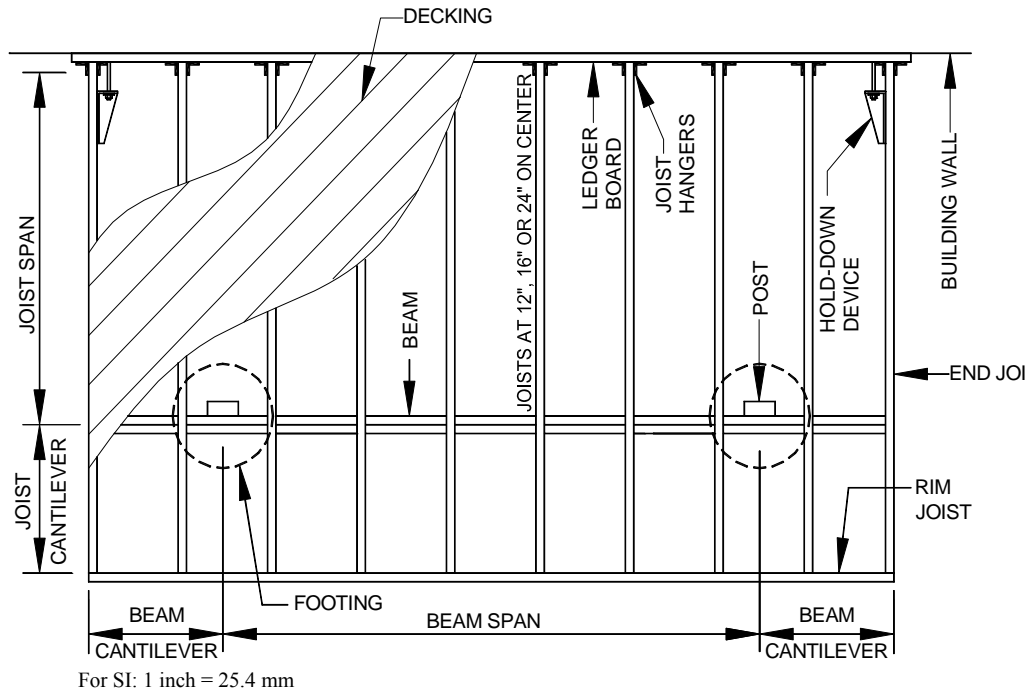


## SECTION R507 DECKS

**R507.1 Application.** The provisions of this section shall provide prescriptive requirements for the design and construction of all uncovered, wood-framed, single-span exterior decks.

**R507.2 Requirements.** Deck construction shall be capable of accommodating all vertical and horizontal loads in accordance with Section R301 and of transmitting the resulting loads to the supporting structural elements. Where a deck, or portions thereof, does not comply with one or more of the requirements of this section, those portions shall be designed in accordance with Section R301.1.3, AF&PA/NDS and accepted engineering practice.



**FIGURE R507.2  
DECK CONSTRUCTION**

**R507.3 Materials.** Materials used in the construction of a deck shall meet the provisions of this section and as approved per Section 112.2 of the Virginia Construction Code.

**R507.3.1 Preservative-treated lumber.** Dimensioned lumber shall be identified in accordance with Section R502.1 and preservative-treated in accordance with Section R317. All lumber in contact with the ground shall be identified as suitable for ground contact.

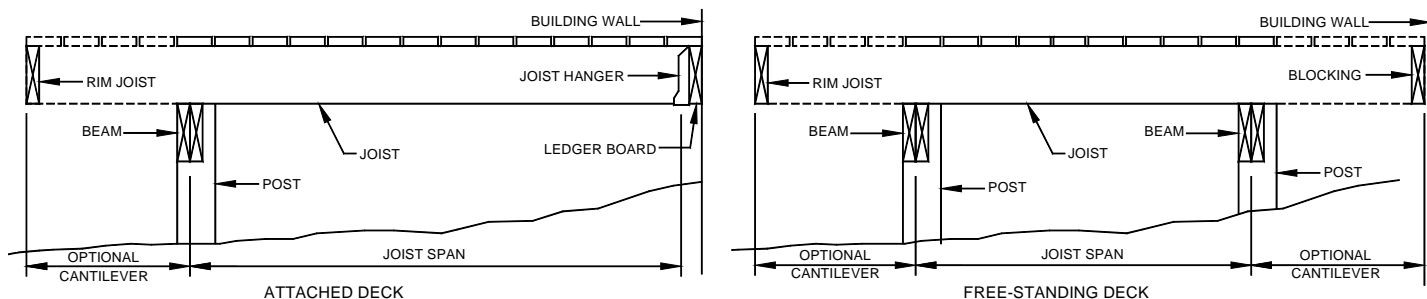
**R507.3.2 Fasteners and connectors.** All fasteners and connectors shall be in accordance with Section R317.3 and installed in per the manufacturer. Fasteners and connectors exposed to salt water or located within 300 feet (90 m) of a salt-water shoreline shall be stainless steel grade 304 or 316 in accordance with ASTM A 240. All nails shall be helical or annular and in accordance with ASTM F 1667. Bolts and screws shall be in accordance with ANSI/ASME B18.6 and installed in accordance with AF&PA/NDS.

**R507.3.3 Flashing.** Flashing shall be corrosion-resistant metal of minimum nominal 0.019 inch (0.5 mm) thickness or approved non-metallic material.

**R507.3.4 Wood/plastic composites.** Wood/plastic composites shall bear a label indicating the required performance levels and demonstrating compliance with the provisions of ASTM D 7032 and shall be installed per the manufacturer.

