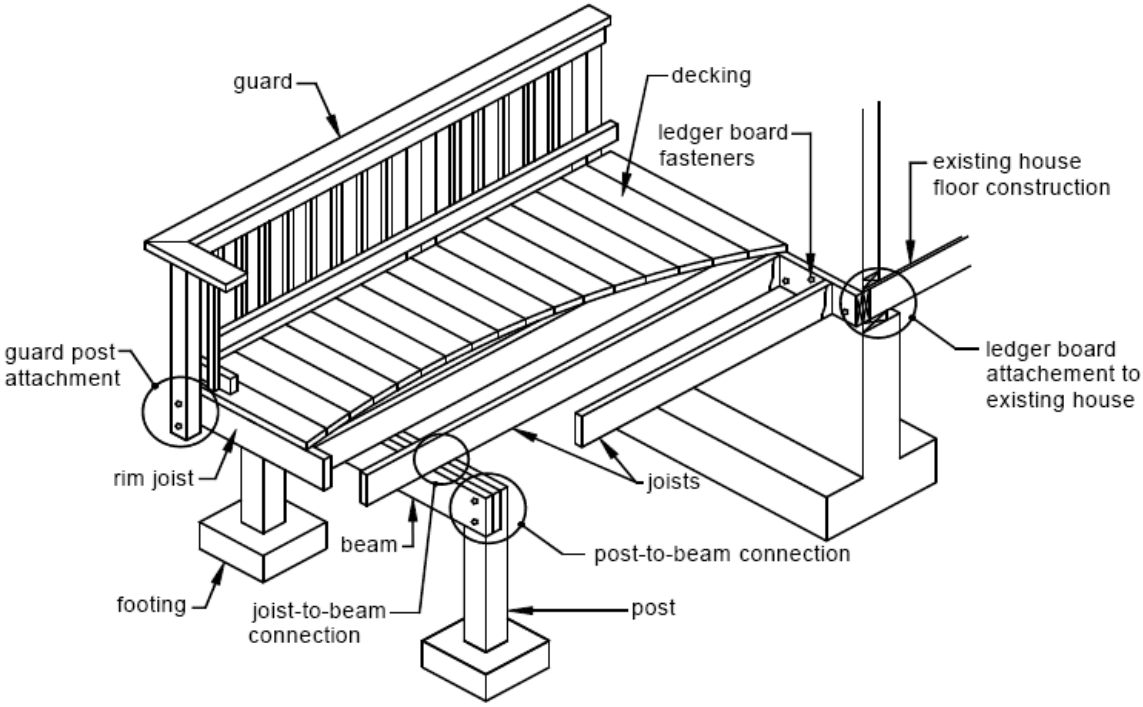
Shenandoah Co. Deck Installation Guide

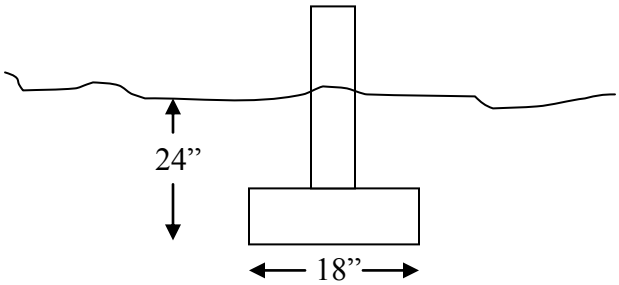
(With 2009 IRC Code Changes)



All residential decks constructed in Shenandoah County must comply with the 2009 International Residential Code (IRC) and the 2009 Virginia Uniform Statewide Building Code amendments to the 2009 IRC. This guide is for general assistance and specific questions and concerns must be addressed on **your submitted construction drawings**. To apply for a building permit you will need two sets of construction drawings. You will be asked to provide a copy of your Zoning Approval if your project is located in one of the towns located in Shenandoah County. If your project is located in the county you will be asked to complete a **Zoning Application** when you apply for your building permit. You will also be asked to provide all contractor information if you are not building this deck yourself.

