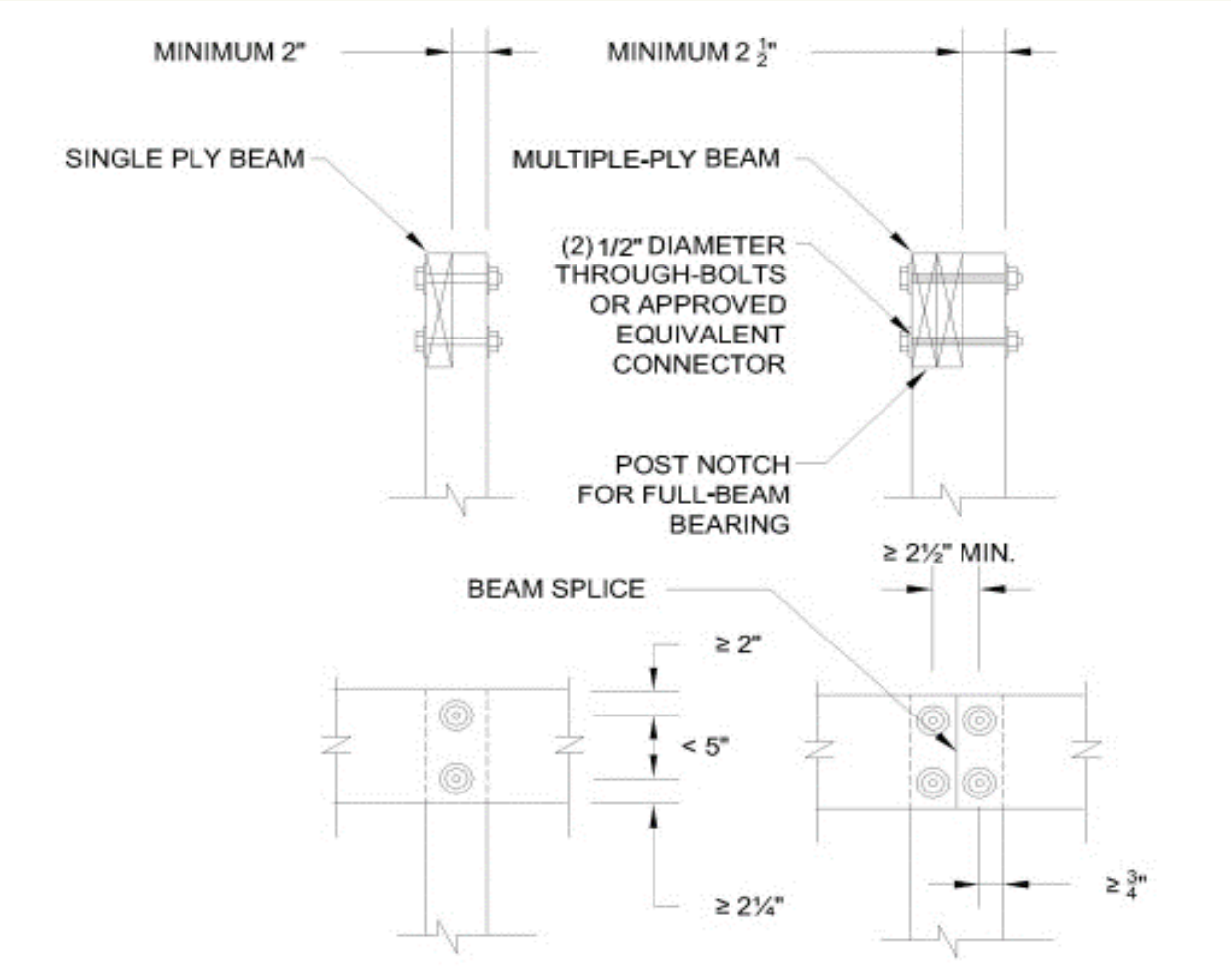


FIGURE R507.5.1(2) NOTCHED POST-TO-BEAM CONNECTION

R507.6 DECK JOISTS

R507.6 Deck joists.
Maximum allowable spans for wood deck joists, as shown in Figure R507.6, shall be in accordance with Table R507.6. The maximum joist spacing shall be limited by the decking materials in accordance with Table R507.7.

TABLE R507.6 DECK JOIST SPAN

TABLE R507.6
MAXIMUM DECK JOIST SPANS

LOAD[a] (psf)	JOIST SPECIES[b]	JOIST SIZE	ALLOWABLE JOIST SPAN [b, c] (feet-inches)			MAXIMUM CANTILEVER[d,f] (feet-inches)							
			Joist spacing (inches)			Joist back span[g] (feet)							
			12	16	24	4	6	8	10	12	14	16	18
40 live load	Southern pine	2 × 6	9-11	9-0	7-7	1-0	1-6	1-5	NP	NP	NP	NP	NP
		2 × 8	13-1	11-10	9-8	1-0	1-6	2-0	2-6	2-3	NP	NP	NP
		2 × 10	16-2	14-0	11-5	1-0	1-6	2-0	2-6	3-0	3-4	3-4	NP
		2 × 12	18-0	16-6	13-6	1-0	1-6	2-0	2-6	3-0	3-6	4-0	4-1
	Douglas fir-larch[e] Hem-fir[e] Spruce-pine-fir[e]	2 × 6	9-6	8-4	6-10	1-0	1-6	1-4	NP	NP	NP	NP	NP
		2 × 8	12-6	11-1	9-1	1-0	1-6	2-0	2-3	2-0	NP	NP	NP
		2 × 10	15-8	13-7	11-1	1-0	1-6	2-0	2-6	3-0	3-3	NP	NP
		2 × 12	18-0	15-9	12-10	1-0	1-6	2-0	2-6	3-0	3-6	3-11	3-11
	Redwood[f] Western cedars[f] Ponderosa pine[f] Red pine[f]	2 × 6	8-10	8-0	6-10	1-0	1-4	1-1	NP	NP	NP	NP	NP
		2 × 8	11-8	10-7	8-8	1-0	1-6	2-0	1-11	NP	NP	NP	NP
		2 × 10	14-11	13-0	10-7	1-0	1-6	2-0	2-6	3-0	2-9	NP	NP
		2 × 12	17-5	15-1	12-4	1-0	1-6	2-0	2-6	3-0	3-6	3-8	NP