**R507.4 Decking.** Wood decking shall be nominal 2x6 lumber, span-rated decking or wood/plastic composites placed at an angle between 45 and 90 degrees to the joists with a  $\frac{1}{8}$  inch (3 mm) spacing between parallel members or per the manufacturer. Decking shall be attached to each joist with (2)8d nails, (2)#8 wood screws or per the manufacturer. Decking shall be secured to the top of the band joist with 8d nails or #8 wood screws at 6 inches (152 mm) on center.

**R507.5 Joists.** Joists shall be constructed in accordance Figure R507.5 with allowable spans in accordance with Table R507.5. The maximum cantilever permitted shall be equal to  $\frac{1}{4}$  of the joist span.



**FIGURE R507.5  
DECK JOIST SPANS**

**TABLE R507.5  
SPAN LENGTHS DECK JOISTS  
(maximum spans for southern pine <sup>a</sup>)**

JOIST SPACING (inches)	JOIST SIZE	JOISTS WITH NO CANTILEVER	JOISTS WITH CANTILEVERS
12	2 x 6	11'-1"	7'-5"
	2 x 8	13'-8"	10'-9"
	2 x 10	17'-5"	15'-6"
	2 x 12	18'-0"	18'-0"
16	2 x 6	9'-7"	6'-9"
	2 x 8	12'-5"	10'-9"
	2 x 10	15'-10"	15'-6"
	2 x 12	18'-10"	18'-0"
24	2 x 6	7'-10"	5'-10"
	2 x 8	10'-2"	10'-2"
	2 x 10	13'-1"	13'-1"
	2 x 12	15'-5"	15'-5"

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

a. Tabulated values are based on grade #2 and wet service.

**R507.5.1 Joist bearing.** Joist bearing shall be provided in accordance with Section R502.6 and fastened to the beam in accordance with Table R602.3(1) and to the joist hangers per the manufacturer. Joist hangers shall have a capacity as specified in Table R507.5.1.

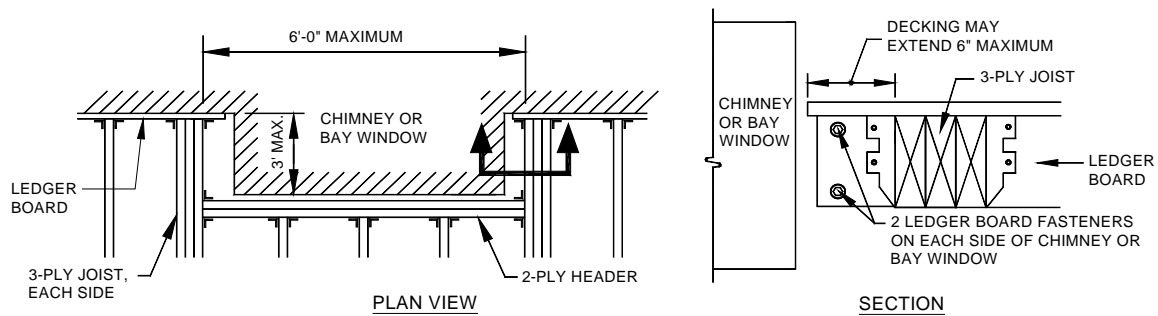
**Table R507.5.1  
JOIST HANGER CAPACITY**

JOIST SIZE	CAPACITY (pounds)
2 x 6	350
2 x 8	600
2 x 10	700
2 x 12	800

For SI: 1 pound = 4.45 N

**R507.5.2 Joist ends.** Rim joists of the same dimensioned lumber as the joists shall be secured to the end of each joist with (3)10d nails or (3)#10x3 inch long wood screws. Joist ends adjacent to the building wall of free-standing decks shall be blocked with full depth nominal 2x lumber toe nailed at each end with (3)10d nails.

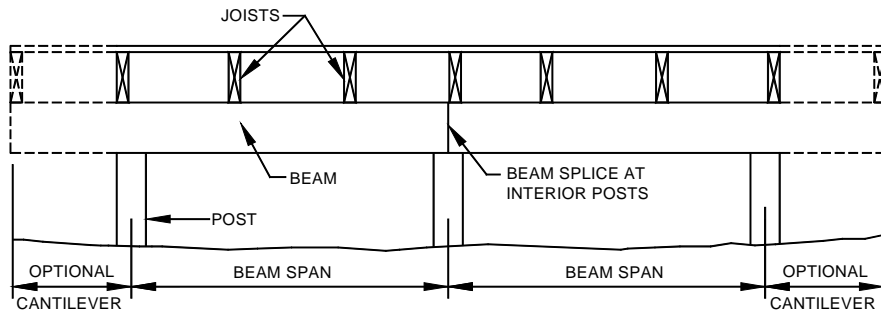
**R507.5.3 Joist framing at chimney or bay window.** Joist and header framing at chimneys, bay windows and other building protrusions shall be constructed in accordance with Figure R507.5.3 and Table R602.3(1). The size of each header ply shall be equal to the specified joist size. Joist hangers shall be specifically designed for the number of plies identified.



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

**FIGURE R507.5**  
**FRAMING AT CHIMNEY OR BAY WINDOW**

**R507.6 Beams.** Beams shall be constructed in accordance Figure R507.6 with plies fastened in accordance with Table R602.3(1). Allowable beam spans shall be in accordance with Table R507.6. Beams shall be permitted to cantilever at each end up to  $\frac{1}{4}$  of the beam span. Splices of multi-span beams shall be located at interior post locations.



