

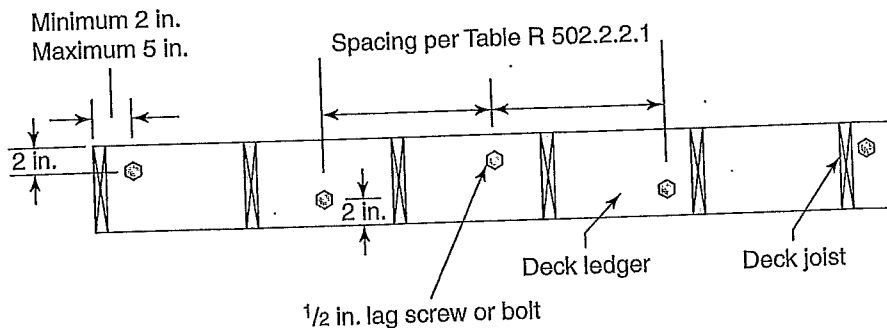
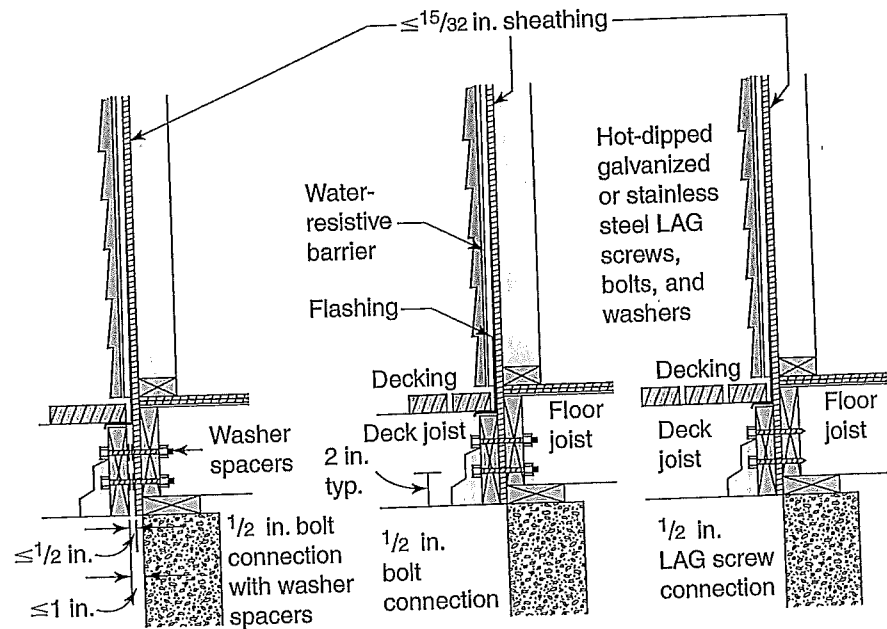
R502.2.2.1 and Table R502.2.2.1

Deck Ledger Connection

CHANGE TYPE: Addition

CHANGE SUMMARY: Prescriptive methods for securely attaching a wood deck to the dwelling structure are now included in the IRC.

2009 CODE: R502.2.2.1 Deck Ledger Connection to Band Joist. For decks supporting a total design load of 50 pounds per square foot (2394 Pa) [40 pounds per square foot (1915 Pa) live load plus 10 pounds per square foot (479 Pa) dead load], the connection between a deck ledger of pressure-preservative-treated Southern Pine, incised pressure-preservative-treated Hem-Fir or approved decay-resistant species, and a 2-inch (51 mm) nominal lumber band joist bearing on a sill plate or wall plate shall be constructed with 1/2-inch (12.7 mm) lag screws or bolts with washers in accordance with Table R502.2.2.1. Lag screws, bolts and washers shall be hot-dipped galvanized or stainless steel.



