Residential Deck Handout
International Residential Code (IRC)

HOW TO USE THIS GUIDE

This guide was designed to assist in creating a construction plan to build a simple deck using conventional construction methods. Non-conventionally constructed decks may require a design professional.

1. Complete this Building Guide by indicating which construction details will be used.

2. Provide a Site Plan showing the dimensions of your project and its relationships to existing buildings or structures, utilities, property lines and easements. In addition to project dimensions, your plot plan must also show other details such as post locations and spacing, joist and beam spans, and any other pertinent information not shown on the section drawing.

3. Now you are ready to apply for your building permit. The majority of permit applications can be processed with little delay. The submitted documents will help determine if the project is in compliance with building codes, zoning ordinances and other applicable laws.

4. Inspections. A footing inspection is required before they can be poured. A framing inspection may be required before you lay decking or attach handrails to verify plans are being followed and that proper connections are used. All projects must receive a final inspection in order to verify that your project meets code, is safe to use and to close out the permit. Remember YOU are responsible to get the inspections! If you are unsure during the construction process contact Building Department (319)393-0588.

This handout is intended to assist in the sizing of elements required for erecting a residential deck within the limits based on the current adopted version of the International Residential Code (IRC). Compliance with applicable codes and ordinances falls on the owner and/or contractor.

HOW TO CALCULATE FOOTINGS FOR A DECK OR PORCH

Step 1: Find the Area Supported by each Footing in Square Feet = (A x B).

**Step 2:** Determine the type of Load supported by each post.

* Load for open decks shall be 50# PSF based on a floor load only.

* Load for covered decks, porches and 3 season rooms shall be 90# PSF based on a floor load of 50# PSF plus a roof load of 40# PSF.

Step 3: Find the Total Load (TL) supported by each footing by multiplying the Area by the Load.

Step 4: Divide the Total Load by 2000, which is the presumed soil bearing capacity of local soil.

Step 5: Use the resulting value (Footing PSF) to find the proper footing size on the table below. Each Footing PSF will require a Footing Diameter with the minimum size listed below it on the table. Any fraction of a number larger than the Footing PSF listed shall be supported by a footing of the next larger diameter.
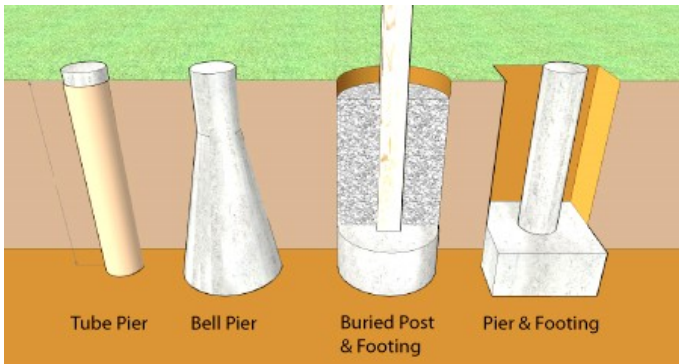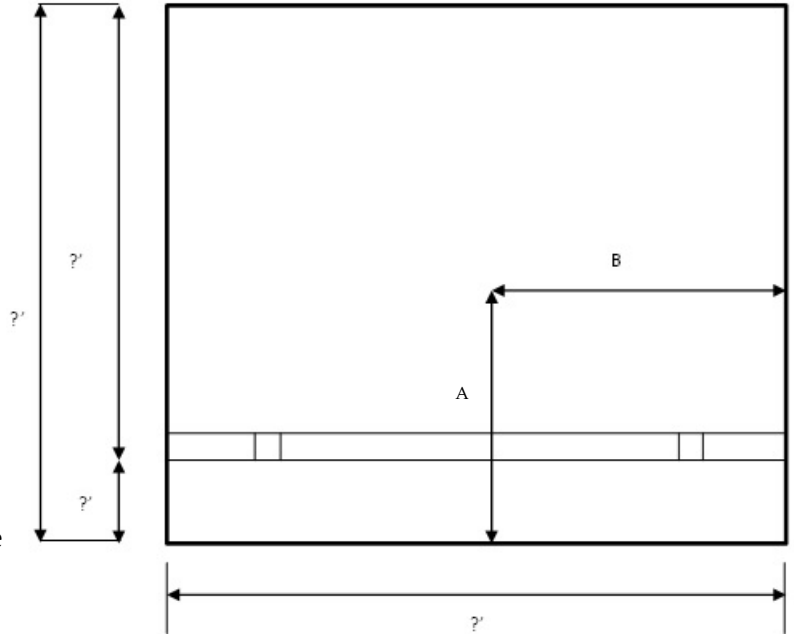
TABLE R507.8 DECK POST HEIGHT[a]	
DECK POST SIZE	**MAXIMUM HEIGHT[a]**
4 x 4	8'
4 x 6	8'
6 x 6	14'

For SI: 1 foot = 304.8 mm.

a. Measured to the underside of the beam.

