POST REQUIREMENTS

All deck post sizes shall be 6x6 (nominal) or larger, and the maximum height shall be in accordance with Table 4 and measured from grade or top of foundation, whichever is highest, to the underside of the beam. Under prescriptive limits of this document, 8x8 nominal posts can be substituted anywhere in Table 4 but are limited to a maximum height of 14'-0". Posts shall be centered on footings. Cut ends and notches of posts shall be field treated with an *approved* preservative (such as copper naphthenate) [R402.1.2]. The beam shall be attached to the post by notching as shown in Figure 8A or by providing an *approved* post cap to connect the beam and post as shown in Figure 8B. All 3-ply beams shall be connected to the post by a post cap. All through-bolts shall have washers under the bolt head and nut. Attachment of the beam to the side of the post without notching is prohibited (see Figure 9).

Provide diagonal bracing parallel to the beam at each corner post greater than 2'-0" in height as shown in Figure 10. Diagonal bracing is prohibited on center posts. Bracing shall be fastened to the post at one end and the beam at the other with ½" diameter lag screws. For non-ledger decks, (see Figure 21) diagonal bracing may be omitted at the beam and posts adjacent to the house.

Figure 8A. Post-to-Beam Attachment Requirements.

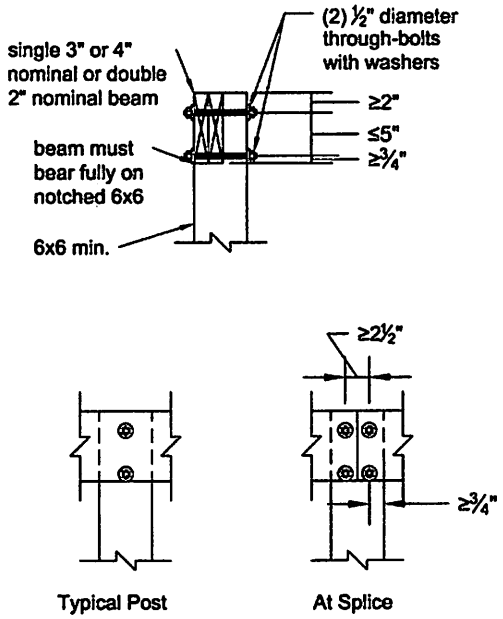


Figure 8B. Alternate *Approved* Post-to-Beam Post Cap Attachment.

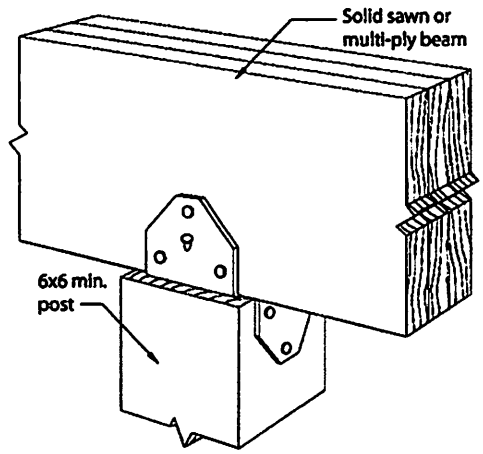


Figure 9. Prohibited Post-to-Beam Attachment Condition.

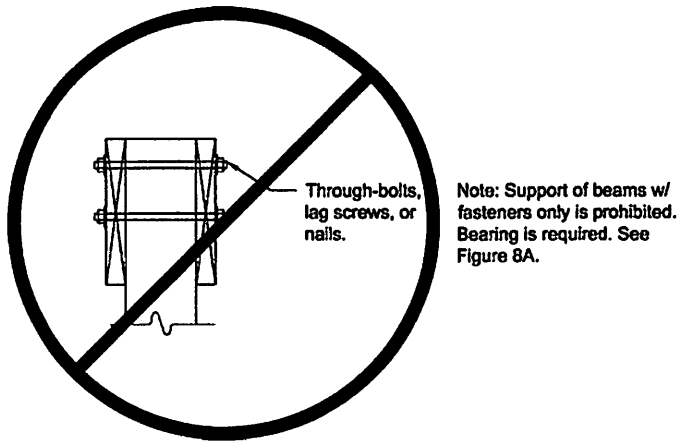
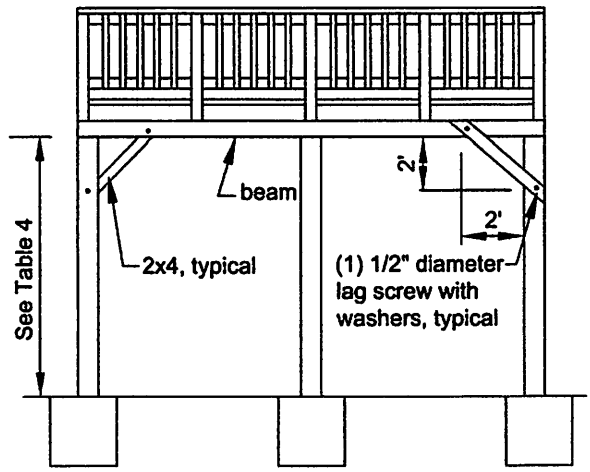


Figure 10. Diagonal Bracing.



DIAGONAL BRACING PARALLEL TO BEAM
Note: Diagonal Bracing is prohibited on center posts.

Figure 13A. Wood I-Joist Profile.

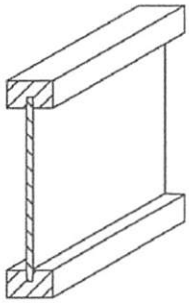


Figure 13B. Metal Plate Connected (MPC) Wood Floor Trusses with a 2x4 Lumber "Ribbon" at the Ends of the Trusses.

