SECTION R507
EXTERIOR DECKS

R507.1 Decks. Wood-framed decks shall be in accordance with this section. For decks using materials and conditions not prescribed in this section, refer to Section R301.

R507.2 Materials. Materials used for the construction of decks shall comply with this section.

R507.2.1 Wood materials. Wood materials shall be No. 2 grade or better lumber, preservative-treated in accordance with Section R317, or approved, naturally durable lumber, and termite protected where required in accordance with Section R318. Where design in accordance with Section R301 is provided, wood structural members shall be designed using the wet service factor defined in AWC NDS. Cuts, notches and drilled holes of preservative-treated wood members shall be treated in accordance with Section R317.1.1. All preservative-treated wood products in contact with the ground shall be labeled for such usage.

R507.2.1.1 Engineered wood products. Engineered wood products shall be in accordance with Section R502.

R507.2.2 Plastic composite deck boards, stair treads, guards, or handrails. Plastic composite exterior deck boards, stair treads, guards and handrails shall comply with the requirements of ASTM D7032 and this section.

R507.2.2.1 Labelling. Plastic composite deck boards and stair treads, or their packaging, shall bear a label that indicates compliance with ASTM D7032 and includes the allowable load and maximum allowable span determined in accordance with ASTM D7032. Plastic or composite handrails and guards, or their packaging, shall bear a label that indicates compliance with ASTM D7032 and includes the maximum allowable span determined in accordance with ASTM D7032.

R507.2.2.2 Flame spread index. Plastic composite deck boards, stair treads, guards, and handrails shall exhibit a flame spread index not exceeding 200 when tested in accordance with ASTM E84 or UL 723 with the test specimen remaining in place during the test.

Exception: Plastic composites determined to be noncombustible.

R507.2.2.3 Decay resistance. Plastic composite deck boards, stair treads, guards and handrails containing wood, cellulosic or other biodegradable materials shall be decay resistant in accordance with ASTM D7032.

R507.2.2.4 Termite resistance. Where required by Section 318, plastic composite deck boards, stair treads, guards and handrails containing wood, cellulosic or other biodegradable materials shall be termite resistant in accordance with ASTM D7032.
R507.2.2.5 Installation of plastic composites. Plastic composite deck boards, stair treads, guards and handrails shall be installed in accordance with this code and the manufacturer’s instructions.

R507.2.3 Fasteners and connectors. Metal fasteners and connectors used for all decks shall be in accordance with Section R317.3 and Table R507.2.3.

R507.2.4 Flashing. Flashing shall be corrosion-resistant metal of nominal thickness not less than 0.019 inch (0.48 mm) or approved nonmetallic material that is compatible with the substrate of the structure and the decking materials.

R507.2.5 Alternate materials. Alternative materials, including glass and metals, shall be permitted.

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. The footing depth shall be in accordance with Section R403.1.4.

Exception: Free-standing decks consisting of joists directly supported on grade over their entire length.

R507.3.1 Minimum size. The minimum size of concrete footings shall be in accordance with Table R507.3.1, based on the tributary area and allowable soil-bearing pressure in accordance with Table R404.1.4.

R507.3.2 Minimum depth. Deck footings shall extend below the frost line specified in Table R301.2(1) in accordance with Section R403.1.4.1.

Exceptions:
1. Free-standing decks that meet all of the following criteria:
   1.1. The joists bear directly on precast concrete pier blocks at grade without support by beams or posts.
   1.2. The area of the deck does not exceed 200 square feet (18.9 m²).

1.3. The walking surface is not more than 20 inches (616 mm) above grade at any point within 36 inches (914 mm) measured horizontally from the edge.

2. Free-standing decks need not be provided with footings that extend below the frost line.

R507.4 Deck posts. For single-level wood-framed decks with beams sized in accordance with Table R507.5, deck post size shall be in accordance with Table R507.4.

<table>
<thead>
<tr>
<th>DECK POST SIZE</th>
<th>MAXIMUM HEIGHT(a) (feet-inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 × 4</td>
<td>6-9(a)</td>
</tr>
<tr>
<td>4 × 6</td>
<td>8</td>
</tr>
<tr>
<td>6 × 6</td>
<td>14</td>
</tr>
<tr>
<td>8 × 8</td>
<td>14</td>
</tr>
</tbody>
</table>

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.

R507.4.1 Deck post to deck footing connection. Where posts bear on concrete footings in accordance with Section R403 and Figure R507.4.1, lateral restraint shall be provided by manufactured connectors or a minimum post embedment of 12 inches (305 mm) in surrounding soils or concrete piers. Other footing systems shall be permitted.

Exception: Where expansive, compressible, shifting or other questionable soils are present, surrounding soils shall not be relied on for lateral support.

R507.5 Deck Beams. Maximum allowable spans for wood deck beams, as shown in Figure R507.5, shall be in accordance with Table R507.5. Beam plies shall be fastened with two rows of 10d (3-inch × 0.128-inch) nails minimum at 16 inches (406 mm) on center along each edge. Beams shall be

<table>
<thead>
<tr>
<th>ITEM</th>
<th>MATERIAL</th>
<th>MINIMUM FINISH/COATING</th>
<th>ALTERNATE FINISH/COATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nails and timber rivets</td>
<td>In accordance with ASTM F1667</td>
<td>Hot-dipped galvanized per ASTM A153</td>
<td>Stainless steel, silicon bronze or copper</td>
</tr>
<tr>
<td>Bolts</td>
<td>In accordance with ASTM A397 (bolts), ASTM A563 (nuts), ASTM F844 (washers)</td>
<td>Hot-dipped galvanized per ASTM A153, Class C (Class D for (1/4)-inch diameter and less) or mechanically galvanized per ASTM B695, Class 55 or 410 stainless steel</td>
<td>Stainless steel, silicon bronze or copper</td>
</tr>
<tr>
<td>Lag screws (including nuts and washers)</td>
<td>Per manufacturer’s specification</td>
<td>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/ft² (total both sides)</td>
<td>Stainless steel</td>
</tr>
</tbody>
</table>

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. Fasteners shall be drilled a minimum \(1/4\)-inch and a maximum \(1/8\)-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.
permitted to cantilever at each end up to one-fourth of the allowable beam span. Deck beams of other materials shall be permitted where designed in accordance with accepted engineering practices.

**R507.5.1 Deck beam bearing.** The ends of beams shall have not less than 1 inch (25.4 mm) of bearing on wood or metal and not less than 3 inches (76 mm) 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).

**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.

**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. The maximum joist cantilever shall be limited to one-fourth of the joist span or the maximum cantilever length specified in Table R507.6, whichever is less.

**R507.6.1 Deck joist bearing.** The ends of joists shall have not less than 1 inch (25.4 mm) of bearing on wood or metal and not less than 3 inches (76 mm) 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 Table R602.3(1). Joists bearing on top of a 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.

**R507.6.2 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 (3-inch by 0.128-inch) (76 mm by 3.3 mm) nails or three No. 10 x 3-inch (76 mm) long wood screws.

