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Inspections Division
Date: 09/29/15

Deck Construction Guide

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Based on the 2006 International Residential Code

Typical Deck Construction Detail

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Deck Anatomy

LEGEND

- **A** Frost Footing
- **B** Concrete Pier
- **C** Post Base Connector
- **D** Drop Beam
- **E** Existing House Floor
- **F** Flashing
- **G** 1/2" Lag Bolt w/Washers
- **H** Ledger Board
- **I** Blocking
- **J** Joist
- **K** Decking
- **L** Rim Joist
- **M** 4x4 Rail Post
- **N** 2x2 Baluster
- **O** Guard Rail
- **P** Rail Top Cap

DESIGN LOADS

All decks shall be designed to support a live load of 40 lbs. per square foot and a dead load of 15 lbs. per square foot.

WOOD REQUIREMENTS

Unless noted otherwise in these details, all framing lumber shall be Southern Pine, Grade #2 or better and shall be pressure treated ACQ or CA-B in accordance with American Wood-Preservers' Association Standards. All lumber in contact with the ground shall be rated as "ground contact". Please note that not all treated lumber is rated for ground contact.

HARDWARE AND FASTENERS

All hardware and fasteners (joist hangers, post anchors, mechanical fasteners, nails, screws, bolts, etc.) shall be galvanized with 1.85 oz/sf of zinc (G-185 Coating) or shall be stainless steel. Look for products such as "zmax" from simpson-strong-tie or "triple zinc" from USP.

DECKING REQUIREMENTS

All decking material shall be 2x6 or 5/4 (five-quarter) board. Attach decking to each joist with a minimum of (2) ring shank 8D nails or 2-1/2" wood screws. Decking may be applied diagonally at a 45 degree angle perpendicular to the joists. Decking composed of foreign lumber, composite, or manufactured materials may be substituted only when the product has an approved evaluation report from an accredited testing laboratory. Check with your local building department for approved materials or refer to the list of approved decking products.

Approved composite decking materials list available at: http://www.decks.com/article330.aspx

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Frost Footing Detail

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Table 1: Frost Footing Sizes