DECK JOISTS

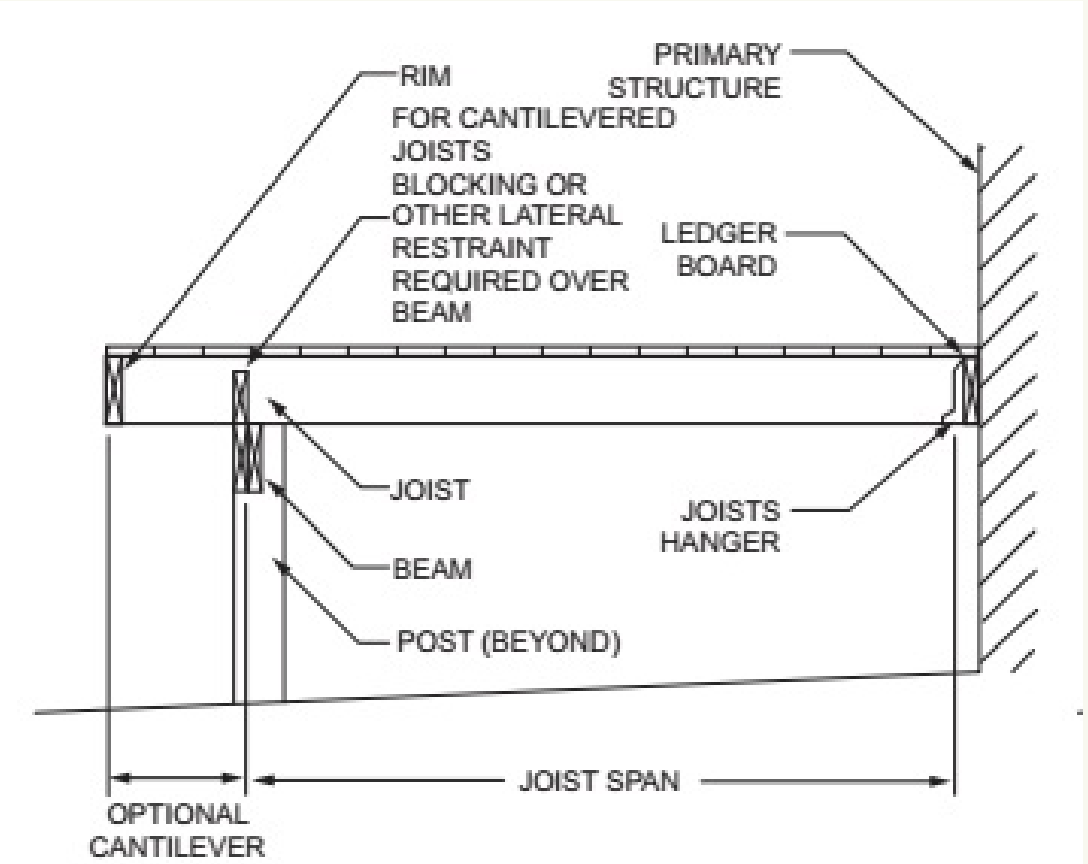
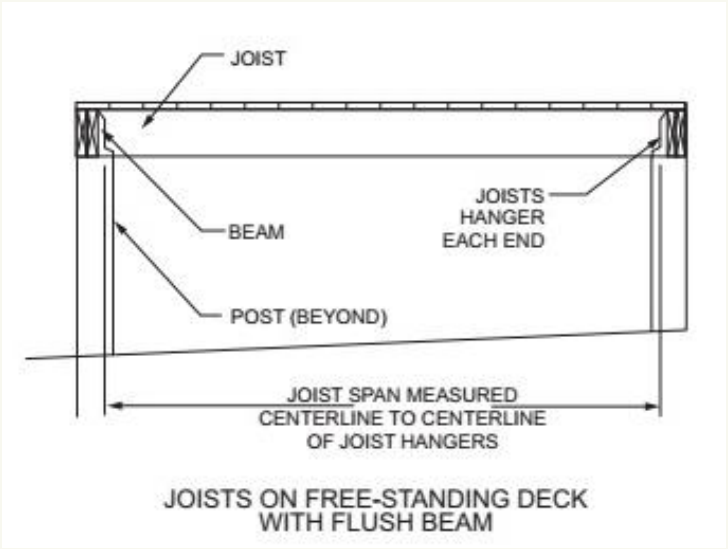
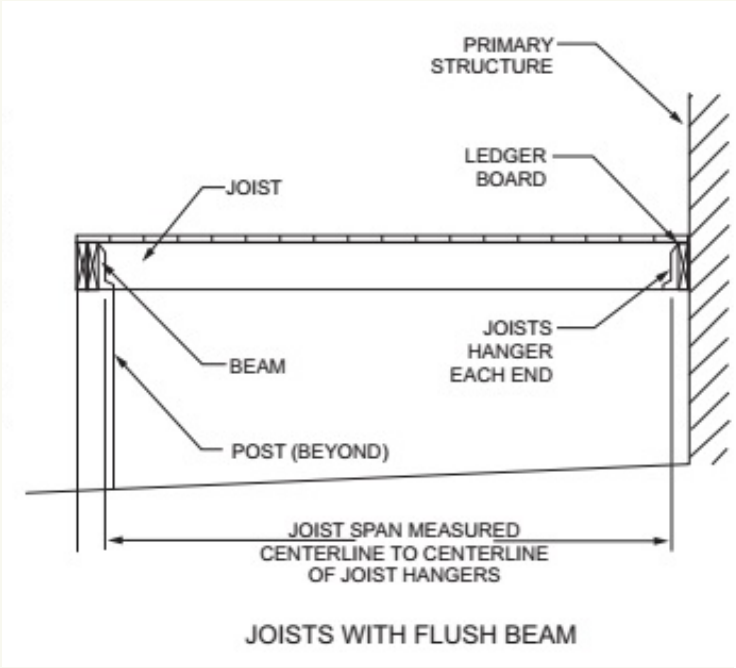