**R507.7 Decking.** Maximum allowable spacing for joists supporting decking 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. Other approved decking or fastener systems shall be installed in accordance with the manufacturer’s installation requirements.
<table>
<thead>
<tr>
<th>LIVE OR GROUND SNOW LOAD (psf)</th>
<th>TRIBUTARY AREA (sq. ft.)</th>
<th>1500°</th>
<th>2000°</th>
<th>2500°</th>
<th>≥ 3000°</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Side of a square footing (inches)</td>
<td>Diameter of a round footing (inches)</td>
<td>Thickness (inches)</td>
<td>Side of a square footing (inches)</td>
<td>Diameter of a round footing (inches)</td>
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<tr>
<td>40</td>
<td>20</td>
<td>12</td>
<td>14</td>
<td>6</td>
<td>12</td>
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<tr>
<td></td>
<td>160</td>
<td>35</td>
<td>40</td>
<td>15</td>
<td>30</td>
</tr>
</tbody>
</table>

For SF: 1 inch = 25.4 mm, 1 square foot = 0.0929 m², 1 pound per square foot = 0.0479 kPa.

a. Interpolation permitted, extrapolation not permitted.
b. Based on highest load case: Dead + Live or Dead + Snow.
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.
### figure R507.5
TYPICAL DECK JOIST SPANS

#### TABLE R507.5
**DECK BEAM SPAN LENGTHS**

<table>
<thead>
<tr>
<th>SPECIES</th>
<th>SIZE</th>
<th>DECK JOIST SPAN LESS THAN OR EQUAL TO:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(feet)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Southern pine</td>
<td>1 - 2 x 6</td>
<td>4-11</td>
</tr>
<tr>
<td></td>
<td>1 - 2 x 8</td>
<td>5-11</td>
</tr>
<tr>
<td></td>
<td>1 - 2 x 10</td>
<td>7-0</td>
</tr>
<tr>
<td></td>
<td>1 - 2 x 12</td>
<td>8-3</td>
</tr>
<tr>
<td></td>
<td>2 - 2 x 6</td>
<td>6-11</td>
</tr>
<tr>
<td></td>
<td>2 - 2 x 8</td>
<td>8-9</td>
</tr>
<tr>
<td></td>
<td>2 - 2 x 10</td>
<td>10-4</td>
</tr>
<tr>
<td></td>
<td>2 - 2 x 12</td>
<td>12-2</td>
</tr>
<tr>
<td></td>
<td>2 - 2 x 14</td>
<td>13-0</td>
</tr>
<tr>
<td></td>
<td>2 - 2 x 16</td>
<td>15-3</td>
</tr>
<tr>
<td>Douglas fir-larch, hem-fir, spruce-pine-fir, redwood, western cedars, ponderosa pine, red pine</td>
<td>3 x 6 or 2 - 2 x 6</td>
<td>5-5</td>
</tr>
<tr>
<td></td>
<td>3 x 8 or 2 - 2 x 8</td>
<td>6-10</td>
</tr>
<tr>
<td></td>
<td>3 x 10 or 2 - 2 x 10</td>
<td>8-4</td>
</tr>
<tr>
<td></td>
<td>3 x 12 or 2 - 2 x 12</td>
<td>9-8</td>
</tr>
<tr>
<td></td>
<td>4 x 6</td>
<td>6-5</td>
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<td>4 x 8</td>
<td>8-5</td>
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<td>4 x 10</td>
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<td>4 x 12</td>
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<td>3 - 2 x 6</td>
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<td></td>
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<tr>
<td></td>
<td>3 - 2 x 10</td>
<td>12-0</td>
</tr>
<tr>
<td></td>
<td>3 - 2 x 12</td>
<td>13-11</td>
</tr>
</tbody>
</table>

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. Ground snow load, live load = 40 psf, dead load = 10 psf, L/\(\Delta\) = 360 at main span, L/\(\Delta\) = 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.
For SI: 1 inch = 25.4 mm.

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

For SI: 1 inch = 25.4 mm.

FIGURE R507.5.1(2)
NOTCHED POST-TO-BEAM CONNECTION
CANTILEVERED JOISTS WITH DROPPED BEAM

JOISTS ON FREE-STANDING DECK WITH DROPPED BEAM

JOISTS WITH FLUSH BEAM

JOISTS ON FREE-STANDING DECK WITH FLUSH BEAM

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

<table>
<thead>
<tr>
<th>SPECIES</th>
<th>SIZE</th>
<th>ALLOWABLE JOIST SPAN*</th>
<th>MAXIMUM CANTILEVER*</th>
<th>SPACING OF DECK JOISTS WITH CANTILEVERS*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>12</td>
<td>16</td>
<td>24</td>
</tr>
<tr>
<td>Southern pine</td>
<td>2 × 6</td>
<td>9-11</td>
<td>9-0</td>
<td>7-7</td>
</tr>
<tr>
<td></td>
<td>2 × 8</td>
<td>13-1</td>
<td>11-10</td>
<td>9-8</td>
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<td>2 × 10</td>
<td>16-2</td>
<td>14-0</td>
<td>11-5</td>
</tr>
<tr>
<td></td>
<td>2 × 12</td>
<td>18-0</td>
<td>16-6</td>
<td>13-6</td>
</tr>
<tr>
<td>Douglas fir-larch, hem-fir, spruce-pine-fir</td>
<td>2 × 6</td>
<td>9-6</td>
<td>8-8</td>
<td>7-2</td>
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<tr>
<td></td>
<td>2 × 8</td>
<td>12-6</td>
<td>11-1</td>
<td>9-1</td>
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<td></td>
<td>2 × 10</td>
<td>15-8</td>
<td>13-7</td>
<td>11-1</td>
</tr>
<tr>
<td></td>
<td>2 × 12</td>
<td>18-0</td>
<td>15-9</td>
<td>12-10</td>
</tr>
<tr>
<td>Redwood, western cedars, ponderosa pine, red pine</td>
<td>2 × 6</td>
<td>8-10</td>
<td>8-0</td>
<td>7-0</td>
</tr>
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<td>2 × 8</td>
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<td></td>
<td>2 × 12</td>
<td>17-5</td>
<td>15-1</td>
<td>12-4</td>
</tr>
</tbody>
</table>

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. Ground snow load, live load = 40 psf, dead load = 10 psf, L/Δ = 360.
c. Ground snow load, 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 R507.7
MAXIMUM JOIST SPACING FOR DECKING

<table>
<thead>
<tr>
<th>DECKING MATERIAL TYPE AND NOMINAL SIZE</th>
<th>MAXIMUM ON-CENTER JOIST SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Decking perpendicular to joist</td>
</tr>
<tr>
<td>1 1/4-inch-thick wood</td>
<td>16 inches</td>
</tr>
<tr>
<td>2-inch-thick wood</td>
<td>24 inches</td>
</tr>
<tr>
<td>Plastic composite</td>
<td>In accordance with Section R507.2</td>
</tr>
</tbody>
</table>

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.
R507.8 Vertical and lateral supports. 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 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 structure cannot be verified during inspection, decks shall be self-supporting.

R507.9 Vertical and lateral supports at band joist. Vertical and lateral supports for decks shall comply with this section.

R507.9.1 Vertical supports. Vertical loads shall be transferred to band joists with ledgers in accordance with this section.

R507.9.1.1 Ledger details. Deck ledgers shall be a minimum 2-inch by 8-inch (51 mm by 203 mm) 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.

R507.9.1.2 Band joist details. Band joists supporting a ledger shall be a minimum 2-inch nominal (51 mm), solid-sawn, spruce-pine-fir or better lumber or a minimum 1-inch by 9 1/2-inch (25 mm x 241 mm) dimension, Douglas fir or better, laminated veneer lumber. Band joists shall bear fully on the primary structure capable of supporting all required loads.

R507.9.1.3 Ledger to band joist details. 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).

R507.9.1.4 Alternate ledger details. Alternate framing configurations supporting a ledger constructed to meet the load requirements of Section R301.5 shall be permitted.

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 (610 mm) of each end of the deck. Each device shall have an allowable stress design capacity of not less than 1,500 pounds (6672 N). Where the lateral load connections are provided in accordance with Figure 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 (3336 N).

<table>
<thead>
<tr>
<th>CONNECTION DETAILS</th>
<th>JOIST SPAN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6' and less</td>
</tr>
<tr>
<td></td>
<td>On-center spacing of fasteners</td>
</tr>
<tr>
<td>1/2-inch diameter lag screw with 1/2-inch maximum sheathing</td>
<td>30</td>
</tr>
<tr>
<td>1/2-inch diameter bolt with 1/2-inch maximum sheathing</td>
<td>36</td>
</tr>
<tr>
<td>1/2-inch diameter bolt with 1-inch maximum sheathing</td>
<td>36</td>
</tr>
</tbody>
</table>

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. Snow load shall not be assumed to act concurrently with live load.
c. The tip of the lag screw shall fully extend beyond the inside face of the band joist.
d. Sheathing shall be wood structural panel or solid sawn lumber.
e. Sheathing shall be permitted to be wood structural panel, gypsum board, fiberboard, lumber or foam sheathing. Up to 1/4-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

<table>
<thead>
<tr>
<th>Ledger(^a)</th>
<th>TOP EDGE</th>
<th>BOTTOM EDGE</th>
<th>ENDS</th>
<th>ROW SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Band Joist(^b)</td>
<td>2 inches(^a)</td>
<td>3/4 inch</td>
<td>2 inches(^b)</td>
<td>1 7/8 inches(^b)</td>
</tr>
</tbody>
</table>

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

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

2019 CALIFORNIA RESIDENTIAL CODE
For SI: 1 inch = 25.4 mm.

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

Figure R507.9.2(1)
Deck attachment for lateral loads

Sheathing
Siding
Flashing for water tightness
Decking
Approved joist hangers
2x ledger with fasteners in accordance with Table R507.2
Hold-down device min 750 lb. capacity at 4 locations, evenly distributed along deck and one within 24" of each end of the ledger. Hold-down devices shall fully engage deck joist per hold-down manufacturer.

