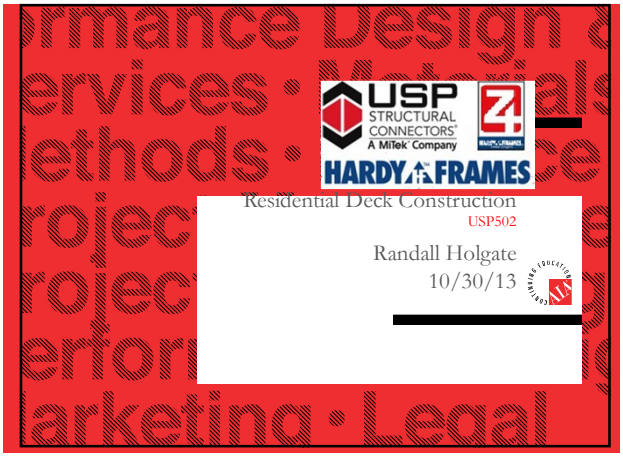
Commercial intro

- USP , starting as TECO in 1933, the Original connector company, now owned by MiTek, a Berkshire Hathaway Co. and the leader in whole house design software and truss and component fabrication machinery wants you to turn to us for solutions for single and multi-family structures from free deck design sftware, to beams, shear walls and All Thrd. rod systems for hi wind and seismic areas.

All You need to write down

- www.USPconnectors.com
- Rholgate@mii.com
- 770-362-9288



Notes to Designers and Bldg. Officials

- Please be aware that this course has been created to provide continuing education to a broad spectrum of architects, engineers, building designers and building officials and inspectors.
- Some states and enforcement jurisdictions have adopted amendments to ICC codes referenced here that address more stringent construction practices or local practices wherein the municipality has intimate knowledge and has incorporated that into the local code.
- USP urges caution to contact local code agencies for exact codes with amendments in effect for the construction site.

Credit(s) earned on completion of this course will be reported to AIA CES for AIA members. Certificates of Completion for both AIA members and non-AIA members are available upon request.

This course is registered with AIA CES for continuing professional education. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the AIA of any material of construction or any method or manner of handling, using, distributing, or dealing in any material or product.

Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

Course Description

This course covers a brief overview of the structural code requirements of International Residential Code® (IRC) for residential wood deck construction. Learn about the code, design requirements, and good industry practice recommendations

Learning Objectives

At the end of the this course, participants will be able to:

1. Recognize how decks live in a tough environment and detailing is critical
2. Learn code specific loads that apply to a deck
3. Choosing the correct connection for each section of a deck
4. Fastener and connector selection, load capacity and corrosion issues

Residential Decks

Why worry about decks?

#1) Very common building elements.

#2) Often built by often homeowners.

#3) Includes technically challenging details.

#4) Exposed to brunt of the weather for the life of the structure.

#5) Failures are very high profile – often with injuries- even death.

Residential Decks

- Statistics*
  - 40, 000,000 decks in the US over 20 years old
    - If just 1% unsafe, 40,000 potential problems
  - 2000 – 2006 Deck Related Incidents
    - 30 deaths
    - 350 injuries
    - 75% of persons involved in a deck collapse likely to be killed or injured

*Source North American Deck and Railing Association

Deck Statistics

"Decks cause more injuries and loss of life than any other part of the home structure. Except for hurricanes and tornadoes, more injuries may be connected to deck failures than all other wood building components and loading cases combined."

-Don Bender, Director of Wood Materials and Engineering Laboratory at Washington State University

Residential Decks

Picture of homeowner building deck.

Residential Decks

Decks live in a tough environment

Pressure Treated Lumber

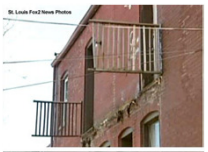
- **UC3B ABOVE GROUND Exposed** -- Wood and wood based materials used in exterior construction and not in contact with the ground. Materials do not require an exterior coating, but may be finished to achieve a desired aesthetic appearance. Materials are used for a variety of applications in either horizontal and vertical positions such as **decking**, sills, walkways**, railings and fence pickets**

- **UC4A GROUND CONTACT General Use** -- Wood and wood-based materials used in contact with the ground, fresh water, or other situations favorable to deterioration. Examples are fence posts, **deck posts**, guardrail posts, structural lumber, timbers and utility poles located in regions of low natural potential for wood decay and insect attack.

Not Pressure Treated

Deck Safety

Failures



Deck Safety

What is a Deck.

Deck Safety

When do I have to get a building permit?

R105.2 Work exempt from permit.

Permits shall not be required for the following. *Exemption from permit requirements of this code shall not be deemed to grant authorization for any work to be done in any manner in violation of the provisions of this code or any other laws* or ordinances of this jurisdiction.

Building:

10. Decks not exceeding 200 square feet in area, that are not more than 30 inches above grade at any point, are not attached to a dwelling and do not serve the exit door required by Section R311.4.

Deck Safety

Deck near grade.