FIGURE R507.6 TYPICAL DECK JOIST SPANS

DECK JOISTS





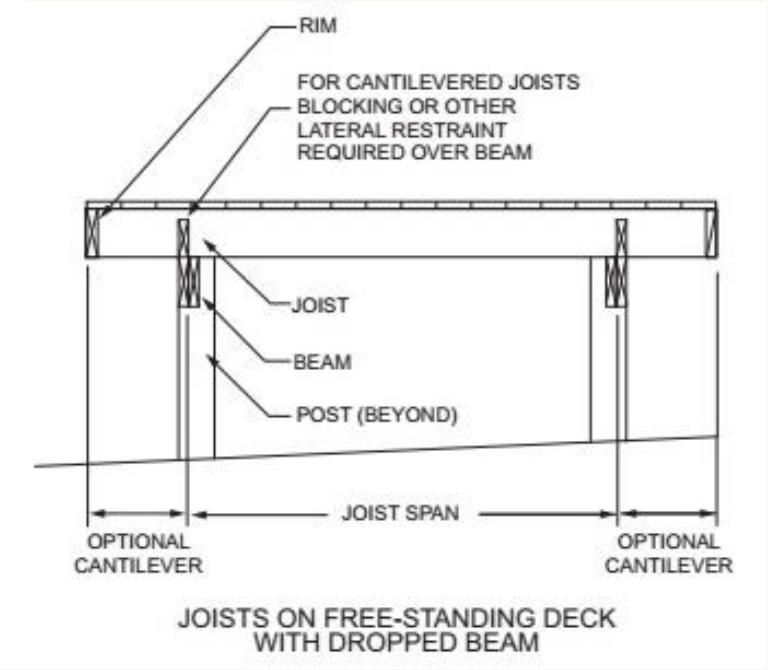


FIGURE R507.6 TYPICAL DECK JOIST SPANS

DECK JOIST BEARING

R507.6.1 Deck joist bearing. The ends of joists shall have not less than 1 ½ inches of bearing on wood or metal and not less than 3 inches of bearing on concrete or masonry over its entire width. Joists bearing on top of a multiple-ply beam or ledger shall be fastened in accordance with R602.3(1). Joists bearing on top of any single-ply beam or ledger shall be attached by a mechanical connector. Joist framing into the side of a beam or ledger board shall be supported by *approved* joist hangers.

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DECK JOIST BEARING

R507.6.1 Deck joist lateral restraint. Joist ends and bearing locations shall be provided with lateral resistance to prevent rotation. Where lateral restraint is provided by joist hangers or blocking between joists, their depth shall equal not less than 60 percent of the joist depth. Where lateral restraint is provided by rim joists, they shall be secured to the end of each joist with not fewer than three 10d nails or three No. 10 x 3-inch-long wood screws.

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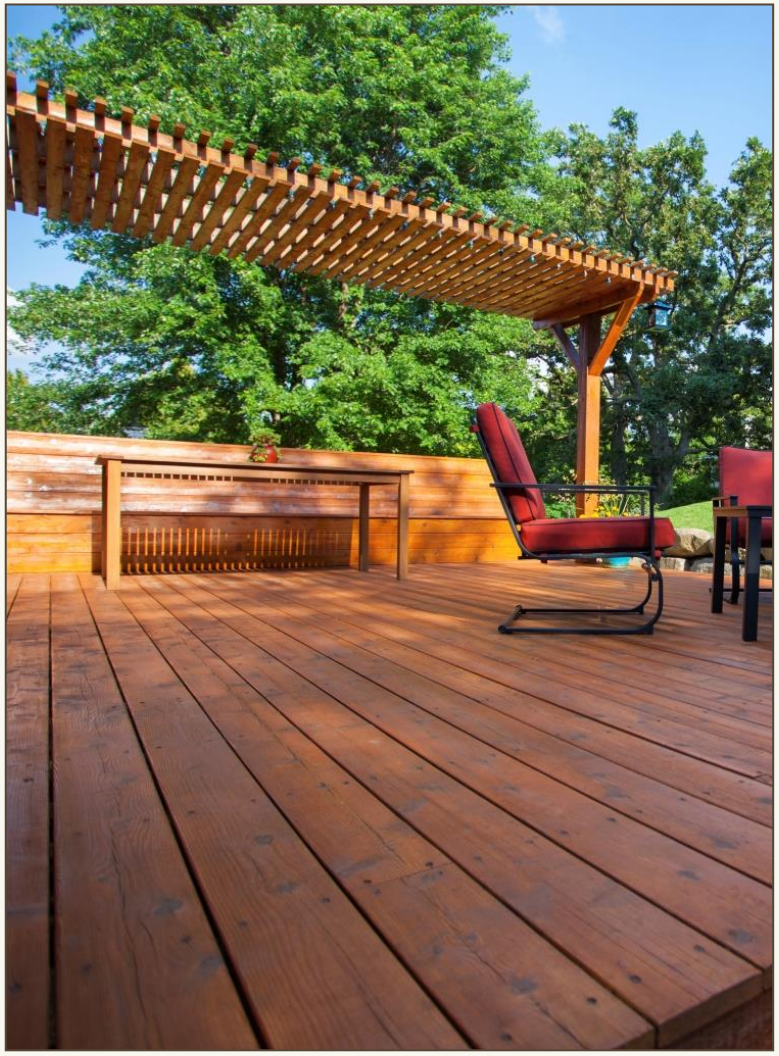
R507.7 DECKING

R507.7 Decking. Maximum allowable spacing for joists supporting wood decking, excluding *stairways*, shall be in accordance with Table R507.7. Wood decking shall be attached to each supporting member with not less than two 8d threaded nails or two No. 8 wood screws. Maximum allowable spacing for joists supporting *plastic composite* decking shall be in accordance with Section R507.2. Other *approved* decking or fastener systems shall be installed in accordance with the manufacturer's installation instructions.