A fully threaded ½" diameter lag screw predrilled w/ min. 3" penetration to center of top plate, studs, or header.

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

Figure R507.9.2(2)
Deck attachment for lateral loads

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2019 California Residential Code
R301.2.2.8 Cold-formed steel framing in Seismic Design Categories D₁, D₂, and D₃. In Seismic Design Categories D₁, D₂, and D₃, cold-formed steel framing shall comply with the requirements of AISI S230.

R301.2.2.9 Masonry chimneys. In Seismic Design Categories D₁, D₂, and D₃, masonry chimneys shall be reinforced and anchored to the building in accordance with Sections R1003.3 and R1003.4.

R301.2.2.10 Anchorage of water heaters. In Seismic Design Categories D₁, D₂, and D₃, water heaters shall be anchored against movement and overturning in accordance with the California Plumbing Code.

R301.2.3 Snow loads. Wood-framed construction, cold-formed, steel-framed construction and masonry and concrete construction, and structural insulated panel construction in regions with ground snow loads 70 pounds per square foot (3.35 kPa) or less, shall be in accordance with Chapters 5, 6 and 8. Buildings in regions with ground snow loads greater than 70 pounds per square foot (3.35 kPa) shall be designed in accordance with accepted engineering practice.

R301.2.4 Floodplain construction. Buildings and structures constructed in whole or in part in flood hazard areas (including A or V Zones) as established in Table R301.2(1), and substantial improvement and repair of substantial damage of buildings and structures in flood hazard areas, shall be designed and constructed in accordance with Section R322. Buildings and structures that are located in more than one flood hazard area shall comply with the provisions associated with the most restrictive flood hazard area. Buildings and structures located in whole or in part in identified floodways shall be designed and constructed in accordance with ASCE 24.

R301.2.4.1 Alternative provisions. As an alternative to the requirements in Section R322, ASCE 24 is permitted subject to the limitations of this code and the limitations therein.

R301.3 Story height. The wind and seismic provisions of this code shall apply to buildings with story heights not exceeding the following:

1. For wood wall framing, the story height shall not exceed 11 feet 7 inches (3531 mm) and the laterally unsupported bearing wall stud height permitted by Table R602.3(5).

2. For cold-formed steel wall framing, the story height shall not be more than 11 feet 7 inches (3531 mm) and the unsupported bearing wall stud height shall not be more than 10 feet (3048 mm).

3. For masonry walls, the story height shall not be more than 13 feet 7 inches (4140 mm) and the bearing wall clear height shall be not more than 12 feet (3658 mm).

Exception: An additional 8 feet (2438 mm) of bearing wall clear height is permitted for gable end walls.

4. For insulating concrete form walls, the maximum story height shall not exceed 11 feet 7 inches (3531 mm) and the maximum unsupported wall height per story as permitted by Section R608 tables shall not exceed 10 feet (3048 mm).

5. For structural insulated panel (SIP) walls, the story height shall be not more than 11 feet 7 inches (3531 mm) and the bearing wall height per story as permitted by Section R610 tables shall not exceed 10 feet (3048 mm).

Individual walls or wall studs shall be permitted to exceed these limits as permitted by Chapter 6 provisions, provided that story heights are not exceeded. An engineered design shall be provided for the wall or wall framing members where the limits of Chapter 6 are exceeded. Where the story height limits of this section are exceeded, the design of the building, or the noncompliant portions thereof, to resist wind and seismic loads shall be in accordance with the California Building Code.

R301.4 Dead load. The actual weights of materials and construction shall be used for determining dead load with consideration for the dead load of fixed service equipment.

R301.5 Live load. The minimum uniformly distributed live load shall be as provided in Table R301.5.

<table>
<thead>
<tr>
<th>USE</th>
<th>LIVE LOAD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uninhabitable attics without storage&lt;sup&gt;2&lt;/sup&gt;</td>
<td>10</td>
</tr>
<tr>
<td>Uninhabitable attics with limited storage&lt;sup&gt;2&lt;/sup&gt;</td>
<td>20</td>
</tr>
<tr>
<td>Habitable attics and attics served with fixed stairs&lt;sup&gt;2&lt;/sup&gt;</td>
<td>30</td>
</tr>
<tr>
<td>Balconies (exterior) and decks&lt;sup&gt;2&lt;/sup&gt;</td>
<td>60&lt;sup&gt;6&lt;/sup&gt;</td>
</tr>
<tr>
<td>Fire escapes</td>
<td>40</td>
</tr>
<tr>
<td>Guards and handrails&lt;sup&gt;3&lt;/sup&gt;</td>
<td>20&lt;sup&gt;4&lt;/sup&gt;</td>
</tr>
<tr>
<td>Guard in-fill components&lt;sup&gt;3&lt;/sup&gt;</td>
<td>50&lt;sup&gt;6&lt;/sup&gt;</td>
</tr>
<tr>
<td>Passenger vehicle garages&lt;sup&gt;4&lt;/sup&gt;</td>
<td>50&lt;sup&gt;6&lt;/sup&gt;</td>
</tr>
<tr>
<td>Rooms other than sleeping rooms</td>
<td>40</td>
</tr>
<tr>
<td>Sleeping rooms</td>
<td>30</td>
</tr>
<tr>
<td>Stairs</td>
<td>40&lt;sup&gt;6&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

For SI: 1 pound per square foot = 0.0479 kPa, 1 square inch = 645 mm², 1 pound = 4.45 N.

- a. Elevated garage floors shall be capable of supporting a 2,000-pound load applied over a 20-square-inch area.
- b. Uninhabitable attics without storage are those where the clear height between joists and rafters is not more than 42 inches, or where there are not two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches in height by 24 inches in width, or greater, within the plane of the trusses. This live load need not be assumed to act concurrently with any other live load requirements.
- c. Individual stair treads shall be designed for the uniformly distributed live load or a 300-pound concentrated load acting over an area of 4 square inches, whichever produces the greater stresses.
- d. A single concentrated load applied in any direction at any point along the top.
- e. See Section R507.1 for decks attached to exterior walls.
- f. Guard in-fill components (all those except the handrail), balusters and panel fillers shall be designed to withstand a horizontally applied normal load of 50 pounds on an area equal to 1 square foot. This load need not be assumed to act concurrently with any other live load requirement.
- g. Uninhabitable attics with limited storage are those where the clear height between joists and rafters is 42 inches or greater, or where there are two or more adjacent trusses with web configurations capable of accommodating...
R403.1.3.2 Masonry stem walls with concrete footings. In Seismic Design Categories Dₙ, D₁, and D₂, where a masonry stem wall is supported on a concrete footing, not fewer than one No. 4 vertical bar shall be installed at not more than 4 feet (1219 mm) on center. The vertical bar shall have a standard hook and extend to the bottom of the footing and shall have support and cover as specified in Section R403.1.3.5.3 and extend not less than 14 inches (357 mm) into the stem wall. Standard hooks shall comply with Section R608.5.4.5. Not fewer than one No. 4 horizontal bar shall be installed within 12 inches (305 mm) of the top of the wall and one No. 4 horizontal bar shall be located 3 to 4 inches (76 mm to 102 mm) from the bottom of the footing. Masonry stem walls shall be solid grouted.