Deck Construction

Materials used in the construction of a deck

Wood, Plastic and Metal

Deck Construction

Structural Lumber for outdoor durability

AWPA Use Category	Service Conditions	Use Environment	Example Applications	Preservatives and Retentions[4,7]
UC1	Interior construction, Above ground, Dry	Continuously protected from weather or other sources of moisture	General framing, interior construction	Untreated
UC2	Interior construction, Above ground, Damp	Protected from weather, but may be subject to sources of moisture	Sill plates	SBX-DOT, Organic ACQ-D (0.25), CA-B (0.10), CA-C (0.06), MCQ (0.25), µCA-C (0.05)
UC3A	Exterior construction, Above ground, Rapid water runoff	Exposed to all weather cycles, not exposed to prolonged wetting	Exposed exterior beams or columns in an open, covered structure	ACQ-D (0.25), MCQ (0.25), CA-B (0.10), CA-C (0.06), µCA-C (0.05), Organic
UC3B	Exterior construction, Above ground, Poor water runoff	Exposed to all weather cycles, including prolonged wetting	Deck beams and joists	ACQ-D (0.25), MCQ (0.25), CA-B (0.10), CA-C (0.06), µCA-C (0.05), Organic
UC4A	Exterior construction, Ground contact, General use	Ground contact or fresh water exposed to all weather cycles	Deck posts	ACQ-D (0.40), MCQ (0.40), CA-B (0.21), CA-C (0.15), µCA-C (0.14)
UC4B	Exterior construction, Ground contact, Critical structural	Ground contact, fresh or salt water exposed to all weather cycles	Permanent wood foundations, critical structural members	ACQ-D (0.60), MCQ (0.60), CA-B (0.31), CA-C (0.25), µCA-C (0.23)

Deck Construction

Naturally decay resistive species of lumber:

The USDA Forest Products Laboratory "Wood Handbook", lists heartwood of the following species as "Resistant or very resistant" to decay:

Bald cypress (old growth only)	Black locust	Post oak
Catalpa	Mesquite	White oak
Cedars Red	Mulberry	Osage orange
Black cherry	Bur oak	Redwood
Chestnut	Chestnut oak	Sassafras
Arizona cypress	Gambel oak	Black walnut
Junipers	Oregon white oak	Pacific yew

Deck Construction

R507.3 Wood/plastic composites.

Wood/plastic composites used in exterior deck boards, stair treads, handrails and guardrail systems *shall bear a label* indicating the required performance levels and demonstrating compliance with the provisions of ASTM D 7032.

R507.3.1 Installation of wood/plastic composites.

Wood/plastic composites shall be installed in accordance with the manufacturer's instructions.

Deck Construction

R507.3 Wood/plastic composites.

Wood/plastic composites used in exterior deck boards, stair treads, handrails and guardrail systems shall bear a label indicating the required performance levels and demonstrating compliance with the provisions of ASTM D 7032.

Deck Construction

R317.3.1 Fasteners for preservative-treated wood.

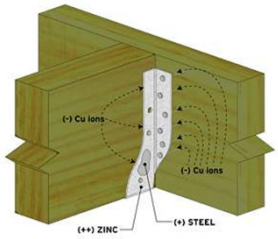
Fasteners, including nuts and washers, for preservative-treated wood shall be of hot-dipped, zinc-coated galvanized steel, stainless steel, silicon bronze or copper. Coating types and weights for connectors in contact with preservative-treated wood shall be in accordance with the connector manufacturer's recommendations. In the absence of manufacturer's recommendations, a minimum of ASTM A 653 type G185 zinc-coated galvanized steel, or equivalent, shall be used.

Exceptions:

1. One-half-inch-diameter (12.7 mm) or greater steel bolts.
2. Fasteners other than nails shall be permitted to be of mechanically deposited zinc-coated steel with coating weights in accordance with ASTM B 695, Class 55 minimum.

Deck Safety

Connector Corrosion

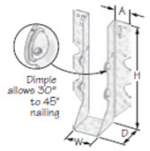


Deck Safety

G-185

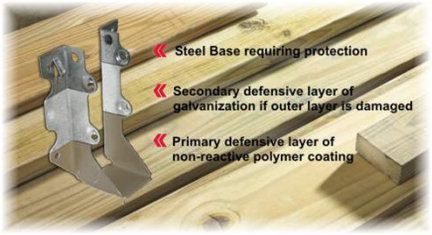
Heavy Galvanizing

Conventional Hangers



Deck Safety

Organic Polymer Coating



Deck Safety

Stainless Steel

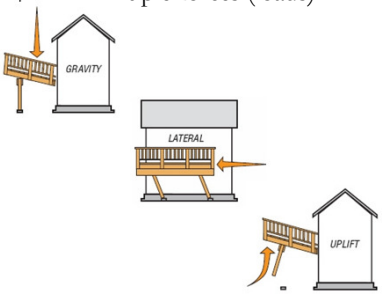
Maximum Corrosion

Resistance

STAINLESS STEEL

Deck Design Loads

- Decks are subject to multiple forces (loads)
  - Gravity
  - Lateral
  - Uplift



Deck Design Loads

.

