



CITY OF
GRAND RAPIDS
ITS IN MINNESOTA'S NATURE

DECKS

City of Grand Rapids
Building Safety Division

218-326-7601

www.cityofgrandrapidsmn.com



This handout is intended only as a guide and is based in part on the 2015 Minnesota State Building Code, Grand Rapids City ordinances, and good building practice. While every attempt has been made to insure the correctness of this handout, no guarantees are made to its accuracy or completeness. Responsibility for compliance with applicable codes and ordinances falls on the owner or contractor. For specific questions regarding code requirements, refer to the applicable codes or contact your local Building Safety Division.

BUILDING PERMITS

Building permits are required for decks with the following exception. Freestanding decks (decks not connected to a structure), regardless of size, will not require permits if they are not more than 30 inches above adjacent grade. However, they would still require a zoning permit.

Freestanding decks and decks that are not structurally attached to the dwelling do not require footings that extend below the frost depth.

Building permits are not required for patios made of concrete or pavers on grade.

Building permits can be obtained from the Building Safety Division by filling out an application and submitting your building plans. Building permits are typically processed within 5 business days of receiving a complete set of plans.

PLANS

The Building Safety Division has a handout illustrating what needs to be included on deck plans.

★ THINK YOU MIGHT ENCLOSE YOUR DECK IN THE FUTURE?

Deck plans are approved on the assumption that the deck will be used only as a deck for the life of the structure. Because footing sizes, setbacks, structural supports, and a host of other deck components are different for enclosed porches than for decks, it is important that you indicate on your plans the desire to convert the deck at a future date. You should then design your deck to carry future loads and meet setbacks and other rules.

MATERIALS

Fasteners

Nails and other hardware must be hot-dipped zinc-coated (galvanized), stainless steel or equal to these. Screws should be either hot-dipped galvanized or electroplated with a polymer coating.

12d nails are recommended on nominal 2-inch decking. 10d nails are recommended for 5/4" decking.

With lag screws, use a flat washer under the head. Use washers under the nut and head of machine bolts and just under the nut of carriage bolts.

Lumber

All wood used in deck construction must be pressure treated lumber or wood that is naturally resistant to decay such as redwood or cedar.

★ Wood used above ground, in contact with the ground, or below ground requires different degrees of treatment. Check the labels of the material you are buying to determine where it can be used. ***Because the new preservative treatments are very corrosive, make sure that any metal connectors used in the construction of your deck are approved by the manufacturer for use with treated wood.***

Decking

★ Materials commonly used for decking include standard dimension lumber (either 2X4 or 2X6), radius-edged decking, or a manufactured decking product. ***2X6 dimension lumber is the only lumber product that can be used on joist spacing of 24 inches.***

Radius-edged Patio Decking (5/4 decking) has been specifically developed for outdoor decks. ***Redwood and cedar patio decking is intended to be used flat-wise in load-bearing applications where spans do not exceed 16" o.c. (12" o.c. when installed diagonally to joists). Southern pine decking may span 24" o.c. or 16" o.c. when installed diagonally to joists.***

★ ***Manufactured decking products may be used only when approved by the Building Department.*** This approval is based on the material carrying an NER research report. Decking without a research report will not be approved. Ask the decking supplier to provide you with a copy of the research report. The Building Safety Division maintains a list of decking materials that have been approved for use in Minnesota that is available upon request. ***Caution – some manufactured deck products are approved for decking but not for stair treads. In some cases where manufactured decking is approved for stairs, the spacing of supports may be significantly reduced compared to use on the deck itself. Read the research report for further information.***

MAXIMUM DECK BOARD SPANS	
2x6 OR 5/4 SOUTHERN PINE PERPENDICULAR TO JOIST	24" O.C.
5/4 CEDAR OR REDWOOD AND 2X4 PERPENDICULAR TO JOIST OR 5/4 SOUTHERN PINE OR 2X6 AT 45 DEGREES TO JOIST	16" O.C.
5/4 AND 2X4 AT 45 DEGRESS TO JOIST	12" O.C.

