



Residential Deck Guide

The Following is a prescriptive guide to residential decks per the requirements of Pa uniform construction code. **Section 403.61** of the PA UCC mandates that installation of decks other than uncovered decks no more than 30” above grade require a permit, furthermore individual local municipalities may elect to amend the PA Ucc requiring more stringent requirements beyond those implemented by the UCC. The following guide has been put together in an attempt to bring together the most misunderstood elements of the building code(s) regarding the construction of residential decks. Elements of this document are obtained from the 2015 International Residential Code, 1993 Boca code (stair Geometry) and AWC prescriptive guide for wood decks.

R507.1 Decks.

Wood-framed decks shall be in accordance with this section or Section R301 for materials and conditions not prescribed herein. 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. 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.

R507.2 Deck ledger connection to band joist.

Deck ledger connections to band joists shall be in accordance with this section, Tables R507.2 and R507.2.1, and Figures R507.2.1(1) and R507.2.1(2). For other grades, species, connection details and loading conditions, deck ledger connections shall be designed in accordance with Section R301.

TABLE R507.2

DECK LEDGER CONNECTION TO BAND JOIST a, b

(Deck live load = 40 psf, deck dead load = 10 psf, snow load £ 40 psf)

CONNECTION DETAILS	JOIST SPAN						
	6' and less	6'1" - 8'	8'1" - 10'	10'1" - 12'	12'1" - 14'	14'1" - 16'	16'1" - 18'
	On Center Spacing						
1/2-inch diameter lag screw with 1/2-inch maximum sheathing c, d	30	23	18	15	13	11	10
1/2-inch diameter bolt with 1/2-inch maximum Sheathing d	36	36	34	29	24	21	19
1/2-inch diameter bolt with 1-inch maximum Sheathing e	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. Ledgers shall be flashed in accordance with Section R703.8 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 1/2-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.

R507.2.1 Ledger details.

Deck ledgers installed in accordance with Section R507.2 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 installed in accordance with Section R507.2 **shall not** support concentrated loads from **beams or girders**. Deck ledgers shall not be supported on **stone or masonry veneer**.

TABLE 507.2.1

PLACEMENT OF LAG SCREWS AND BOLTS IN DECK LEDGERS AND BAND JOISTS

MINIMUM END AND EDGE DISTANCES AND SPACING BETWEEN ROWS				
	Top Edge	Bottom Edge	Ends	Row Spacing
Ledger <i>note a</i>	2 Inches <i>note d</i>	3/4 Inch	2 Inches <i>note b</i>	1 5/8 Inches <i>note b</i>
Band Joist <i>note c</i>	¾ Inch	2 Inches	2 Inches <i>note b</i>	1 5/8 Inches <i>note b</i>

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 R507.2.1(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 R507.2.1(1).

R507.2.2 Band joist details.

Band joists attached by a ledger in accordance with Section R507.2 shall be a minimum 2-inch-nominal (51 mm), solid-sawn, spruce-pine-fir lumber or a minimum 1-inch by 9 1/2-inch (25 mm ´ 241 mm) dimensional, Douglas fir, laminated veneer lumber. Band joists attached by a ledger in accordance with Section R507.2 shall be fully supported by a wall or sill plate below.

R507.2.3 Ledger to band joist fastener details.

Fasteners used in deck ledger connections in accordance with Table R507.2 shall be hot-dipped galvanized or stainless steel and shall be installed in accordance with Table R507.2.1 and Figures R507.2.1(1) and R507.2.1(2).

R507.2.4 Deck lateral load connection.

The lateral load connection required by Section R507.1 shall be permitted to be in accordance with Figure R507.2.3(1) or R507.2.3(2). Where the lateral load connection is provided in accordance with Figure R507.2.3(1), hold-down tension devices shall be installed in not less than two locations per deck, within 24 inches 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 R507.2.3(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).

R507.3 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 D 7032 and the requirements of Section 507.3.

R507.3.1 Labeling.