**FIGURE R507.6**  
**DECK BEAM SPANS**

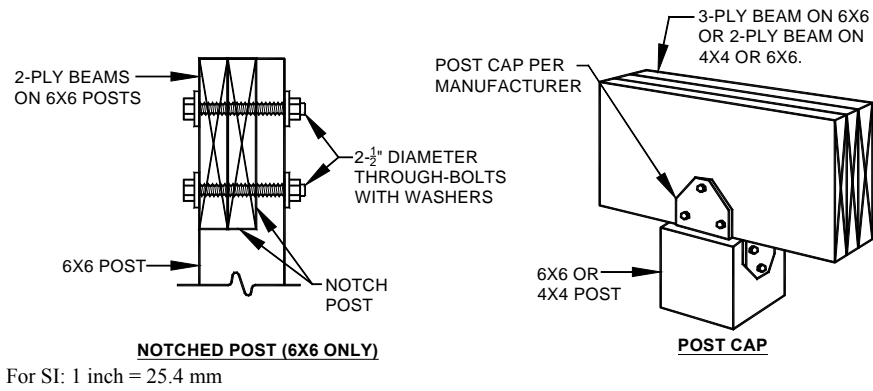
**TABLE R507.6**  
**BEAM SPAN LENGTHS<sup>a</sup>**

JOIST SPAN	BEAM SIZE							
	(2)2x6	(2)2x8	(2)2x10	(2)2x12	(3)2x6	(3)2x8	(3)2x10	(3)2x12
≤ 6'	7'-1"	9'-2"	11'-10"	13'-11"	8'-7"	11'-4"	14'-5"	17'-5"
6' - 8'	6'-2"	7'-11"	10'-3"	12'-0"	7'-8"	9'-11"	12'-10"	15'-1"
8' - 10'	5'-6"	7'-1"	9'-2"	10'-9"	6'-11"	8'-11"	11'-6"	13'-6"
10' - 12'	5'-0"	6'-6"	8'-5"	9'-10"	6'-3"	8'-1"	10'-6"	12'-4"
12' - 14'	4'-8"	6'-0"	7'-9"	9'-1"	5'-10"	7'-6"	9'-9"	11'-5"
14' - 16'	4'-4"	5'-7"	7'-3"	8'-6"	5'-5"	7'-0"	9'-1"	10'-8"
16' - 18'	4'-1"	5'-3"	6'-10"	8'-0"	5'-2"	6'-7"	8'-7"	10'-1"

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

a. Tabulated values are based on southern pine, grade #2, wet service.

**R507.6.1 Beam bearing.** Beam bearing shall be provided at posts in accordance with Section R502.6 and Figure R507.6.1. Post caps, if used, shall have a minimum capacity of 5,000 pounds (22.25 kN) and shall be specifically manufactured for the beam and post sizes.



**FIGURE R507.6.1  
BEAM BEARING**

**R507.7 Posts.** Posts shall be nominal 4x4 with a maximum height of 10 feet (3048 mm) or nominal 6x6 with a maximum height of 18 feet (5486 mm). Post height shall be measured from the top of the footing to the underside of the beam. Post to beam connections shall be in accordance with Section R507.6.1, and post to footing connections shall be in accordance with Section R507.8.

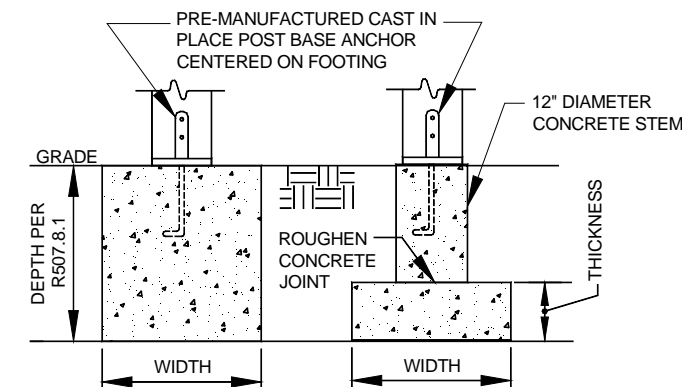
**R507.8 Footings.** Deck footings shall meet the requirements of Section R403, Figure R507.8 and Table R507.8.

**TABLE R507.8  
FOOTING SIZES**

BEAM SPAN	JOIST SPAN	FOOTING WIDTH		MINIMUM THICKNESS
		SQUARE	ROUND	
≤ 8'	≤ 10'	15"	17"	6"
	10' - 14'	18"	20"	8"
	14' - 18'	21"	23"	9"
8' - 12'	≤ 10'	19"	21"	8"
	10' - 14'	22"	24"	10"
	14' - 18'	26"	28"	11"
12' - 17'-5"	≤ 10'	23"	25"	10"
	10' - 14'	28"	30"	12"

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

a. Tabular values are based on 1,500 pounds per square foot (71.8 kPa) load bearing pressure.



For SI: 1 inch = 25.4 mm

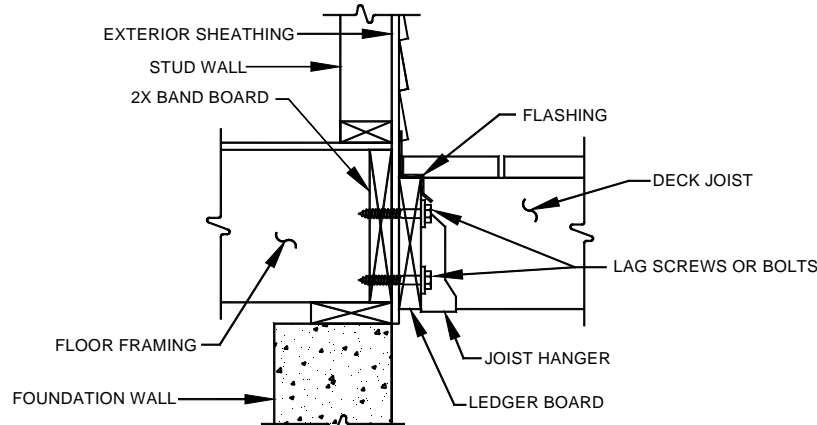
**FIGURE R507.8  
DECK FOOTINGS**

**R507.8.1 Footing depth.** The minimum depth of footings shall meet the requirements of Section R403.1.4 and be of sufficient depth such that the footing does not impose lateral pressure on adjacent building foundation walls.