FORMULA: [(A x B) x TL] / 2000 = Footing Area in Square Feet

MINIMUM AREA REQUIRED FOR A ROUND PIER FOOTING									
Footing Ft² (from calculation)	0.35	0.55	0.79	1.07	1.39	1.77	2.18	2.63	3.12
Minimum Footing Diameter	8"	10"	12"	14"	16"	18"	20"	22"	24"

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TABLE R507.6
DECK BEAM SPAN LENGTHS[a, b] (ft. - in.)

SPECIES[c]	SIZE[d]	DECK JOIST SPAN LESS THAN OR EQUAL TO: (feet)						
		6	8	10	12	14	16	18
Southern pine	$2 - 2 \times 6$	6-11	5-11	5-4	4-10	4-6	4-3	4-0
	$2 - 2 \times 8$	8-9	7-7	6-9	6-2	5-9	5-4	5-0
	$2 - 2 \times 10$	10-4	9-0	8-0	7-4	6-9	6-4	6-0
	$2 - 2 \times 12$	12-2	10-7	9-5	8-7	8-0	7-6	7-0
	$3 - 2 \times 6$	8-2	7-5	6-8	6-1	5-8	5-3	5-0
	$3 - 2 \times 8$	10-10	9-6	8-6	7-9	7-2	6-8	6-4
	$3 - 2 \times 10$	13-0	11-3	10-0	9-2	8-6	7-11	7-6
	$3 - 2 \times 12$	15-3	13-3	11-10	10-9	10-0	9-4	8-10
Douglas fir-larch[e], hem-fir[e], spruce-pine-fir[e], redwood, western cedars, ponderosa pine[f], red pine[f]	3×6 or $2 - 2 \times 6$	5-5	4-8	4-2	3-10	3-6	3-1	2-9
	3x8 or $2 - 2$x8	6-10	5-11	5-4	4-10	4-6	4-1	3-8
	3x10 or $2 - 2$x10	8-4	7-3	6-6	5-11	5-6	5-1	4-8
	3x12 or $2 - 2$x12	9-8	8-5	7-6	6-10	6-4	5-11	5-7
	4×6	6-5	5-6	4-11	4-6	4-2	3-11	3-8
	4×8	8-5	7-3	6-6	5-11	5-6	5-2	4-10
	4×10	9-11	8-7	7-8	7-0	6-6	6-1	5-8
	4×12	11-5	9-11	8-10	8-1	7-6	7-0	6-7
	$3 - 2 \times 6$	7-4	6-8	6-0	5-6	5-1	4-9	4-6
	$3 - 2 \times 8$	9-8	8-6	7-7	6-11	6-5	6-0	5-8
	$3 - 2 \times 10$	12-0	10-5	9-4	8-6	7-10	7-4	6-11
	$3 - 2 \times 12$	13-11	12-1	10-9	9-10	9-1	8-6	8-1

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.

a. Ground snow load, live load = 40 psf, dead load = 10 psf, **deflection** = L/360 at main span, L/180 at cantilever with a 220-pound point load applied at the end.

b. Beams supporting deck joists from one side only.

c. No. 2 grade, wet service factor.

d. Beam depth shall be greater than or equal to depth of joists with a flush beam condition.