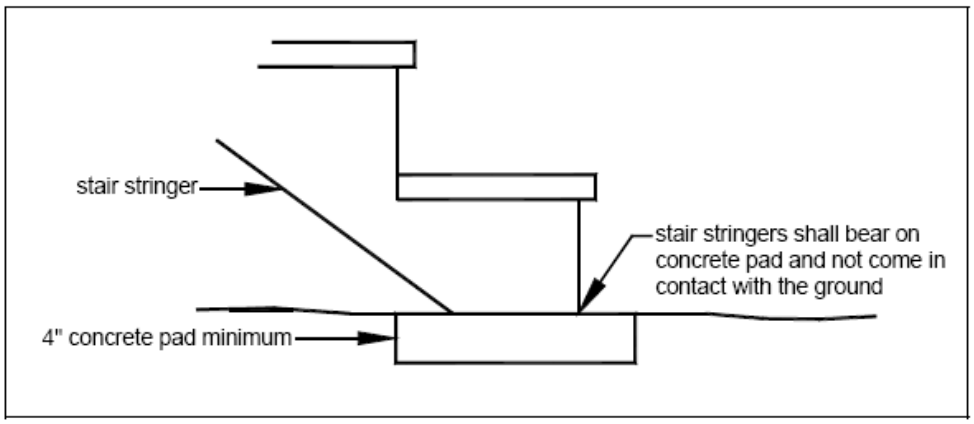
The following information is provided for your assistance in preparing your construction drawings for review and approval by this office. Any questions may be addressed by calling our office at 540-459-6185.

Foundations



Footings

The typical deck foundation used can be square or round with a minimum cross dimension of 18 inches. The minimum thickness of this pier footing is 6 inches. The bottom of this footing must be placed below the established frost line of 24 inches. Note, on smaller structures the size of this pier can be reduced based on the load-bearing values of the soil. Manufactured products like *Deck Plugs* can be used when following their manufacture design requirements. Some products on the market today do not meet the minimum standard. Please evaluate these products carefully before any purchase. Support for stair landing columns and bottom of stringers with 4 or more risers must be on a frost depth footing. The bottom of stair stringers with less than 4 risers may be supported on a concrete pad four inches thick and flush with the surface.

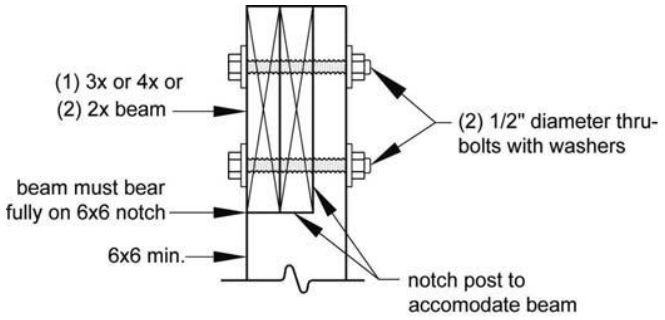


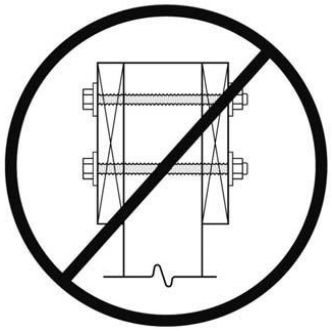
This illustration is for stair stringers with not more than 3 rises.

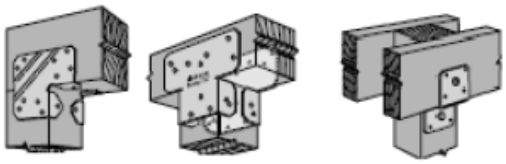
Framing

All framing must be with approved naturally durable wood or wood that in preservative treated in accordance with AWPA U1 standards. All ground contact treated wood must be listed for such use. All field cut ends, notches, and drilled holes *must be treated* in the field in accordance with an approved AWPA M4 treatment.
Update 9/21/2010:
Deck Post 6x6 minimum for beam/girder support is recommended. The use of 4x4 post are approved with approved post to beam connectors. Post length greater than 14 ft. from top of footing to beam/girder for 6x6 post and 6 ft. for 4x4 post connections must be an approved engineered design.

Beam Connection to Column







Approved post to beam connectors

Update 8/11/2010
Floor Joist
Floor joist shall be connected by use of approved joist hangers approved for both support and uplift protection. The use of toenails or nails subject to withdrawal shall not be used.