Deck ledger connection

TABLE R502.2.2.1 Fastener Spacing for a Southern Pine or Hem-Fir Deck Ledger and a 2-Inch Nominal Solid-Sawn Spruce-Pine-Fir Band Joist^{e,f,g}
(Deck Live Load = 40 psf, Deck Dead Load = 10 psf)

Joist Span	6'-0" and	6'-1" to	8'-1" to	10'-1" to	12'-1" to	14'-1" to	16'-1" to
	Less	8'-0"	10'-0"	12'-0"	14'-0"	16'-0"	18'-0"
Connection Details	On-Center Spacing of Fasteners ^{d,e}						
½"-diameter lag screw with 15/32" maximum sheathing ^a	30	23	18	15	13	11	10
½"-diameter bolt with 15/32" maximum sheathing	36	36	34	29	24	21	19
½"-diameter bolt with 15/32" maximum sheathing and ½" stacked washers ^{b,h}	36	36	29	24	21	18	16

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

- a. The tip of the lag screw shall fully extend beyond the inside face of the band joist.
- b. The maximum gap between the face of the ledger board and face of the wall sheathing shall be ¼."
- c. Ledgers shall be flashed to prevent water from contacting the house band joist.
- d. Lag screws and bolts shall be staggered in accordance with Section R502.2.2.1.1.
- e. Deck ledger shall be minimum 2 × 8 pressure-preservative-treated No. 2 grade lumber or other approved materials as established by standard engineering practice.
- f. When solid-sawn pressure-preservative-treated deck ledgers are attached to a minimum 1 inch thick engineered wood product (structural composite lumber, laminated veneer lumber, or wood structural panel band joist), the ledger attachment shall be designed in accordance with accepted engineering practice.
- g. A minimum 1 by 9½ Douglas Fir laminated veneer lumber rimboard shall be permitted in lieu of the 2-inch nominal band joist.
- h. Wood structural panel sheathing, gypsum board sheathing or foam sheathing not exceeding 1 inch in thickness shall be permitted. The maximum distance between the face of the ledger board and the face of the band joist shall be 1 inch.

R502.2.2.1.1 Placement of Lag Screws or Bolts in Deck Ledgers. The lag screws or bolts shall be placed 2 inches (51 mm) in from the bottom or top of the deck ledgers and between 2 and 5 inches (51 and 127 mm) in from the ends. The lag screws or bolts shall be staggered from the top to the bottom along the horizontal run of the deck ledger.

R502.2.2.2 Alternate Deck Ledger Connections. Deck ledger connections not conforming to Table R502.2.2.1 shall be designed in accordance with accepted engineering practice. Girders supporting deck joists shall not be supported on deck ledgers or band joists. Deck ledgers shall not be supported on stone or masonry veneer.

R502.2.2.3 Deck Lateral Load Connection. The lateral load connection required by Section R502.2.2 shall be permitted to be in accordance with Figure R502.2.2.3. Hold-down tension devices shall be provided in not less than two locations per deck, and each device shall have an allowable stress design capacity of not less than 1500 pounds (6672 N).

CHANGE SIGNIFICANCE: In the 2006 IRC, floor construction must be capable of accommodating all loads, and the deck provisions of Section R502.2.2 require positive connection to the primary structure to resist both vertical and lateral loads. Other than those performance requirements and the mention that nails subject to withdrawal were not satisfactory for the connection, the 2006 IRC contained no *R502.2.2.1 and Table R502.2.2.1 continues*

*R502.2.2.1 and Table R502.2.2.1
continued*

specific methods for attaching a deck to the structure. Many have expressed concern that the traditional methods of deck construction in use across the country for many years, typically approved locally as conventional construction without an engineered design, may not be adequate. Deck failures have occurred occasionally due to improper attachment. The new prescriptive methods for deck ledger connection to the band joist were developed through engineering analysis and testing of the various materials listed and intend to provide an adequate in-service safety factor. The intent of these prescriptive provisions is to provide guidance to designers, contractors, and building officials in determining proper and safe attachment of the deck to the structure and to ensure consistent application of the code.

The prescribed methods of attachment permit fastening to a 2-inch nominal solid-sawn lumber band joist or a minimum 1-inch by 9½-inch Douglas fir laminated veneer lumber (LVL) rimboard. Attachment to other engineered wood products, such as structural composite lumber or wood structural panel band joists, requires a design in accordance with accepted engineering practice. For bolt connections, the code permits a maximum distance of 1 inch between the face of the ledger board and the face of the band joist. Bolt and lag screw spacing is otherwise based on a maximum sheathing thickness of $\frac{15}{32}$ inch. In addition to the maximum spacing requirements, the hot-dipped galvanized or stainless steel lag screws or bolts must be located 2 inches from the top or bottom of the deck ledger and from 2 to 5 inches from the end of the ledger.