JOIST LENGTH		POST SPACING 4'			5'			6'			7'			8'			9'			10'			11'			12'			13'			14'		
6'	Corner Footing	6	5	4	7	6	5	7	6	5	8	7	6	9	7	6	9	7	6	10	8	7	10	8	7	10	9	7	11	9	8	11	9	8
	Intermediate Footing	9	8	7	10	8	7	10	9	7	11	9	8	12	10	9	13	10	9	14	11	10	14	12	10	15	12	10	15	13	11	16	13	11
7'	Corner Footing	7	5	5	7	6	5	8	7	6	9	7	6	9	8	7	10	8	7	10	8	7	11	9	8	11	9	8	12	10	9	12	10	9
	Intermediate Footing	9	8	7	10	8	7	11	9	8	12	10	9	13	11	9	14	11	10	15	12	10	15	13	11	16	13	11	17	14	12	17	14	12
8'	Corner Footing	7	6	5	8	6	6	9	7	6	9	8	7	10	8	7	10	8	7	11	9	8	11	9	8	12	10	9	13	10	9	13	11	9
	Intermediate Footing	10	8	7	11	9	8	12	10	9	13	11	9	14	11	10	15	12	10	16	13	11	16	13	12	17	14	12	18	15	13	18	15	13
9'	Corner Footing	7	6	5	8	7	6	9	7	6	10	8	7	10	9	7	11	9	8	12	10	8	12	10	9	13	10	9	13	11	9	14	11	10
	Intermediate Footing	10	9	7	12	10	8	13	10	9	14	11	10	15	12	10	16	13	11	17	14	12	17	14	12	18	15	13	18	15	13	20	16	14
10'	Corner Footing	8	6	6	9	7	6	10	8	7	10	8	7	11	9	8	12	10	8	12	10	9	13	11	9	14	11	10	14	12	10	15	12	10
	Intermediate Footing	11	9	8	12	10	9	14	11	10	15	12	10	16	13	11	17	14	12	17	14	12	18	15	13	19	16	14	20	16	14	21	17	15
11'	Corner Footing	8	7	6	9	7	6	10	8	7	11	9	8	12	9	8	12	10	9	13	11	9	14	11	10	14	12	10	15	12	10	15	13	11
	Intermediate Footing	12	9	8	13	11	9	14	12	10	15	12	10	16	13	11	17	14	12	17	14	12	18	15	13	19	16	14	20	16	14	21	17	15
12'	Corner Footing	9	7	6	10	8	7	10	9	7	11	9	8	12	10	9	13	10	9	14	11	10	14	12	10	15	12	10	15	13	11	16	13	11
	Intermediate Footing	12	10	9	14	11	10	15	12	10	16	13	11	17	14	12	18	15	13	19	16	14	20	16	14	21	17	15	22	18	15	23	18	16
13'	Corner Footing	9	7	6	10	8	7	11	9	8	12	10	8	13	10	9	13	11	9	14	12	10	15	12	10	15	13	11	16	13	11	17	14	12
	Intermediate Footing	13	10	9	14	12	10	15	13	11	17	14	12	18	15	13	19	15	13	20	16	14	21	17	15	22	18	15	23	19	16	24	19	17
14'	Corner Footing	9	8	7	10	8	7	11	9	8	12	10	9	13	11	9	14	11	10	15	12	10	15	13	11	16	13	11	17	14	12	17	14	12
	Intermediate Footing	13	11	9	15	12	10	16	13	11	17	14	12	18	15	13	20	16	14	21	17	15	22	18	15	23	18	16	24	19	17	24	20	17
15'	Corner Footing	10	8	7	11	9	8	12	10	8	13	10	9	14	11	10	14	12	10	15	12	11	16	13	11	17	14	12	17	14	12	18	15	13
	Intermediate Footing	14	11	10	15	12	11	17	14	12	18	15	13	19	16	14	20	17	14	21	17	15	22	18	16	23	19	17	24	20	17	25	21	18
16'	Corner Footing	10	8	7	11	9	8	12	10	9	13	11	9	14	11	10	15	12	10	16	13	11	16	13	12	17	14	12	18	15	13	18	15	13
	Intermediate Footing	14	11	10	16	13	11	17	14	12	18	15	13	20	16	14	21	17	15	22	18	16	22	19	16	24	20	17	25	21	18	26	21	18

Requirements for 3-Season Porches or Screen Porches:

A. Increase corner footing size by 90%
B. Increase center footing size by 55%
C. Locate all footings at extremities of deck. (No Cantilevers)

All Footing sizes above are base diameters (in inches) and are listed for three soil types:

(Table 1 Key)	Clay	Sand	Gravel
Corner Footing	6	5	4
Intermediate Footing	9	8	7

FOOTINGS

See Table 1 for footing size. Footings must be 8" minimum thickness. Frost footings shall be installed below frost line. Check with your local building department for footing depth requirements. All footings shall bear on solid ground.

EXCAVATION

Call before you dig. Have all utilities marked. US Phone numbers available at: http://www.decks.com/article38.aspx

CONCRETE

Use a minimum 2,500 PSI concrete mix for frost footing foundations.

HARDWARE

Concrete anchors and post base connectors shall be galvanized with 1.85 oz/sf of zinc (G-185) coating) or stainless steel.

Frost Footing Types

LEGEND

- **A** Concrete Pier
- **B** Bell Footing
- **C** .60 RET buried post on concrete footing
- **D** Concrete Footing and Pier

Alternate footing: Wood posts must be .60 RET pressure treated for ground contact.

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Typical Deck Ledger Board Details

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GENERAL

Attach the ledger board, which shall be equal to or greater than the joist size, to the existing exterior wall in accordance with the Ledger Board to House Band Detail. When attachments are made to the existing house rim board, the rim board shall be capable of supporting the new deck. If this cannot be verified or the conditions at the existing house differ from the details herein, then a free-standing deck is required. See sheet 5.

SIDING AND 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 with copper nails), stainless steel, UV resistant plastic, or galvanized steel coated with G-185 coating.