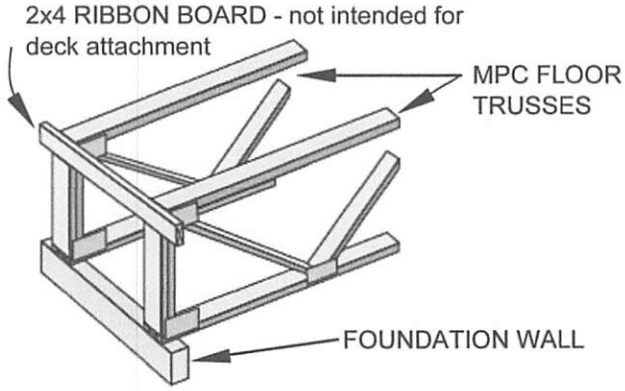


Figure 14. General Attachment of Ledger Board to Band Joist or Rim Joist.

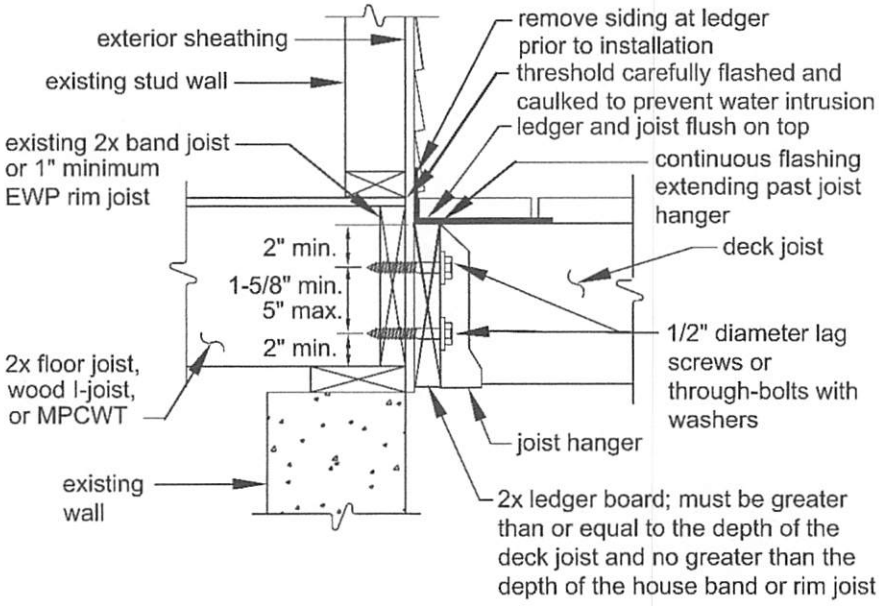
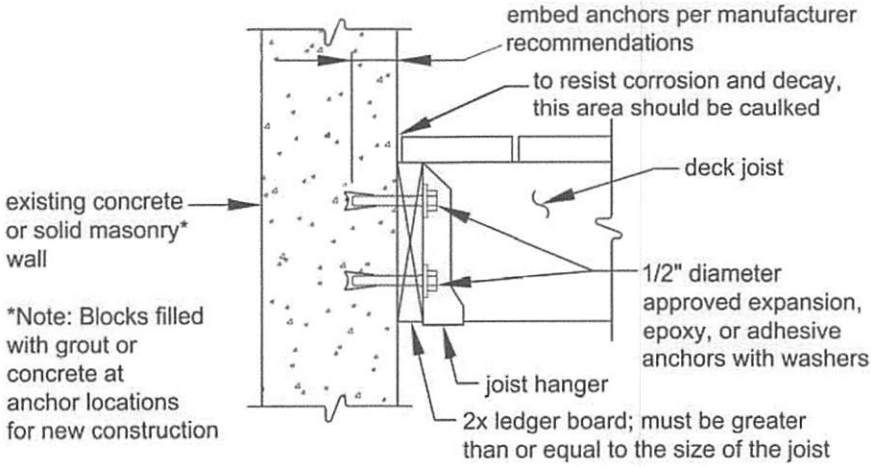
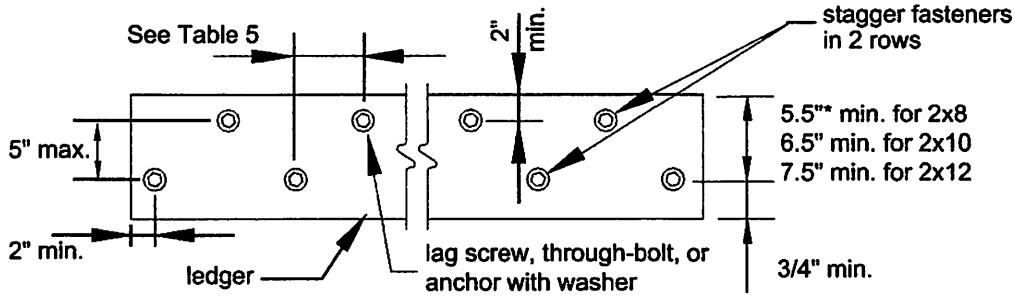


Figure 15. Attachment of Ledger Board to Foundation Wall (Concrete or Solid Masonry).



Placement of lag screws or bolts in deck ledgers
The lag screws or bolts shall be placed as shown in Figure 19. The lag screws or bolts shall be staggered from the top to the bottom along the horizontal run of the deck ledger (see Figure 19). Proper installation of lag screws or bolts shall be verified by the authority having jurisdiction.

Figure 19. Ledger Board Fastener Spacing and Clearances.

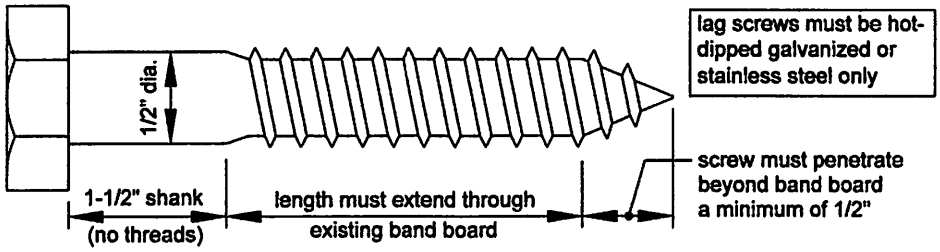


Through-Bolts
Through-bolts shall have a diameter of ½". Pilot holes for through-bolts shall be $^{17}/_{32}$" to $^{9}/_{16}$" in diameter. Through-bolts require washers at the bolt head and nut.