R502.2.2 Decks. 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 as applicable. Such attachment shall not be accomplished by the use of toenails or nails subject to withdrawal. Where positive connection to the primary building structure cannot be verified during inspection, decks shall be self-supporting. For decks with cantilevered framing members, connections 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

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 m) 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.

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.
Update 11/10/10
The use of other approved manufactured connectors allowed per manufacture specifications.

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 FigureR502.2.2.3. 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).

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

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[a, f, g]
(Deck live load = 40 psf, deck dead load = 10 psf)

JOIST SPAN	6' and less	6'1" to 8'	8'1" to 10'	10'1" to 12'	12'1" to 14'	14'1" to 16'	16'1" to 18'
Connection details	On-center spacing of fasteners[d, e]						
1/2 inch diameter lag screw with 15/32 inch maximum sheathing[a]	30	23	18	15	13	11	10
1/2 inch diameter bolt with 15/32 inch maximum sheathing	36	36	34	29	24	21	19
1/2 inch diameter bolt with 15/32 inch maximum sheathing and 1/2 inch stacked washers[b, h]	36	36	29	24	21	18	16

For SI: 1 inch = 25.4 mm, 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 1/2".

c. Ledgers shall be flashed to prevent water from contacting the house band joist.

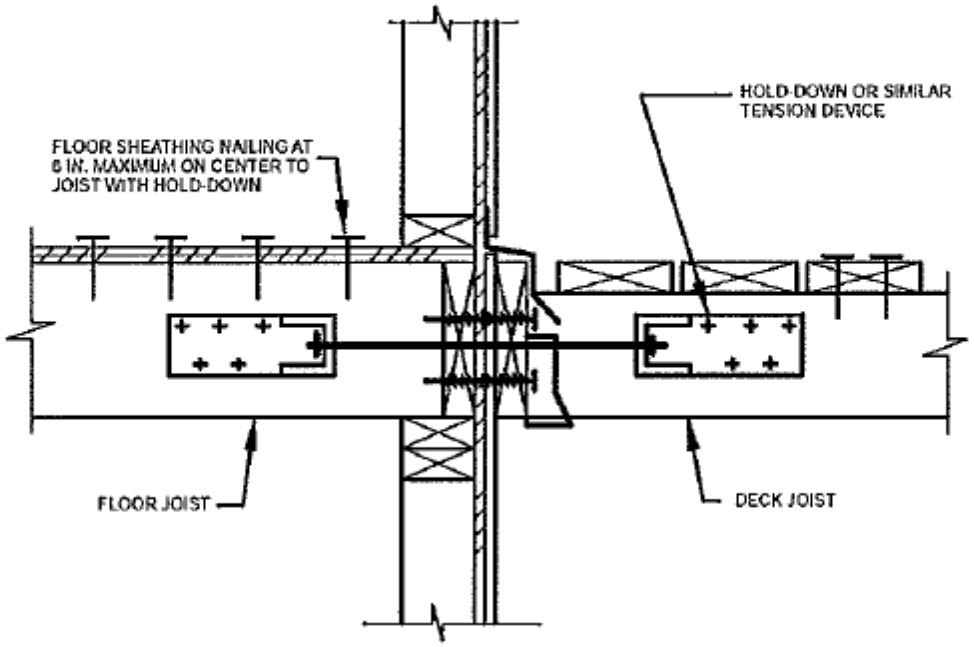
d. Lag screws and bolts shall be staggered in accordance with Section R502.2.2.1.1.

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 × 9 1/2 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.



Figurer R502.2.2.3

Flashing

House siding, or the exterior finish system, must be removed prior to the installation of the ledger board. Flashing is required at any ledger board connection to a wall of wood framed construction and shall be composed of copper (attached using copper nails), stainless steel, UV resistant plastic or galvanized steel coated with 1.85 oz/sf of zinc (G-185 coating)