Plastic composite deck boards and stair treads, or their packaging, shall bear a label that indicates compliance to ASTM D 7032 and includes the allowable load and maximum allowable span determined in accordance with ASTM D 7032. Plastic or composite handrails and guards, or their packaging, shall bear a label that indicates compliance to ASTM D 7032 and includes the maximum allowable span determined in accordance with ASTM D 7032.

R507.3.2 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 E 84 or UL 723 with the test specimen remaining in place during the test.

Exception: Plastic composites determined to be noncombustible.

R507.3.3 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 D 7032.

R507.3.4 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 D 7032.

507.3.5 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.

R507.4 Decking.

Maximum allowable spacing for joists supporting decking shall be in accordance with Table R507.4. Wood decking shall be attached to each supporting member with not less than (2) 8d threaded nails or (2) No. 8 wood screws.

**TABLE R507.4
MAXIMUM JOIST SPACING**

MATERIAL TYPE AND NOMINAL SIZE	MAXIMUM ON-CENTER JOIST SPACING	
	Perpendicular to joist	Diagonal to joist α
1 1/4-inch-thick wood	16 inches	12 inches
2-inch-thick wood	24 inches	16 inches
Plastic composite	In accordance with Section R507.3	In accordance with Section R507.3

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

R507.5 Deck joists.

Maximum allowable spans for wood deck joists, as shown in Figure R507.5, shall be in accordance with Table R507.5. Deck joists shall be permitted to cantilever not greater than one-fourth of the actual, adjacent joist span.

R507.5.1 Lateral restraint at supports.

Joist ends and bearing locations shall be provided with lateral restraint 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 less than (3) 10d (3-inch x 0.128-inch) nails or (3) No. 10 x 3-inch (76 mm) long wood screws.

TABLE R507.5
DECK JOIST SPANS FOR COMMON LUMBER SPECIES *f* (ft. - in.)

SPECIES <i>a</i>	SIZE	SPACING OF DECK JOISTS WITH NO CANTILEVER <i>b</i> (inches)			SPACING OF DECK JOISTS WITH CANTILEVERS <i>c</i> (inches)		
		12" o.c.	16" o.c.	24" o.c.	12" o.c.	16" o.c.	24" o.c.
Southern Pine	2x6	9'-11"	9'-0"	7'-7"	6'-8"	6'-8"	6'-8"
	2x8	13'-1"	11'-10"	9'-8"	10'-1"	10'-1"	9'-8"
	2x10	16'-2"	14'-0"	11'-5"	14'-6"	14'-0"	11'-5"
	2x12	18'-0"	16'-6"	13'-6"	18'-0"	16'-6"	13'-6"
Douglas Fir-Larch <i>d</i> , Hem- Fir <i>d</i> , spruce-pine-fir <i>d</i>	2x6	9'-6"	8'-8"	7'-2"	6'-3"	6'-3"	6'-3"
	2x8	12'-6"	11'-1"	9'-1"	9'-5"	9'-5"	9'-1"
	2x10	15'-8"	13'-7"	11'-1"	13'-7"	13'-7"	11'-1"
	2x12	18'-0"	15'-9"	12'-10"	18'-0"	15'-9"	12'-10"
Redwood, Western cedars, ponderosa pine <i>e</i> , red pine	2x6	8'-10"	8'-0"	7'-0"	5'-7"	5'-7"	5'-7"
	2x8	11'-8"	10'-7"	8'-8"	8'-6"	8'-6"	8'-6"
	2x10	14'-11"	13'-0"	10'-7"	12'-3"	12'-3"	10'-7"
	2x12	17'-5"	15'-1"	12'-4"	16'-5"	15'-1"	12'-4"

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.

- No. 2 grade with wet service factor.
- Ground snow load, live load = 40 psf, dead load = 10 psf, L/D = 360.
- Ground snow load, live load = 40 psf, dead load = 10 psf, L/D = 360 at main span, L/D = 180 at cantilever with a 220-pound point load applied to end.
- Includes incising factor.
- Northern species with no incising factor
- Cantilevered spans not exceeding the nominal depth of the joist are permitted.