FOOTINGS

Call Gopher State One Call for utility locations at least two working days before you dig – 1-800-252-1166 or 651-454-0002.

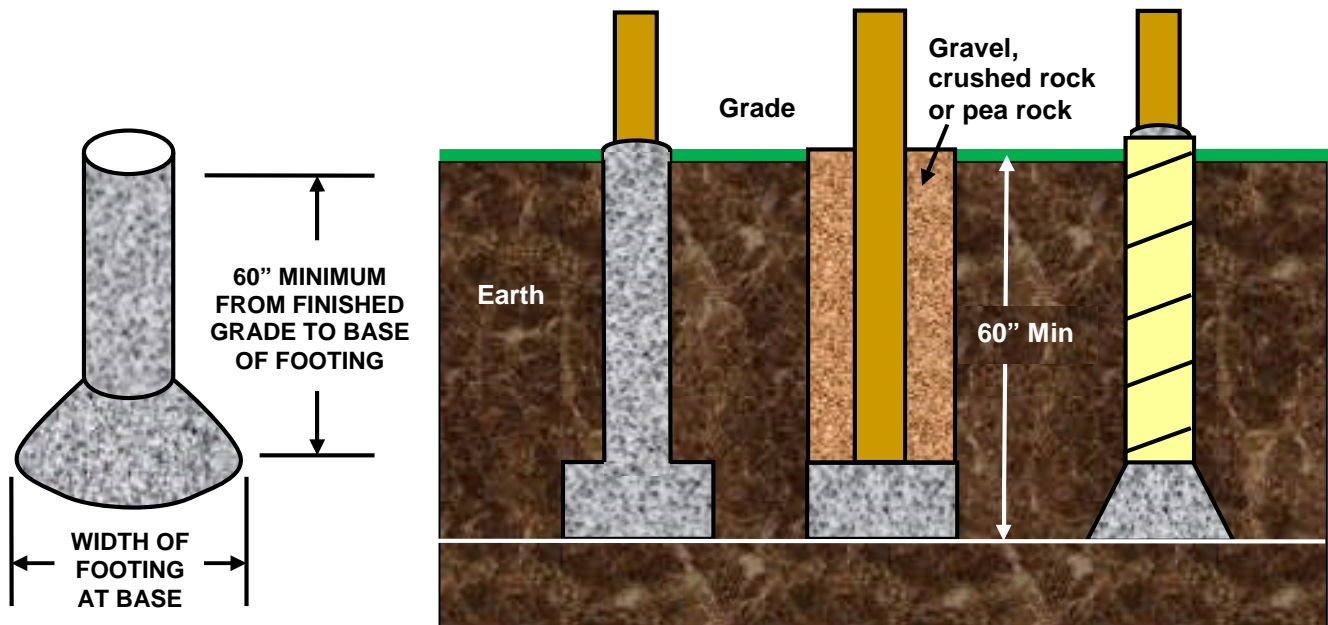


Deck footings should be sized according to the following table. Footings must extend at least 60 inches below grade (frost line) except for decks that are not connected to a dwelling.

DECK FOOTING SIZES (2000 psf soils)					
Area of Deck Supported in Sq Ft	Footing Diameter Required in Inches	Area of Deck Supported in Sq Ft	Footing Diameter Required in Inches	Area of Deck Supported in Sq Ft	Footing Diameter Required in Inches
14	8	43	14	87	20
18	9	49	15	96	21
22	10	56	16	106	22
26	11	63	17	116	23
32	12	71	18	126	24
37	13	79	19	137	25

Required footing sizes are determined by calculating the area of the deck supported by each footing. Loads shall be assumed to be equally shared between the supporting elements.