Expansion and Adhesive Anchors
Use *approved* expansion or adhesive anchors when attaching a ledger board to a concrete or solid masonry wall as shown in Figure 15. Expansion and adhesive anchor bolts shall have a diameter of ½". Minimum spacing and embedment length shall be per the manufacturer's recommendations. All anchors must have washers.

Lag Screws
Lag screws shall have a diameter of ½" (see MINIMUM REQUIREMENTS). Lag screws may be used only when the field conditions conform to those shown in Figure 14. See Figure 20 for lag screw length and shank requirements. All lag screws shall be installed with washers.

Figure 20. Lag Screw Requirements.

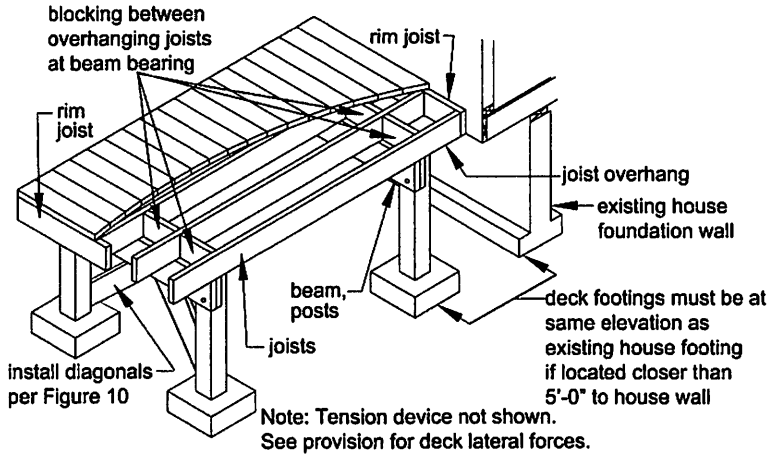


Lag screw installation requirements: Each lag screw shall have pilot holes drilled as follows: 1) Drill a ½" diameter hole in the ledger board, 2) Drill a $^{5}/_{16}$" diameter hole into the band board of the house. DO NOT DRILL A ½" DIAMETER HOLE INTO THE BAND JOIST.
The threaded portion of the lag screw shall be inserted into the pilot hole by turning. DO NOT DRIVE LAG SCREWS WITH A HAMMER. Use soap or a wood-compatible lubricant as required to facilitate tightening. Each lag screw shall be thoroughly tightened (snug but not over-tightened to avoid wood damage).

NON-LEDGER DECKS - FOR RESISTING VERTICAL LOADS

Non-ledger decks use the house for resisting lateral loads but do not utilize the exterior wall of the house to support vertical loads (see Figure 21). Rather than supporting the deck on a ledger, an additional beam with posts is provided at or within the lesser of L_O or L/4 of the house. THE ASSOCIATED DECK POST FOOTINGS SHALL BE PLACED AT THE SAME ELEVATION AS THE HOUSE FOOTING IF LOCATED CLOSER THAN 5'-0" TO A HOUSE WALL (see Figure 2 and Figure 12). For houses with basements, a cylindrical footing (caisson) is recommended to minimize required excavation at the basement wall. Beam size is determined by Table 3. Non-ledger decks shall be attached to the house per Table 5 and Figures 22 or 23 for lateral loads.

Figure 21. Non-Ledger Deck - For Resisting Vertical Loads.



DECK LATERAL LOADS

Attachment to House: Decks shall be positively anchored to the primary structure [R507.1]. The lateral connection required shall be permitted to be in accordance with Figure 22 or 23 for ledger and non-ledger decks. Hold-down tension devices shall be provided in not less than two locations within two feet of the edge of the deck, and shall have an allowable stress design capacity of not less than 1,500 lb [R507.2.4].

The wall must be sheathed with minimum $^3/_8$" wood structural panel sheathing. Use lag screws or through-bolts when fastening to a band joist; use expansion anchors or epoxy anchors when fastening to concrete or masonry. DO NOT ATTACH TO BRICK VENEERS. VERIFY THIS CONDITION IN THE FIELD PRIOR TO UTILIZING THIS METHOD. Fasteners shall penetrate beyond the house band board and be installed per Table 5.

For non-ledger decks, blocking or framing angles can be used in lieu of joist hangers and shall be provided on each side of each joist. Blocking shall be installed with 5-10d threaded nails into the rim joist or the framing angle shall have a lateral capacity of 600 lb. Flashing over the rim joist is required and must be installed in accordance with the flashing provisions in the LEDGER ATTACHMENT REQUIREMENTS.

Get Your Deck Up to Code

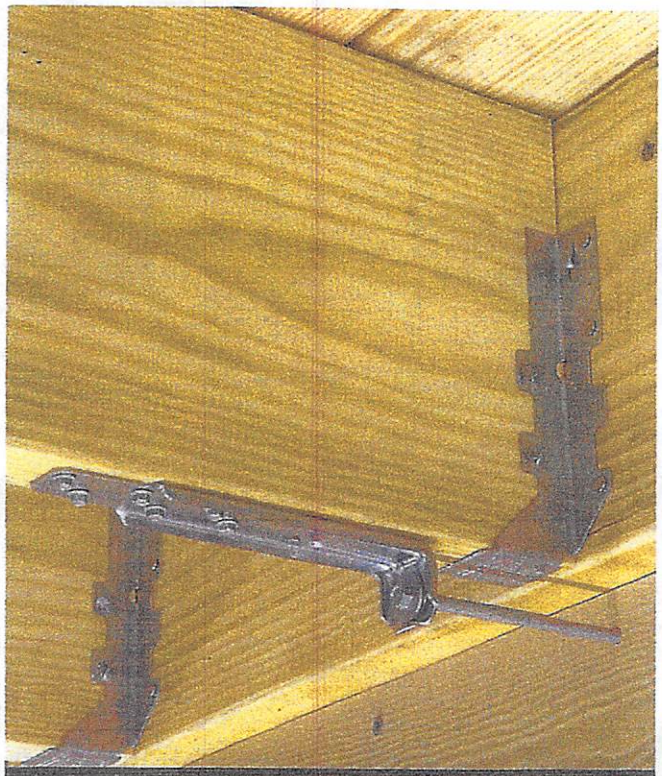
SIMPSON Strong-Tie

New DTT1Z Deck Tension Tie Provides Alternate Approach to Attaching Decks to Homes

The new DTT1Z deck tension tie provides a less invasive approach for attaching a new deck to a home or retrofitting an existing deck to current code standards. This tension tie addresses a 2015 International Residential Code provision (section R507.2.4) that now allows four 750 lb. lateral connectors to be fastened to framing in the house with a lag screw. This provision is an alternative to using two 1,500 lb. lateral connections from the deck to the floor joists within the house.