e. Includes incising factor.
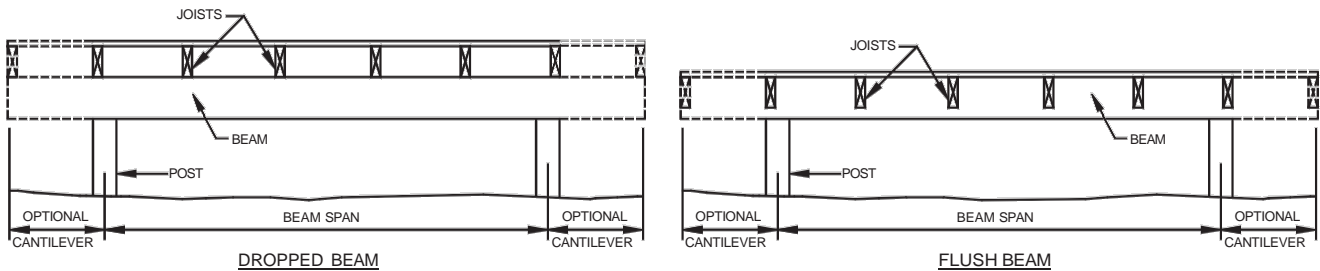
f. Northern species. Incising factor not included.

FIGURE R507.6
TYPICAL DECK BEAM SPANS

TABLE R507.4
MAXIMUM JOIST SPACING

MATERIAL TYPE AND NOMINAL SIZE	MAXIMUM ON-CENTER JOIST SPACING	
	Perpendicular to joist	Diagonal to joist[a]
$1^{1}/_{4}$-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

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

SPECIES[a]	SIZE	SPACING OF DECK JOISTS WITH NO CANTILEVER[b] (inches)			SPACING OF DECK JOISTS WITH CANTILEVERS[c] (inches)		
		12	16	24	12	16	24
Southern pine	2 × 6	9-11	9-0	7-7	6-8	6-8	6-8
	2 × 8	13-1	11-10	9-8	10-1	10-1	9-8
	2 × 10	16-2	14-0	11-5	14-6	14-0	11-5
	2 × 12	18-0	16-6	13-6	18-0	16-6	13-6
Douglas fir-larch[d], hem-fir[d] spruce-pine-fir[d]	2 × 6	9-6	8-8	7-2	6-3	6-3	6-3
	2 × 8	12-6	11-1	9-1	9-5	9-5	9-1
	2 × 10	15-8	13-7	11-1	13-7	13-7	11-1
	2 × 12	18-0	15-9	12-10	18-0	15-9	12-10
Redwood, western cedars, ponderosa pine[e], red pine[e]	2 × 6	8-10	8-0	7-0	5-7	5-7	5-7
	2 × 8	11-8	10-7	8-8	8-6	8-6	8-6
	2 × 10	14-11	13-0	10-7	12-3	12-3	10-7
	2 × 12	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.

a. No. 2 grade with wet service factor.

b. Ground snow load, live load = 40 psf, dead load = 10 psf, deflection = L''/ 360.

c. Ground snow load, live load = 40 psf, dead load = 10 psf, deflection=L''/360 at main span, L''/180 at cantilever with a 220-pound point load applied to end.

d. Includes incising factor.