R507.6 Deck Beams.

Maximum allowable spans for wood deck beams, as shown in Figure R507.6, shall be in accordance with Table R507.6. 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 permitted to cantilever at each end up to one-fourth of the actual beam span. Splices of multispan beams shall be located at interior post locations.

Deck Beam Spans are Per the 2018 IRC, See attached Chart

Species <i>c</i>	Size <i>d</i>	Deck Joist spans less than or equal to: (feet and inches)						
		6	8	10	12	14	16	18
Southern Pine	1-2x6	4-11	4-0	3-7	3-3	3-0	2-10	2-8
	1-2x8	5-11	5-1	4-7	4-2	2-10	3-7	3-5
	1-2x10	7-0	6-0	5-5	4-11	4-7	4-3	4-0
	1-2x12	8-3	7-1	6-4	5-10	5-5	5-0	4-9
	2-2x6	6-11	5-11	5-4	4-10	4-6	4-3	4-0
	2-2x8	8-9	7-7	6-9	6-2	5-9	5-4	5-0
	2-2x10	10-4	9-0	8-0	7-4	6-6	6-4	6-0
	2-2x12	12-2	10-7	9-5	8-7	8-0	7-6	7-0
	3-2x6	8-2	7-5	6-8	6-1	5-8	5-3	5-0
	3-2x8	10-10	9-6	8-6	7-9	7-2	6-8	6-4
	3-2x10	13-0	11-3	10-0	9-2	8-6	7-11	7-6
3-2x12	15-3	13-3	11-10	10-9	10-0	9-4	8-10	
Douglas Fir-Larch <i>e</i> , Hem- Fir <i>e</i> , Spruce-Pine-Fir <i>e</i> , Redwood, Western Cedars, Ponderosa Pine <i>f</i> , Red Pine <i>f</i>	3x6 or 2-2x6	5-5	4-8	4-2	3-10	3-6	3-1	2-9
	3x8 or 2-2x8	6-10	5-11	5-4	4-10	4-6	4-1	3-8
	3x10 or 2-2x10	8-4	7-3	6-6	5-11	5-6	5-1	4-8
	3x12 or 2-2x12	9-8	8-5	7-6	6-10	6-4	5-11	5-7
	4x6	6-5	5-6	4-11	4-6	4-2	3-11	3-8
	4x8	8-5	7-3	6-6	5-11	5-6	5-2	4-10
	4x10	9-11	8-7	7-8	7-0	6-6	6-1	5-8
	4x12	11-5	9-11	8-10	8-1	7-6	7-0	6-7
	3-2x6	7-4	6-8	6-0	5-6	5-1	4-9	4-6
	3-2x8	9-8	8-6	7-7	6-11	6-5	6-0	5-8
	3-2x10	12-0	10-5	9-4	8-6	7-10	7-4	6-11
	3-2x12	13-11	12-1	10-9	9-10	9-1	8-6	8-1

R507.7 Deck joist and deck beam bearing.

The ends of each joist and beam shall have not less than 1 1/2 inches (38 mm) of bearing on wood or metal and not less than 3 inches (76 mm) on concrete or masonry for the entire width of the beam. Joist framing into the side of a ledger board or beam shall be supported by approved joist hangers. Joists bearing on a beam shall be connected to the beam to resist lateral displacement.

R507.7.1 Deck post to deck beam.

Deck beams shall be attached to deck posts in accordance with Figure R507.7.1 or by other equivalent means capable to resist lateral displacement. Manufactured post-to-beam connectors shall be sized for the post and beam sizes. All bolts shall have washers under the head and nut.

Exception: Where deck beams bear directly on footings in accordance with Section R507.8.1.

R507.8 Deck posts.

For single-level wood-framed decks with beams sized in accordance with Table R507.6, deck post size shall be in accordance with the following

DECK POST SIZE **MAXIMUM HEIGHT** see note a.