R403.1.3.3 Slabs-on-ground with turned-down footings. In Seismic Design Categories Dₙ, D₁, and D₂, slabs-on-ground cast monolithically with turned-down footings shall have not fewer than one No. 4 bar at the top and the bottom of the footing or one No. 5 bar or two No. 4 bars in the middle third of the footing depth.

Where the slab is not cast monolithically with the footing, No. 3 or larger vertical dowels with standard hooks on each end shall be installed at not more than 4 feet (1219 mm) on center in accordance with Figure R403.1.3, Detail 2. Standard hooks shall comply with Section R608.5.4.5.

R403.1.3.4 Interior bearing and braced wall panel footings in Seismic Design Categories Dₙ, D₁, and D₂. In Seismic Design Categories Dₙ, D₁, and D₂, interior footings supporting bearing walls or braced wall panels, and cast monolithically with a slab on grade, shall extend to a depth of not less than 12 inches (305 mm) below the top of the slab.

R403.1.3.5 Reinforcement. Footing and stem wall reinforcement shall comply with Sections R403.1.3.5.1 through R403.1.3.5.4.

R403.1.3.5.1 Steel reinforcement. Steel reinforcement shall comply with the requirements of ASTM A615, A706 or A996. ASTM A996 bars produced from rail steel shall be Type R. The minimum yield strength of reinforcing steel shall be 40,000 psi (276 MPa).

R403.1.3.5.2 Location of reinforcement in wall. The center of vertical reinforcement in stem walls shall be located at the centerline of the wall. Horizontal and vertical reinforcement shall be located in footings and stem walls to provide the minimum cover required by Section R403.1.3.5.3.

R403.1.3.5.3 Support and cover. Reinforcement shall be secured in the proper location in the forms with tie wire or other bar support system to prevent displacement during the concrete placement operation. Steel reinforcement in concrete cast against the earth shall have a minimum cover of 3 inches (75 mm). Minimum cover for reinforcement in concrete cast in removable forms that will be exposed to the earth or weather shall be 1 1/2 inches (38 mm) for No.

5 bars and smaller, and 2 inches (50 mm) for No. 6 bars and larger. For concrete cast in removable forms that will not be exposed to the earth or weather, and for concrete cast in stay-in-place forms, minimum cover shall be 3/4 inch (19 mm).

R403.1.3.5.4 Lap splices. Vertical and horizontal reinforcement shall be the longest lengths practical. Where splices are necessary in reinforcement, the length of lap splice shall be in accordance with Table R608.5.4.1 and Figure R608.5.4(1). The maximum gap between noncontact parallel bars at a lap splice shall not exceed the smaller of one-fifth the required lap length and 6 inches (152 mm) [see Figure R608.5.4(1)].

R403.1.3.6 Isolated concrete footings. In detached one- and two-family dwellings that are three stories or less in height and constructed with stud bearing walls, isolated plain concrete footings supporting columns or pedestals are permitted.

R403.1.4 Minimum depth. Exterior footings shall be placed not less than 12 inches (305 mm) below the undisturbed ground surface. Where applicable, the depth of footings shall also conform to Sections R403.1.4.1 through R403.1.4.2.

R403.1.4.1 Frost protection. Except where otherwise protected from frost, foundation walls, piers and other permanent supports of buildings and structures shall be protected from frost by one or more of the following methods:

1. Extended below the frost line specified in Table R301.2.(1).
2. Constructed in accordance with Section R403.3.
3. Constructed in accordance with ASCE 32.
4. Erected on solid rock.

Footings shall not bear on frozen soil unless the frozen condition is permanent.

Exceptions:

1. Protection of free-standing accessory structures with an area of 600 square feet (56 m²) or less, of light-frame construction, with an eave height of 10 feet (3048 mm) or less shall not be required.
2. Protection of free-standing accessory structures with an area of 400 square feet (37 m²) or less, of other than light-frame construction, with an eave height of 10 feet (3048 mm) or less shall not be required.
3. Decks not supported by a dwelling need not be provided with footings that extend below the frost line.

R403.1.5 Slope. The top surface of footings shall be level. The bottom surface of footings shall not have a slope exceeding one unit vertical in 10 units horizontal (10-percent slope). Footings shall be stepped where it is necessary to change the elevation of the top surface of the footings or
Residential “Wildland Urban Interface” (W.U.I.) new construction requirements and clarification for Mariposa County per the 2013 California Residential Code.

CRC section R327 “materials and construction methods for exterior wildfire exposure” is attached.

**Roofs:** Class A roof covering is allowed. For Class B and less, please verify in California State Fire Marshal product listing [http://osfm.fire.ca.gov](http://osfm.fire.ca.gov) for approved systems. Ridge venting that is a part of the class A roof covering is allowed. Metal valley flashing (26ga) needs one layer of # 72 ASTM cap sheet installed underneath. Roof gutters (metal or plastic) need debris covering (wire or plastic mesh, etc.)

**Attic Vents:** “shall be protected by corrosion-resistant, noncombustible wire mesh with 1/8 - inch openings (max) or its equivalent”. Eave and cornice vents may not be used unless they resist the intrusion of flame and burning embers (the SFM listed vents) into the attic area of the structure. Gable end vents shall be protected by corrosion resistant, non-combustible wire mesh with 1/8 inch openings max, or its equivalent.

**Under Floor Vents:** “shall be protected by corrosion-resistant, noncombustible wire mesh with 1/8 - inch openings max, or its equivalent”.

**Eaves:** Standard exposed rafter tail framing with solid 2x bird blocking for the eaves are allowed. Eave and cornice vents may not be used unless they “resist the intrusion of flame and burning embers (the SFM listed vents) into the attic area of the structure”. If you enclose the rafter tails (a soffit) you must use noncombustible materials and if you vent it you must use vents that resist the intrusion of flame and burning embers (the SFM listed vents).

**Exterior walls:** “Exterior walls shall be approved noncombustible or ignition-resistant material” “HardiePlank”, APA 303 T1-11, SFM 12-7A-1, etc. Note: It is the permit holder’s responsibility to present the building inspector with written evidence that the siding of choice meets California State Fire Marshal requirements [http://osfm.fire.ca.gov](http://osfm.fire.ca.gov) at the time of siding inspection. Non-listed siding material will not be allowed. Non-rated window, door and corner trim is allowed.

**Exterior windows:** All exterior windows shall be insulating-glass units with at least one tempered pane in all window sections.

**Exterior doors:** All exterior doors shall be at least a 20 minute fire-resistance rating or equivalent (solid wood 1 3/8” thick). Raised panel solid wood doors with a tapered tongue less than 1 ¼” thick are approved (SFM standard 12-7A-1) Noncombustible vehicle access doors are allowed.

**Decking Surfaces:** Decking, surfaces, stair treads, risers, and landings of decks, porches, and balconies where any portion of such surface is within 10 feet of the primary structure shall be approved ignition resistant or noncombustible materials. Standard and pressure treated 2x and greater deck framing material is allowed (SFM interpretation 09-024 “CBC Ch 7A has no requirements that apply to deck support structures (joists, framing, posts, etc).”

**Under-floor Appendages:** The underside of kickouts and appendages (not decks) shall maintain the ignition-resistant integrity of the exterior walls.

**Accessory Structures:** Miscellaneous and accessory structures are per R327.10 (attached). Be aware that if you convert a non-habitable structure built after January 2008 to a habitable structure, all of the above will apply.

The above requirements are not all-inclusive. It is the permit holder’s responsibly to know all of the regulations.

Revised per 2013 California Residential Code.
2. Door overlaps onto jambs and headers.

3. Garage door jambs and headers covered with metal flashing.

**SECTION R337.9 DECKING**

**R337.9.1 General.** The walking surface material of decks, porches, balconies and stairs shall comply with the requirements of this section.

**R337.9.2 Where required.** The walking surface material of decks, porches, balconies and stairs shall comply with the requirements of this section when any portion of such surface is within 10 feet (3048 mm) of the building.

**R337.9.3 Decking surfaces.** The walking surface material of decks, porches, balconies and stairs shall be constructed with one of the following materials:

1. Material that complies with the performance requirements of Section R337.9.4 when tested in accordance with both ASTM E2632 and ASTM E2726.