e. Northern species with no incising factor

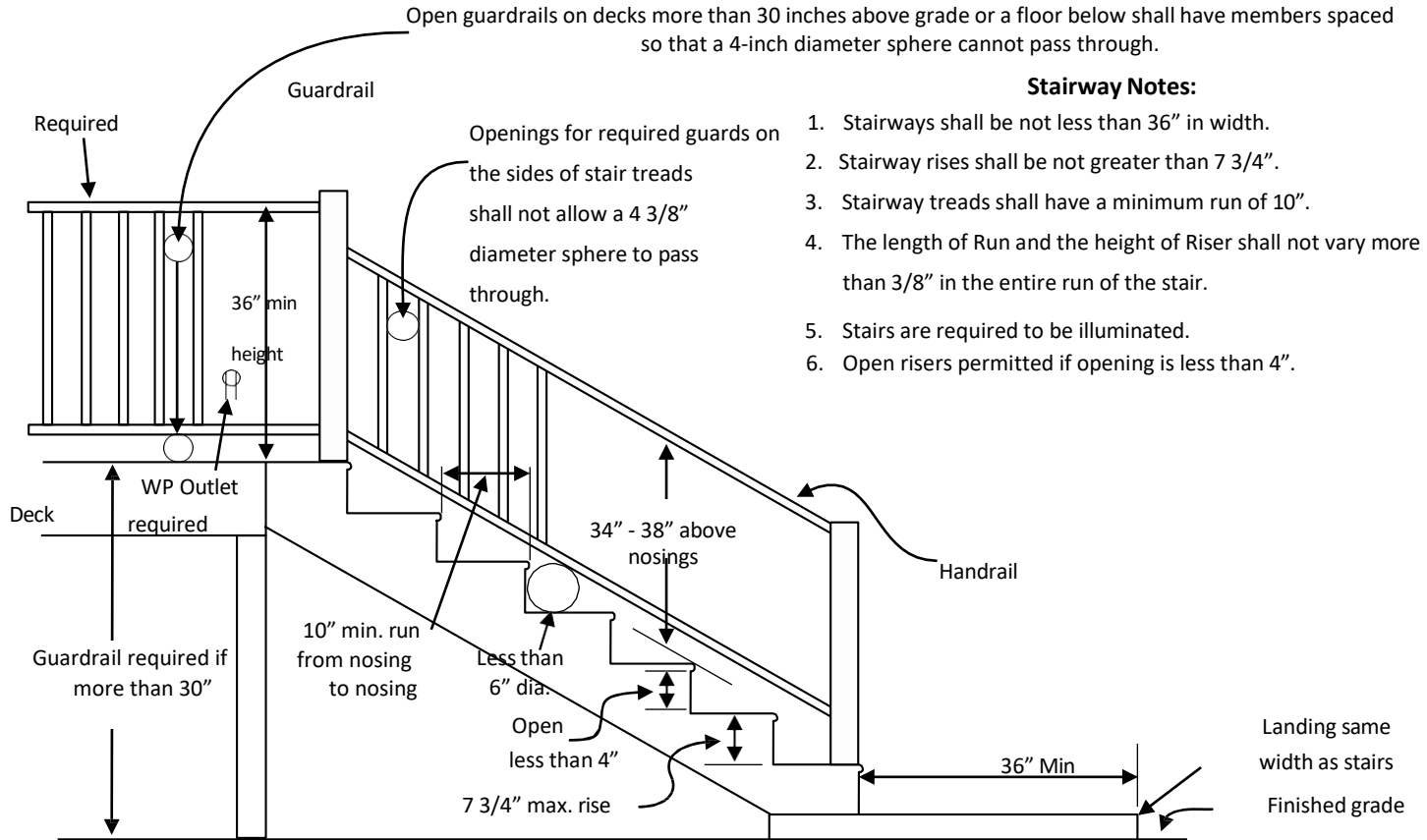f. Cantilevered spans not exceeding the nominal depth of the joist are permitted.
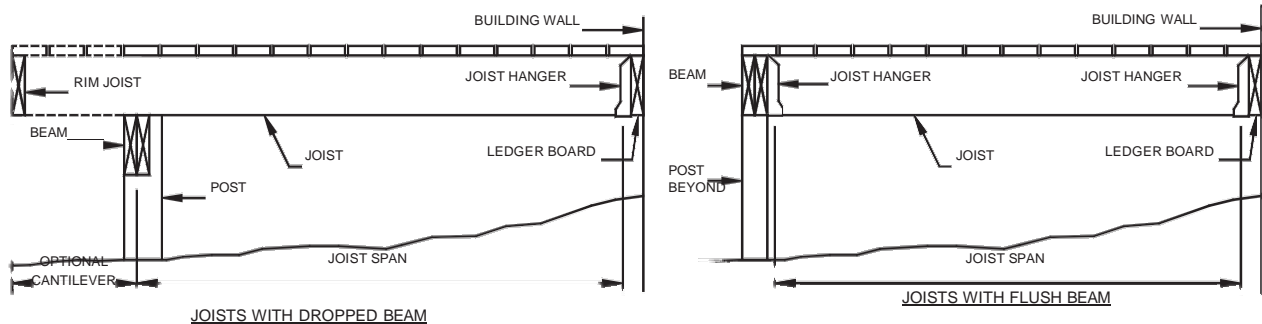
FIGURE R507.5
TYPICAL DECK JOIST SPANS

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Robins
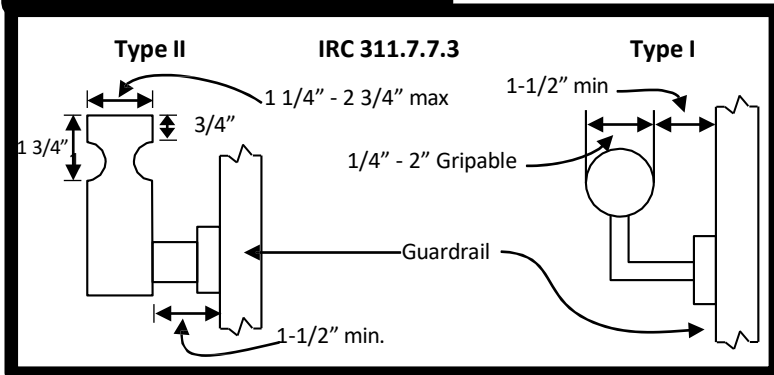Community Family Friends

Open guardrails on decks more than 30 inches above grade or a floor below shall have members spaced so that a 4-inch diameter sphere cannot pass through.