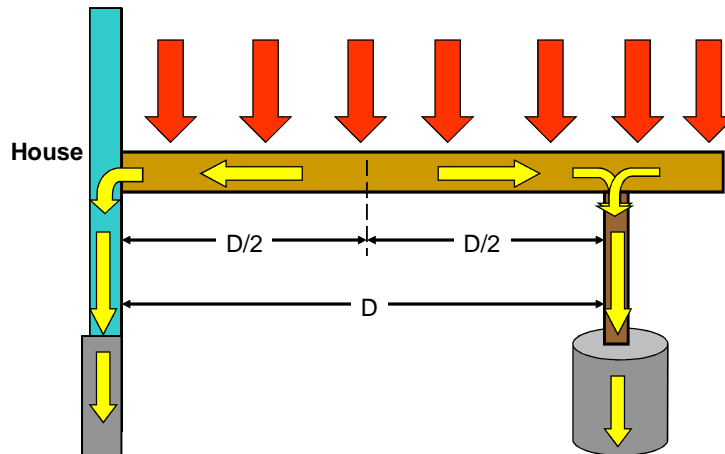
Don't overlook cantilevers.



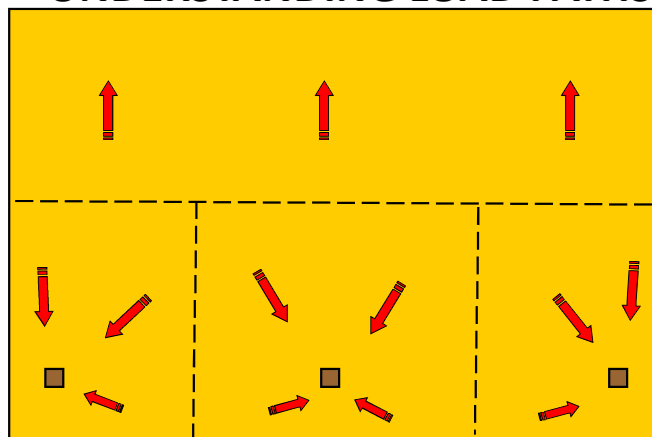
Footings supporting a 4x4 column must be not less than 6-inch diameter. Post footings supporting columns larger than 4x4 must be not less than 8-inch diameter. The bottom of post footings may be "belled" to achieve the desired minimum bearing area. The base of the footing must be at least 60 inches below finished grade. Care should be exercised to center

the column on the footing. Posts imbedded in the ground must be 60% C.C.A. or equal. The use of a fiberboard tube will allow you to elevate the top of the footing above finished grade to provide protection of the wood post from lawn mowers and trimmers.

UNDERSTANDING LOAD PATHS



UNDERSTANDING LOAD PATHS



Loads are assumed to be uniform across the floor

DECK FRAMING

Ledger Board



The ledger board attaches to the house frame or foundation. ***Make sure the ledger is securely attached to the dwelling (R507.2). Install metal flashing at top, and caulk sides and bottom.***

FASTENER SPACING FOR SOUTHERN PINE OR HEM-FIR DECK LEDGER AND 2-INCH NOMINAL SOLID-SAWN SPRUCE-PINE-FIR BAND JOIST

Deck Live Load = 40 psf, Deck Dead Load = 10 psf^{3,6,7}

JOIST SPAN (ft)	6' and less	6'1" to 8'	8'1" to 10'	10'1" to 12'	12'1" to 14'	14'1" to 16'	16'1" to 18'
CONNECTION DETAILS	ON-CENTER SPACING OF FASTENERS^{4,5}						
1/2" DIAM. LAG SCREW WITH 1 5/32" SHEATHING ¹	30	23	18	15	13	11	10
1/2" DIAM. BOLT WITH 1 5/32" MAX. SHEATHING	36	36	34	29	24	21	19
1/2" DIAM. BOLT / 1 5/32" MAX. SHEATHING AND 1/2" STACKED WASHERS ^{2,8}	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 the face of the wall sheathing shall be 1/2".