DECKING

TABLE R507.7 MAXIMUM JOIST SPACING FOR WOOD DECKING

DECKING MATERIAL TYPE AND NOMINAL SIZE	DECKING PERPENDICULAR TO JOIST		DECKING DIAGONAL TO JOIST[a]	
	Single span[c]	Multiple span[c]	Single span[c]	Multiple span[c]
	Maximum on-center joist spacing (inches)			
$1\frac{1}{4}$-inch-thick wood[b]	12	16	8	12
2-inch-thick wood	24	24	18	24

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.

b. Other maximum span provided by an accredited lumber grading or inspection agency also allowed.

c. Individual wood deck boards supported by two joists shall be considered single span and three or more joists shall be considered multiple span.

R507.8 VERTICAL AND LATERAL SUPPORT

R507.8 Vertical and lateral support. 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 by the use of toenails or nails subject to withdrawal. For decks with cantilevered floor framing members, connection 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. Where positive connection to the primary building cannot be verified during inspection, decks shall be self supporting.

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R507.8 VERTICAL AND LATERAL SUPPORT

R507.9 SUPPORT AT BAND JOISTS

- Section divided into vertical and lateral support of the deck
  - Ledger details
  - Band joist details
  - Lateral connection
  - Alternates

R507.9.1.1 LEDGER DETAILS

R507.9.1.1 Ledger details. Deck ledgers shall be a minimum 2-inch by 8-inch nominal, pressure-preservative-treated Southern pine, incised pressure-preservative-treated hem-fir, or *approved*, naturally durable, No. 2 grade or better lumber. Deck ledgers shall not support concentrated loads from beams or girders. Deck ledgers shall not be supported on stone or masonry veneer.

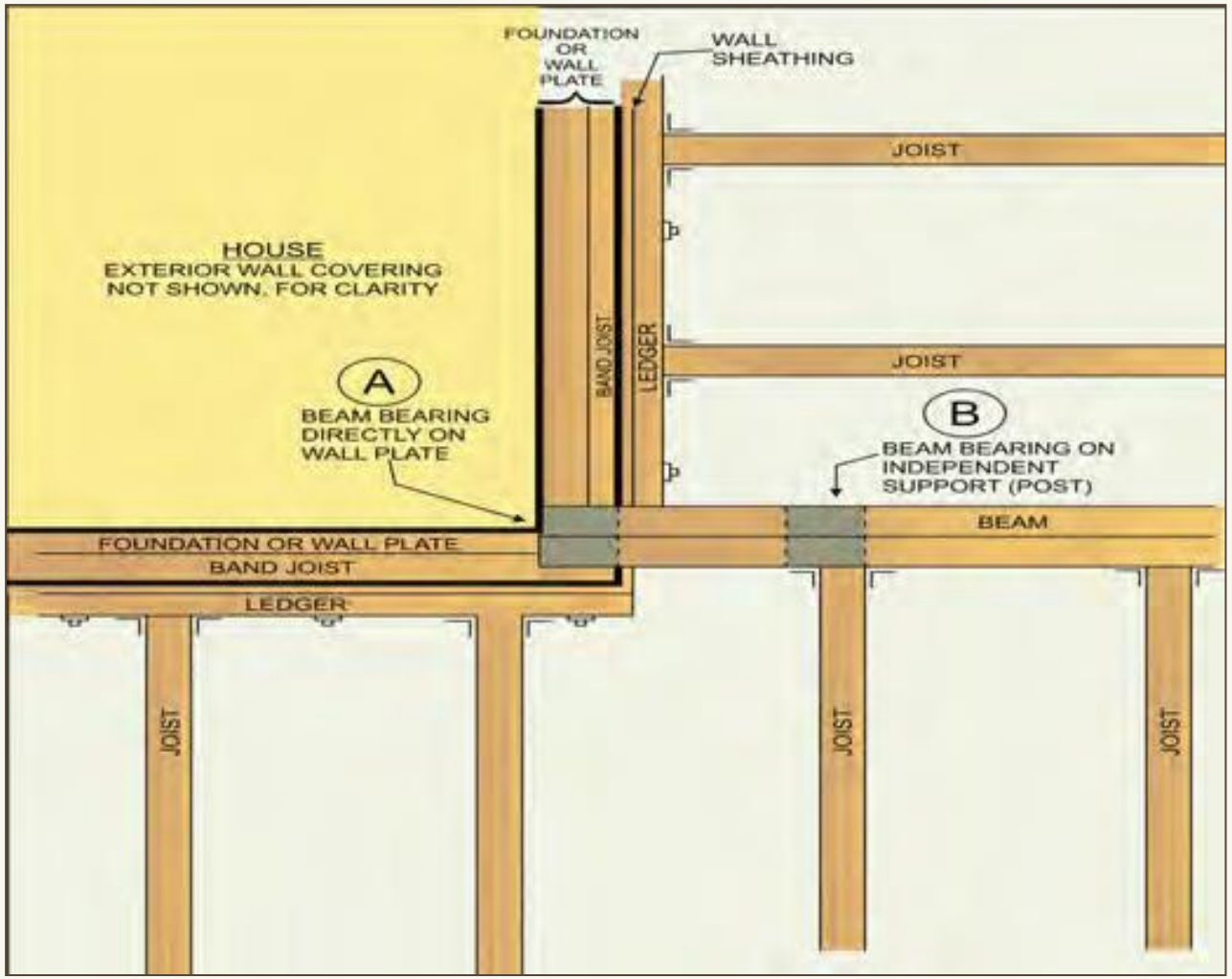
R507.9.1.1 LEDGER DETAILS

R507.9.1.1 LEDGER DETAILS

Ledger at dwelling corners

A built-up beam used to carry joists cannot be attached to the ledger or band joist.