The DTT1Z is specifically designed to comply with this new code detail that permits the lateral connection from the deck joists to be made to top plates, studs, or headers within the supporting structure. This eliminates the need to access the floor joists inside the house.

The DTT1Z fastens to the narrow or wide face of a single 2x with Strong-Drive® SD Connector screws. The new Strong-Drive® SDWH Timber-Hex HDG screw with an integral washer attaches the tension tie to the supporting structure.



The DTT1Z deck tension tie with the Strong Drive® SDWH TIMBER-HEX HDG screw accommodates most installation conditions regardless of the siding type or ledger thickness.

Additional Features

- ZMAX® coating offers additional corrosion protection for exterior and preservative-treated wood applications
- DTT1Z offered as an individual part or as part of a retail pack with Strong-Drive® SD Connector Screws and SDWH Timber-Hex HDG Screws

CODE REQUIRED 2-LATERAL LOAD CONNECTION OR 4-TENSION TIES

Additional Fastening Options

To Joist:

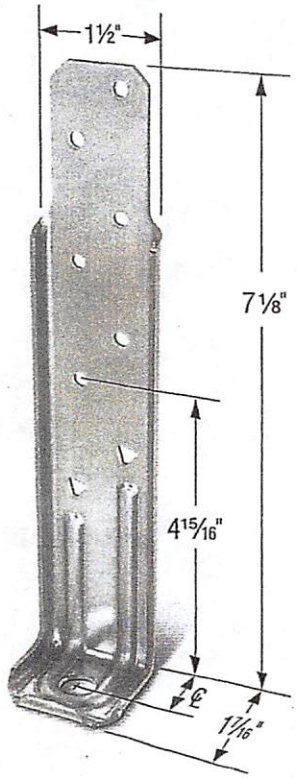
- #9x1½" Strong-Drive® SD Connector Screw
- 10dx1½" HDG nail

To Structure:

- Strong-Drive® SDWH Timber-Hex HDG Screw (available in 4"-12" lengths)
- ⅜" machine bolt, anchor bolt or lag screw (washer required)
- ⅜" Titen® HD Heavy Duty screw anchor (interior dry holdown applications only, see page 4)

Model No.	℄	Anchor Dia. or Type	Fasteners	Allowable Tension Loads (lbs.) (160)				Deflection at Allowable Load (in.)
				Dry		Wet		
				DF/SP	SPF/HF	DF/SP	SPF/HF	
DTT1Z	3¼"	⅜"[5] or SDWHG[6]	6-SD #9x1½"	840	840	840	755	0.170
			6-10dx1½"	910	640[4]	795	640[4]	0.167
			8-10dx1½"	910	850	910	850	0.167

1. Allowable loads have been increased 60% for wind or earthquake loading with no further increase allowed.
2. Dry values are applicable to installations into wood with a moisture content that does not exceed 19%.
3. Wet values are applicable to installations into wood with a moisture content greater than 19% at time of installation or in service. Values include a NDS wet service factor for the fasteners.
4. DTT1Z installations with allowable loads of less than 750 lbs. do not satisfy the 2015 IRC requirements for deck-to-house lateral load connections.
5. A standard ⅜" cut washer is required when using a ⅜" machine bolt, anchor bolt or lag screw.
6. The Strong-Drive® SDWH Timber-Hex HDG screw with a min. of 3" of thread penetration into dry lumber has an allowable withdrawal load (160) of 1380 lbs. into SP, 1225 lbs. into DF and 1020 lbs. into SPF/HF.
7. Load values are valid if the product is flush with the end of the framing member or installed away from the end.
8. FASTENERS: SD #9x1½" (model SD9112) = 0.131" dia. x 1½" long, 10dx1½ = 0.148" dia. x 1½" long.



DTT1Z Deck Tension Tie
U.S. Patent Pending

Ledger Attachment

Code Requirements

- ✓ 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.

  IRC 2009 Section R502.2.2
  IRC 2012 Section R507.1
  IBC 2009/2012 Section 1604.8.3

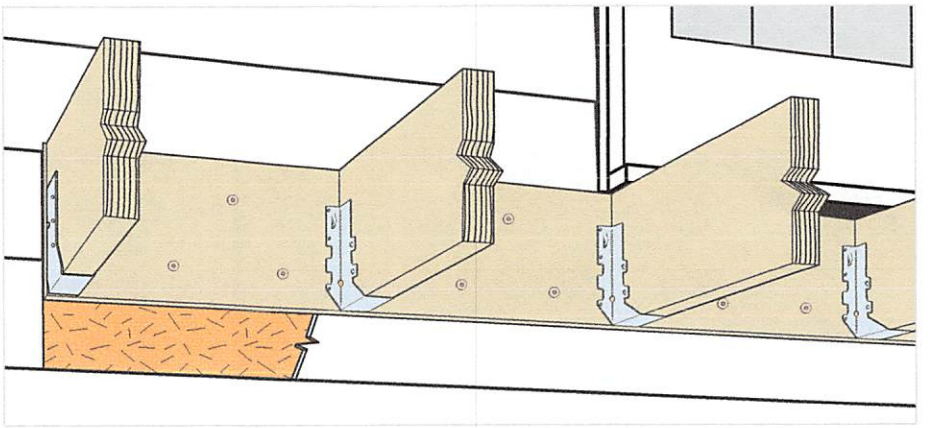
- ✓ For decks supporting a total design load of 50 pounds per square foot (40 pounds per square foot live load plus 10 pounds per square foot dead load), the connection between a deck ledger of pressure preservative-treated Southern Pine, incised pressure-preservative-treated Hem-Fir or approved decay-resistant species, and a 2-inch nominal lumber band joist bearing on a sill plate or wall plate shall be constructed with ½-inch lag screws or bolts with washers in accordance with Table R502.2.2.1 (IRC 2012 Table R507.2).