**R507.9 Deck attachment to building.** Decks shall be attached to the building wall in accordance with this section or shall be free-standing per Section R507.10. Deck ledger boards shall be nominal 2x lumber with a depth greater than or equal to the deck joists.

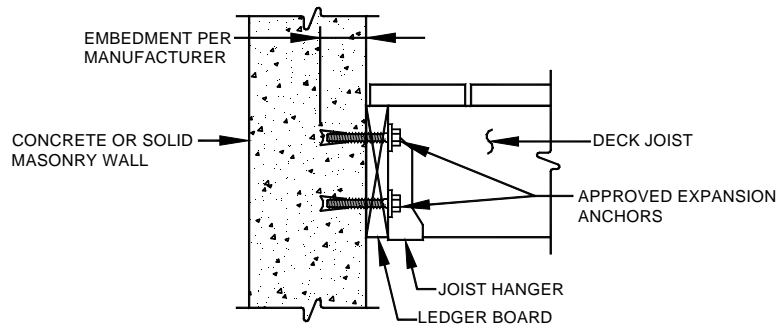
**R507.9.1 Attachment to resist vertical load.** Decks shall be attached to the building wall to resist vertical load in accordance with Sections R507.9.1.1 through R507.9.1.4.

**R507.9.1.1 Ledger board to band board.** A ledger board shall be attached to a nominal 2x lumber band board with ½ inch (13 mm) diameter lag screws or through bolts with washers at a spacing specified in Section R507.9.1.4 and as shown in Figure R507.9.1.1. The exterior finish material shall be removed prior to installation of the ledger board. Flashing at a door threshold shall be installed to prevent water intrusion from rain or melting ice and snow.



**FIGURE R507.9.1.1**  
**LEDGER BOARD TO BAND BOARD ATTACHMENT**

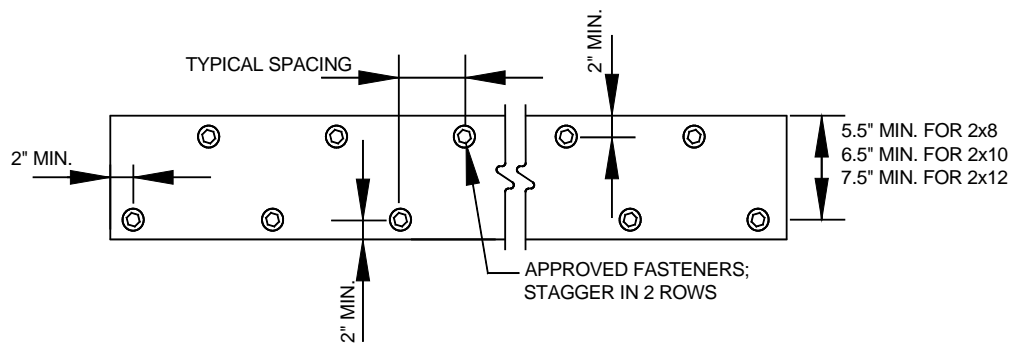
**R507.9.1.2 Ledger board to solid foundation wall.** A ledger board shall be attached to a concrete or solid masonry foundation wall with approved ½ inch (13 mm) diameter expansion anchors at a spacing specified in Section R507.9.5 and as shown in Figure R507.9.2. Expansion anchors shall be installed per the manufacturer.



**FIGURE R507.9.2**  
**LEDGER BOARD TO SOLID FOUNDATION WALL ATTACHMENT**

**R507.9.1.3 Alternate connections.** An approved engineered wood rim board with a minimum thickness of 1 inch (25 mm) shall be permitted to substitute for a 2x lumber band board provided it has designed and manufactured to support a deck. A ledger board attachment to a masonry or stone veneer, hollow masonry wall, ribbon board of open web floor trusses, band board of a cantilevered floor and other conditions not addressed herein shall be designed in accordance with accepted engineering practice, or the deck shall be free-standing in accordance with Section R507.10.

**R507.9.1.4 Fastener placement.** Ledger board fasteners shall be placed in accordance with Figure R507.9.1.4 and spaced in accordance with Table R507.9.1.4 to resist vertical load.