Floor Framing

Treated SYP Span Table

TABLE 14 WET-SERVICE FLOOR JOISTS – 40 PSF LIVE LOAD, 10 PSF DEAD LOAD, 360 DEFLECTION

DECKS; MOISTURE CONTENT EXCEEDS 19%

Size (inches)	Spacing (inches on center)	Grade									
		Visually Graded				Machine Stress Rated (MSR)			Machine Evaluated Lumber (MEL)		
		SS	No.1	No.2	No.3	2400f - 2.0E	2250f - 1.9E	1950f - 1.7E	M23	M14	M29
2x6	12.0	10-9	10-7	10-4	9-4	11-2	11-0	10-7	10-9	10-7	10-7
	16.0	9-9	9-7	9-5	8-1	10-2	10-0	9-7	9-9	9-7	9-7
	19.2	9-2	9-0	8-9	7-4	9-6	9-4	9-0	9-2	9-0	9-0
	24.0	8-7	8-5	7-10	6-7	8-10	8-8	8-5	8-7	8-5	8-5
2x8	12.0	14-2	13-11	13-8	11-11	14-8	14-5	13-11	14-2	13-11	13-11
	16.0	12-11	12-8	12-5	10-3	13-4	13-2	12-8	12-11	12-8	12-8
	19.2	12-2	11-11	11-4	9-5	12-7	12-4	11-11	12-2	11-11	11-11
	24.0	11-3	11-1	10-2	8-5	11-8	11-6	11-1	11-3	11-1	11-1
2x10	12.0	18-1	17-9	17-5	14-0	18-9	18-5	17-9	18-1	17-9	17-9
	16.0	16-5	16-2	15-10	12-2	17-0	16-9	16-2	16-5	16-2	16-2
	19.2	15-6	15-1	14-8	11-1	16-0	15-9	15-2	15-6	15-2	15-2
	24.0	14-4	13-6	13-1	9-11	14-11	14-8	14-1	14-4	14-1	14-1
2x12	12.0	22-0	21-7	21-2	16-8	22-10	22-5	21-7	22-0	21-7	21-7
	16.0	20-0	19-8	18-10	14-6	20-9	20-4	19-8	20-0	19-8	19-8
	19.2	18-10	17-11	17-2	13-2	19-6	19-2	18-6	18-10	18-6	18-6
	24.0	17-6	16-1	15-5	11-10	18-1	17-10	17-2	17-6	17-2	17-2

Girder Sizing Table

Table 3. Deck Beam Spans (L_B)[1]

Species	Size	Joist Spans (L_J) Less Than or Equal to: 6'	8'	10'	12'	14'	16'	18'
Southern Pine	2-2x6	7' - 1"	6' - 2"	5' - 6"	5' - 0"	4' - 8"	4' - 4"	4' - 1"
	2-2x8	9' - 2"	7' - 11"	7' - 1"	6' - 6"	6' - 0"	5' - 7"	5' - 3"
	2-2x10	11' - 10"	10' - 3"	9' - 2"	8' - 5"	7' - 9"	7' - 3"	6' - 10"
	2-2x12	13' - 11"	12' - 0"	10' - 9"	9' - 10"	9' - 1"	8' - 6"	8' - 0"
	3-2x6	8' - 7"	7' - 8"	6' - 11"	6' - 3"	5' - 10"	5' - 5"	5' - 2"
	3-2x8	11' - 4"	9' - 11"	8' - 11"	8' - 1"	7' - 6"	7' - 0"	6' - 7"
	3-2x10	14' - 5"	12' - 10"	11' - 6"	10' - 6"	9' - 9"	9' - 1"	8' - 7"
	3-2x12	17' - 5"	15' - 1"	13' - 6"	12' - 4"	11' - 5"	10' - 8"	10' - 1"

Floor cantilevers.

Floor cantilever spans shall not exceed the nominal depth of the wood floor joist. Floor cantilevers supporting an exterior balcony are permitted to be constructed in accordance with Table R502.3.3(2). This table can also be used for deck cantilever with proper uplift connections (joist hangers) at the house ledger board connection. Solid blocking is required at the cantilever support (girder).