  IRC 2009 Section R502.2.2.1
  IRC 2012 Section R507.2

- ✓ Deck ledger connections not conforming to Table R502.2.2.1 (IRC 2012 Table R507.2) 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.

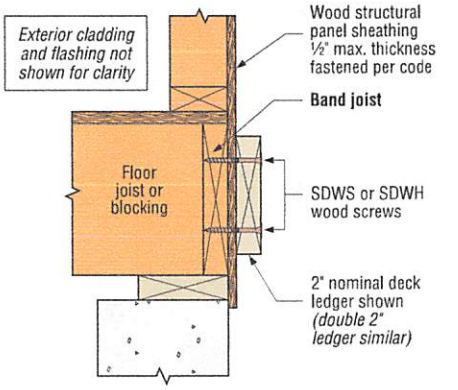
  IRC 2009, Section R502.2.2.2.
  IRC 2012 Section R507.2.2

Selection of products based upon performance and/or suitability for a specific application should be made by a qualified professional. Simpson Strong-Tie recommends that deck designs be approved by the local building department before construction begins.



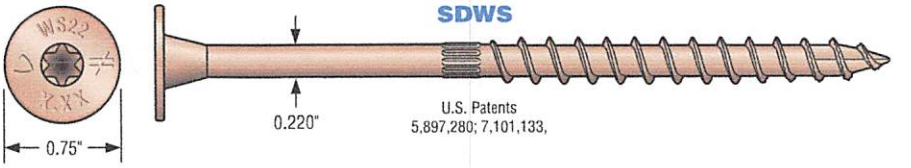
One of the most common causes for deck failure is ledgers that pull away from the primary structure, resulting in complete collapse.

The Simpson Strong-Tie Strong-Drive SDWS and SDWH structural wood screws provide an easy-to-install, high-strength alternative to lag screws and through-bolts. They are ideal for securely attaching ledgers to structural wood members, are easier to drive than comparable fasteners, and are coated for many exterior and preservative-treated wood applications.



Ledger-to-Band Joist Assembly

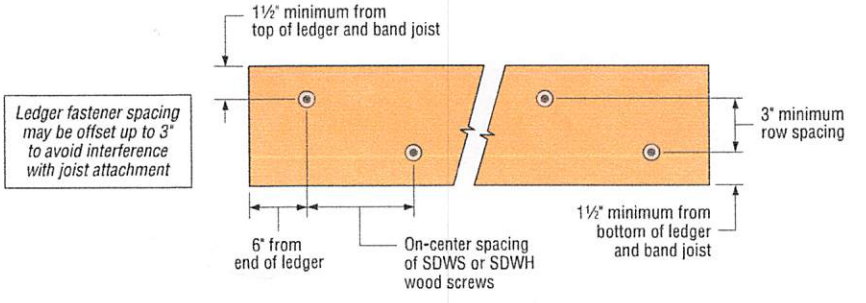
Strong-Drive® Structural Wood Screw



- 4CUT™ tip, serrated thread, and knurled shank reduce installation torque
- Identification on all screw heads
- Low-profile washer head provides excellent bearing area and a clean look

Code listed per IAPMO UES ER-192.

For stainless-steel ledger fastening, use the Strong-Drive SDS structural wood screw *(page 21)*.



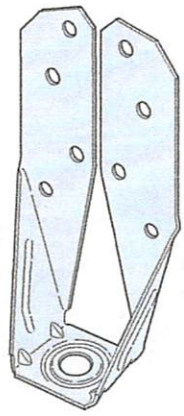
SDWS/SDWH Screw Spacing Detail

For more information on ledger attachment see *Fastening Systems* catalog C-FS and flier F-SDWSSDWH.

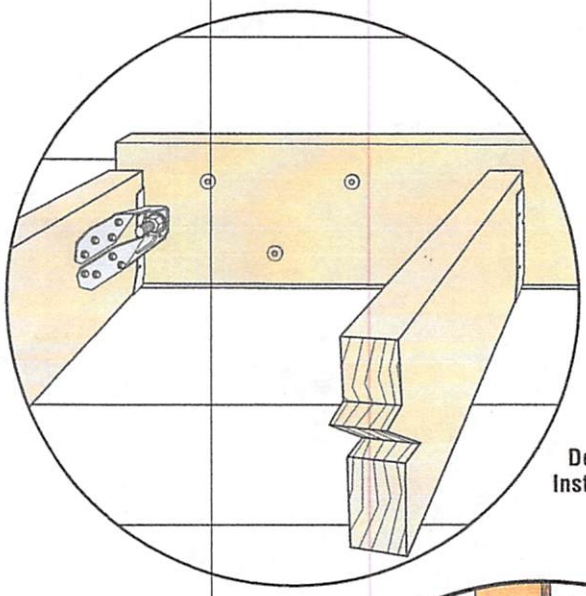
Lateral-Load Connection

For decks that are partially supported by an adjacent structure, the connection between the deck and that structure is vital. A bolted or screwed ledger-to-rim board connection is suitable to support gravity loads, however in some cases the building codes require a connection that is able to resist higher lateral loads. In these situations tension ties are typically called out to tie the joists of the deck directly to the joists of the structure.

The Simpson Strong-Tie® DTT2 Deck Tension Tie complies with IRC provisions for laterally tying the deck to the house. The DTT2 fastens easily to the joist using Simpson Strong-Tie® Strong Drive® screws (included).