TABLE R301.5
MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS
(In pounds per square foot)

USE	LIVE LOAD
Uninhabitable attics without storage[b]	10
Uninhabitable attics with limited storage[b, g]	20
Habitable attics and attics served with fixed stairs	30
Balconies (exterior) and decks[e]	40
Fire escapes	40
Guardrails and handrails[d]	200[h]
Guardrail in-fill components[f]	50[h]
Passenger vehicle garages[a]	50[a]
Rooms other than sleeping room	40
Sleeping rooms	30
Stairs	40[c]

For SI: 1 pound per square foot = 0.0479 kPa, 1 square inch = 645 mm^2, 1 pound = 4.45 N.

a. Elevated garage floors shall be capable of supporting a 2,000-pound load applied over a 20-square-inch area.
b. Uninhabitable attics without storage are those where the maximum clear height between joists and rafters is less than 42 inches, or where there are no two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches high by 24 inches in width, or greater, within the plane of the trusses. This live load need not be assumed to act concurrently with any other live load requirements.
c. Individual stair treads shall be designed for the uniformly distributed live load or a 300-pound concentrated load acting over an area of 4 square inches, whichever produces the greater stresses.
d. A single concentrated load applied in any direction at any point along the top.
e. See Section R502.2.2 for decks attached to exterior walls.
f. Guard in-fill components (all those except the handrail), balusters and panel fillers shall be designed to withstand a horizontally applied normal load of 50 pounds on an area equal to 1 square foot. This load need not be assumed to act concurrently with any other live load requirement.
g. Uninhabitable attics with limited storage are those where the maximum clear height between joists and rafters is 42 inches or greater, or where there are two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches in height by 24 inches in width, or greater, within the plane of the trusses.
   1. The live load need only be applied to those portions of the joists or truss bottom chords where all of the following conditions are met:
      1. The attic area is accessible from an opening not less than 20 inches in width by 30 inches in height that is located where the clear height in the attic is a minimum of 30 inches.
      2. The slopes of the joists or truss bottom chords are no greater than 2 inches vertical to 12 units horizontal.
      3. Required insulation depth is less than the joist or truss bottom chord member depth.
   2. The remaining portions of the joists or truss bottom chords shall be designed for a uniformly distributed concurrent live load of not less than 10 lbf/ft^2.
h. Glazing used in handrail assemblies and guards shall be designed with a safety factor of 4. The safety factor shall be applied to each of the concentrated loads applied to the top of the rail, and to the load on the in-fill components. These loads shall be determined independent of one another, and loads are assumed not to occur with any other live load.

Deck Design Loads

Portion of **Table R301.5**

Habitable attics and attics served with fixed stairs	30
Balconies (exterior) and decks[e]	40
Fire escapes	40
Guardrails and handrails[d]	200[h]
Guardrail in-fill components[f]	50[h]
Passenger vehicle garages[a]	50[a]
Rooms other than sleeping room	40
Sleeping rooms	30
Stairs	40[c]

Deck Design Loads

Footnotes to Table R301.5

c. Individual Stair Treads shall be designed for the uniformly distributed live load or **a 300-pound concentrated load acting over an area of 4 square inches**, whichever produces the greater stresses.

d. A single concentrated load applied in **any direction at any point** along the top.

e. See Section R502.2.2 for decks attached to exterior walls.

f. Guard in-fill components (all those except the handrail), balusters and panel fillers shall be designed to withstand a horizontally applied normal load **of 50 pounds on an area equal to 1 sq ft**. This load need not be assumed to act concurrently with any other live load requirement.

h. Glazing used in handrail assemblies and guards shall be designed with a **safety factor of 4**. The safety factor shall be applied to each of the concentrated loads applied to the top of the rail, and to the load on the in-fill components. These loads shall be determined independent of one another, and loads are assumed not to occur with any other live load.

Bearing – Joist Framing - R502.6.2

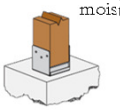
R502.6.2 Joist framing
Joists framing into the side of a wood girder shall be supported by approved *framing anchors* or on ledger strips not less than nominal 2 inches by 2 inches.

Columns- Durability - R317.1.4

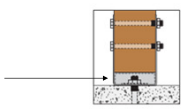
Wood Columns. Wood columns shall be approved wood of natural decay resistance or approved pressure preservative treated wood.

Exceptions:

- Posts or columns which are either **exposed to the weather** or located in basements or cellars, supported by piers or metal pedestals projecting 1 inch (25.4 mm) above the floor or finished grade and 6 inches (152 mm) above exposed earth, and are separated there by an approved impervious moisture barrier.



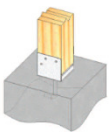
Typical ***PA44E*** *installation*

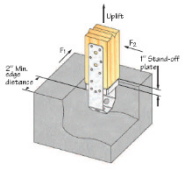


PAU *cross-section*

Columns – Lateral Restraint- R407

R407.3 Structural requirements. The columns shall be restrained to prevent lateral displacement at the bottom end. Wood columns shall not be less in nominal size than 4 inches by 4 inches (102 mm by 102 mm) and steel columns shall not be less than 3-inch-diameter (76 mm) standard pipe or approved equivalent.