Guardrail

Required

Openings for required guards on the sides of stair treads shall not allow a 4 3/8" diameter sphere to pass through.

36" min

height

WP Outlet
required

Deck

34" - 38" above
nosings

Handrail

Guardrail required if
more than 30"

10" min. run
from nosing
to nosing

Less than
6" dia.

Open
less than 4"

7 3/4" max. rise

36" Min

Landing same
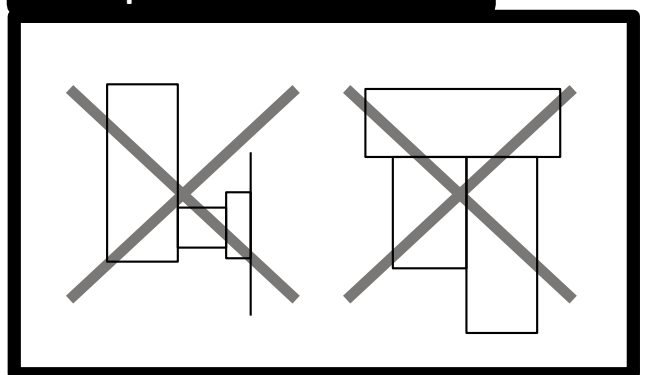width as stairs

Finished grade

Stairway Notes:

1. Stairways shall be not less than 36" in width.
2. Stairway rises shall be not greater than 7 3/4".
3. Stairway treads shall have a minimum run of 10".
4. The length of Run and the height of Riser shall not vary more than 3/8" in the entire run of the stair.
5. Stairs are required to be illuminated.
6. Open risers permitted if opening is less than 4".

Preferred Handrail Details

Type II   IRC 311.7.7.3   Type I

1 1/4" - 2 3/4" max

3/4"

1-1/2" min

1 3/4"

1/4" - 2" Gripable

Guardrail

1-1/2" min.

Unacceptable Handrails

LEDGER BOARD DETAILS

- Minimum of ½" lag screws or bolts are required and are to be staggered with spacing as shown in the table below.

- All screws or bolts are to be placed 2 inches in from the bottom and top edge of the ledger and between 2 and 5 inches in from the ends.

- Tips of the lag screws are to extend past the inside face of the band joist.

- Lag screws, bolts, and washers are to be <u>hot-dipped galvanized or stainless steel</u> when using.

- Ledger boards shall not be attached to open web trusses, brick veneers, or hollow concrete block.

JOIST SPAN Connection details	6' OR 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'
			Inches on center spacing of fasteners				
½" diameter lag screw	30	23	18	15	13	11	10
½" diameter bolt	36	36	34	29	24	21	19