2. Ignition-resistant material that complies with the performance requirements of Section R337.4.3 when tested in accordance with ASTM E84 or UL 723.

3. Material that complies with the performance requirements of both SFM Standard 12-7A-4 and SFM Standard 12-7A-5.

4. Exterior fire retardant treated wood.

5. Noncombustible material.

6. Any material that complies with the performance requirements of SFM Standard 12-7A-4A when attached exterior wall covering is also composed of noncombustible or ignition-resistant material.

   **Exception:** Wall material may be of any material that otherwise complies with this chapter when the decking surface material complies with the performance requirements ASTM E84 with a Class B flame spread rating.

7. Any material that complies with the performance requirements of Section R337.9.5 when tested in accordance with ASTM E2632 and when attached exterior wall covering is also composed of only noncombustible or ignition-resistant materials.

   **Exception:** Wall material shall be permitted to be of any material that otherwise complies with this chapter when the decking surface material complies with the performance requirements ASTM E84 with a Class B flame spread index.

**R337.9.4 Requirements for type of ignition-resistant material in Section R337.9.3, Item 1.** The material shall be tested in accordance with both ASTM E2632 and ASTM E2726 and shall comply with the conditions of acceptance in Sections R337.9.4.1 and R337.9.4.2. The material shall also be tested in accordance with ASTM E84 or UL 723 and comply with the performance requirements of Section R337.4.3.

**R337.9.4.1 Conditions of acceptance for ASTM E2632.** The ASTM E2632 test shall be conducted on a minimum of three test specimens and the conditions of acceptance in Items 1 through 3 below shall be met. If any one of the three tests does not meet the conditions of acceptance, three additional tests shall be run. All of the additional tests shall meet the conditions of acceptance.

1. Peak heat release rate of less than or equal to 25 kW/ft² (269 kW/m²).

2. Absence of sustained flaming or glowing combustion of any kind at the conclusion of the 40-minute observation period.

3. Absence of falling particles that are still burning when reaching the burner or floor.

**R337.9.4.2 Conditions of acceptance for ASTM E2726.** The ASTM E2726 test shall be conducted, using a "Class A" size roof test brand, on a minimum of three test specimens and the conditions of acceptance in Items 1 and 2 below shall be met. If any one of the three test specimens does not meet the conditions of acceptance, three additional tests shall be run. All of the additional tests shall meet the conditions of acceptance.

1. Absence of sustained flaming or glowing combustion of any kind at the conclusion of the 40-minute observation period.

2. Absence of falling particles that are still burning when reaching the burner or floor.

**R337.9.5 Requirements for type of material in Section R337.9.3, Item 7.** The material shall be tested in accordance with ASTM E2632 and shall comply with the following condition of acceptance. The ASTM E2632 test shall be conducted on a minimum of three test specimens and the peak heat release rate shall be less than or equal to 25 kW/ft² (269 kW/m²). If any one of the three tests does not meet the conditions of acceptance, three additional tests shall be run. All the additional tests shall meet the condition of acceptance.

**SECTION R337.10 ACCESSORY STRUCTURES**

**R337.10.1 General.** Accessory buildings and miscellaneous structures defined in this section that have the potential to pose a significant exterior fire exposure hazard to applicable buildings during wildfires shall be constructed to conform to the requirements of this section.

**R337.10.2 Applicability.** The provisions of this section shall apply to the buildings covered by Section R337.1.3 Exception 1. This section shall also apply to specified attached and detached miscellaneous structures that require a building permit, including but not limited to: trellises, arbors, patio covers, gazebos and similar structures.

**Exceptions:**

1. Decks shall comply with the requirements of Section R337.9.
DTT Deck Tension Ties

DTT tension ties are safe, cost-effective connectors designed to meet or exceed code requirements for deck construction. These versatile DTT connectors are also load rated as a holdown for light-duty shearwalls and braced wall panel applications.

For new construction or to make an existing current deck code-compliant, the DTT12 can be used as a tension-tie to satisfy the 2016 IRC provision for a 750 lb. lateral load connection to the house at four locations per deck. This new code detail permits the lateral connection with the deck joists to be made to top plates, studs, or headers within the supporting structure, which eliminates the need to access to the floor joists inside the home. The DTT12 connector is available individually or in a kit of 4 along with 4 Strong-Drive® SDWH Timber-Hex HDG screws and 24 Strong-Drive® SD Connector screws.

The new DTT12 fastens to the narrow or wide face of a single 2x with Simpson Strong-Tie® Strong-Drive® SD Connector screws or nails and accepts a 3/8" machine bolt, anchor bolt, or lag screw (washer required) or can be installed with the new Strong-Drive SDWH Timber-Hex HDG screw with an integral washer. The DTT2 fastens easily to the wide face of a single or double 2x using Simpson Strong-Tie® Strong-Drive SDS Heavy-Duty Connector screws (included) and accepts a 1/2" machine bolt or anchor bolt.

The DTT2 can be used to satisfy the IRC provision for a 1,500 lbs. lateral load connection at two locations per deck. Additionally, the DTT2 has been tested and evaluated in deck guardrail post applications to resist the code-specified lateral forces at the top of railing assemblies. The DTT2 is also available with longer 21/2" Strong-Drive SDS Heavy-Duty Connector screws (model DTT2-BSD2.5) to achieve higher loads when needed.

Material: 14 gauge

Finish: DTT2/DTT2Z—ZMAX® coating; DTT2SS—Stainless steel; see Corrosion Information.

Installation:

- Use all specified fasteners. See General Notes.
- A standard cut washer (included) must be installed between the nut and the seat.
- Simpson Strong-Tie® Strong-Drive SDS Heavy-Duty Connector screws install best with a low speed high torque drill with a 3/8" hex head driver.
- Strong-Drive SD Connector screws install with a 1/4" hex head driver.
- Strong-Drive SDWH Timber-Hex HDG screws install with a 3/8" hex head driver.

For Shearwall Installation, see HOW/DTT2.
**Load Table:** See code report listings below

These products are available with additional corrosion protection. Additional products on this page may also be available with this option. Check with Simpson Strong-Tie for details.

<table>
<thead>
<tr>
<th>Model No.</th>
<th>C</th>
<th>Anchor Dia.</th>
<th>Fasteners</th>
<th>Minimum Wood Member Thickness</th>
<th>Allowable Tension Loads</th>
</tr>
</thead>
<tbody>
<tr>
<td>DT12</td>
<td>3/8</td>
<td>1/8 OD</td>
<td>6-SD #9x1 1/4</td>
<td>1 1/8</td>
<td>840</td>
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<td></td>
<td></td>
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<td>6-10x1 1/2</td>
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<td></td>
<td></td>
<td></td>
<td>8-10x1 1/2</td>
<td></td>
<td>810</td>
</tr>
<tr>
<td>DT22/DT2SS</td>
<td>7/16</td>
<td>1/8</td>
<td>8-1/4x1 1/2 SDS</td>
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<td>8-1/4x2 1/4 SDS</td>
<td>3</td>
<td>2145</td>
</tr>
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</table>

1. The allowable loads have been increased 15% for wind or earthquake loading with no further increase allowed.
2. DT12 installations with allowable loads below 750 lbs. do not satisfy the 2015 IRC requirements for deck-to-house lateral load connections.
3. The Strong-Drive® SDWH Timber-Hex HDG screw with a minimum of 3" of thread penetration into dry lumber has an allowable withdrawal load (16O) of 1360 lbs. into SP, 1225 lbs. into DF, and 1020 lbs. into SPF/HF.
4. Load values are valid if the product is flush with the end of the framing member or installed away from the end.
5. The guardrail post illustration above addresses an outward force on the guardrail. An additional DT22Z can be added at the lower bolt to address an inward force.
6. A 3/8" HDG round washer is required when using a tag screw.
Drawings: To download drawings, right-click or Ctrl-click on the link, then choose "Save Target As..."

Download the Simpson Strong-Tie AutoCAD View, which allows you to insert Ortho views directly into your AutoCAD drawing.