³ Ledgers shall be flashed to prevent water from contacting the house band joist.

⁴ Lag screws and bolts shall be placed two inches from the bottom or top of deck ledgers and between two and five inches from the ends. Lag screws or bolts shall be staggered from the top to the bottom along the horizontal run of the deck ledger.

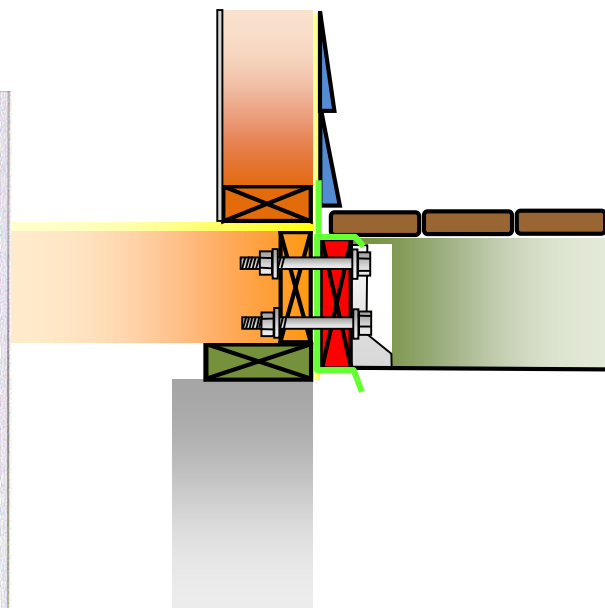
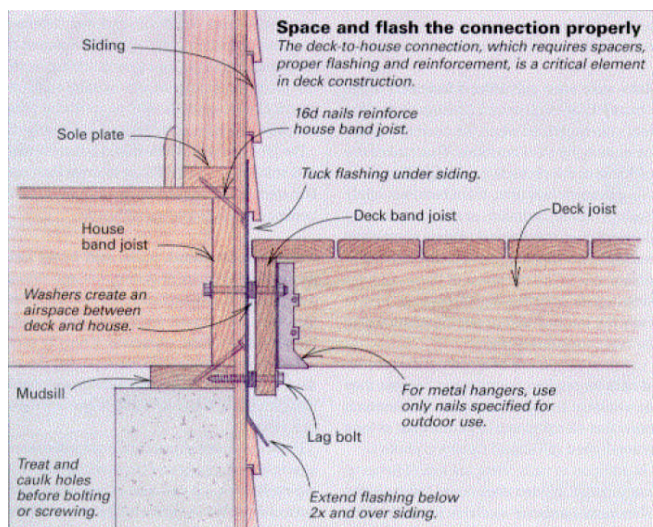
⁵ Deck ledgers shall be minimum 2X8 pressure-preservative treated No. 2 grade lumber or other approved materials as established by standard engineering practices.

⁶ When solid-sawn pressure-preservative-treated deck ledgers are attached to engineered wood products (structural composite rim board or laminated veneer lumber), the ledger attachment shall be designed in accordance with accepted engineering practices.