When using engineered fastener screws (Ledgerlock®), follow manufacturer's instructions for spacing and location.
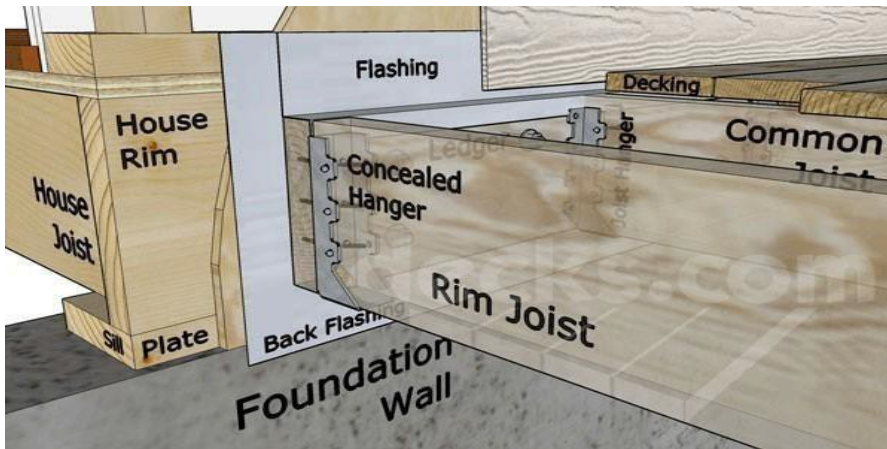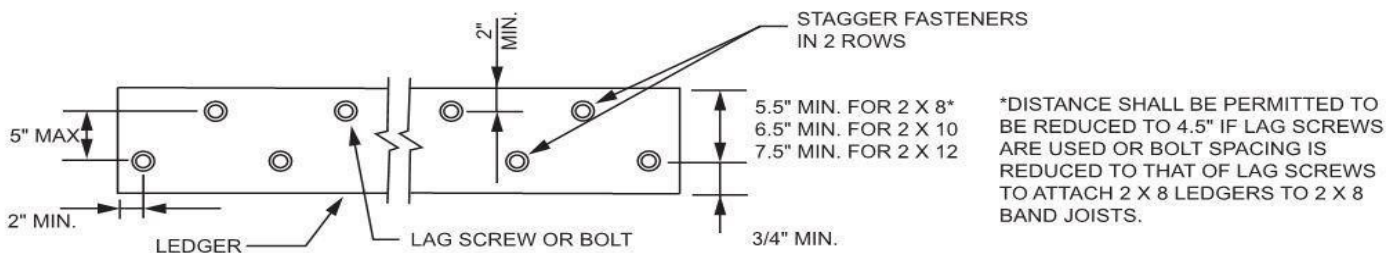

Photo courtesy of Decks.com

Flashing
- House siding must be removed prior to the installation of the ledger board.
- Flashing is required where a ledger is fastened to wood construction.

2" MIN.
5" MAX.
2" MIN.

STAGGER FASTENERS IN 2 ROWS

5.5" MIN. FOR 2 X 8*
6.5" MIN. FOR 2 X 10
7.5" MIN. FOR 2 X 12

3/4" MIN.

LEDGER

LAG SCREW OR BOLT

*DISTANCE SHALL BE PERMITTED TO BE REDUCED TO 4.5" IF LAG SCREWS ARE USED OR BOLT SPACING IS REDUCED TO THAT OF LAG SCREWS TO ATTACH 2 X 8 LEDGERS TO 2 X 8 BAND JOISTS.

For SI: 1 inch = 25.4 mm.

FIGURE R507.9.1.3(1)
PLACEMENT OF LAG SCREWS AND BOLTS IN LEDGERS

Lateral Loads

floor sheathing nailing at
S· maximum on center to
joist with hold down

hold down or simllar
tension device

floor joist

deck joist
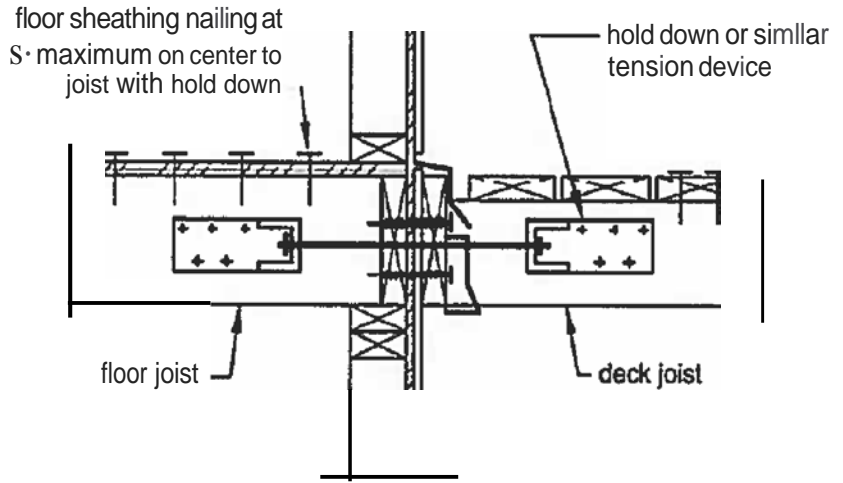
Decks attached to the exterior wall of the dwelling are required to be anchored to protect the lateral load of the deck. **Hold-Down Tension Devices** shall be installed in not less than <u>two</u> locations per deck and <u>within 24" of each end of the deck</u>. Each device shall have an allowable stress design capacity of not less than 1,500 pounds.