Catalog Pages (PDFs):
C-C-2015 (Wood Construction Connectors), page 208

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Related Categories:
Holdowns and Tension Ties (Wood Construction)
Deck Products (Wood Construction)
Concrete Connectors and Anchors (Wood Construction)

Technical Bulletins (PDFs):
Code Compliant Guardrail Post Connections Expiration extended to 12/31/14
Installation Options for Deck Lateral Load Connections
Connector Solutions to Meet the Wall-Rafting Requirements of the 2009 International Residential Code® Expiration extended to 12/31/14
Anchoring Solutions for Simpson Strong-Tie® Connectors You can order the bulletin by mail:
City of Los Angeles RR Values for Holdowns in Shearwall and Wall Anchorage Assemblies Expiration extended to 12/31/14
Panelized Roof Systems

Files (PDFs):
Deck Connector System/Patio Cover System
Deck Connection and Fastening Guide You can order this file by mail.
Wood-Resistant Construction Guide
Get Your Deck Up to Code - New DTTZ Deck Tension Tie
Sistemas de Connectores Para Decks e Sistemas de Connectores Para Coberturas e Pergolas (Deck Connector System and Patio Cover System - in Portuguese for Brazil)
• Sistéme de Connecteurs pour Terrasse et Sistéme de Toit de Patio (Deck Connector System and Patio Cover System - in French for Canada)

Engineering Letters (PDFs):
DTZ Tension Tie Supporting a Beam
Code Compliant Guard Rail Post Connections, Supplementation to T-GRDRI PST, Maximum Guard Rail Height of 42 inches

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have the bottom of the clear opening not greater than 44 inches (1118 mm) measured from the floor; where the sill height is below grade, it shall be provided with a window well in accordance with Section R310.2.3.

R310.2.3 Window wells. The horizontal area of the window well shall be not less than 9 square feet (0.9 m²), with a horizontal projection and width of not less than 36 inches (914 mm). The area of the window well shall allow the emergency escape and rescue opening to be fully opened.

Exception: The ladder or steps required by Section R310.2.3.1 shall be permitted to encroach not more than 6 inches (152 mm) into the required dimensions of the window well.

R310.2.3.1 Ladder and steps. Window wells with a vertical depth greater than 44 inches (1118 mm) shall be equipped with a permanently affixed ladder or steps usable with the window in the fully open position. Ladders or steps required by this section shall not be required to comply with Section R311.7. Ladders or rungs shall have an inside width of not less than 12 inches (305 mm), shall project not less than 3 inches (76 mm) from the wall and shall be spaced not more than 18 inches (457 mm) on center vertically for the full height of the window well.

R310.2.3.2 Drainage. Window wells shall be designed for proper drainage by connecting to the building's foundation drainage system required by Section R405.1 or by an approved alternative method.

Exception: A drainage system for window wells is not required where the foundation is on well-drained soil or sand-gravel mixture soils in accordance with the United Soil Classification System, Group I Soils, as detailed in Table R405.1.

R310.2.4 Emergency escape and rescue openings under decks and porches. Emergency escape and rescue openings installed under decks and porches shall be fully operable and provide a path not less than 36 inches (914 mm) in height to a yard or court.

R310.2.5 Replacement windows. Replacement windows installed in buildings meeting the scope of this code shall be exempt from the maximum sill height requirements of Section R310.2.2 and the requirements of Section R310.2.1, provided that the replacement window meets the following conditions:

1. The replacement window is the manufacturer's largest standard size window that will fit within the existing frame or existing rough opening. The replacement window is of the same operating style as the existing window or a style that provides for an equal or greater window opening area than the existing window.

2. The replacement window is not part of a change of occupancy.

R310.3 Emergency escape and rescue doors. Where a door is provided as the required emergency escape and rescue opening, it shall be a side-hinged door or a slider. Where the opening is below the adjacent grade, it shall be provided with an area well.

R310.3.1 Minimum door opening size. The minimum net clear height opening for any door that serves as an emergency and escape rescue opening shall be in accordance with Section R310.2.1.

R310.3.2 Area wells. Area wells shall have a width of not less than 36 inches (914 mm). The area well shall be sized to allow the emergency escape and rescue door to be fully opened.

R310.3.2.1 Ladder and steps. Area wells with a vertical depth greater than 44 inches (1118 mm) shall be equipped with a permanently affixed ladder or steps usable with the door in the fully open position. Ladders or steps required by this section shall not be required to comply with Section R311.7. Ladders or rungs shall have an inside width of not less than 12 inches (305 mm), shall project not less than 3 inches (76 mm) from the wall and shall be spaced not more than 18 inches (457 mm) on center vertically for the full height of the exterior stairwell.

R310.3.2.2 Drainage. Area wells shall be designed for proper drainage by connecting to the building's foundation drainage system required by Section R405.1 or by an approved alternative method.

Exception: A drainage system for area wells is not required where the foundation is on well-drained soil or sand-gravel mixture soils in accordance with the United Soil Classification System, Group I Soils, as detailed in Table R405.1.

R310.4 Bars, grilles, covers and screens. Where bars, grilles, covers, screens or similar devices are placed over emergency escape and rescue openings, area wells, or window wells, the minimum net clear opening size shall comply with Sections R310.2.1 through R310.2.3, and such devices shall be releasable or removable from the inside without the use of a key, tool, special knowledge or force greater than that required for the normal operation of the escape and rescue opening. The release mechanism shall be maintained operable at all times.

Such bars, grills, grates or any similar devices shall be equipped with an approved exterior release device for use by the fire department only when required by the authority having jurisdiction.

Where security bars (burglar bars) are installed on emergency egress and rescue windows or doors, on or after July 1, 2000, such devices shall comply with California Building Standards Code, Part 12, Chapter 12-3 and other applicable provisions of this code.
Residential - Egress
stairs - handrails +
guards

SECTION R311
MEANS OF EGRESS

R311.1 Means of egress. Dwellings shall be provided with a means of egress in accordance with this section. The means of egress shall provide a continuous and unobstructed path of vertical and horizontal egress travel from all portions of the dwelling to the required egress door without requiring travel through a garage. The required egress door shall open directly into a public way or to a yard or court that opens to a public way.

R311.2 Egress door. Not less than one egress door shall be provided for each dwelling unit. The egress door shall be side-hinged, and shall provide a clear width of not less than 32 inches (813 mm) where measured between the face of the door and the stop, with the door open 90 degrees (1.57 rad). The clear height of the door opening shall be not less than 78 inches (1981 mm) in height measured from the top of the threshold to the bottom of the stop. Other doors shall not be required to comply with these minimum dimensions. Egress doors shall be readily openable from inside the dwelling without the use of a key or special knowledge or effort.

R311.3 Floors and landings at exterior doors. There shall be a landing or floor on each side of each exterior door. The width of each landing shall be not less than the door served. Landings shall have a dimension of not less than 36 inches (914 mm) measured in the direction of travel. The slope at exterior landings shall not exceed 1/4 unit vertical in 12 units horizontal (2 percent).

Exception: Exterior balconies less than 60 square feet (5.6 m²) and only accessed from a door are permitted to have a landing that is less than 36 inches (914 mm) measured in the direction of travel.

R311.3.1 Floor elevations at the required egress doors. Landings or finished floors at the required egress door shall be not more than 1 1/2 inches (38 mm) lower than the top of the threshold.

Exception: The landing or floor on the exterior side shall be not more than 7 1/4 inches (196 mm) below the top of the threshold provided that the door does not swing over the landing or floor.

Where exterior landings or floors serving the required egress door are not at grade, they shall be provided with access to grade by means of a ramp in accordance with Section R311.8 or a stairway in accordance with Section R311.7.

R311.3.2 Floor elevations at other exterior doors. Doors other than the required egress door shall be provided with landings or floors not more than 7 1/4 inches (196 mm) below the top of the threshold.

Exception: A top landing is not required where a stairway of not more than two risers is located on the exterior side of the door, provided that the door does not swing over the stairway.

R311.3.3 Storm and screen doors. Storm and screen doors shall be permitted to swing over exterior stairs and landings.

R311.4 Vertical egress. Egress from habitable levels including habitable attics and basements that are not provided with an egress door in accordance with Section R311.2 shall be by one or more ramps in accordance with Section R311.8 or one or more stairways in accordance with Section R311.7 or both. For habitable levels or basements located more than one story above or more than one story below an egress door, the maximum travel distance from any occupied point to a stairway or ramp that provides egress from such habitable level or basement, shall not exceed 50 feet (15240 mm).