For SI: 1 inch = 25.4 mm

**FIGURE R507.9.1.4  
LEDGER BOARD FASTENER PLACEMENT**

**TABLE R507.9.1.4  
FASTENER SPACING**

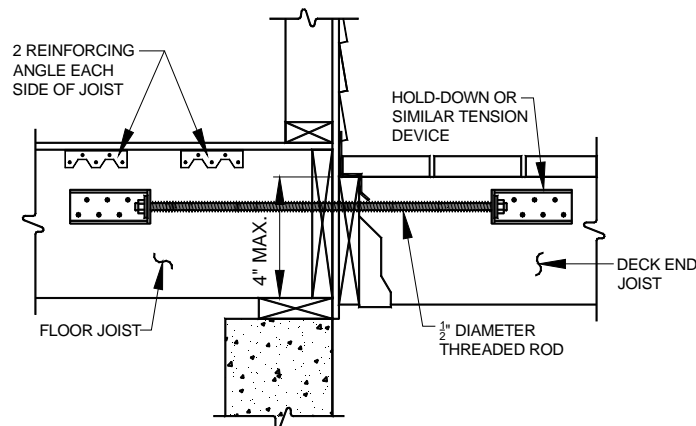
FASTENER	BAND BOARD	JOIST SPAN						
		≤6'	6'-8'	8'-10'	10'-12'	12'-14'	14'-16'	16'-18'
Lag screws <sup>a</sup>	1" min. engineered wood product	24"	18"	14"	12"	10"	9"	8"
	2x lumber	30"	23"	18"	15"	13"	11"	10"
Through bolts	1" min. engineered wood product	24"	18"	14"	12"	10"	9"	8"
	2x lumber	36"	36"	34"	29"	24"	21"	19"
Expansion anchors	-	36"	36"	34"	29"	24"	21"	19"

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

a. The tip of the lag screw shall fully extend beyond the inside face of the band board.

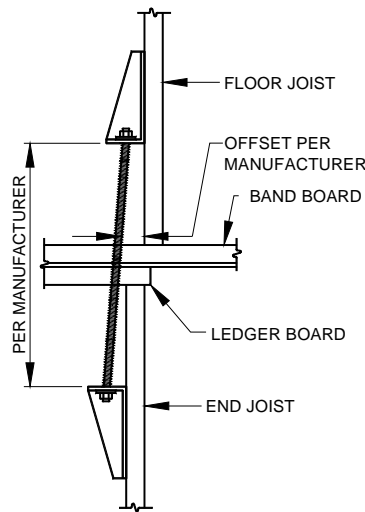
**R507.9.2 Attachment to resist horizontal load.** Decks shall be capable of resisting lateral load equivalent to a 1,500 pound (6672 N) tension force at each end of the deck ledger in accordance with this section or accepted engineering practice.

**R507.9.2.1 Connection at parallel joists.** Where floor joists and deck joists are parallel, provide a hold-down or similar tension device with a minimum capacity of 1,500 pounds (6672 N) at each end joist as shown in Figures R507.2 and R507.9.2.1(1). Where floor joists and deck joists do not align, threaded rods shall be permitted to offset as shown in Figure R507.9.2.1(2) and per the manufacturer of the hold-down or tension device system. Reinforcing angles shall have a minimum capacity of 375 pounds (1668 N) and shall not be required where the floor sheathing is attached to the floor joists with fasteners at 6 inches (152 mm) on center.



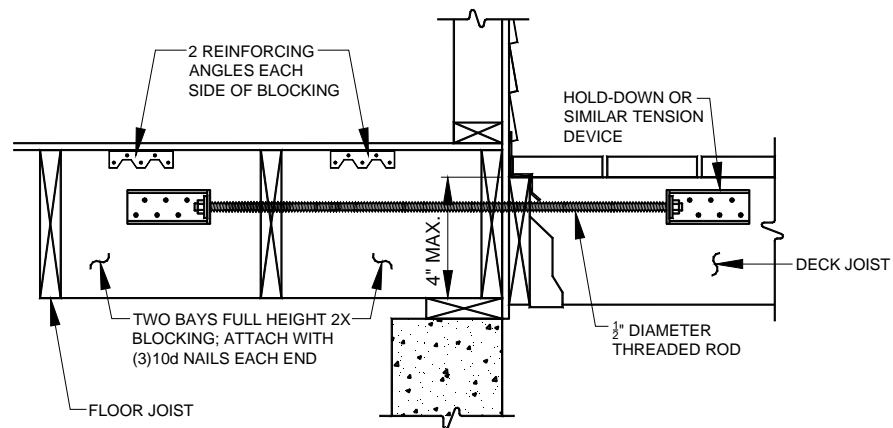
For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm

**FIGURE R507.9.2.1(1)  
CONNECTION AT PARALLEL JOISTS**



**FIGURE R507.9.2.1(2)**  
**OFFSET AT PARALLEL JOISTS**

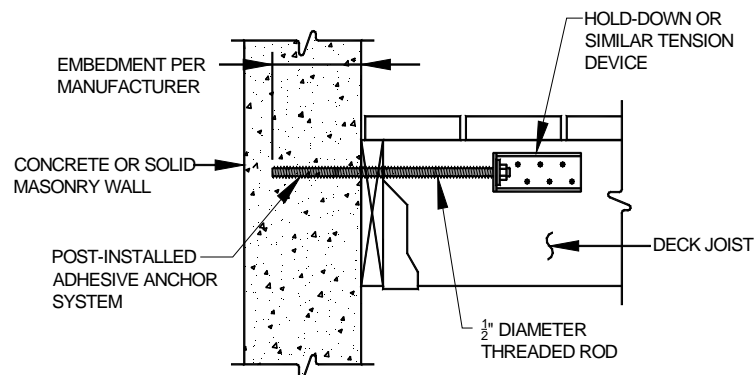
**R507.9.2.2 Connection at perpendicular joists.** Where floor joists and deck joists are perpendicular, provide a hold-down or similar tension device with a minimum capacity of 1,500 pounds (6672 N) at each end joist and blocking between floor joists as shown in Figure R507.9.2.2. Reinforcing angles shall have a minimum capacity of 375 pounds (1668 N) and shall not be required where the floor sheathing is attached to the floor joists with fasteners at 6 inches (152 mm) on center.