- Option “A” shows the beam extending into the existing structure and resting on the foundation below, while
- Option “B” depicts an independent support provided underneath the beam, such as a post or pier.



R507.9.1.2 BAND JOIST DETAILS

R507.9.1.2 Band joist details. Band joists supporting a ledger shall be a minimum 2-inch-nominal solid-sawn spruce-pine-fir or better lumber or a minimum 1-inch nominal engineered wood rim boards in accordance with Section R502.1.7. Band joists shall bear fully on the primary structure capable of supporting all required loads.

R507.9.1.2 BAND JOIST DETAILS

Band joist details

Solid board must exist, in the case of open web joists, the ribbon strip of OSB is not sufficient connection.

R507.9.1.3 LEDGER TO BAND JOIST DETAIL

R507.9.1.3 Ledger to band joist connection. Fasteners used in deck ledger connections in accordance with Table R507.9.1.3(1) shall be hot-dipped galvanized or stainless steel and shall be installed in accordance with Table R507.9.1.3(2) and Figures R507.9.1.3(1) and R507.9.1.3(2).

R507.9.1.3 LEDGER TO BAND JOIST DETAIL

TABLE R507.9.1.3(1)
DECK LEDGER CONNECTION TO BAND JOIST

LOAD[c] (psf)	JOIST SPAN[a] (feet)	ON-CENTER SPACING OF FASTENERS[b] (inches)		
		1/2-inch diameter lag screw with 1/2-inch maximum sheathing[d, e]	1/2-inch diameter bolt with 1/2-inch maximum sheathing[e]	1/2-inch diameter bolt with 1-inch maximum sheathing[f]
40 live load	6	30	36	36
	8	23	36	36
	10	18	34	29
	12	15	29	24
	14	13	24	21
	16	11	21	18
	18	10	19	16

R507.9.1.3 LEDGER TO BAND JOIST DETAIL

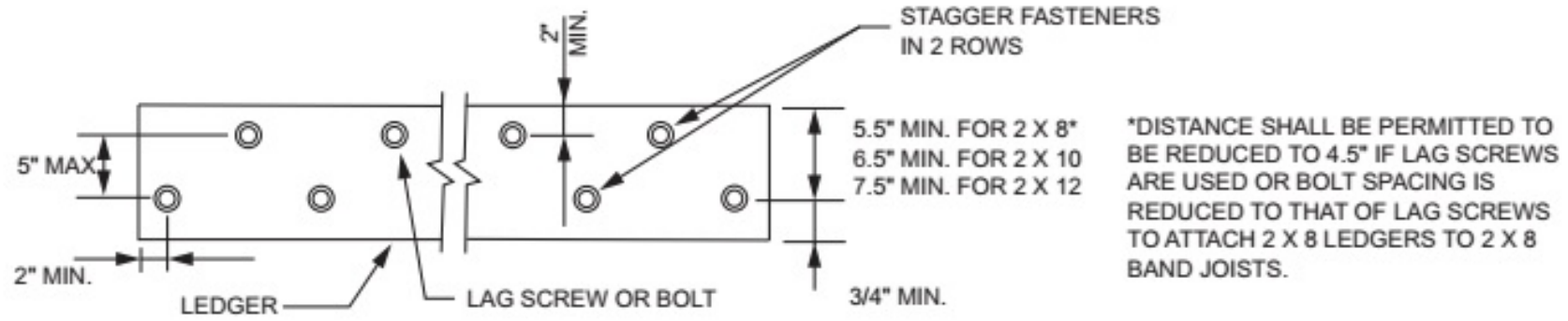
TABLE R507.9.1.3(2) PLACEMENT OF LAG SCREWS AND BOLTS IN DECK LEDGERS AND BAND JOISTS

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).