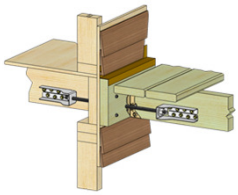




Deck Connections

R507.2.3 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. 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***.



Deck Connections

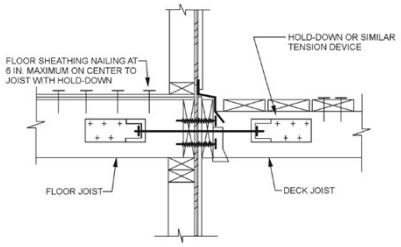
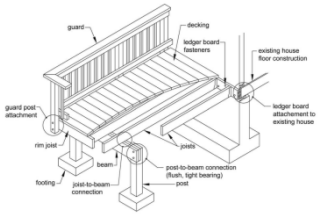


FIGURE 507.2.3
DECK ATTACHMENT FOR LATERAL LOADS

Prescriptive Residential Wood Deck Construction Guide

Based on the *2009 International Residential Code*

- http://www.awc.org/Publications/DCA/DCA6/DCA6-09.pdf



Beam-Column Connections

Figure 8. Post-to-Beam Attachment Requirements

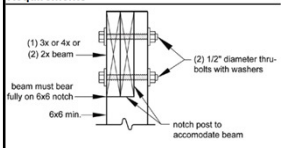
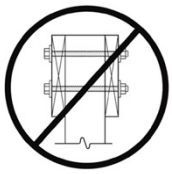
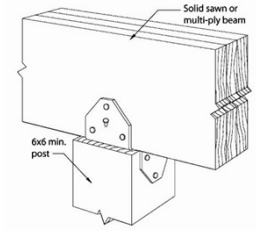


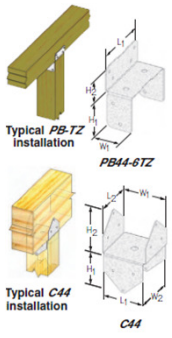
Figure 9. Prohibited Post-to-Beam Attachment Condition



Beam-Column Connections

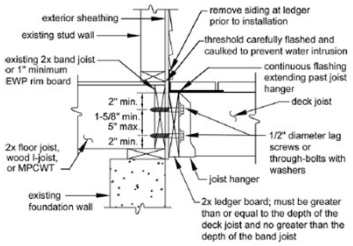
Figure 10. Alternate Approved Post-to-Beam Post Cap Attachment





Ledger Connections

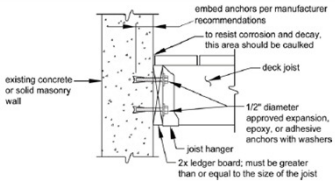
Figure 14. General Attachment of Ledger Board to Band Joist or Rim Board



From: Prescriptive Residential Wood Deck Construction Guide- AF&PA Design for Code Acceptance 6

Ledger Connections

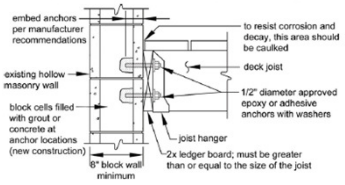
Figure 15. Attachment of Ledger Board to Foundation Wall (Concrete or Solid Masonry)



From: Prescriptive Residential Wood Deck Construction Guide- AF&PA Design for Code Acceptance 6

Ledger Connections

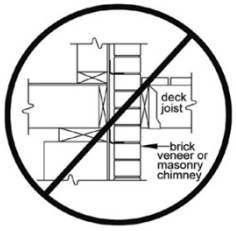
Figure 16. Attachment of Ledger Board to Foundation Wall (Hollow Masonry)



From: Prescriptive Residential Wood Deck Construction Guide- AF&PA Design for Code Acceptance 6

Ledger Connections

Figure 17. No Attachment to or Through Exterior Veneers (Brick, Masonry, Stone)



From: Prescriptive Residential Wood Deck Construction Guide- AF&PA Design for Code Acceptance 6

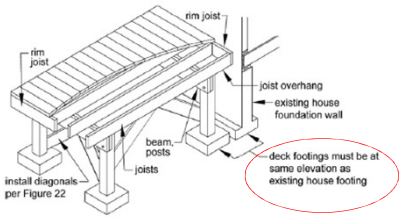
Ledger Connections

Figure 18. No Attachment to House Overhang

From: Prescriptive Residential Wood Deck Construction Guide- AF&PA Design for Code Acceptance 6

Footings

Figure 21. Free-Standing Deck



From: Prescriptive Residential Wood Deck Construction Guide- AF&PA Design for Code Acceptance 6

Guards - R312

➢**R312.1 Where Required**

Guards shall be located along open-sided walking surfaces, including stairs, ramps, and landings, that are located more than 30 inches measured vertically to the floor or grade below at any point within 36 inches horizontally to the edge of the open side. Insect screening shall not be considered as a guard.