Two of these... or... Four of these

Where the load connections are provided in accordance with Figure RS07.2.3(2) the hold-down tensions devices shall be installed in not less than <u>four</u> locations per deck - <u>two within 24" of each end of the deck</u> and <u>two evenly spaced between</u> - and each device shall have an allowable <u>stress design capacity</u> of not less than 750 pounds.

NOTE
THIS DETAIL IS APPLICABLE WHERE FLOOR JOISTS ARE PARALLEL TO DECK JOISTS.

SHEATHING SIDING

FLASHING FOR WATER TIGHTNESS

DECKING

2' MIN.

FLOOR JOISTS

APPROVED JOIST HANGERS

2x LEDGER WITH FASTENERS IN ACCORDANCE WITH TABLE R507.2

HOLD DOWN DEVICE MIN 750 LB CAPACITY AT 4 LOCATIONS, EVENLY DISTRIBUTED ALONG DECK AND ONE WITHIN 2' OF EACH END OF THE LEDGER. HOLD DOWN DEVICES SHALL FULLY ENGAGE DECK JOIST PER HOLD-DOWN MANUFACTURER.

A FULLY THREADED 3/8" DIAMETER LAG SCREW PREDRILLED **W/ MIN** 3" PENETRATION TO CENTER OF TOP PLATE. STUDS. OR HEADER

For SI I inch = 25.4mm. l foot = 304.8 mm.

FIGURE R507.2.312)
DECK ATTACHMENT FOR LATERAL LOADS

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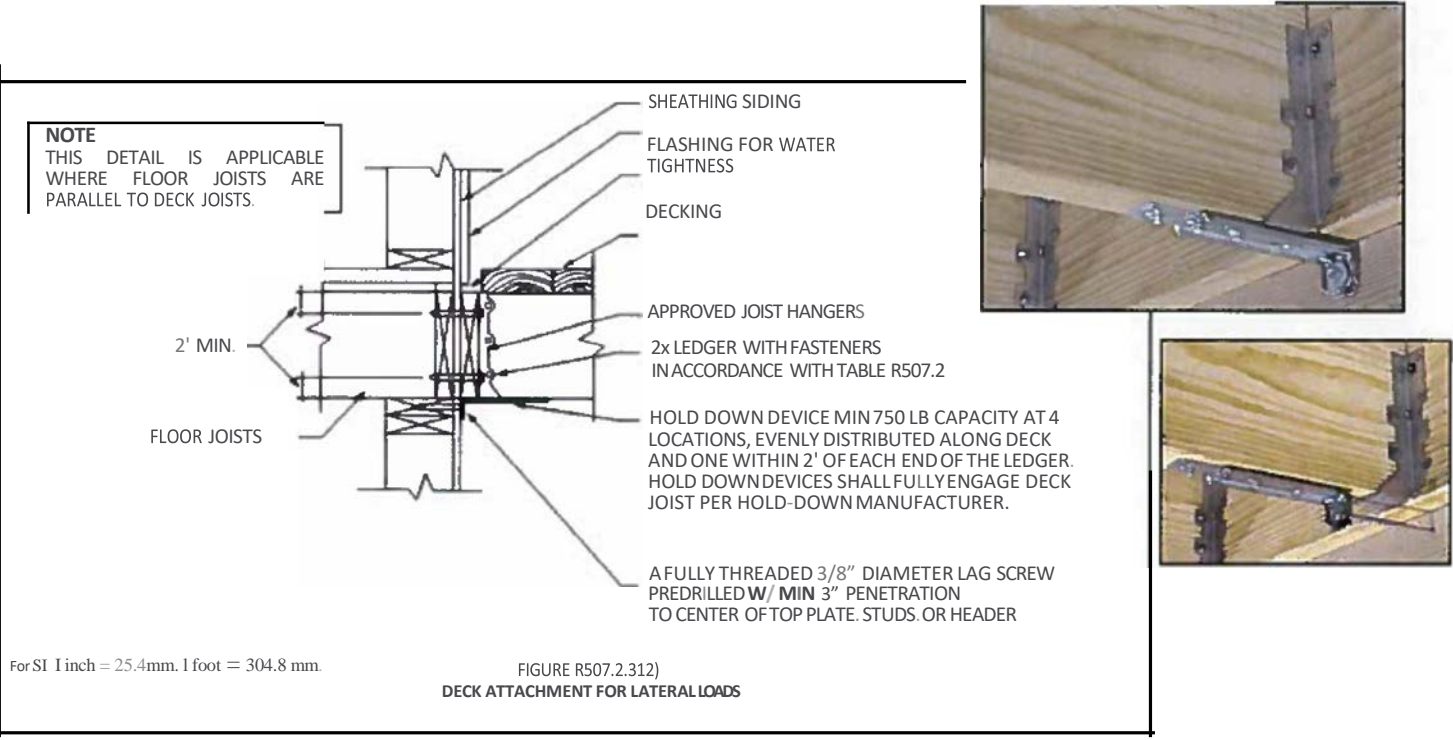
SAMPLE DECK PLAN