Ledger Board To House Band Detail

MANUFACTURED WOOD JOISTS

Many new homes constructed with manufactured wood "I" joists include a 1-1/4" manufactured solid rim board that can support the attachment of a deck. " However, older homes may be constructed with rim boards that are too thin (less than 1") to support a deck. In such cases a free-standing deck is required or additional interior blocking is needed. See sheet 5.

PROHIBITED LEDGER ATTACHMENTS

Attachments to the ends of pre-manufactured open web joists, to brick veneers, hollow concrete block walls and house overhangs or bay windows require additional engineering design..

Ledger Board To Solid Concrete Foundation Wall

CONCRETE FOUNDATION WALL ATTACHMENT

- Install using 1/2" diameter sleeve anchors with washers.
- Install according to manufacturers' instructions.
- 1/2 " sleeve anchors must be embedded 2-1/2" minimum.
- Top of ledger board must be caulked to resist corrosion and decay.

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Typical Deck Ledger Board Details 2

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Ledger Board Fastener Spacing

LEDGER BOARD FASTENERS

The spacing between ledger board fasteners is dependent on the span length of the joists. Use the following table to determine fastener spacing and install to the configuration in Table 2. All fasteners shall be installed with washers and must be thoroughly tightened.

LAG BOLTS

Lag bolts shall be a minimum 1/2" and installed with washers. Lag bolts must be hot-dipped galvanized or stainless steel. Lag bolts must penetrate beyond rim board a minimum of 1/2".

LAG BOLT INSTALLATION REQUIREMENTS

Each lag bolt shall have pilot holes drilled as follows:

1) Drill a 1/2" pilot hole in the ledger board.
2) Drill a 5/16" diameter hole into the solid connection material of the existing house.

Do not drill a 1/2" diameter hole into the solid connection material. The threaded portion of the lag screw shall be inserted into the pilot hole by turning. Do not drive with a hammer. Each lag screw shall be thoroughly tightened.

Table 2: Ledgerboard Fastener Schedule

Joist Span	Fastener Spacing, On Center		
	1/2" Lag Screws	WHHB*	Thrubolts
0' - 6'	30"	16"	36"
6' - 8'	23"	12"	36"
8' - 10'	18"	10"	34"
10' - 12'	15"	8"	29"
12' - 14'	13"	7"	24"
14' - 16'	11"	6"	21"
16' - 18'	10"	5"	19"

*Washer Headed Hardened Bolts

Framing Around A Bay Window: Alternative Framing Technique

Never support deck directly to house cantilevers such as door and window bays or chimneys. Installing a beam across the house cantilever will transfer the load to the solid house wall. See beam span chart table for beam sizing.

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Lateral Support Of Free Standing Deck

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Lateral Support of Free Standing Deck

FREE STANDING DECKS

Decks which are free-standing do not utilize the exterior wall of the existing house to support vertical loads; instead an additional beam with posts is provided at or within 2' of the existing house. The associated deck post footings must be installed on virgin or compacted soil to prevent sinking. Free standing decks greater than 2 feet above grade shall resist lateral loading and horizontal movement by providing diagonal bracing or by attaching the deck to the exterior wall of the house.

DIAGONAL BRACING

Provide diagonal bracing both parallel and perpendicular to the beam at each post as shown in lateral support of free standing deck detail. When parallel to the beam, the bracing shall be bolted to the post at one end and beam at the other. When perpendicular to the beam, the bracing shall be bolted to the post at one end and the joist at the other. When a joist does not align with the bracing location, provide blocking between the next adjacent joists.