For SI: 1 inch = 25.4 mm

**FIGURE R507.9.2.2**  
**LATERAL SUPPORT WHERE INTERIOR JOIST PERPENDICULAR TO DECK**

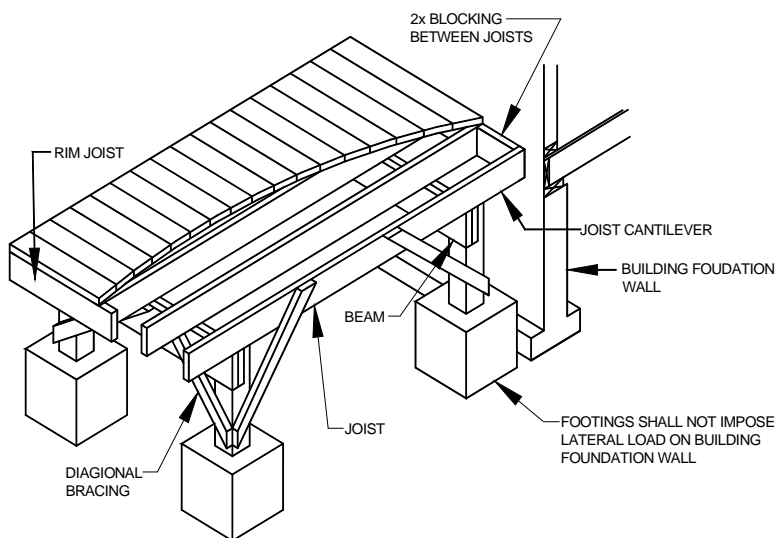
**R507.9.2.3 Connection at solid foundation wall.** Where decks are attached to concrete or solid masonry foundation walls, provide a hold-down or similar tension device as shown in Figure R507.9.2.3. Post-installed adhesive anchor system shall have a pull-out capacity of 1,500 pounds (6672 N). Embedment length and installation shall be per the manufacturer. Holes through the ledger board shall be protected to prevent water intrusion.



For SI: 1 inch = 25.4 mm

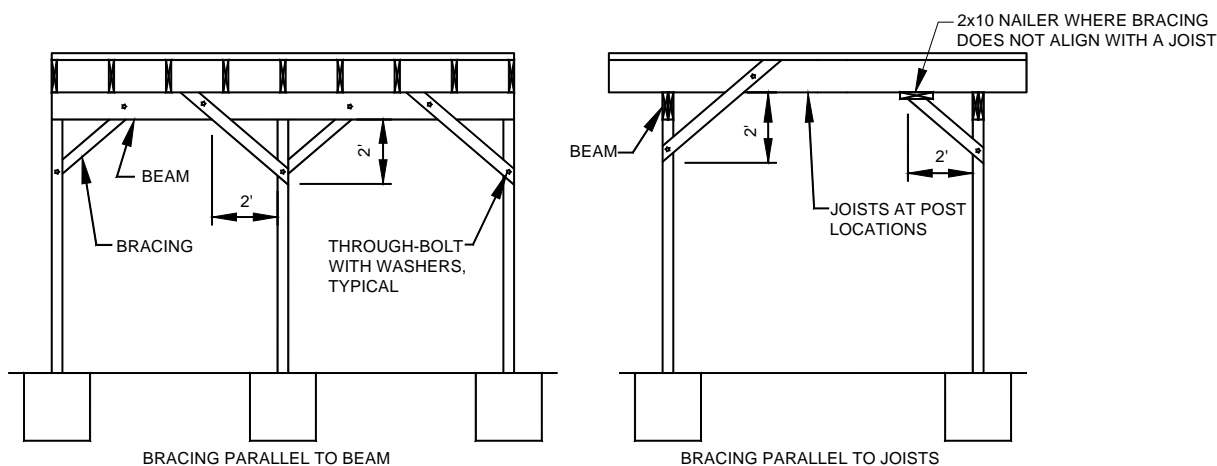
**FIGURE R507.9.2.3**  
**LATERAL SUPPORT TO SOLID FOUNDATION WALL**

**R507.10 Free-standing decks.** As shown in Figure R507.10, free-standing decks shall have an additional beam and posts adjacent the building exterior wall in place of a ledger board attachment. The beam shall be sized in accordance with Section R507.6 and shall be located adjacent the exterior wall or at a maximum distance equal to the allowable joist cantilever.



**FIGURE R507.10  
FREE-STANDING DECK**

**R507.10.1 Diagonal bracing.** Diagonal bracing shall be installed on free-standing decks greater than 30 inches (762 mm) above grade in accordance with Figure R507.10.1. Bracing shall be placed at each post location in the parallel and perpendicular directions to the beam. Bracing shall be a minimum of nominal 2x4 lumber and shall be fastened to framing with one ½ inch (12 mm) diameter through bolt with washers at each end. Where bracing does not align with a joist, a 2x10 nailer shall be fastened to the underside of joists with 2-10d nails at each joist. Bracing shall be fastened to the nailer with 3-10d toe nails.