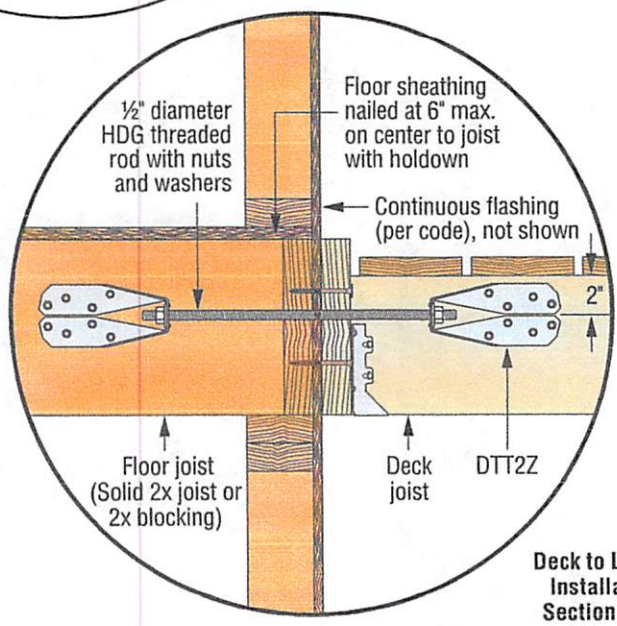


The DTT2Z Deck Tension Tie is a multi-purpose connector ideal for lateral load and deck-post connections. It features a ZMAX® coating for added corrosion resistance. For stainless steel model use the DTT2SS.



Deck to Ledger Installation Detail

For more information on common framing conditions not addressed by the 2009/2012 IRC detail, refer to Simpson Strong-Tie technical bulletin T-DECKLATLOAD.



Deck to Ledger Installation Section View

Code Requirements

✓ 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.

IRC 2009 Section R502.2.2.3

✓ The lateral load connection required by Section R507.1 shall be permitted to be in accordance with Figure R507.2.3. Where the lateral load connection is provided in accordance with Figure R507.2.3, 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.

IRC 2012 Section R507.2.3

Selection of products based upon performance and/or suitability for a specific application should be made by a qualified professional. Simpson Strong-Tie recommends that deck designs be approved by the local building department before construction begins.

ZMAX G185
HDG HOT DIP GALVANIZED®
SST300 STAINLESS STEEL®

These products are available with a ZMAX® or hot-dip galvanized coating. Stainless-steel connectors are also available for higher exposure environments or applications using certain preservative-treated woods. See page 18 for more details.

Figure 22. Lateral Load Device with Floor Joists Parallel to Deck Joists.

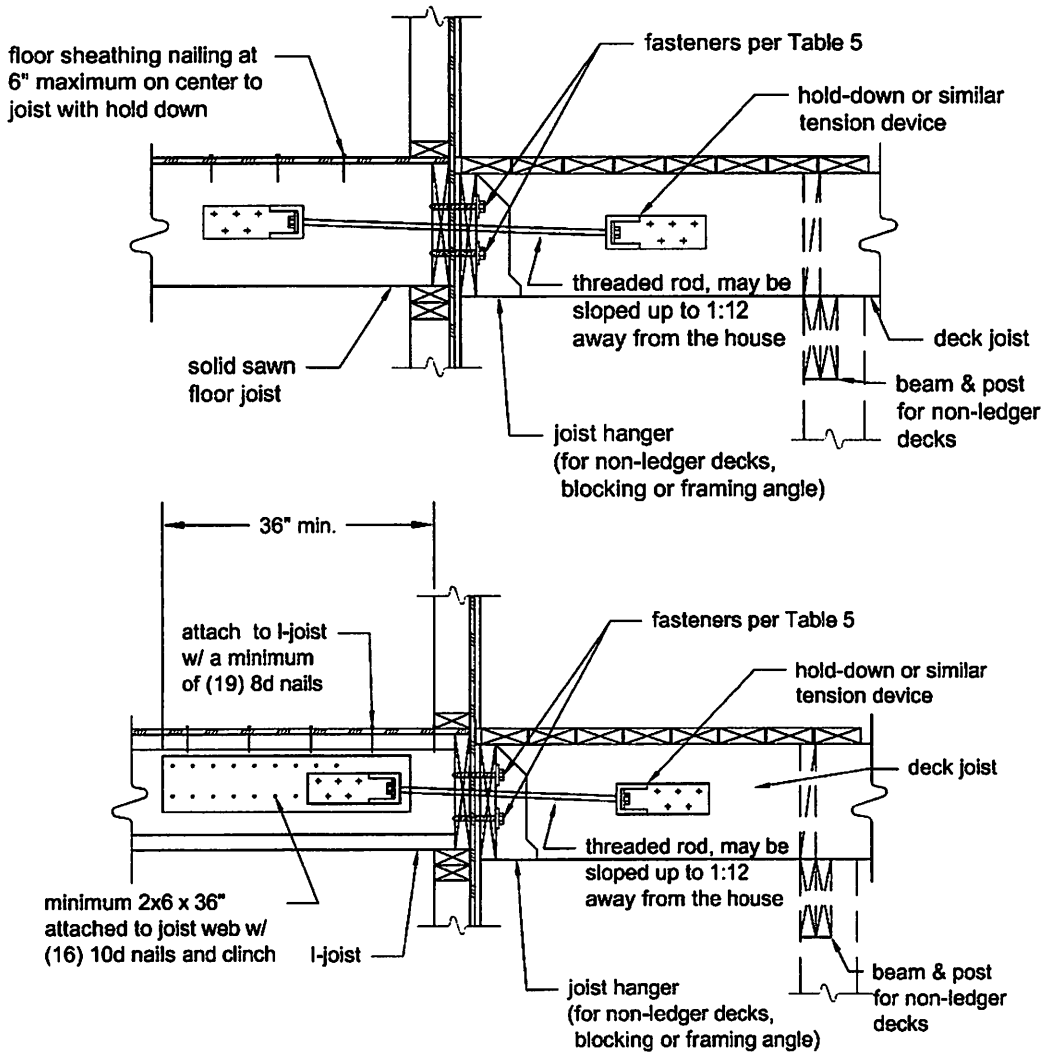
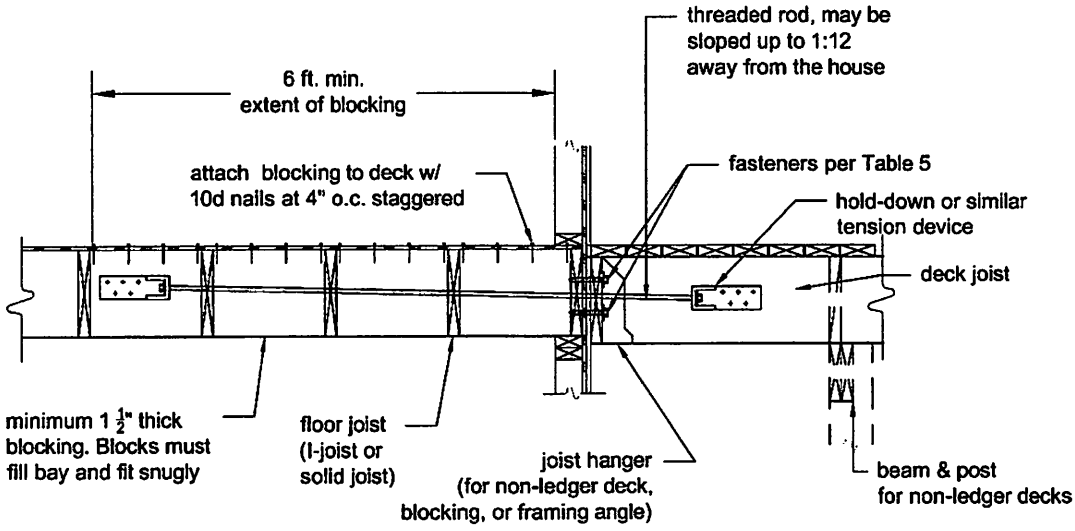