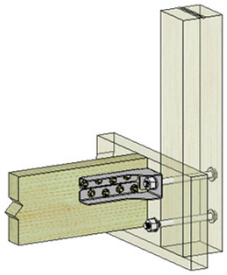
➢**R312.2 Height**

Required guards at open-sided walking surfaces, including stairs, porches, balconies or landings, shall be not less than 36 inches high measured vertically above the adjacent walking surface, adjacent fixed seating or the line connecting the leading edges of the treads.

Railing to Post Deck Attachment

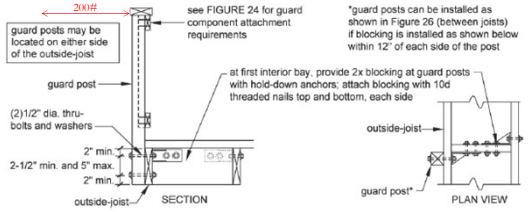
- IRC Table R301.5

Guardrails and handrails shall resist a single concentrated 200 lb load applied in any direction. Post must be fastened to the rim joist and tied back to the joist



Guardrail Posts

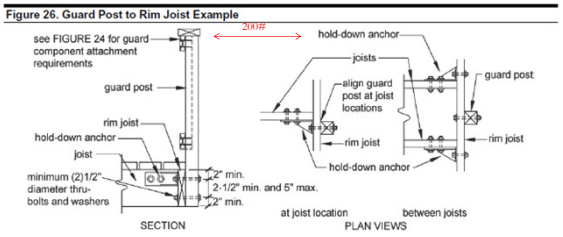
Figure 25. Guard Post to Outside Joist Example



From: Prescriptive Residential Wood Deck Construction Guide- AF&PA Design for Code Acceptance 6

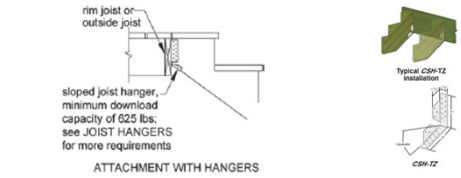
Guardrail Posts

Figure 26. Guard Post to Rim Joist Example



Stair Stringer Connection

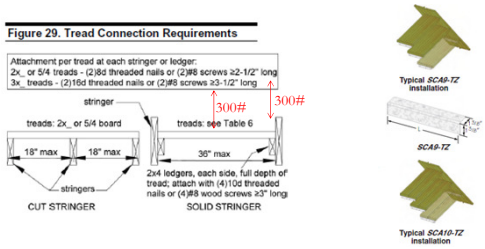
Figure 31. Stair Stringer Attachment Detail



From: Prescriptive Residential Wood Deck Construction Guide- AF&PA Design for Code Acceptance 6

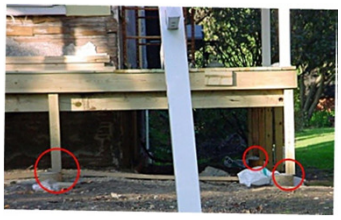
Stair Tread Connection

Figure 29. Tread Connection Requirements



From: Prescriptive Residential Wood Deck Construction Guide- AF&PA Design for Code Acceptance 6

Problems



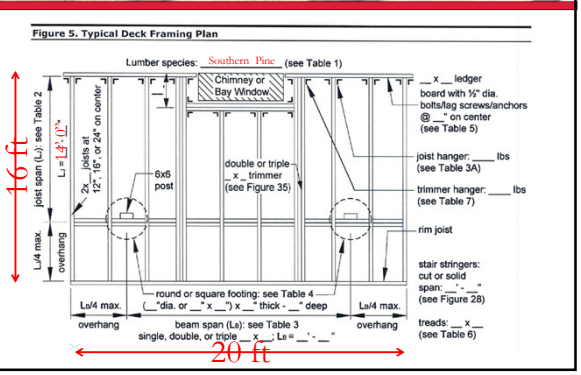
Problems

Problems

Problems

Problems

Problems



Gross dimensions of deck 16' x

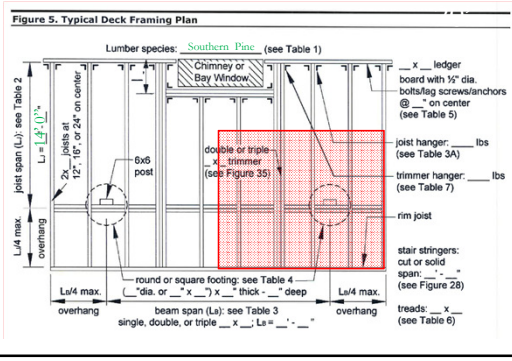
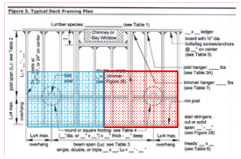


Table 4. Footing Sizes[1]