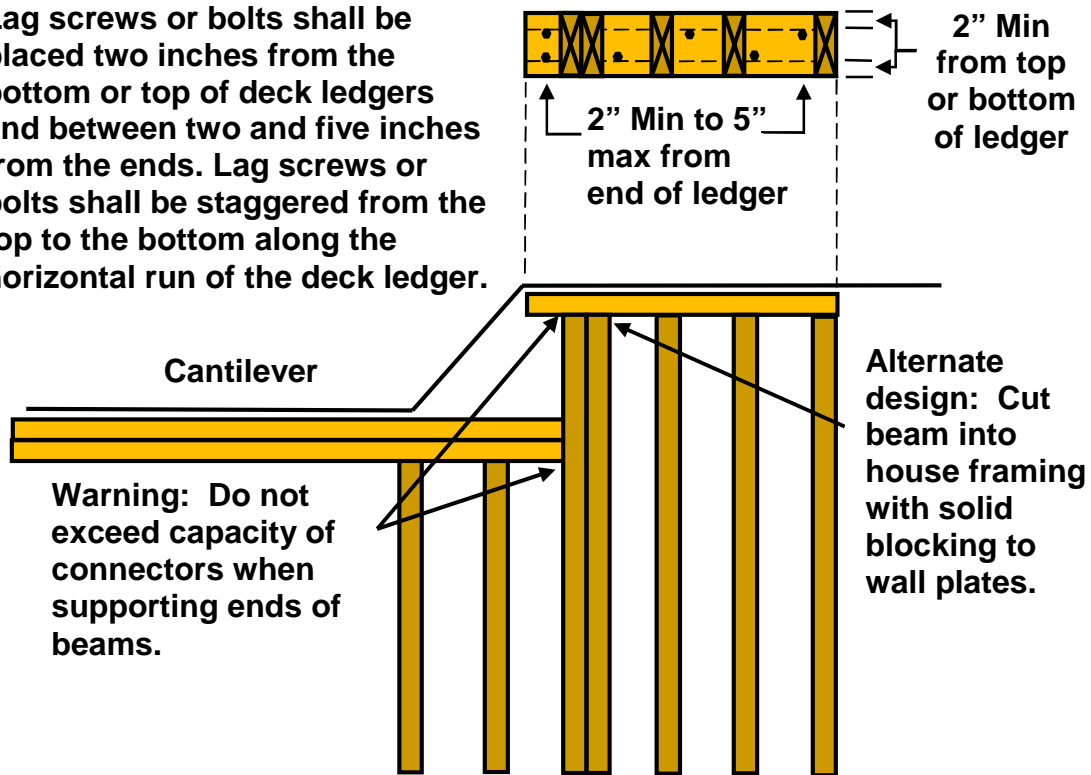
⁷ A minimum 1 X 9 1/2 Douglas Fir laminated veneer rimboard shall be permitted in lieu of the 2-inch nominal band joist.

⁸ Wood structural panel sheathing, gypsum board sheathing, or foam sheathing not exceeding one inch in thickness shall be permitted. The maximum distance between the face of the ledger board and the band joist shall be one inch.

❖ Capacity of lag or carriage bolts shall not exceed 400 lb's per bolt unless design provided.



Lag screws or bolts shall be placed two inches from the bottom or top of deck ledgers and between two and five inches from the ends. Lag screws or bolts shall be staggered from the top to the bottom along the horizontal run of the deck ledger.



Warning: Do not exceed capacity of connectors when supporting ends of beams.

Alternate design: Cut beam into house framing with solid blocking to wall plates.

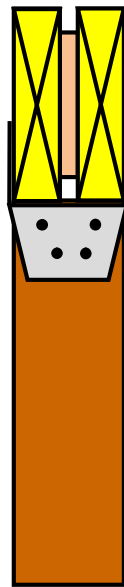
WARNING: CAPACITY OF LAG OR CARRIAGE BOLTS SHALL NOT EXCEED 400 LB'S PER BOLT UNLESS DESIGN PROVIDED.

Beams

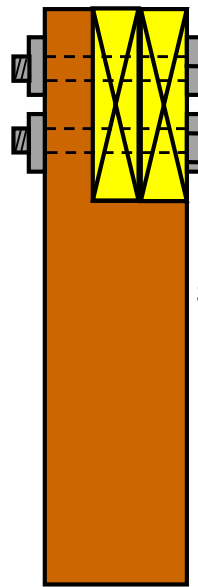
Construct the beam using two or more 2 inch nominal pieces of lumber. Nail the beam together using 16d nails at 16 inches o.c. along each edge of the beam. A spacer may be used to fir the beam to a 3½ -inch width. Beams should be installed with any arch or crown facing up. Attachments to columns should be with post caps designed for such use.