TABLE R502.3.3(2)
CANTILEVER SPANS FOR FLOOR JOISTS SUPPORTING EXTERIOR BALCONY[a, b, e, f]

Member Size	Spacing	Maximum Cantilever Span (Uplift Force at Backspan Support in lb)[c, d]		
		Ground Snow Load		
		≤ 30 psf	50 psf	70 psf
2 × 8	12″	42″ (139)	39″ (156)	34″ (165)
2 × 8	16″	36″ (151)	34″ (171)	29″ (180)
2 × 10	12″	61″ (164)	57″ (189)	49″ (201)
2 × 10	16″	53″ (180)	49″ (208)	42″ (220)
2 × 10	24″	43″ (212)	40″ (241)	34″ (255)
2 × 12	16″	72″ (228)	67″ (260)	57″ (268)
2 × 12	24″	58″ (279)	54″ (319)	47″ (330)

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

a. Spans are based on No. 2 Grade lumber of Douglas fir-larch, hem-fir, southern pine, and spruce-pine-fir for repetitive (3 or more) members.

b. Ratio of backspan to cantilever span shall be at least 2:1.

c. Connections capable of resisting the indicated uplift force shall be provided at the backspan support.

d. Uplift force is for a backspan to cantilever span ratio of 2:1. Tabulated uplift values are permitted to be reduced by multiplying by a factor equal to 2 divided by the actual backspan ratio provided (2/backspan ratio).

e. A full-depth rim joist shall be provided at the cantilevered end of the joists. Solid blocking shall be provided at the cantilevered support.

f. Linear interpolation shall be permitted for ground snow loads other than shown.

Stairway, Handrails, Illumination, & Guarding Requirements

Stairways As modified by the Virginia USBC

Riser height. The maximum riser height shall be 8-1/4 inches (210 mm). The riser shall be measured vertically between the leading edges of the adjacent treads. The greatest riser height within any flight of stairs shall not exceed the smallest by more than 3/8 inch (9.5 mm).

Tread depth. The minimum tread depth shall be 9 inches (229 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 3/8 inch (9.5 mm). Winder treads shall have a minimum tread depth of 10 inches (254 mm) measured as above at a point 12 inches (305 mm) from the side where the treads are narrower. Winder treads shall have a minimum tread depth of 6 inches (152 mm) at any point. Within any flight of stairs, the greatest winder tread depth at the 12 inch (305 mm) walk line shall not exceed the smallest by more than 3/8 inch (9.5 mm).