Beam Span, L_B	Joist Span L_J	Round Footing Diameter	Square Footing Dimension	Footing Thickness[2]
6'	≤10'	15"	13"	6"
	≤14'	17"	15"	6"
	≤18'	20"	18"	7"
8'	≤10'	17"	15"	6"
	≤14'	20"	18"	8"
	≤18'	23"	21"	9"
10'	≤10'	19"	17"	7"
	≤14'	22"	20"	9"
	≤18'	25"	23"	10"
12'	≤10'	21"	19"	8"
	≤14'	24"	22"	10"
	≤18'	28"	26"	11"
14'	≤10'	22"	20"	9"
	≤14'	26"	24"	11"
	≤18'	30"	28"	12"
16'	≤10'	24"	22"	9"
	≤14'	28"	26"	12"
	≤18'	32"	30"	13"
18'	≤10'	25"	23"	10"
	≤14'	30"	28"	12"
	≤18'	34"	32"	14"

1. Assumes 1,500 psf soil bearing capacity.
2. Assumes 2,500 psi compressive strength of concrete. Coordinate footing thickness with post base and anchor requirements.



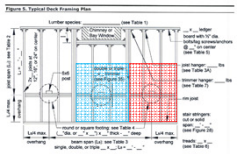


Figure 5. Typical Deck Framing Plan

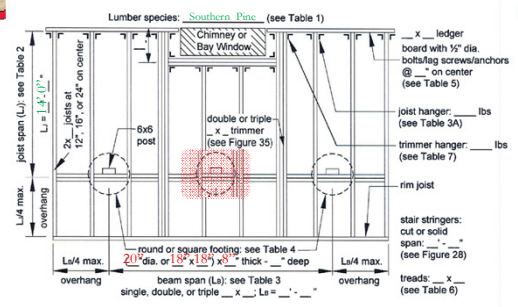


Table 3. Deck Beam Spans (L_B)[1] for Joists Framing from One Side Only

Species	Size[4]	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"
Douglas Fir-Larch[2], Hem-Fir[2], SPF[2], Redwood, Western Cedars, Ponderosa Pine[3], Red Pine[3]	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"

1. Assumes 40 psf live load, 10 psf dead load, L/360 simple span beam deflection limit, L/180 cantilever deflection limit, No. 2 grade, and wet service conditions.
2. Incising assumed for refractory species including Douglas fir-larch, hem-fir, and spruce-pine-fir.
3. Design values based on northern species with no incising assumed.
4. Beam depth must be equal to or greater than joist depth if joist hangers are used (see Figure 6, Option 3).

Figure 5. Typical Deck Framing Plan

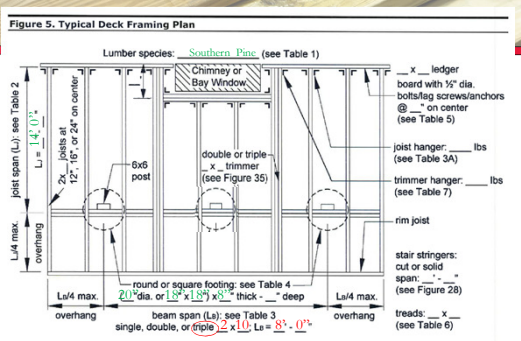


Table 2. Maximum Joist Spans (L_J)

Species	Size	Joist Spacing (o.c.) Without Overhangs[1] 12"	16"	24"	With Overhangs up to $L_J/4$[2] 12"	16"	24"
Southern Pine	2x8	13' - 8"	12' - 5"	10' - 2"	10' - 9"	10' - 9"	10' - 2"
	2x10	17' - 5"	15' - 10"	13' - 1"	15' - 6"	15' - 6"	13' - 1"
	2x12	18' - 0"	18' - 0"	15' - 5"	18' - 0"	18' - 0"	15' - 5"
Douglas Fir-Larch, Hem-Fir, SPF[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[4], Red Pine[4]	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"

1. Assumes 40 psf live load, 10 psf dead load, L/360 deflection, No. 2 grade, and wet service conditions. See Figure 1B.
2. Assumes 40 psf live load, 10 psf dead load, L/180 cantilever deflection with 220 lb point load, No. 2 grade, and wet service conditions. See Figure 1A and Figure 2.
3. Incising assumed for refractory species including Douglas fir-larch, hem-fir, and spruce-pine-fir.
4. Design values based on northern species with no incising assumed.

Figure 5. Typical Deck Framing Plan

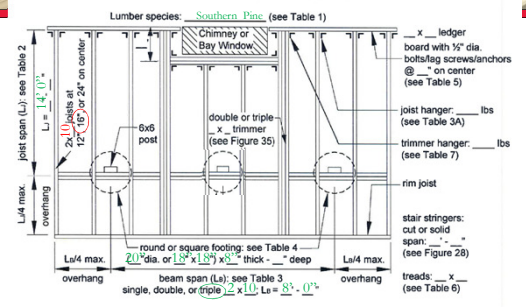


Figure 35: Detail for Framing Around a Chimney or Bay Window

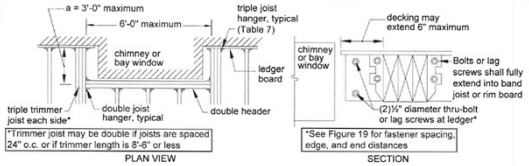


Table 7. Trimmer Joist Hanger Download Capacity

Joist Size	Minimum Capacity, lbs
2x8	1050
2x10	1380
2x12	1500

JOIST HANGERS

Joist hangers, as shown in Figure 7, shall each have a minimum download capacity in accordance with Table 3A. The joist hanger shall be selected from an approved manufacturer's product data based on the dimensions of the joist or header it is carrying. Joist hangers shall be galvanized or stainless steel (see MINIMUM REQUIREMENTS).