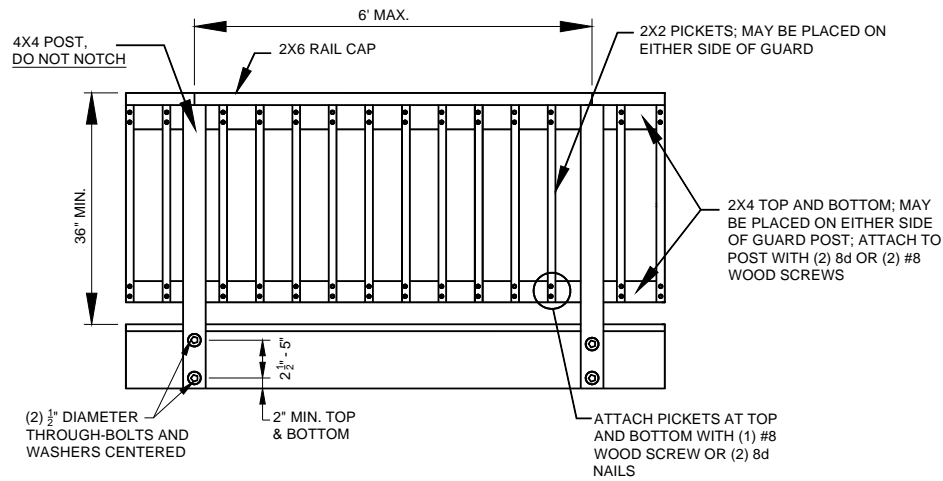


For SI: 1 foot = 304.8 mm

**FIGURE R507.10.1  
FREE-STANDING DECK DIAGONAL BRACING**

**R507.12 Deck guards.** Deck guards shall be constructed in accordance with Section R312, Figure R507.12 and this section. Alternate guards and guard systems shall comply with Section R507.2.

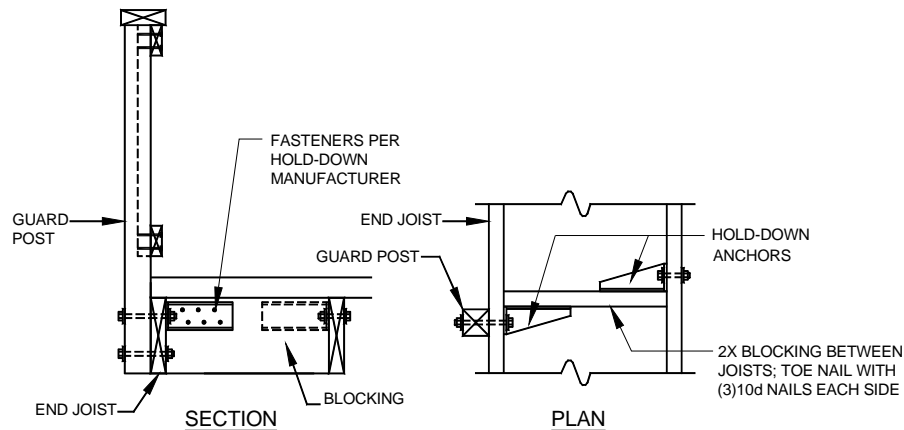




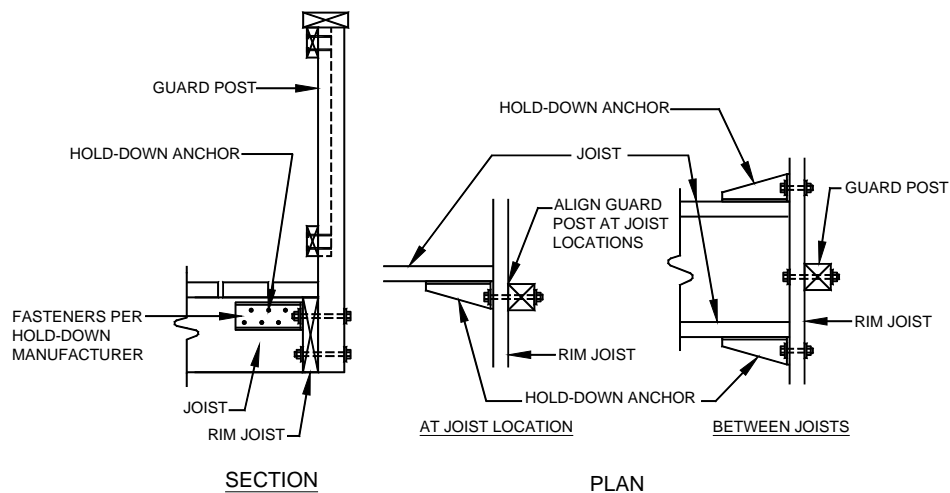
For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm

**FIGURE R507.12  
DECK GUARD**

**R507.12.1 Guard post attachment.** Guard posts shall be attached to the inside or outside face of the rim joists or end joists in accordance with Figure R507.12.1(1) and R507.12.1(2). Hold-down anchors shall have a minimum capacity of 1,800 pounds (8006 N).



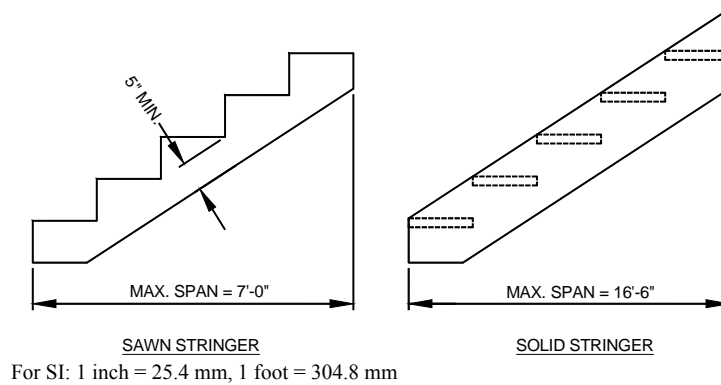
**FIGURE R507.12.1(1)  
GUARD POST TO END JOIST**