4 x 4	nominal	8'
4 x 6	nominal	8'
6 x 6	nominal	14'

For SI: 1 foot = 304.8 mm.

a. Measured to the underside of the beam.

R507.8.1 Deck post to deck footing.

Posts shall bear on footings in accordance with Section R403 and Figure R507.8.1. Posts shall be restrained to prevent lateral displacement at the bottom support. Such lateral restraint shall be provided by manufactured connectors installed in accordance with Section R507 and the manufacturers' instructions or a minimum post embedment of 12 inches (305 mm) in surrounding soils or concrete piers.

Other Code Requirements per the 2015 IRC**R303.8 Exterior stairway illumination.**

Exterior stairways shall be provided with an artificial light source located at the top landing of the stairway. Exterior stairways providing access to a basement from the outdoor grade level shall be provided with an artificial light source located at the bottom landing of the stairway.

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. Landings of shapes other than square or rectangular shall be permitted provided that the depth at the walk line and the total area is 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.

Handrails**R311.7.8 Handrails.**

Handrails shall be provided on not less than one side of each continuous run of treads or flight 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).

R311.7.8.2 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 1 1/2 inches (38 mm) between the wall and the handrails.

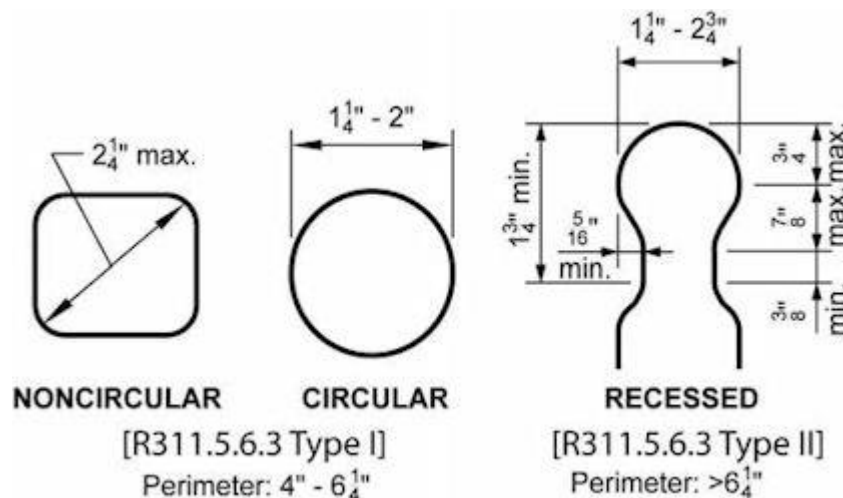
Exceptions:

1. Handrails shall be permitted to be interrupted by a newel post at the turn.
2. The use of a volute, turnout, starting easing or starting newel shall be allowed over the lowest tread.

R311.7.8.3 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 dimension of not less than 4 inches (102 mm) and not greater than 6 1/4 inches (160 mm) with a cross section of dimension 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 a distance of 3/4 inch (19 mm) measured vertically from the tallest portion of the profile and achieve a depth of not less than 5/16 inch (8 mm) within 7/8 inch (22 mm) below the widest portion of the profile. This required depth shall continue for not less than 3/8 inch (10 mm) to a level that is not less than 1 3/4 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).



Railing/ Guards

R312.1.1 Where required.

Guards shall be located along 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 36 inches (914 mm) in height as measured vertically above the adjacent walking surface or the line connecting the leading edges of the treads.

Exceptions:

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

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.

R317.1.1 Field treatment.

Field-cut ends, notches and drilled holes of preservative-treated wood shall be treated in the field in accordance with AWPA M4.

E3901.7 Outdoor outlets.