Use joist hangers with inside flanges when clearances to the edge of the beam or ledger board dictate. **Do not use clip angles or brackets to support joists.**

Table 3A: Joist Hanger Download Capacity

Joist Size	Minimum Capacity, lbs
2x8	600
2x10	700
2x12	800

Figure 7: Typical Joist Hangers

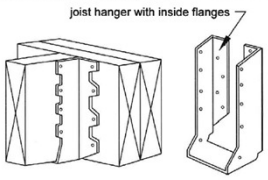


Figure 5. Typical Deck Framing Plan

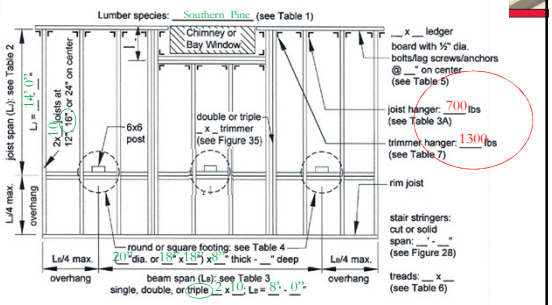
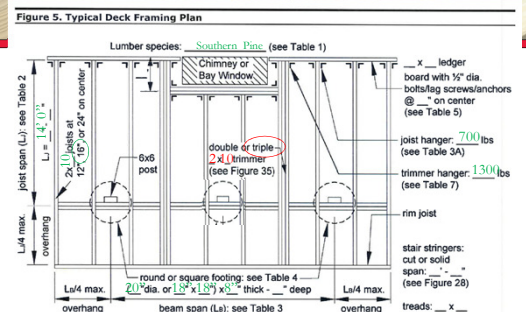


Figure 5. Typical Deck Framing Plan



LEDGER BOARD FASTENERS

Only those fasteners noted below are permitted. LEAD ANCHORS ARE PROHIBITED.

Deck ledger connection to band joist or rim board. The connection between a deck ledger and a 2-inch nominal lumber band joist (1-½" actual) or EWP rim board bearing on a sill plate or wall plate shall be constructed with ½" lag screws or bolts with washers per Table 5 and Figure 19 (see MINIMUM REQUIREMENTS).

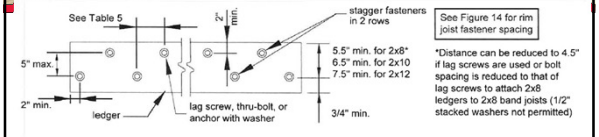
Table 5. Fastener Spacing for a Southern Pine, Douglas Fir-Larch, or Hem-Fir Deck Ledger and a 2-inch Nominal Solid-Sawn Spruce-Pine-Fir[7,9] Band Joist or EWP Rim Board[8]

(Deck Live Load = 40 psf, Deck Dead Load = 10 psf)[3,8]

Joist Span	Rim Board or Band Joist	6'-0" and less	6'-1" to 8'-0"	8'-1" to 10'-0"	10'-1" to 12'-0"	12'-1" to 14'-0"	14'-1" to 16'-0"	16'-1" to 18'-0"
Connection Details		On-Center Spacing of Fasteners[4,5]						
½" diameter lag screw with 15/32" maximum sheathing[1]	1" EWP[6]	24"	18"	14"	12"	10"	9"	8"
	1-⅛" EWP[6]	28"	21"	16"	14"	12"	10"	9"
	1-½" Lumber[7,9]	30"	23"	18"	15"	13"	11"	10"
½" diameter bolt with 15/32" maximum sheathing	1" EWP[6]	24"	18"	14"	12"	10"	9"	8"
	1-⅛" EWP[6]	28"	21"	16"	14"	12"	10"	9"
	1-½" Lumber[7,9]	36"	36"	34"	29"	24"	21"	19"
½" diameter bolt with 15/32" maximum sheathing and ½" stacked washers[2,9]	1" EWP[6]	24"	18"	14"	12"	10"	9"	8"
	1-⅛" EWP[6]	28"	21"	16"	14"	12"	10"	9"
	1-½" Lumber[7,9]	36"	36"	29"	24"	21"	18"	16"