BEAM SPAN TABLE FOR SOUTHERN PINE BEAMS											
JOIST LENGTH	POST SPACING										
	4'	5'	6'	7'	8'	9'	10'	11'	12'	13'	14'
6"	2-2X6	2-2X6	2-2X6	2-2X6	2-2X6	2-2X6	2-2X8	2-2X8	2-2X10	2-2X10	2-2X10
7'	2-2X6	2-2X6	2-2X6	2-2X6	2-2X6	2-2X8	2-2X8	2-2X10	2-2X10	2-2X10	2-2x12
8'	2-2X6	2-2X6	2-2X6	2-2X6	2-2X8	2-2X8	2-2X8	2-2X10	2-2X10	2-2x12	2-2x12
9'	2-2X6	2-2X6	2-2X6	2-2X6	2-2X8	2-2X8	2-2X10	2-2X10	2-2x12	2-2x12	3-2x10
10'	2-2X6	2-2X6	2-2X6	2-2X6	2-2X8	2-2X8	2-2X10	2-2X10	2-2x12	3-2x10	3-2x10
11'	2-2X6	2-2X6	2-2X6	2-2X8	2-2X8	2-2X10	2-2X10	2-2x12	2-2x12	3-2x10	3-2x12
12'	2-2X6	2-2X6	2-2X6	2-2X8	2-2X8	2-2X10	2-2X10	2-2x12	2-2x12	3-2x10	3-2x12
13'	2-2X6	2-2X6	2-2X6	2-2X8	2-2X8	2-2X10	2-2X10	2-2x12	3-2x10	3-2x12	3-2x12
14'	2-2X6	2-2X6	2-2X6	2-2X8	2-2X10	2-2X10	2-2x12	2-2x12	3-2x12	3-2x12	3-2x12
15'	2-2X6	2-2X6	2-2X8	2-2X8	2-2X10	2-2X10	2-2x12	3-2x10	3-2x12	3-2x12	ENG BM
16'	2-2X6	2-2X6	2-2X8	2-2X8	2-2X10	2-2x12	2-2x12	3-2x10	3-2x12	3-2x12	ENG BM