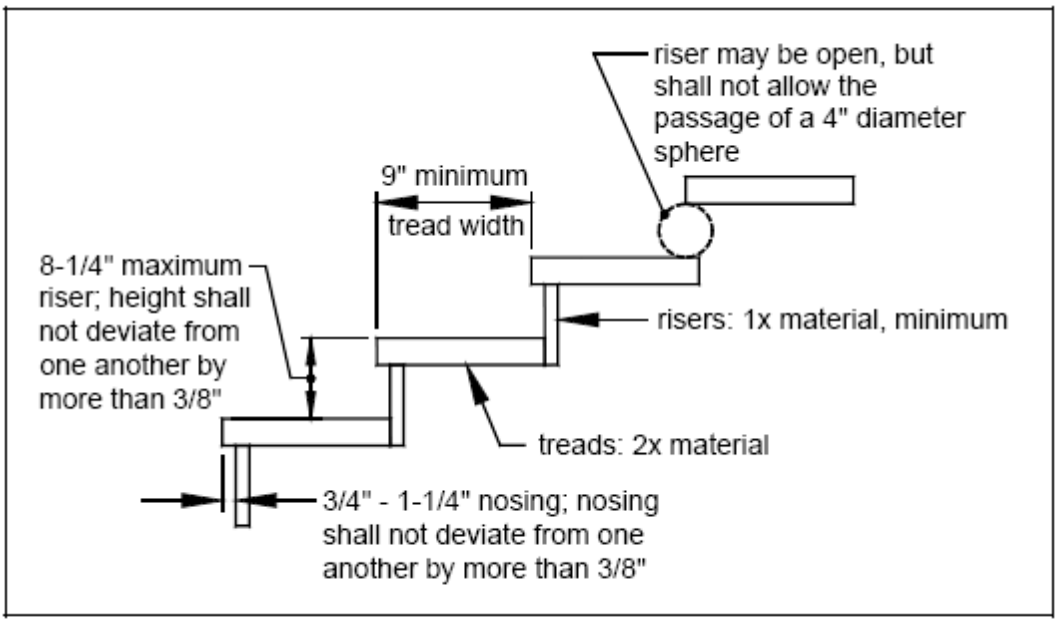


FIGURE 32: TREAD AND RISER DETAIL

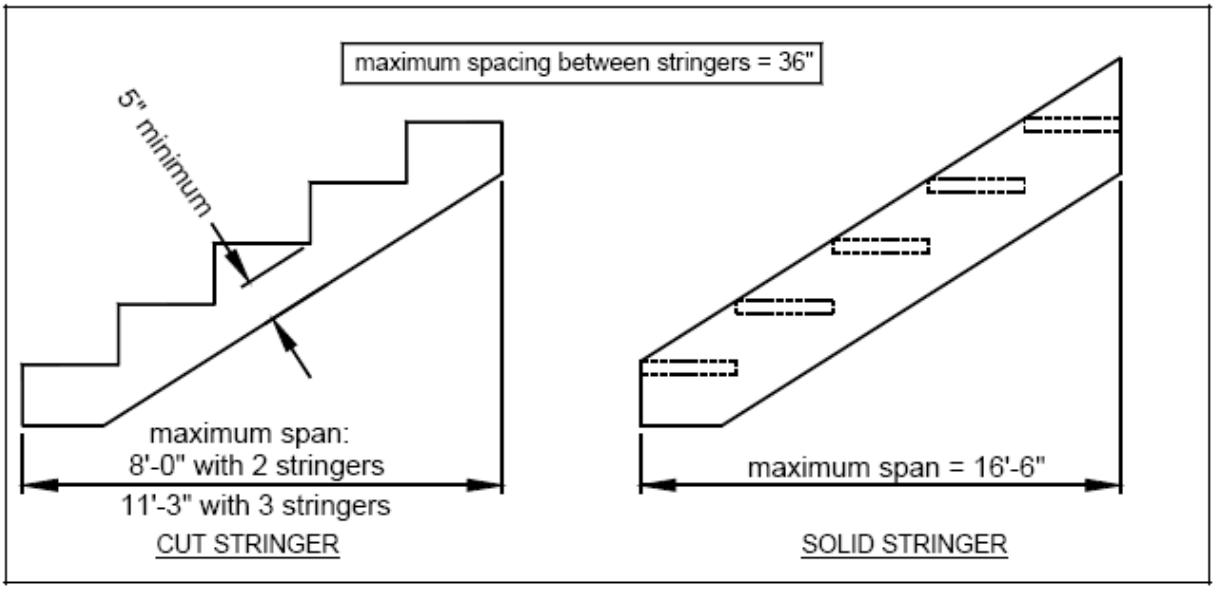


FIGURE 33: STAIR STRINGER REQUIREMENTS

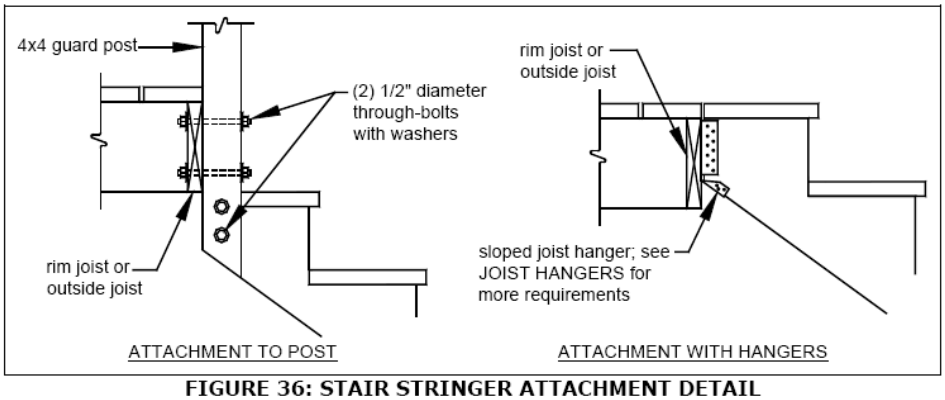
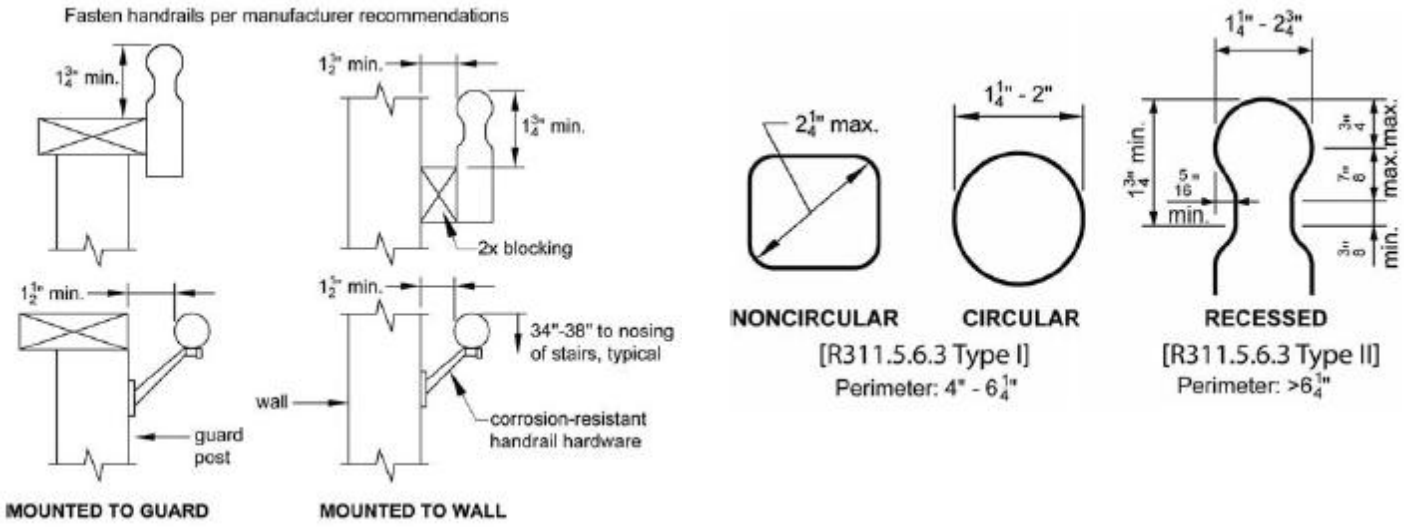


FIGURE 36: STAIR STRINGER ATTACHMENT DETAIL

Handrails.

Handrails shall be provided on at least one side of each continuous run of treads or flight with four or more risers.
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).
Continuity. Handrails for stairways 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. Handrails adjacent to a wall shall have a space of not less than 11/2 inch (38 mm) between the wall and the handrails.
Handrail grip size. All 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 at least 11/4 inches (32 mm) and not greater than 2 inches (51 mm). If the handrail is not circular it shall have a perimeter dimension of at least 4 inches (102 mm) and not greater than 61/4 inches (160 mm) with a maximum cross section of dimension of 21/4 inches(57 mm).
2. Type II. Handrails with a perimeter greater than 61/4 inches (160 mm) shall provide a graspable finger recess area on both sides of the profile. The finger recess shall begin within a distance of 3/4 inch (19 mm) measured vertically from the tallest portion of the profile and achieve a depth of at least 5/16 inch (8 mm) within 7/8 inch (22 mm) below the widest portion of the profile. This required depth shall continue for at least 3/8 inch (10mm)to a level that