Not less than one receptacle outlet that is readily accessible from grade level and located not more than 6 feet, 6 inches (1981 mm) above grade, shall be installed outdoors at the front and back of each dwelling unit having direct access to grade level. Balconies, decks, and porches that are accessible from inside of the dwelling unit shall have at least one receptacle outlet installed within the perimeter of the balcony, deck, or porch. The receptacle shall be located not more than 6 feet, 6 inches (1981 mm) above the balcony, deck, or porch surface. [210.52(E)]

Stair Geometry per 1993 Boca

- (a) The maximum riser height is 8 ¼” There may be no more than 3/8-inch variation in riser height is to be measured vertically between leading edges of the adjacent treads
- (b) The minimum tread depth is 9” measured from tread nosing to tread nosing
- (c) The greatest depth within any flight of stairs may not exceed the smallest by more than 3/8 inch
- (d) All treads may have a uniform projection of not more than 1 ½” when solid risers are used
- (e) Stairways may not be less than 3’ in clear width and a clear headroom of 6’8” shall be maintained for the entire run of the stair
- (f) Handrails may project from each side of a stairway a distance of 3 ½” into the required width of the stair

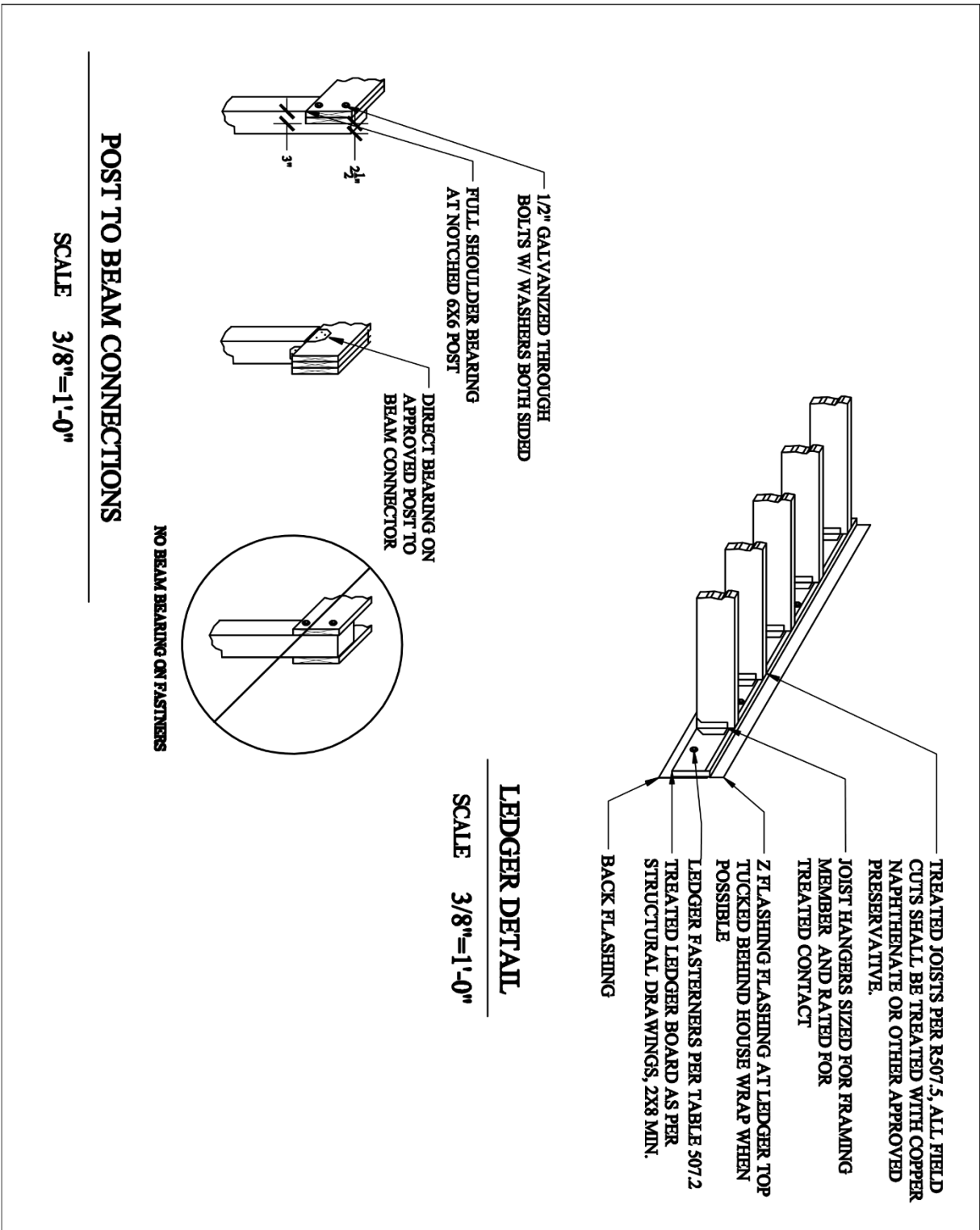
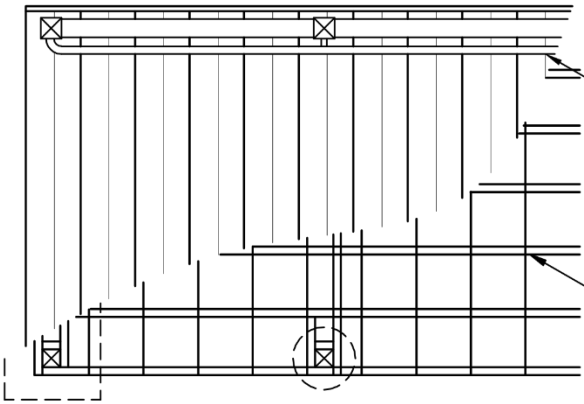