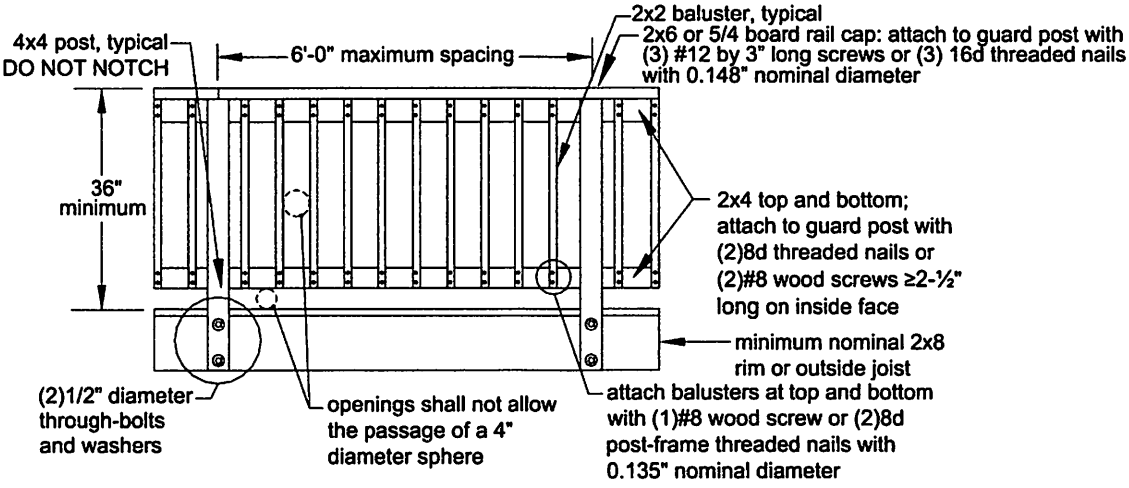
Figure 23. Lateral Load Device with Floor Joists Perpendicular to Deck Joists.



GUARD REQUIREMENTS

All decks greater than 30" above grade are required to have a guard [R312.1] - one example is shown in Figure 24. Other methods and materials may be used for guard construction when *approved* by the authority having jurisdiction.

Figure 24. Example Guard Detail.

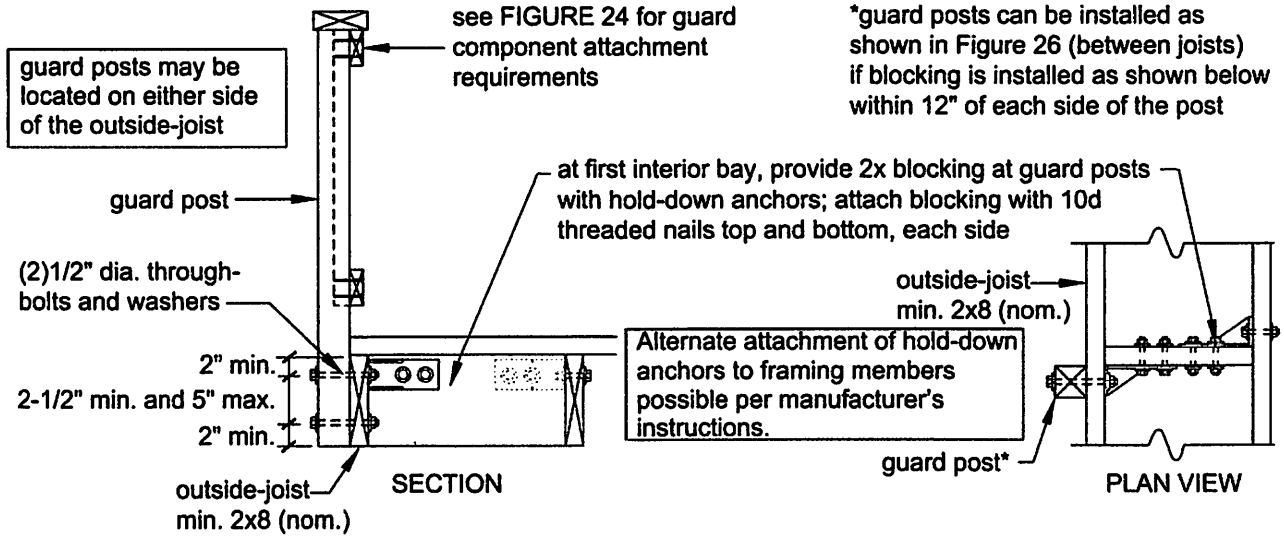


GUARD POST ATTACHMENTS FOR REQUIRED GUARDS

Deck guard posts for required guards shall be a minimum 4x4 (nominal) with an adjusted bending design value not less than 1,100 psi. Joists and rim joists to which guard posts are attached shall be a minimum of 2x8 (nominal).