SWAY BRACING

All decks using horizontal decking should have a diagonal sway brace to prevent racking. Install metal "T Bracing" diagonally across the top of joists or fasten a diagonal deck board below the deck frame decks using diagonal decking do not require sway bracing

Sway Bracing

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Deck Beam and Joist Details

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BEAM SIZING

Based on No. 2 or better Ponderosa and Southern Pine. (treated for weather and/or ground contact)

Table 3: BEAM SIZE

JOIST LENGTH		POST SPACING 4	5	6	7	8	9	10	11	12	13	14
6'	Southern Pine	1-2x6	1-2x6	1-2x6	2-2x6	2-2x6	2-2x6	2-2x8	2-2x8	2-2x10	2-2x10	2-2x10
	Ponderosa Pine	1-2x6	1-2x6	2-2x8	2-2x8	2-2x8	2-2x8	2-2x10	2-2x10	2-2x12	2-2x12	3-2x10
7'	Southern Pine	1-2x6	1-2x6	1-2x6	2-2x6	2-2x6	2-2x8	2-2x8	2-2x10	2-2x10	2-2x10	2-2x12
	Ponderosa Pine	1-2x6	1-2x6	1-2x8	2-2x8	2-2x8	2-2x10	2-2x10	2-2x10	2-2x12	3-2x10	3-2x10
8'	Southern Pine	1-2x6	1-2x6	2-2x6	2-2x6	2-2x8	2-2x8	2-2x8	2-2x10	2-2x10	2-2x12	2-2x12
	Ponderosa Pine	1-2x6	2-2x6	2-2x8	2-2x8	2-2x8	2-2x10	2-2x10	2-2x10	3-2x10	3-2x10	3-2x12
9'	Southern Pine	1-2x6	1-2x6	2-2x6	2-2x6	2-2x8	2-2x8	2-2x10	2-2x10	2-2x12	2-2x12	3-2x10
	Ponderosa Pine	1-2x6	2-2x6	2-2x8	2-2x8	2-2x10	2-2x10	2-2x10	3-2x10	3-2x10	3-2x12	3-2x12
10'	Southern Pine	1-2x6	1-2x6	2-2x6	2-2x6	2-2x8	2-2x8	2-2x10	2-2x12	2-2x12	3-2x10	3-2x10
	Ponderosa Pine	1-2x6	1-2x6	2-2x8	2-2x8	2-2x10	2-2x10	2-2x12	3-2x10	3-2x12	3-2x12	Eng Bm
11'	Southern Pine	1-2x6	2-2x6	2-2x6	2-2x8	2-2x8	2-2x10	2-2x10	2-2x12	2-2x12	3-2x10	3-2x12
	Ponderosa Pine	2-2x6	2-2x6	2-2x8	2-2x8	2-2x10	2-2x12	2-2x12	3-2x10	3-2x12	3-2x12	Eng Bm
12'	Southern Pine	1-2x6	2-2x6	2-2x6	2-2x8	2-2x8	2-2x10	2-2x10	2-2x12	3-2x10	3-2x10	3-2x12
	Ponderosa Pine	2-2x6	2-2x6	2-2x8	2-2x10	2-2x10	2-2x12	2-2x12	3-2x12	3-2x12	Eng Bm	Eng Bm
13'	Southern Pine	1-2x6	2-2x6	2-2x6	2-2x8	2-2x8	2-2x10	2-2x10	2-2x12	3-2x10	3-2x12	3-2x12
	Ponderosa Pine	2-2x6	2-2x6	2-2x8	2-2x10	2-2x12	2-2x12	2-2x12	3-2x12	3-2x12	Eng Bm	Eng Bm
14'	Southern Pine	1-2x6	2-2x6	2-2x6	2-2x8	2-2x10	2-2x10	2-2x12	3-2x10	3-2x12	3-2x12	3-2x12
	Ponderosa Pine	2-2x6	2-2x8	2-2x8	2-2x10	2-2x12	3-2x10	3-2x12	3-2x12	Eng Bm	Eng Bm	Eng Bm
15'	Southern Pine	2-2x6	2-2x6	2-2x8	2-2x8	2-2x10	2-2x12	2-2x12	3-2x10	3-2x12	3-2x12	Eng Bm
	Ponderosa Pine	2-2x6	2-2x8	2-2x8	2-2x10	3-2x10	3-2x10	3-2x12	3-2x12	Eng Bm	Eng Bm	Eng Bm
16'	Southern Pine	2-2x6	2-2x6	2-2x8	2-2x8	2-2x10	2-2x12	2-2x12	3-2x10	3-2x12	3-2x12	Eng Bm
	Ponderosa Pine	2-2x6	2-2x8	2-2x10	2-2x10	3-2x10	3-2x10	3-2x12	3-2x12	Eng Bm	Eng Bm	Eng Bm

Joist sections cantilevered over beams must be calculated as (2X Length) for beam sizing. See cantilevered beam detail: 2A + B = Total Joist Length

Cantilevered Beam Detail

2' maximum cantilever - 6' minimum joist span for cantilever decks.