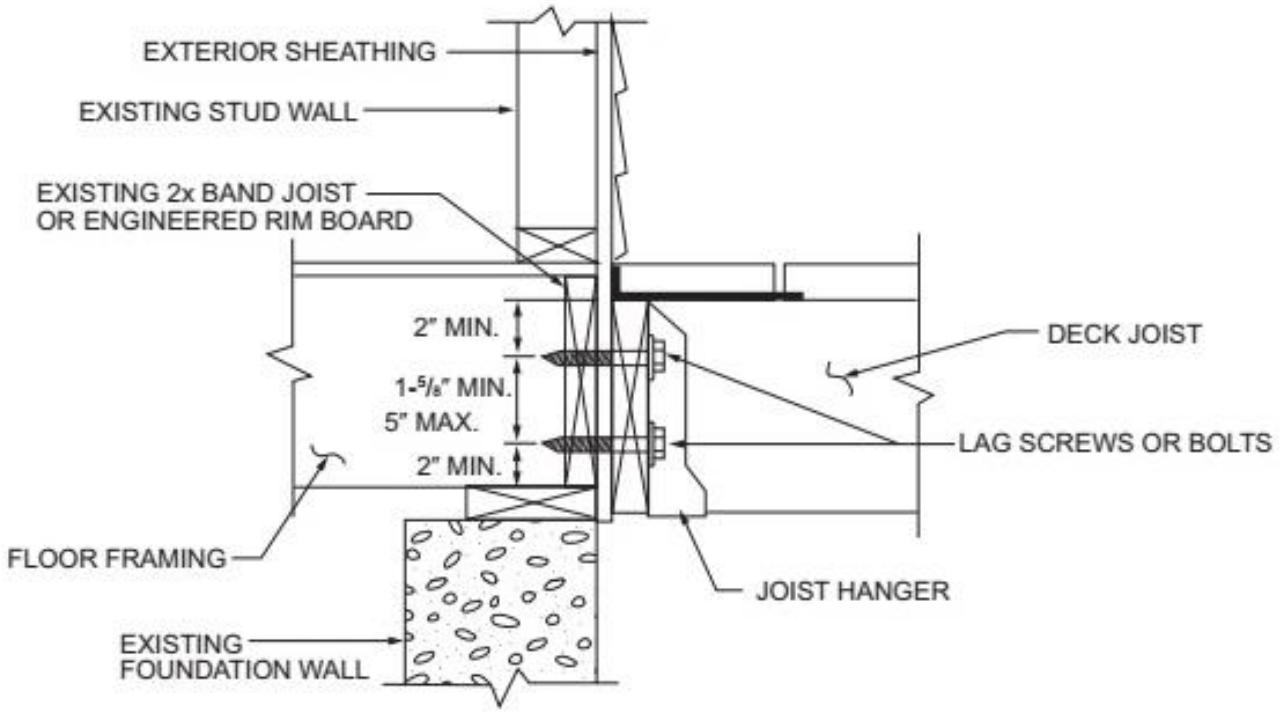
R507.9.1.3 LEDGER TO BAND JOIST DETAIL



For SI: 1 inch = 25.4 mm.

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

R507.9.1.3 LEDGER TO BAND JOIST DETAIL



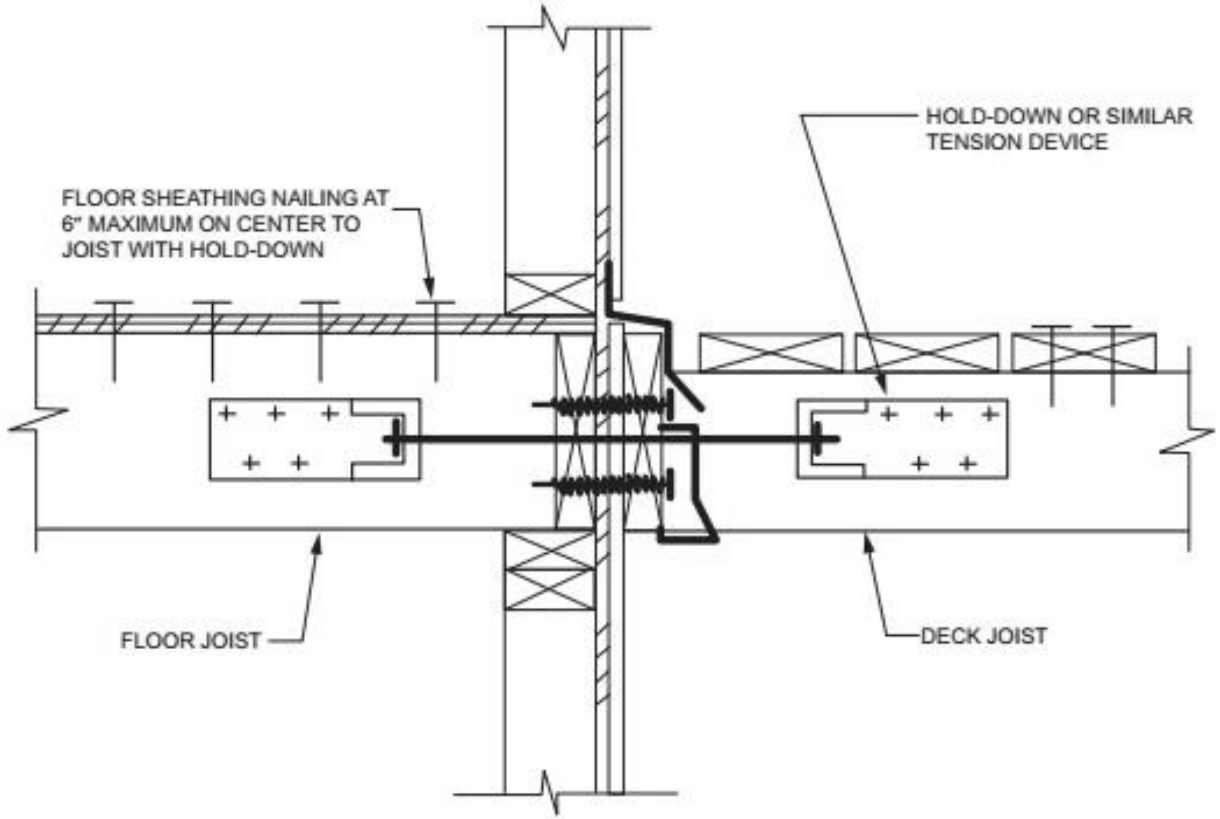
For SI: 1 inch = 25.4 mm.

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

R507.9.2 LATERAL 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 R507.9.2(1), hold-down tension devices shall be installed in not less than two locations per deck, within 24 inches of each end of the deck. Each device shall have an allowable stress design capacity of not less than 1,500 pounds. Where the lateral load connections are provided in accordance with R507.9.2(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.