Guard posts for required guards which run parallel to the deck joists shall be attached to the outside joist per Figure 25. Guard posts for required guards that run perpendicular to the deck joists shall be attached to the rim joist in accordance with Figure 26. Only hold-down anchor models meeting these minimum requirements shall be used. Hold-down anchors shall have a minimum allowable tension load of 1,800 pounds for a 36" maximum guard height and be installed in accordance with the manufacturer's instructions.

Figure 25. Guard Post to Outside-Joist Example.



STAIR HANDRAIL REQUIREMENTS

All stairs with 4 or more risers shall have a handrail on at least one side (see Figure 32A) [R311.7.8]. The handrail height measured vertically from the sloped plane adjoining the tread nosing shall be not less than 34 inches and not more than 38 inches (see Figure 30) [R311.7.8.1]. Handrails shall be graspable and shall be composed of decay-resistant and/or corrosion resistant material. Handrails shall be Type I, Type II, or provide equivalent graspability (see Figure 32B). Type I shall have a perimeter dimension of at least 4" and not greater than 6-¼". Type II rails with a perimeter greater than 6-¼" shall provide a graspable finger recess area on both sides of the profile [R311.7.8.3]. All shapes shall have a smooth surface with no sharp corners. Handrails shall run continuously from a point directly over the lowest riser to a point directly over the highest riser and shall return to the guard at each end (see Figure 33). Handrails may be interrupted by guard posts at a turn in the stair [R311.7.8.2].

STAIR FOOTING REQUIREMENTS [R403]

Where the stairway meets grade, attach the stringers to the stair guard posts as shown in Figure 34. Posts shall bear on footings. All footings shall bear on solid ground and shall be placed at least 12 inches below the undisturbed ground surface or below the frost line, whichever is deeper (see Figure 34). Stringers shall bear on a 2x4 bearing block attached to the post as shown. Stringers shall not bear on new or existing concrete pads or patios that are not founded below this depth. When guards are not required (see GUARD REQUIREMENTS), posts may terminate below the bottom tread elevation. Bolts are only required if a guard post is required.

STAIR LIGHTING REQUIREMENTS [R303.7]

Stairways shall have a light source located at the top landing such that all stairs and landings are illuminated. The light switch shall be operated from inside the house. However, motion detected or timed switches are acceptable.

Figure 32A. Handrail Mounting Examples.

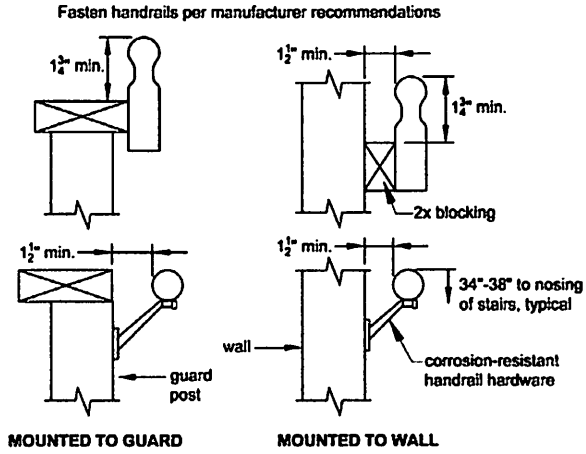


Figure 32B. Handrail Grip Size.

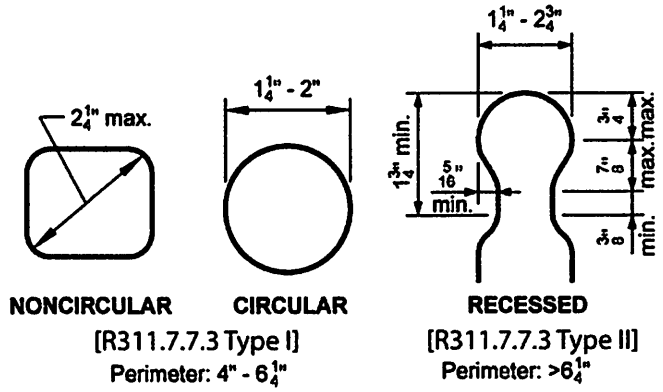


Figure 33. Miscellaneous Stair Requirements.

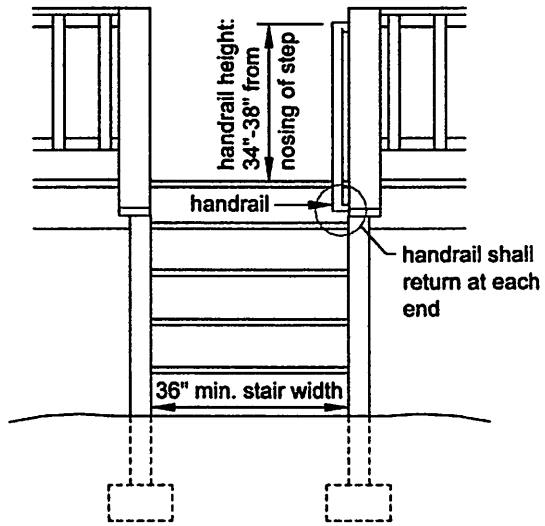


Figure 34. Stair Footing Detail.