[1] The tip of the lag screw shall fully extend beyond the inside face of the band joist.
[2] The maximum gap between the face of the ledger board and face of the wall sheathing shall be ½".
[3] Ledgers shall be flashed or caulked to prevent water from contacting the house band joist (see Figures 14, 15, and 16).
[4] Lag screws and bolts shall be staggered per Figure 19.
[5] Deck ledgers shall be minimum 2x8 pressure-preservative-treated No.2 grade lumber, or other approved materials as established by standard engineering practice.
[6] When solid-sawn pressure-preservative-treated deck ledgers are attached to engineered wood products (minimum 1" thick wood structural panel band joist or structural composite lumber including laminated veneer lumber), the ledger attachment shall be designed in accordance with accepted engineering practice. Tabulated values based on 300 lbs and 350 lbs for 1" and 1-⅛" EWP rim board, respectively.
[7] A minimum 1"x9½" Douglas fir-larch laminated veneer lumber rim board shall be permitted in lieu of the 2" nominal band joist.
[8] Wood structural panel sheathing, gypsum board sheathing, or foam sheathing not exceeding one inch thickness shall be permitted. The maximum distance between the face of the ledger board and the face of the band joist shall be one inch.
[9] Fastener spacing also applies to southern pine, Douglas fir-larch, and hem-fir band joists.

Figure 19: Ledger Board Fastener Spacing and Clearances



Thru-Bolts
Thru-bolts shall have a diameter of ½". Pilot holes for thru-bolts shall be $^{17}/_{32}$" to $^{9}/_{16}$" in diameter. Thru-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 or a hollow masonry wall with a grouted cell as shown in Figure 16. 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 5. Typical Deck Framing Plan

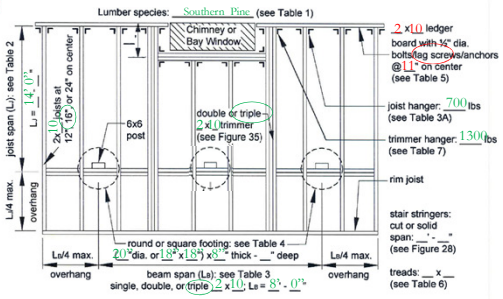


Figure 28. Stair Stringer Requirements

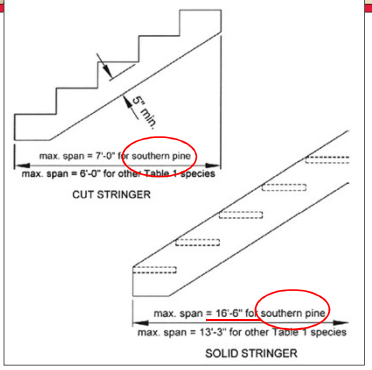


Table 6. Minimum Tread Size for Cut and Solid Stringers[1]

Species	Cut Stringer	Solid Stringer
Southern Pine	2x4 or 5/4	2x6
Douglas Fir Larch, Hem-Fir, SPF[2]	2x4 or 5/4	2x8 or 3x4
Redwood, Western Cedars, Ponderosa Pine[3], Red Pine[3]	2x4 or 5/4	2x10 or 3x4

1. Assumes 300 lb concentrated load, L/288 deflection limit, No. 2 grade, and wet service conditions.
2. Incising assumed for refractory species including Douglas fir-larch, hem-fir, and spruce-pine-fir.
3. Design values based on northern species with no incising assumed.

Figure 5. Typical Deck Framing Plan

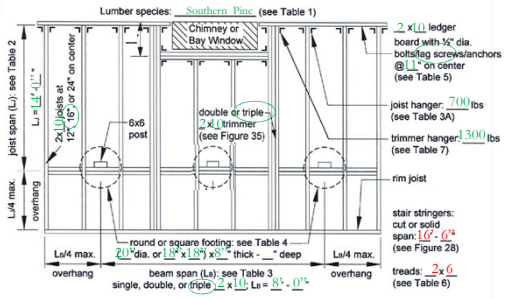


Figure 22. Diagonal Bracing Requirements

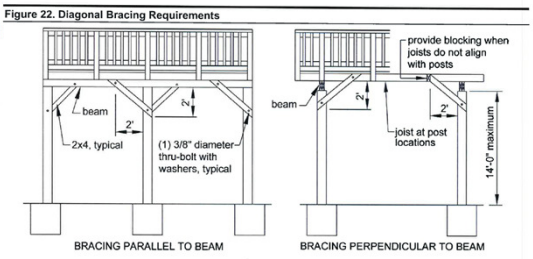
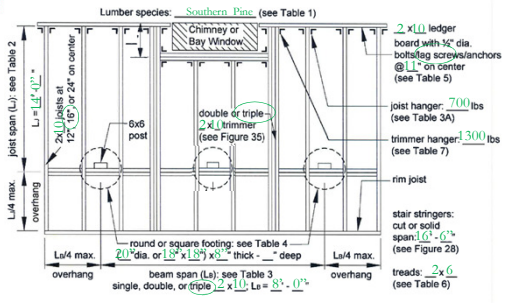


Figure 5. Typical Deck Framing Plan



This concludes The American Institute of Architects Continuing Education Systems Course

Randall Holgate

770-362-9288

rholgate@mii.com