Please include the actual deck shape, dimensions, footing locations and beam locations with your building permit application. All lumber shall be approved pressure treated to .40 retention or naturally resistant to decay (cedar / redwood)

Fill in boxes with the dimension and sizes.

Size of desired deck:

    A. Deck width ___ft. ___in.

    B. Deck length ___ft. ___in.

Ledger board: (Flashing required)

    Size: ___ x ___ (2x8 Minimum)

    Lag or bolt size: _____

Flashing material: _____

Joists:

    Size: ___ x ___

    Spacing: ___ on center

    Length of cantilever: ___

Beams: (Any splices to be over a post.)

    Beam size: Double ___ x ___

    Length of beam: _____

    Number of beams needed: ___

Post

    Height of deck off ground: _____

    Posts spacing: _____

    Number of posts needed: _____
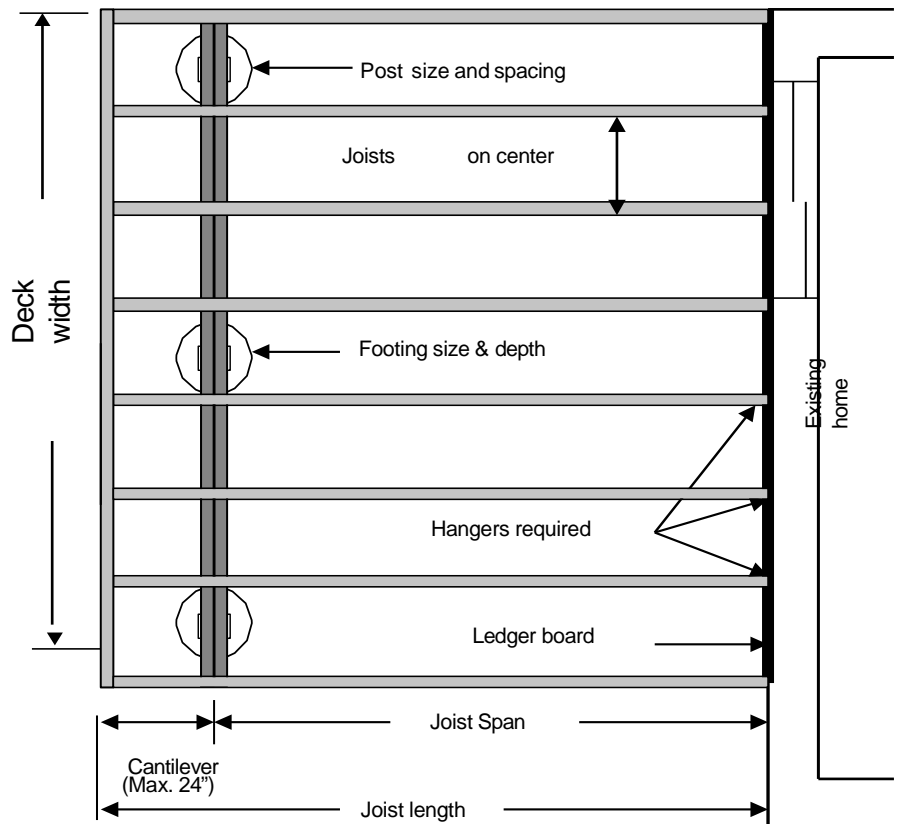
Decking:

    Material: _____

    Size desired: ___ x ___

Footings: (42" min. depth)

    Diameter of footing: _____

OPEN DECK CONSTRUCTION
(Not to scale)

Post size and spacing

Joists ___ on center

Deck width

Footing size & depth

Hangers required

Ledger board

Existing home

Cantilever (Max. 24")

Joist Span

Joist length

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