Section R502.2.2 requires a connection designed for both vertical and lateral loads. Hold-down tension devices are permitted as a prescriptive option to satisfy the lateral load requirement when they are installed on at least two locations per deck and each device has an allowable stress design capacity of not less than 1500 pounds. The detail for hold-down devices as shown in the figure is not a code requirement but if used will comply with Section R502.2.2 even in the most severe Seismic Design Categories covered by the IRC.

- * ALL PRESSURE TREATED LUMBER SHALL BE PROTECTED WITH ACQ WOOD PRESERVATIVE (COPPER PLUS QUAT PRESERVATIVE) OR COPPER AZONE OR MANUF'S EQUAL CONTAINING NO ARSENIC OR CHROMIUM.
 - * FASTENERS SHALL BE HOT-DIPPED GALVANIZED, STAINLESS STEEL, OR APPROVED EQUAL.
 - * ALUMINUM CAN NOT BE USED IN DIRECT CONTACT WITH ACQ TREATED LUMBER. (ex. ALUM FLASHING, etc.) USE HOT-DIPPED GALVANIZED OR APPROVED EQUAL.
1. DECKING TO BE 5/4x6 P.T. OR EQUAL U.N.O.
 2. JOIST TO BE 2x10 P.T. SYP #2 OR BETTER U.N.O.
 3. POSTS TO BE 6x6 P.T. ON 16" DIA. CONC. SONOTUBE MIN. 36" BELOW GRADE W/ APPROVED "SIMPSON" POST BASE ANCHOR OR EQUAL U.N.O.
 4. LEDGER BOARD TO BE FLUSH 2x10 P.T. SYP #2 OR BETTER ATTACHED TO EXIST. BAND JOIST OR FND WALL W/ (2) 1/2" x GALV. LAG SCREWS AND / OR MASONRY WALL ANCHORS 2" FROM TOP AND 2" FROM BOTTOM 24" O.C. STAGGERED U.N.O. INSTALL CONTINUOUS COPPER METAL FLASHING W/ COPPER NAILS AT LEDGER LOCATIONS OR APPROVED EQUAL.
 5. ALL FLUSH FRAMING CONNECTIONS SHALL BE MADE W/ THE APPROPRIATE SIZED HOT-DIPPED GALVANIZED METAL HANGERS & APPROVED HOT-DIPPED GALVANIZED OR STAINLESS STEEL FASTENERS
 6. RAILING TO BE MIN. 3'-0" AFF ATTACHED TO 4x4 POST WITH A MAX. SPACING OF 6'-0". GUARDRAILS & HANDRAILS MUST SUPPORT A SINGLE CONCENTRATED LOAD OF 200 LBS. APPLIED IN ANY DIRECTION AT ANY POINT ALONG THE TOP.
 7. BALUSTER SPACING SHALL NOT PERMIT PASSAGE OF 4" DIA. SPHERE.
 8. STAIRS AND STEPS (2 OR MORE) TO HAVE APPROVED "GRASPABLE" HANDRAIL INSTALLED 34" - 38" FROM NOSE OF TREAD (MIN. ONE SIDE).
 9. All connections and fastenings of wood products shall follow code approved WOOD FRAME CONSTRUCTION FASTENING SCHEDULE.
 10. All hot-dipped galvanized coated fasteners should conform to ASTM Standard A153 and all hot-dipped galvanized coated connectors should conform to ASTM Standard A653 (Class G-185).
- 12" minimum*

R502.1 Identification. Load-bearing members such as joists, beams and girders shall be identified by a grade mark of a lumber grading or inspection agency that has been approved by an accreditation body that complies with DOC PS 20. In lieu of a grade mark, a certificate of inspection issued by a lumber grading or inspection agency meeting the requirements of this section shall be accepted.