LATERAL CONNECTION - R507.9.2



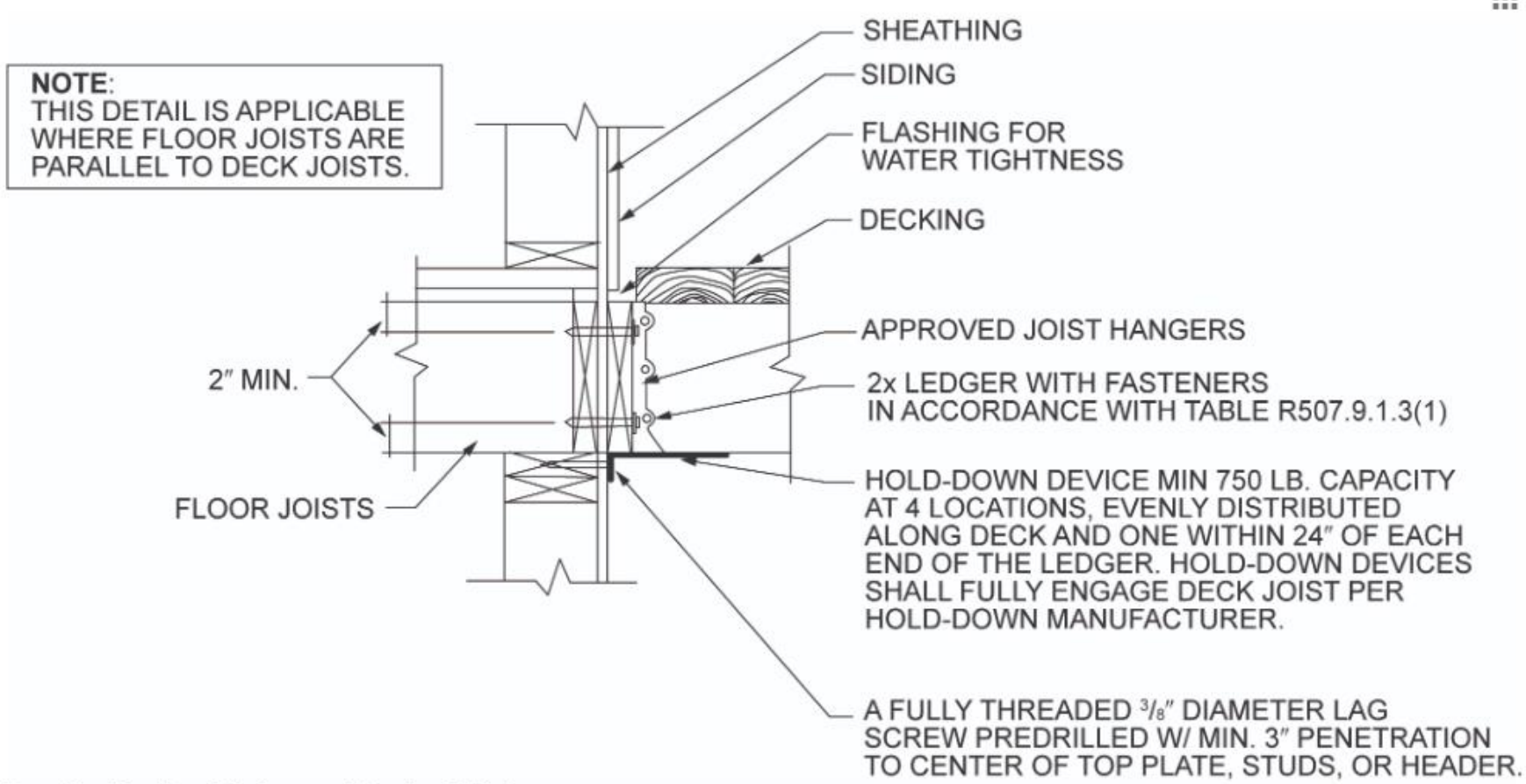
For SI: 1 inch = 25.4 mm.

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

R507.9.2 LATERAL 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 R507.9.2(1), hold-down tension devices shall be installed in not less than two locations per deck, within 24 inches of each end of the deck. Each device shall have an allowable stress design capacity of not less than 1,500 pounds. Where the lateral load connections are provided in accordance with R507.9.2(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.

LATERAL CONNECTION - R507.9.2



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

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

R507.10 GUARDS

R507.10 Exterior guards. *Guards* shall be constructed to meet the requirements of Sections R301.5 and R312, and this section.

R507.10.1 Support of guards. Where *guards* are supported on deck framing, *guard* loads shall be transferred to the deck framing with a continuous load path to the deck joists.

R507.10 GUARDS

R507.10.1.1 Guards supported by the side of deck framing. Where *guards* are connected to the interior or exterior side of a deck joist or beam, the joist or beam shall be connected to the adjacent joists to prevent rotation of the joist or beam. Connections relying only on fasteners in end grain withdrawal are not permitted.

R507.10.1.2 Guards supported on top of deck framing. Where *guards* are mounted on top of the decking, the *guards* shall be connected to the deck framing or blocking and installed in accordance with manufacturer's instructions to transfer the *guard* loads to the adjacent joists.