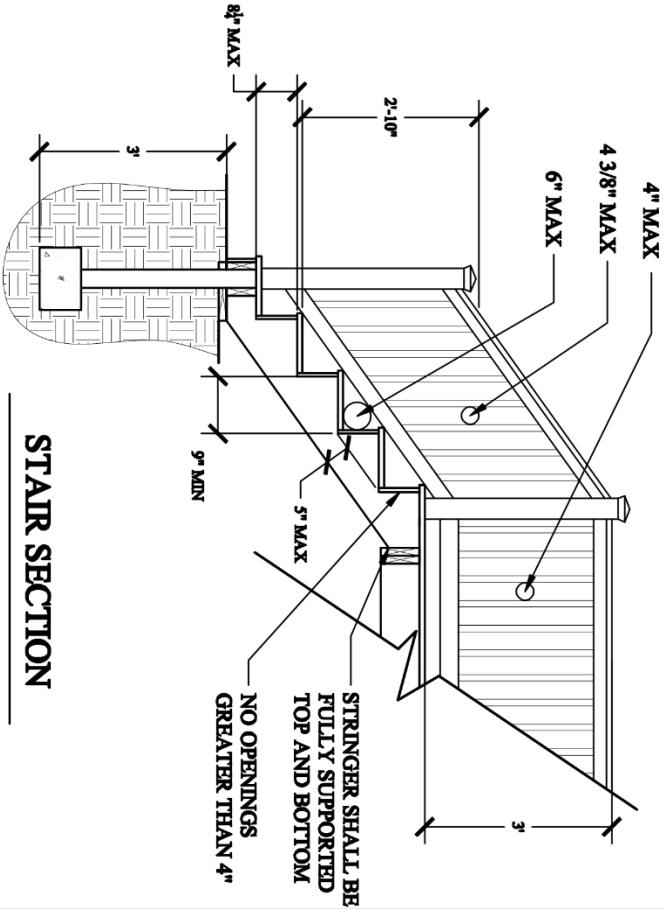
Figure 507.7.1



GRASPABLE HANDRAIL SHALL BE CONTINUOUS AND RETURN TO POSTS TOP AND BOTTOM

2X12 STRINGERS MAX SPACING
16" O.C. W/ 5/4" TREATED DECKING
12" O.C. W/ COMPOSITE
OR PER MANUFACTURER SPEC

STAIR DETAIL
SCALE 3/8"=1'-0"