Joist To Beam Connection Detail

OPTION A

(3) 8D Toe Nailed, (2 on one side, 1 on the other.)

OPTION B

Mechanical fastener or hurricane clip.

OPTION C

Joist hanger top of beam and joist must be at same elevation.

Table 4: JOIST SIZE

	PONDEROSA PINE 12" O.C.	16" O.C.	24" O.C.	SOUTHERN PINE 12" O.C.	16" O.C.	24" O.C.	WESTERN CEDAR 12" O.C.	16" O.C.	24" O.C.
2x6	9'-2"	8'-4"	7'	10'-9"	9'-9"	8'-6"	9'-2"	8'-4"	7'-3"
2x8	12'-1"	10'-10"	8'-10"	14'-2"	12'-10"	11'	12'-1"	11'	9'-2"
2x10	15'-4"	13'-3"	10'-10"	18'	16'-1"	13'-5"	15'-5"	13'-9"	11'-3"
2x12	17'-9"	15'-5"	12'-7"	21'-9"	19'	15'-4"	18'-5"	16'	13'

Based on no. 2 or better wood grades. (design load = 40 lbs live load + 10 lbs dead load, deflection l/360)

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Post and Beam Detail

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Beam Nailing And Post Notch Detail

POST REQUIREMENTS

All deck support posts shall be 6x6, and the maximum height shall be 14'-0".

BEARING

Beams shall have a minimum 1-1/2" solid bearing on top of support posts.

Recommended: nail beams with (5) 2 1/2 framing nails spaced every 16" on center from front and back.

Required: 16D (3-1/2") at 16" on center along each edge.

45 Degree "Clipped Corner" Framing Post And Beam Connection Detail

- **A** Interior mounted rail post lag bolted to deck rim
- **B** Post beam connector
- **C** Corner support post to provide full bearing support to both sides of 45 degree beam

Multilevel Deck: Compound Post Connection Detail

- **A** Post notch.
- **B** Maximum 1" lateral beam overhand of support post.
- **C** Deck beam set on notched 6x6 post and through bolted with (2) 1/2" bolts with washers.
- **D** 6x6 support post.
- **E** Concealed joist hanger.
- **F** 2x6 post cleat bolted to side of 6x6 post to extend beam bearing.

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Typical Stair Detail

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Typical Stair Detail

LEGEND

- **A** Grippable Handrail
- **B** 4-3/8" Max. Sphere
- **C** 6" Max. Sphere
- **D** Stair landing: 3'x3' minimum landing at bottom of stairs. Flat ground may qualify.
- **E** Stair tread: Minimum tread depth is 10".
- **F** Stair riser: Maximum rise: 7-3/4", recommended minimum rise: 4".
- **G** 36" minimum stair width
- **H** 34" - 38" guard rail height above stair nosing

Stringer Detail

STAIR TOLERANCES

Maximum 4" opening at risers greater than 30" above grade. Minimum stair width is 36". Maximum rise is 7-3/4". Minimum recommended rise is 4". Minimum tread depth is 10". Largest tread width or riser height shall not exceed the smallest by more than 3/8". Maximum 4" opening at risers greater than 30" above grade.

STAIR STRINGERS

All stringers shall be 2x12 Southern Pine. Stair stringer spacing is 16" O.C. typical for 5/4x6 wood treads. Verify stair stringer spacing for composite stair treads.

STAIRWAY ILLUMINATION

All exterior stairways shall be illuminated at the top landing to the stairway. Illumination shall be controlled from inside the dwelling or automatically activated.

HEADROOM

Stairs shall be provided with a minimum of 6'-8" headroom clearance. The clearance shall be measured from the nosing of the treads to the ceiling or soffit directly above that line.