R311.5 Landing, deck, balcony and stair construction and attachment. Exterior landings, decks, balconies, stairs and similar facilities shall be positively anchored to the primary structure to resist both vertical and lateral forces or shall be designed to be self-supporting. Attachment shall not be accomplished by use of toenails or nails subject to withdrawal.

R311.6 Hallways. The width of a hallway shall be not less than 3 feet (914 mm).

R311.7 Stairways.

R311.7.1 Width. Stairways shall be not less than 36 inches (914 mm) in clear width at all points above the permitted handrail height and below the required headroom height. The clear width of stairways at and below the handrail height, including treads and landings, shall be not less than 31 1/2 inches (797 mm) where a handrail is installed on one side and 27 inches (698 mm) where handrails are installed on both sides.

Exception: The width of spiral stairways shall be in accordance with Section R311.7.10.1.

R311.7.2 Headroom. The headroom in stairways shall be not less than 6 feet 8 inches (2032 mm) measured vertically from the sloped line adjoining the tread nosing or
from the floor surface of the landing or platform on that portion of the stairway.

**Exceptions:**

1. Where the nosings of treads at the side of a flight extend under the edge of a floor opening through which the stair passes, the floor opening shall not project horizontally into the required headroom more than 4\(\frac{3}{4}\) inches (121 mm).

2. The headroom for spiral stairways shall be in accordance with Section R311.7.10.1.

R311.7.3 Vertical rise. A flight of stairs shall not have a vertical rise larger than 151 inches (3835 mm) between floor levels or landings.

R311.7.4 Walkline. The walkline across winder treads and landings shall be concentric to the turn and parallel to the direction of travel entering and exiting the turn. The walkline shall be located 12 inches (305 mm) from the inside of the turn. The 12-inch (305 mm) dimension shall be measured from the widest point of the clear stair width at the walking surface. Where winders are adjacent within a flight, the point of the widest clear stair width of the adjacent winders shall be used.

R311.7.5 Stair treads and risers. Stair treads and risers shall meet the requirements of this section. For the purposes of this section, dimensions and dimensioned surfaces shall be exclusive of carpets, rugs or runners.

R311.7.5.1 Risers. The riser height shall be not more than 7\(\frac{1}{4}\) inches (196 mm). The riser shall be measured vertically between leading edges of the adjacent treads. The greatest riser height within any flight of stairs shall not exceed the smallest by more than 7\(\frac{1}{4}\) inch (9.5 mm). Risers shall be vertical or sloped from the underside of the nosing of the tread above at an angle not more than 30 degrees (0.51 rad) from the vertical. At open risers, openings located more than 30 inches (762 mm), as measured vertically, to the floor or grade below shall not permit the passage of a 4-inch-diameter (102 mm) sphere.

**Exceptions:**

1. The opening between adjacent treads is not limited on spiral stairways.

2. The riser height of spiral stairways shall be in accordance with Section R311.7.10.1.

R311.7.5.2 Treads. The tread depth shall be not less than 10 inches (254 mm). The tread depth shall be measured horizontally between the vertical planes of the foremost projection of adjacent treads and at a right angle to the tread's leading edge. The greatest tread depth within any flight of stairs shall not exceed the smallest by more than 7\(\frac{3}{8}\) inch (9.5 mm).

R311.7.5.2.1 Winder treads. Winder treads shall have a tread depth of not less than 10 inches (254 mm) measured between the vertical planes of the foremost projection of adjacent treads at the intersections with the walkline. Winder treads shall have a tread depth of not less than 6 inches (152 mm) at any point within the clear width of the stair. Within any flight of stairs, the largest winder tread depth at the walkline shall not exceed the smallest winder tread by more than 7\(\frac{3}{8}\) inch (9.5 mm). Consistently shaped winders at the walkline shall be allowed within the same flight of stairs as rectangular treads and shall not be required to be within 7\(\frac{3}{8}\) inch (9.5 mm) of the rectangular tread depth.

**Exception:** The tread depth at spiral stairways shall be in accordance with Section R311.7.10.1.

R311.7.5.3 Nosings. Nosings at treads, landings and floors of stairways shall have a radius of curvature at the nosing not greater than 7\(\frac{3}{4}\) inch (14 mm) or a bevel not greater than 7\(\frac{3}{8}\) inch (12.7 mm). A nosing projection not less than 7\(\frac{3}{4}\) inch (19 mm) and not more than 7\(\frac{3}{8}\) inches (32 mm) shall be provided on stairways. The greatest nosing projection shall not exceed the smallest nosing projection by more than 7\(\frac{3}{8}\) inch (9.5 mm) within a stairway.

**Exception:** A nosing projection is not required where the tread depth is not less than 11 inches (279 mm).

R311.7.5.4 Exterior plastic composite stair treads. Plastic composite exterior stair treads shall comply with the provisions of this section and Section R507.2.2.

R311.7.6 Landings for stairways. There shall be a floor or landing at the top and bottom of each stairway. The width perpendicular to the direction of travel shall be not less than the width of the flight served. For landings of shapes other than square or rectangular, the depth at the walk line and the total area shall be not less than that of a quarter circle with a radius equal to the required landing width. Where the stairway has a straight run, the depth in the direction of travel shall be not less than 36 inches (914 mm).

**Exception:** A floor or landing is not required at the top of an interior flight of stairs, including stairs in an enclosed garage, provided that a door does not swing over the stairs.

R311.7.7 Stairway walking surface. The walking surface of treads and landings of stairways shall be sloped not steeper than one unit vertical in 48 inches horizontal (2-percent slope).

R311.7.8 Handrails. Handrails shall be provided on not less than one side of each flight of stairs with four or more risers.

R311.7.8.1 Height. Handrail height, measured vertically from the sloped plane adjoining the tread nosing, or finish surface of ramp slope, shall be not less than 34 inches (864 mm) and not more than 38 inches (965 mm).

**Exceptions:**

1. The use of a volute, turnout or starting easing shall be allowed over the lowest tread.
2. Where handrail fittings or bendings are used to provide continuous transition between flights, transitions at winder treads, the transition from handrail to guard, or used at the start of a flight, the handrail height at the fittings or bendings shall be permitted to exceed 38 inches (956 mm).

R311.7.8.2 Handrail projection. Handrails shall not project more than 4 1/2 inches (114 mm) on either side of the stairway.

Exception: Where nosings of landings, floors or passing flights project into the stairway reducing the clearance at passing handrails, handrails shall project not more than 6 1/2 inches (165 mm) into the stairway, provided that the stair width and handrail clearance are not reduced to less than that required.

R311.7.8.3 Handrail clearance. Handrails adjacent to a wall shall have a space of not less than 1 1/2 inches (38 mm) between the wall and the handrails.

R311.7.8.4 Continuity. Handrails shall be continuous for the full length of the flight, from a point directly above the top riser of the flight to a point directly above the lowest riser of the flight. Handrail ends shall be returned or shall terminate in newel posts or safety terminals.

Exceptions:
1. Handrail continuity shall be permitted to be interrupted by a newel post at a turn in a flight with winders, at a landing, or over the lowest tread.
2. A volute, turnout or starting easing shall be allowed to terminate over the lowest tread.

R311.7.8.5 Grip size. Required handrails shall be of one of the following types or provide equivalent graspability.

1. Type I. Handrails with a circular cross section shall have an outside diameter of not less than 1 1/4 inches (32 mm) and not greater than 2 inches (51 mm). If the handrail is not circular, it shall have a perimeter of not less than 4 inches (102 mm) and not greater than 6 1/4 inches (160 mm) and a cross section of not more than 2 1/4 inches (57 mm). Edges shall have a radius of not less than 0.01 inch (0.25 mm).