STRINGER SHALL BE FULLY SUPPORTED TOP AND BOTTOM
NO OPENINGS GREATER THAN 4"

STAIR SECTION
SCALE 3/8"=1'-0"

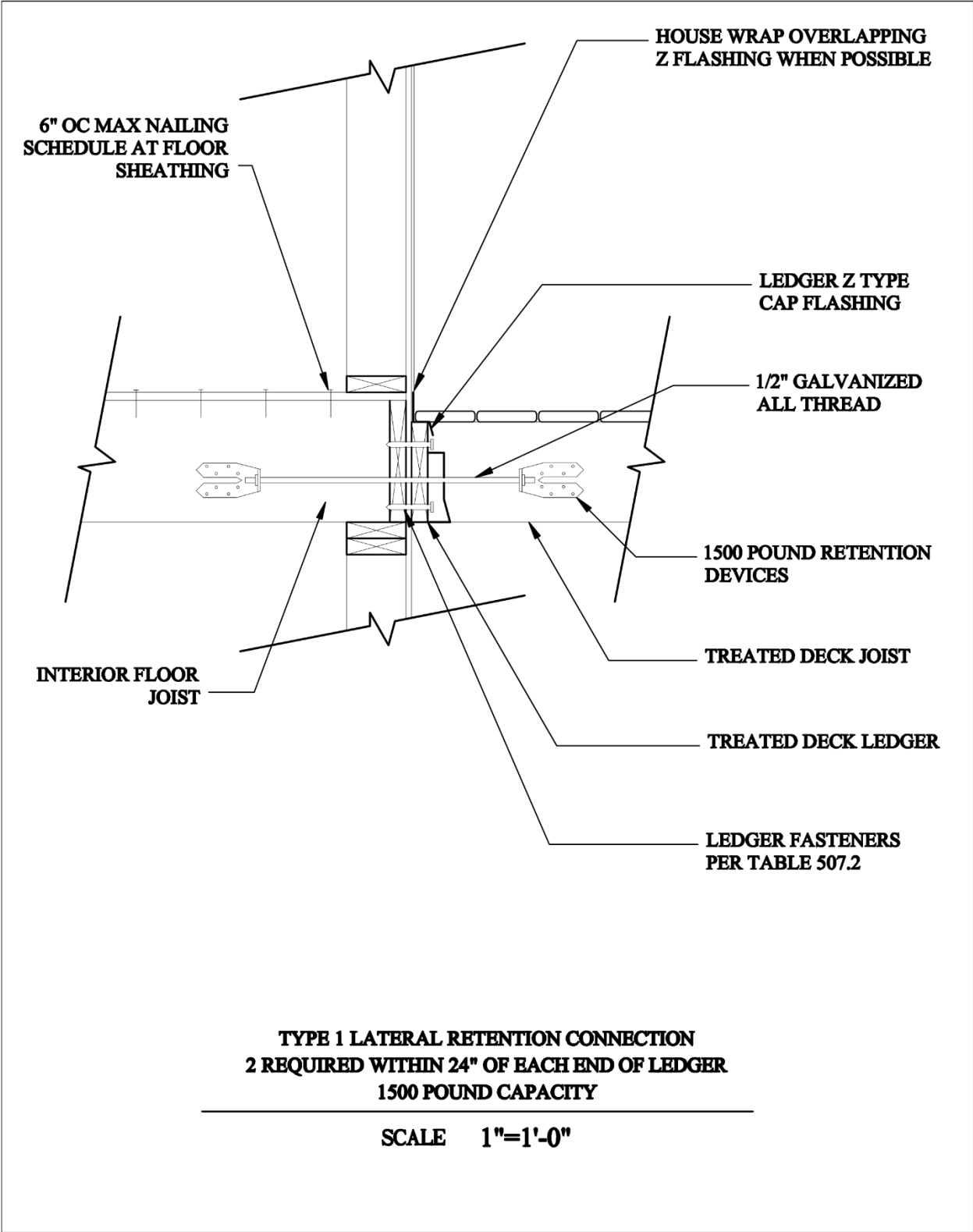


Figure 507.2.3(1)