R502.1.1 Preservative-treated lumber. Preservative treated dimension lumber shall also be identified as required by Section R319.1.

R502.1.2 Blocking and subflooring. Blocking shall be a minimum of utility grade lumber. Subflooring may be a minimum of utility grade lumber or No. 4 common grade boards.

R502.1.3 End-jointed lumber. Approved end-jointed lumber identified by a grade mark conforming to Section R502.1 may be used interchangeably with solid-sawn members of the same species and grade.

R502.1.4 Prefabricated wood I-joists. Structural capacities and design provisions for prefabricated wood I-joists shall be established and monitored in accordance with ASTM D 5055.

R502.1.5 Structural glued laminated timbers. Glued laminated timbers shall be manufactured and identified as required in ANSI/AITC A190.1 and ASTM D 3737.

R502.1.6 Structural log members. Stress grading of structural log members of nonrectangular shape, as typically used in log buildings, shall be in accordance with ASTM D 3957. Such structural log members shall be identified by the grade mark of an approved lumber grading or inspection agency. In lieu of a grade mark on the material, a certificate of inspection as to species and grade issued by a lumber-grading or inspection agency meeting the requirements of this section shall be permitted to be accepted.

R502.1.7 Exterior wood/plastic composite deck boards. Wood/plastic composites used in exterior deck boards shall comply with the provisions of Section R317.4.

R502.2 Design and construction. Floors shall be designed and constructed in accordance with the provisions of this chap-

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.

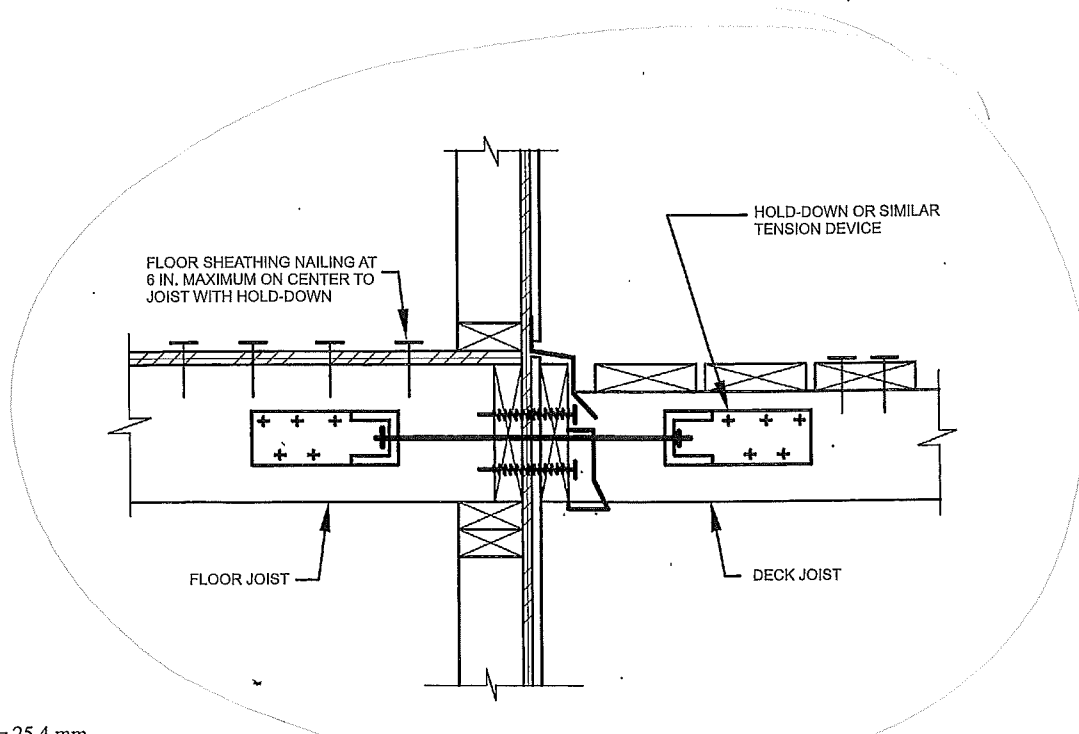
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R502.2.2.3 Deck lateral load connection. The lateral load connection required by Section R502.2.2 shall be permitted to be in accordance with Figure R502.2.2.3. Hold-down tension devices shall be installed in not less than two locations per deck, and each device shall have an allowable stress design capacity of not less than 1500 pounds (6672 N).