**FIGURE R507.12.1(2)  
GUARD POST TO RIM JOIST**

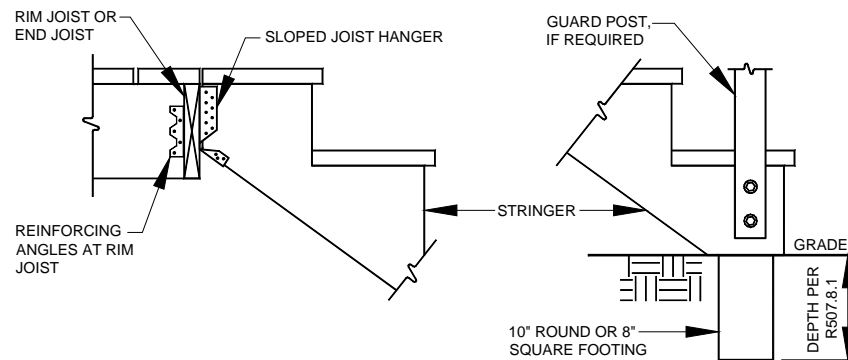
**R507.13 Deck stairs.** Deck stairs shall be constructed in accordance with this section and Section R311.7. Where a flight of stairs has a vertical rise greater than that required per Section R311.7.3, an intermediate landing shall be provided in accordance with Section R311.7.6 and designed as a free-standing deck in accordance with Section R507.10.

**R507.13.1 Stair stringers.** Stair stringers shall be constructed of sawn nominal 2x12 members at 18 inches (457 mm) on center with a throat dimension of 5 inches (127 mm) and a maximum span length as shown in Figure R507.13.1. Stairs with a width equal to 36 inches (914 mm) shall be permitted to be constructed with two solid 2x12 stringers with a maximum span length as shown in Figure R507.13.1.



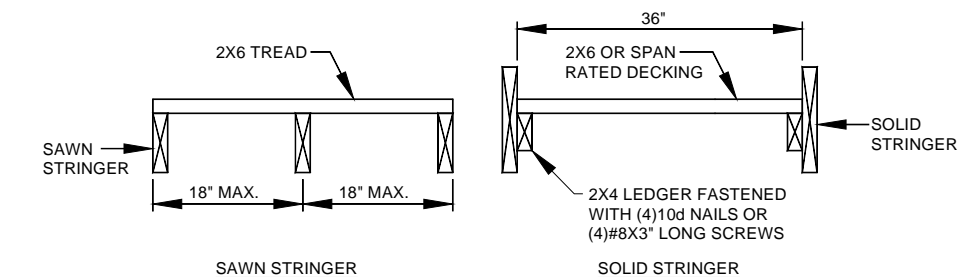
**FIGURE R507.13.1**  
**STAIR STRINGER REQUIREMENTS**

**R507.13.2 Stringer bearing.** Stringers shall bear on joist hangers attached to the deck structure and on footings at grade in accordance with Figure R507.13.2. Joist hangers shall be specifically designed to accommodate sloped connections and shall have a minimum capacity of 625 pounds (2780 N). Reinforcing angles at rim joist locations only shall have a minimum capacity of 325 pounds (1446 N).



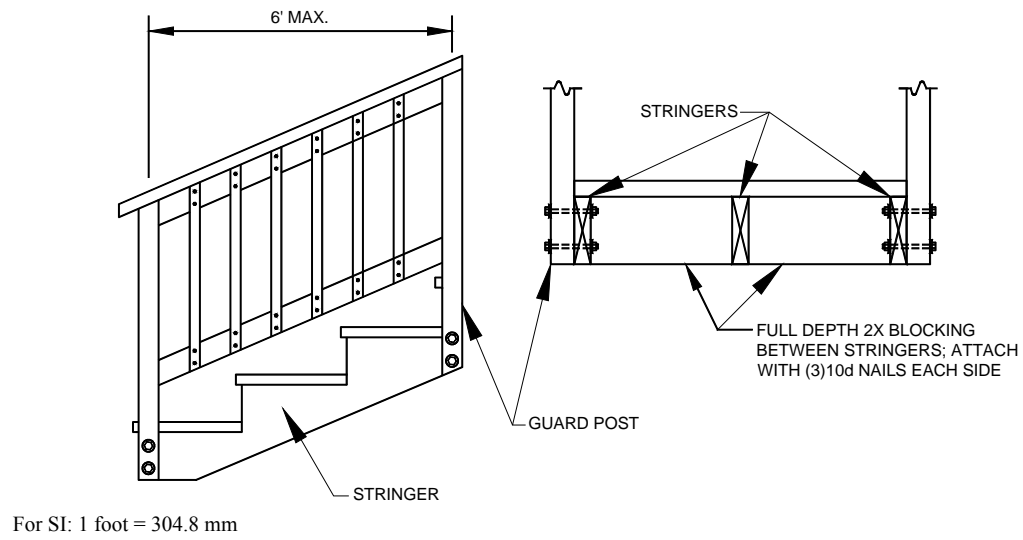
**FIGURE R507.13.2**  
**STRINGER BEARING**

**R507.13.3 Treads and risers.** Stair treads shall be constructed in accordance with this section and Figure R507.13.3. Treads shall be composed of nominal 2x6 lumber. Treads of stairs constructed with solid stringers shall be permitted to be composed of span rated decking. Risers shall be permitted to be composed of nominal 1x lumber. Openings in risers shall not allow the passage of a 4 inch (102 mm) diameter sphere.



**FIGURE R507.13.3**  
**TREAD REQUIREMENTS**

**R507.13.4 Stair guard.** Guards for stairs shall be required per Section R312.1.1 and constructed in accordance with Section R507.12. The attachment of a stair guard post to the stringers shall be constructed in accordance with Figure R507.13.4.



**FIGURE R507.13.4**  
**STAIR GUARD CONNECTION**