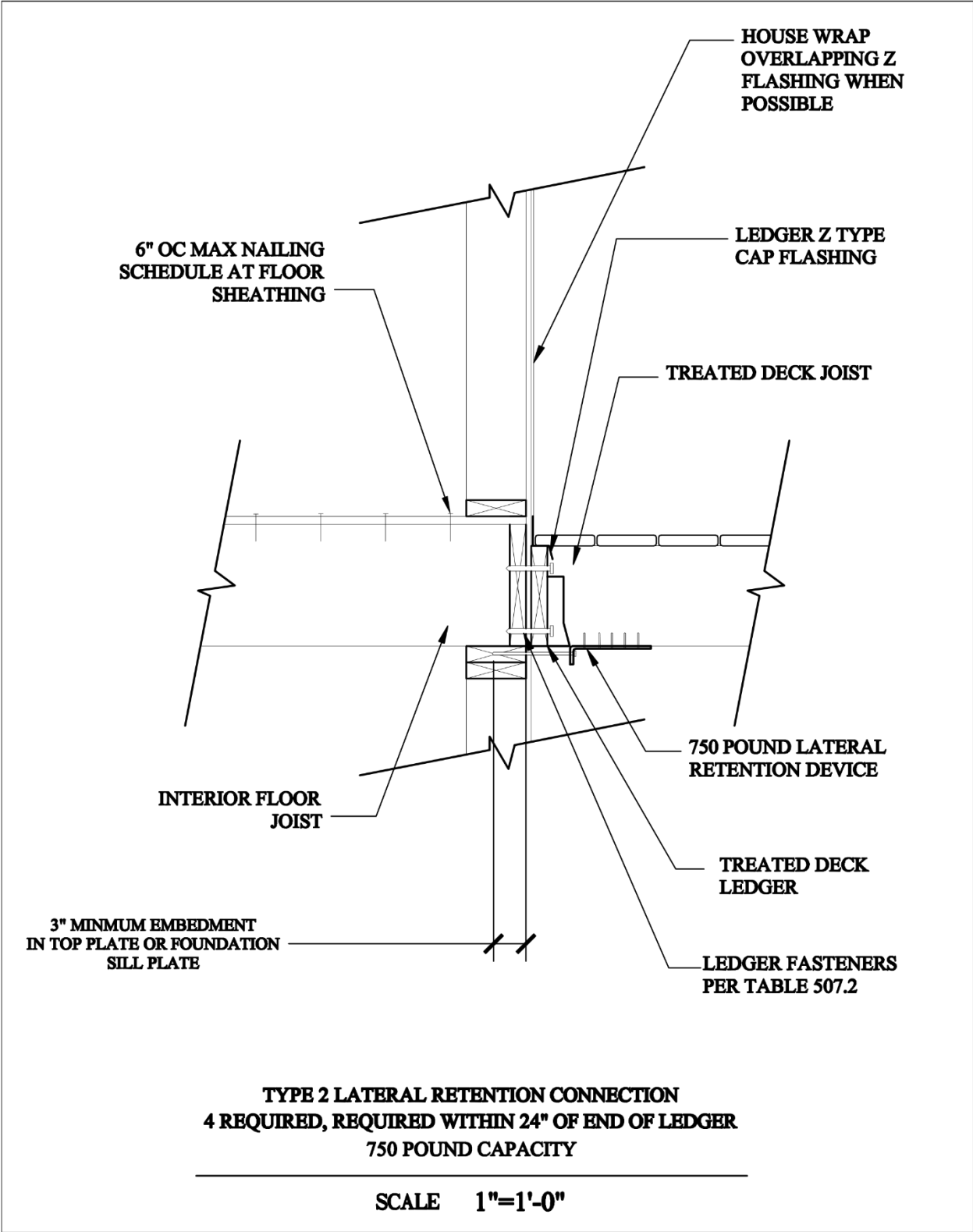


Figure 507.2.3(2)