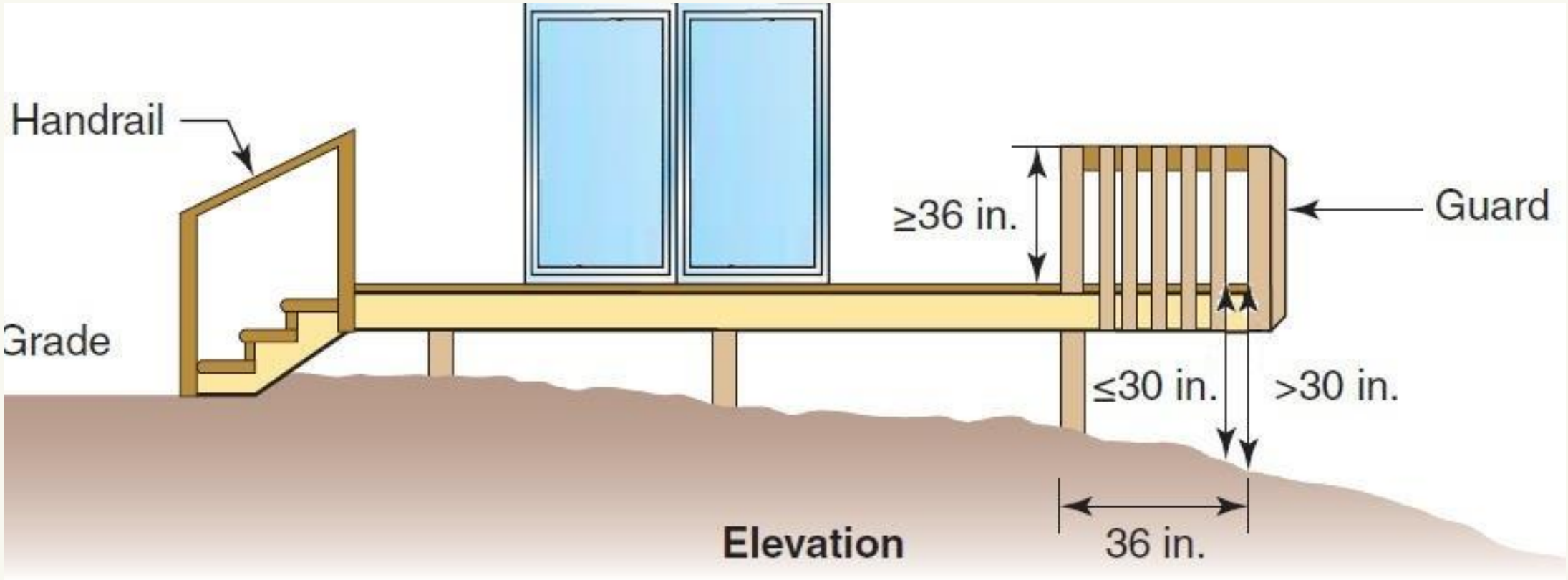
R507.10 GUARDS

R507.10.1.3 Wood posts at deck guards. Where 4-inch by 4-inch wood posts support *guard* loads applied to the top of the *guard*, such posts shall not be notched at the connection to the supporting structure.

R507.10.1.4 Plastic composite guards. *Plastic composite guards* shall comply with the provisions of R507.2.2.

R507.10.5 Other guards. Other *guards* shall be in accordance with either manufacturer's instructions or accepted engineering practice.

R312.1 GUARDS



USEFUL RESOURCES

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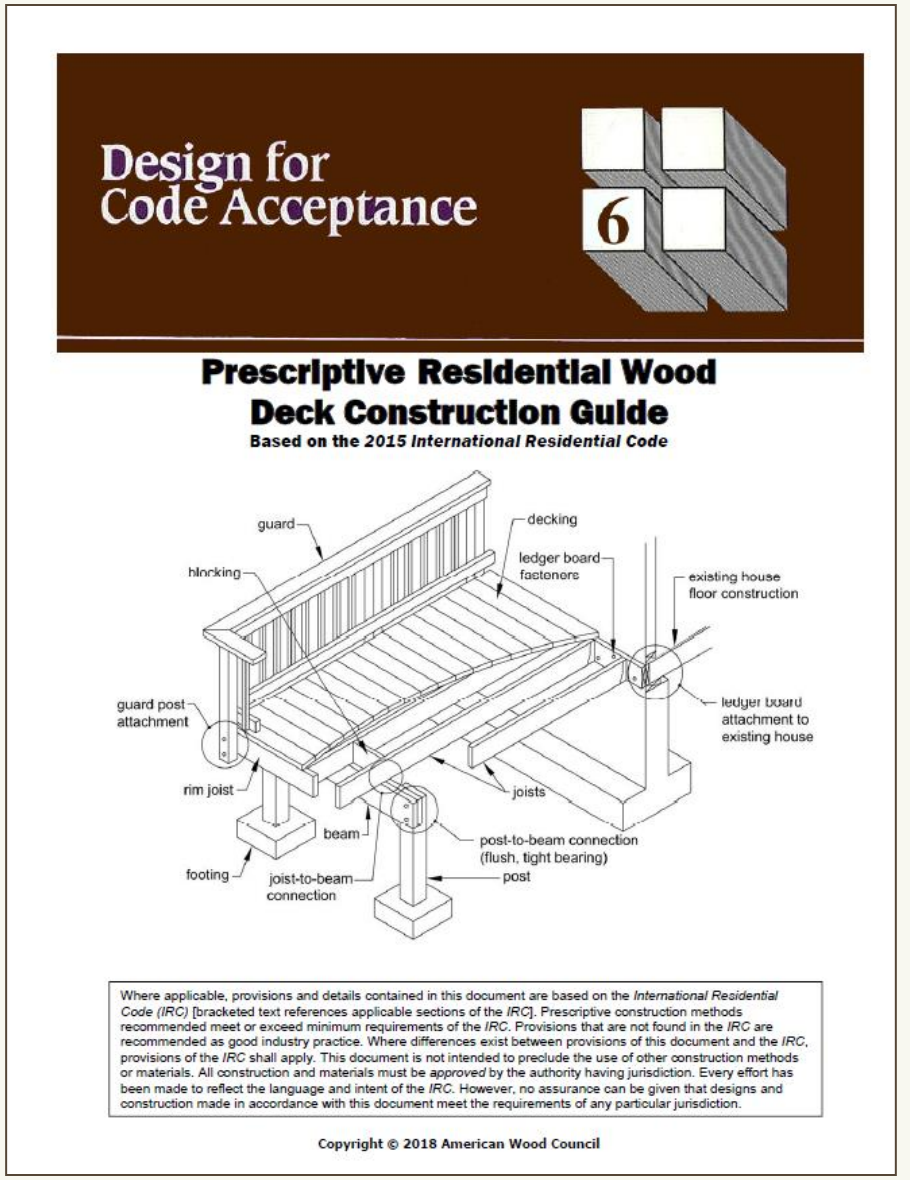

Design for Code Acceptance 6

Prescriptive Residential Wood Deck Construction Guide

Based on the *2015 International Residential Code*

Where applicable, provisions and details contained in this document are based on the *International Residential Code (IRC)* [bracketed text references applicable sections of the *IRC*]. Prescriptive construction methods recommended meet or exceed minimum requirements of the *IRC*. Provisions that are not found in the *IRC* are recommended as good industry practice. Where differences exist between provisions of this document and the *IRC*, provisions of the *IRC* shall apply. This document is not intended to preclude the use of other construction methods or materials. All construction and materials must be *approved* by the authority having jurisdiction. Every effort has been made to reflect the language and intent of the *IRC*. However, no assurance can be given that designs and construction made in accordance with this document meet the requirements of any particular jurisdiction.

Thank you!

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