2. Type II. Handrails with a perimeter greater than 6 1/4 inches (160 mm) shall have a graspable finger recess area on both sides of the profile. The finger recess shall begin within 1 1/4 inch (19 mm) measured vertically from the tallest portion of the profile and have a depth of not less than 3 1/4 inch (8 mm) within 1 1/4 inch (22 mm) below the widest portion of the profile. This required depth shall continue for not less than 1 1/4 inch (10 mm) to a level that is not less than 1 1/4 inches (45 mm) below the tallest portion of the profile. The width of the handrail above the recess shall be not less than 1 1/4 inches (32 mm) and not more than 2 3/4 inches (70 mm). Edges shall have a radius of not less than 0.01 inch (0.25 mm).

R311.7.8.6 Exterior plastic composite handrails. Plastic composite exterior handrails shall comply with the requirements of Section R507.2.2.

R311.7.9 Illumination. Stairways shall be provided with illumination in accordance with Sections R303.7 and R303.8.

R311.7.10 Special stairways. Spiral stairways and bulkhead enclosure stairways shall comply with the requirements of Section R311.7 except as specified in Sections R311.7.10.1 and R311.7.10.2.

R311.7.10.1 Spiral stairways. The clear width at and below the handrails at spiral stairways shall be not less than 26 inches (660 mm) and the walkline radius shall be not greater than 24 1/2 inches (622 mm). Each tread shall have a depth of not less than 6 1/4 inches (171 mm) at the walkline. Treads shall be identical, and the rise shall be not more than 9 1/4 inches (241 mm). Headroom shall be not less than 6 feet 6 inches (1982 mm).

R311.7.10.2 Bulkhead enclosure stairways. Stairways serving bulkhead enclosures, not part of the required building egress, providing access from the outside grade level to the basement shall be exempt from the requirements of Sections R311.3 and R311.7 where the height from the basement finished floor level to grade adjacent to the stairway is not more than 8 feet (2438 mm) and the grade level opening to the stairway is covered by a bulkhead enclosure with hinged doors or other approved means.

R311.7.11 Alternating tread devices. Alternating tread devices shall not be used as an element of a means of egress. Alternating tread devices shall be permitted provided that a required means of egress stairway or ramp serves the same space at each adjoining level or where a means of egress is not required. The clear width at and below the handrails shall be not less than 20 inches (508 mm).

Exception: Alternating tread devices are allowed to be used as an element of a means of egress for lofts, mezzanines and similar areas of 200 gross square feet (18.6 m²) or less where such devices do not provide exclusive access to a kitchen or bathroom.

R311.7.11.1 Treads of alternating tread devices. Alternating tread devices shall have a tread depth of not less than 5 inches (127 mm), a projected tread depth of not less than 8 3/4 inches (216 mm), a tread width of not less than 7 inches (178 mm) and a riser height of not more than 9 1/2 inches (241 mm). The tread depth shall be measured horizontally between the vertical planes of the foremost projections of adjacent treads. The riser height shall be measured vertically between the leading edges of adjacent treads. The riser height and tread depth provided shall result in an angle of ascent from
the horizontal of between 50 and 70 degrees (0.87 and 1.22 rad). The initial tread of the device shall begin at the same elevation as the platform, landing or floor surface.

R311.7.11.2 Handrails of alternating tread devices. Handrails shall be provided on both sides of alternating tread devices and shall comply with Sections R311.7.8.2 to R311.7.8.6. Handrail height shall be uniform, not less than 30 inches (762 mm) and not more than 34 inches (864 mm).

R311.7.12 Ships ladders. Ships ladders shall not be used as an element of a means of egress. Ships ladders shall be permitted provided that a required means of egress stairway or ramp serves the same space at each adjoining level or where a means of egress is not required. The clear width at and below the handrails shall be not less than 20 inches.

Exception: Ships ladders are allowed to be used as an element of a means of egress for lofts, mezzanines and similar areas of 200 gross square feet (18.6 m²) or less that do not provide exclusive access to a kitchen or bathroom.

R311.7.12.1 Treads of ships ladders. Treads shall have a depth of not less than 5 inches (127 mm). The tread shall be projected such that the total of the tread depth plus the nosing projection is not less than 8 1/2 inches (216 mm). The riser height shall be not more than 9 1/2 inches (241 mm).

R311.7.12.2 Handrails of ships ladders. Handrails shall be provided on both sides of ships ladders and shall comply with Sections R311.7.8.2 to R311.7.8.6. Handrail height shall be uniform, not less than 30 inches (762 mm) and not more than 34 inches (864 mm).

R311.8 Ramps.

R311.8.1 Maximum slope. Ramps serving the egress door required by Section R311.2 shall have a slope of not more than 1 unit vertical in 12 units horizontal (8.33 percent slope). Other ramps shall have a maximum slope of 1 unit vertical in 8 units horizontal (12.5 percent).

Exception: Where it is technically infeasible to comply because of site constraints, ramps shall have a slope of not more than 1 unit vertical in 8 units horizontal (12.5 percent).

R311.8.2 Landings required. There shall be a floor or landing at the top and bottom of each ramp, where doors open onto ramps, and where ramps change directions. The width of the landing perpendicular to the ramp slope shall be not less than 36 inches (914 mm).

R311.8.3 Handrails required. Handrails shall be provided on not less than one side of ramps exceeding a slope of one unit vertical in 12 units horizontal (8.33-percent slope).

R311.8.3.1 Height. Handrail height, measured above the finished surface of the ramp slope, shall be not less than 34 inches (864 mm) and not more than 38 inches (965 mm).

R311.8.3.2 Grip size. Handrails on ramps shall comply with Section R311.7.8.5.

R311.8.3.3 Continuity. Handrails where required on ramps shall be continuous for the full length of the ramp. Handrail ends shall be returned or shall terminate in newel posts or safety terminals. Handrails adjacent to a wall shall have a space of not less than 1 1/2 inches (38 mm) between the wall and the handrails.

SECTION R312
GUARDS AND WINDOW FALL PROTECTION
R312.1 Guards. Guards shall be provided in accordance with Sections R312.1.1 through R312.1.4.

R312.1.1 Where required. Guards shall be provided for those portions of open-sided walking surfaces, including stairs, ramps and landings, that are located more than 30 inches (762 mm) measured vertically to the floor or grade below at any point within 36 inches (914 mm) horizontally to the edge of the open side. Insect screening shall not be considered as a guard.

R312.1.2 Height. Required guards at open-sided walking surfaces, including stairs, porches, balconies or landings, shall be not less than 42 inches (1067 mm) in height as measured vertically above the adjacent walking surface or the line connecting the nosings.

Exceptions:

1. Guards on the open sides of stairs shall have a height of not less than 34 inches (864 mm) measured vertically from a line connecting the nosings.

2. Where the top of the guard serves as a handrail on the open sides of stairs, the top of the guard shall be not less than 34 inches (864 mm) and not more than 38 inches (965 mm) as measured vertically from a line connecting the nosings.

R312.1.3 Opening limitations. Required guards shall not have openings from the walking surface to the required guard height that allow passage of a sphere 4 inches (102 mm) in diameter.

Exceptions:

1. The triangular openings at the open side of stair, formed by the riser, tread and bottom rail of a guard, shall not allow passage of a sphere 6 inches (153 mm) in diameter.

2. Guards on the open side of stairs shall not have openings that allow passage of a sphere 4 7/16 inches (111 mm) in diameter.

R312.1.4 Exterior plastic composite guards. Plastic composite exterior guards shall comply with the requirements of Section R317.4.

R312.2 Window fall protection. Window fall protection shall be provided in accordance with Sections R312.2.1 and R312.2.2.
R312.2.1 Window sills. In dwelling units, where the top of the sill of an operable window opening is located less than 24 inches (610 mm) above the finished floor and greater than 72 inches (1829 mm) above the finished grade or other surface below on the exterior of the building, the operable window shall comply with one of the following:

1. Operable window openings will not allow a 4-inch-diameter (102 mm) sphere to pass through where the openings are in their largest opened position.

2. Operable windows are provided with window fall prevention devices that comply with ASTM F2090.

3. Operable windows are provided with window opening control devices that comply with Section R312.2.2.

R312.2.2 Window opening control devices. Window opening control devices shall comply with ASTM F2090. The window opening control device, after operation to release the control device allowing the window to fully open, shall not reduce the net clear opening area of the window unit to less than the area required by Section R310.2.1.