is not less than 13/4 inches (45 mm) below the tallest portion of the profile. The minimum width of the handrail above the recess shall be 11/4 inches (32 mm) to a maximum of 2-3/4 inches (70 mm). Edges shall have a minimum radius of 0.01 inch (0.25 mm).



Illumination.

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.

Guarding

Porches, balconies, ramps or raised floor surfaces located more than 30 inches (762 mm) above the floor or grade below shall have guards not less than 36 inches (914 mm) in height. Open sides of stairs with a total rise of more than 30 inches (762 mm) above the floor or grade below shall have guards not less than 34 inches (864 mm) in height measured vertically from the nosing of the treads.

Porches and decks which are enclosed with insect screening shall be equipped with guards where the walking surface is located more than 30 inches (762 mm) above the floor or grade below.

Guard opening limitations. Required guards on open sides of stairways, raised floor areas, balconies and porches shall have intermediate rails or ornamental closures which do not allow passage of a sphere 4 inches (102mm) or more in diameter.
Exceptions:
1. The triangular openings formed by the riser, tread and bottom rail of a guard at the open side of a stairway are permitted to be of such a size that a sphere 6 inches (152 mm) cannot pass through.
2. Openings for required guards on the sides of stair treads shall not allow a sphere 4 3/8 inches (107 mm) to pass through.