STAIR GUARD RAIL REQUIREMENTS

Guards are required on the side(s) of stairs with a total rise of more than 30" above the floor or grade below. Guards on stairs must be not less than 34" high measured from the nosing of the treads. All required guard rails must have intermediate rails or decorative pattern such that a 4 3/8" diameter sphere will not pass through except that the triangular space formed by the bottom of the guard rail. The stair tread, and stair riser may be such that a 6" diameter sphere will not pass through.

Guard rails must be designed to support a 200 lb. load applied in any direction at any point along the top of the guard rail.

GRIPPABLE HANDRAIL

The top of the handrail shall not be placed less than 34" or more than 38" above the nosing of the treads. The handgrip shall have a smooth surface with no sharp corners. Handrails shall be continuous the full length of the stairs and returned to posts or wall at the ends. The handgrip portion of the handrail shall not be less than 1-1/4" or more than 2-5/8" and shall provide a grippable surface. There are many acceptable styles of handrails that meet the minimum requirements. Consult your local building department.

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Typical Stair Attachment Detail

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Stair Stringer Attachment Detail: Reverse View

- **A** Deck rim joist.
- **B** Attach stair guard rail 4x4 posts to stair stringers with (2) 1/2" lag bolts with washers.
- **C** 2x4 Bottom plate extends deck rim to bottom of stair stringer connection.
- **D** Mechanical connection strap tie forms continuous positive connection between rim, plate, stair stringer.
- **E** 2x12 stair stringer.

Stair Stringer Attachment Detail: Front View

- **A** Deck rim joist.
- **B** Outside stair stringers attached to guard rail 4x4 posts with (2) 1/2" lag bolts with washers.
- **C** Stair stringer fastened to deck frame with joist hanger or equivalent positive connection.
- **D** 2x4 bottom plate extends deck rim to bottom of stair stringer connection.
- **E** 2x12 stair stringer.

Cascading Stair Detail

- **A** 2x4 bottom plate extends deck rim to bottom of stair stringer connection.
- **B** Stair stringer fastened to deck rim with joist hanger or equivalent positive connection.
- **C** 2x12 stringer spaced 16" O.C.
- **D** Recommended 2 - 2x8 base header must be .60 RET treated rated for ground contact
- **E** Install blocking to support decking seams.
- **F** Footing recommended stair may rest on landscaping.

Stairs may rest on landscaping.

Not all composite decking materials are approved for use on stairs.

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Date: 9-10-2008

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Typical Guard Rail Detail

Inspections Division
Date: 09/29/15

Guard Rail Detail

- **A** 4x4 Rail post typical do not notch.
- **B** 6'0" maximum rail post spacing.
- **C** 2x6 or 5/4 board rail cap.
- **D** 2x2 rail picket, typical.
- **E** 2x4 top and bottom. Attach to guard post with 2 - 16D nails on inside face.
- **F** Openings shall not allow the passage of a 4" diameter sphere.
- **G** Attach pickets at top and bottom with 2 1/2" wood screw of 2 - 10D or 12D spiral shank nails.
- **H** 2 1/2" diameter thru-bolts and washers.
- **I** 36" minimum rail height.

GUARD RAIL REQUIREMENTS

All decks greater than 30" above grade are required to have a guard rail. If your are providing a guard rail when one is not required, it should still meet these requirements. All guard rails shall be constructed in strict conformance with the following details. Any pre-fabricated wood, composite, or metal manufactured rail system must be approved by your local building department.

ATTENTION

Do not notch guard rail posts at deck connection. Do not bolt through the top or bottom 1-1/2" of deck joists or beams.

Guard Post to Outside Rim Joist Attachment Detail

- **A** Install 4x4 guard rail post flush to outside of rim joist with (2) 1/2" lag bolts with washers.
- **B** Install 2 guard rail posts for 90 degree corners when attaching guard rails to outside of deck rim.

Guard Post to Inside Rim Joist Attachment Detail

- **A** Install bracing for added rim strength to stiffen guard rails
- **B** Install 1 corner guard rail post when attaching guard rails to inside of deck rim before decking is installed.

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