R502.2.2.4 Exterior wood/plastic composite deck boards. Wood/plastic composite deck boards shall be installed in accordance with the manufacturer's instructions.



For SI: 1 inch = 25.4 mm.

FIGURE 502.2.2.3
DECK ATTACHMENT FOR LATERAL LOADS

finish surface of ramp slope, shall be not less than 34 inches (864 mm) and not more than 38 inches (965 mm).

R311.7.8 Illumination. All stairs shall be provided with illumination in accordance with Section R303.6.

R303.6 Stairway illumination. All interior and exterior stairways shall be provided with a means to illuminate the stairs, including the landings and treads. Interior stairways shall be provided with an artificial light source located in the immediate vicinity of each landing of the stairway. For interior stairs the artificial light sources shall be capable of illuminating treads and landings to levels not less than 1 foot-candle (11 lux) measured at the center of treads and landings. Exterior stairways shall be provided with an artificial light source located in the immediate vicinity of the top landing of the stairway. Exterior stairways providing access to a *basement* from the outside *grade* level shall be provided with an artificial light source located in the immediate vicinity of the bottom landing of the stairway.

Exception: An artificial light source is not required at the top and bottom landing, provided an artificial light source is located directly over each stairway section.

R303.6.1 Light activation. Where lighting outlets are installed in interior stairways, there shall be a wall switch at each floor level to control the lighting outlet where the stairway has six or more risers. The illumination of exterior stairways shall be controlled from inside the *dwelling* unit.

Exception: Lights that are continuously illuminated or automatically controlled.

R303.7 Required glazed openings. Required glazed openings shall open directly onto a street or public alley, or a *yard* or court located on the same *lot* as the building.

Exceptions:

1. Required glazed openings may face into a roofed porch where the porch abuts a street, *yard* or court and the longer side of the porch is at least 65 percent unobstructed and the ceiling height is not less than 7 feet (2134 mm).
2. Eave projections shall not be considered as obstructing the clear open space of a *yard* or court.
3. Required glazed openings may face into the area under a deck, balcony, bay or floor cantilever provided a clear vertical space at least 36 inches (914 mm) in height is provided.

MINIMUM ROOM AREAS

R304.1 Minimum area. Every *dwelling* unit shall have at least one habitable room that shall have not less than 120 square feet (11 m²) of gross floor area.

R304.2 Other rooms. Other habitable rooms shall have a floor area of not less than 70 square feet (6.5 m²).

Exception: Kitchens.

R304.3 Minimum dimensions. Habitable rooms shall not be less than 7 feet (2134 mm) in any horizontal dimension.

Exception: Kitchens.

R304.4 Height effect on room area. Portions of a room with a sloping ceiling measuring less than 5 feet (1524 mm) or a furred ceiling measuring less than 7 feet (2134 mm) from the finished floor to the finished ceiling shall not be considered as contributing to the minimum required habitable area for that room.

SECTION R305 CEILING HEIGHT

R305.1 Minimum height. *Habitable space*, hallways, bathrooms, toilet rooms, laundry rooms and portions of *basements* containing these spaces shall have a ceiling height of not less than 7 feet (2134 mm).

Exceptions:

1. For rooms with sloped ceilings, at least 50 percent of the required floor area of the room must have a ceiling height of at least 7 feet (2134 mm) and no portion of the required floor area may have a ceiling height of less than 5 feet (1524 mm).
2. Bathrooms shall have a minimum ceiling height of 6 feet 8 inches (2032 mm) at the center of the front clearance area for fixtures as shown in Figure R307.1. The ceiling height above fixtures shall be such that the fixture is capable of being used for its intended purpose. A shower or tub equipped with a showerhead shall have a minimum ceiling height of 6 feet 8 inches (2032 mm) above a minimum area 30 inches (762 mm) by 30 inches (762 mm) at the showerhead.