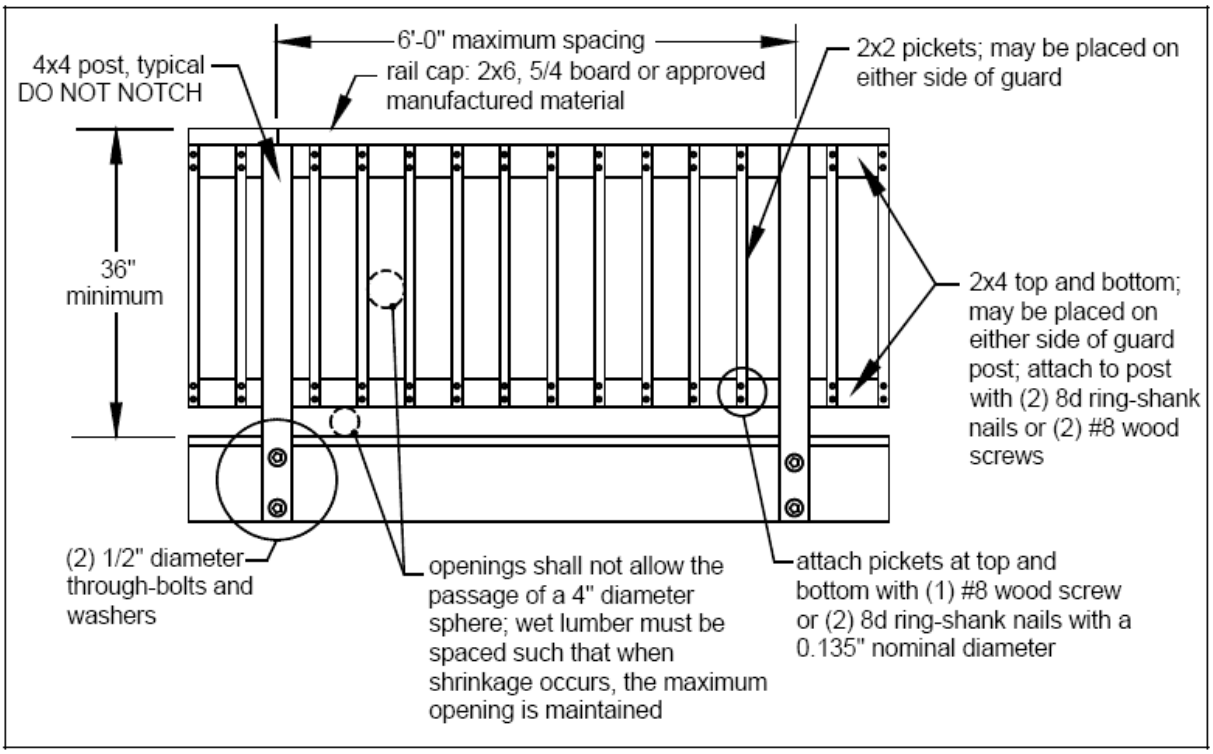


FIGURE 25: TYPICAL GUARD DETAIL

Glazing and Guarding Requirements

(Note; the glazing requirements may require the replacement of existing windows and doors when a new deck is constructed)

Glazing adjacent to stairways, landings and ramps within 36 inches (914 mm) horizontally of a walking surface when the exposed surface of the glass is less than 60 inches (1524 mm) above the plane of the adjacent walking surface.

Glazing adjacent to stairways within 60 inches (1524 mm) horizontally of the bottom tread of a stairway in any direction when the exposed surface of the glass is less than 60 inches (1524 mm) above the nose of the tread.

Component Loading

MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS (in pounds per square foot)
USE LIVE LOAD

Decks	40
Exterior balconies	60
Guardrails and handrails (a)	200
Guardrails in–fill components	50
Stairs	40

(a) A single concentrated load applied in any direction at any point along the top.

Deck designs for concentrated loading such as *Hot Tubs* will require more detailed information for the additional loading to the deck.

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Note, this information is for general deck construction specifications only. Your project may have unique design characteristics that may require more specific information. Please call this office at 540-459-6185 for more information.