METHODS OF ATTACHING BEAM TO COLUMN

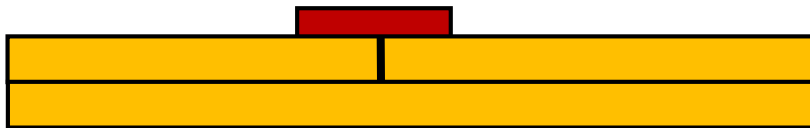


BEAM
SECURED
WITH
POST
CAP

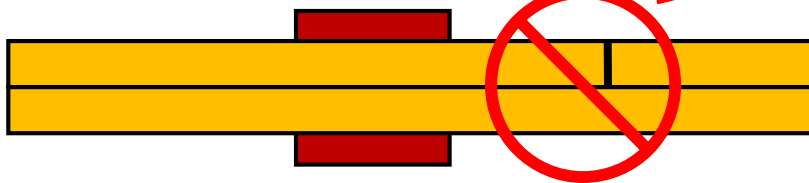


BEAM
SECURED WITH
BOLTS TO
NOTCHED
COLUMN

BEAM SPLICES



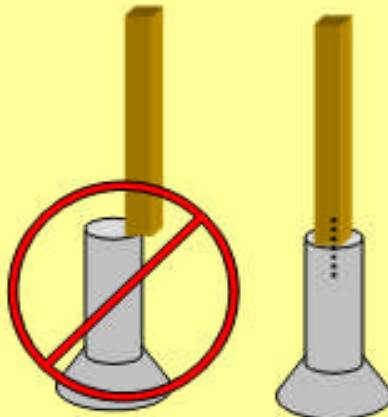
OK



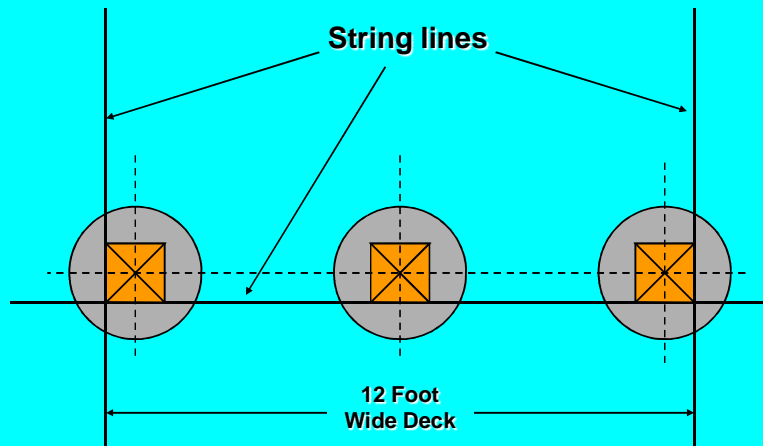
Columns

		MAXIMUM POST HEIGHT IN FEET													
SPECIES	SIZE	SQUARE FEET OF DECK SUPPORTED													
		36	48	60	72	84	96	108	120	132	144	156	165	180	192
SOUTHERN PINE	4X4	10	10	10	9	9	8	8	7	7	6	6	6	6	6
	4X6	14	14	13	12	11	10	10	9	9	8	8	8	7	7
	6X6	17	17	17	17	17	17	17	17	16	16	15	14	13	13
REDWOOD CEDAR	4X4	10	10	9	8	7	7	6	6	5	4				
	4X6	14	13	12	11	10	9	8	8	7	7	7	6	6	5
	6X6	17	17	17	17	17	16	13	7						

THE REQUIRED AREA OF THE COLUMN SHOULD FULLY BEAR ON THE FOOTING



★ HINT: PLACING A SLIGHT CROWN ON THE TOP OF THE FOOTING PREVENTS WATER ACCUMULATIONS AND PREMATURE COLUMN FAILURE.



Note that the intersection of your string lines is not the center of the footing. Adjust according to the location and size of your column.

Joists

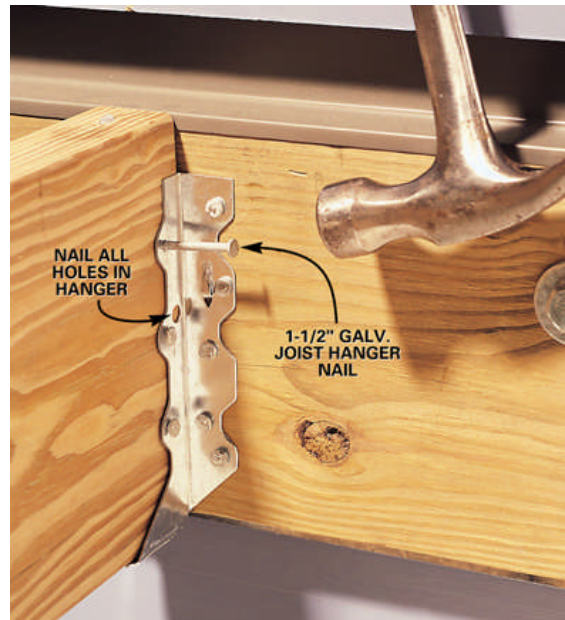
JOIST SPANS						
	SOUTHERN PINE			WESTERN CEDAR		
JOIST	12" oc	16" oc	24" oc	12" oc	16" oc	24" oc
2X6	10'9"	9'9"	8'6"	9'2"	8'4"	7'3"
2X8	14'2"	12'10"	11'0"	12'1"	11'0"	9'2"
2X10	18'0"	16'1"	13'5"	15'5"	13'9"	11'3"
2X12	21'9"	19'0"	15'4"	18'5"	16'0"	13'0"

MAXIMUM CANTILEVER SPANS FOR JOISTS WITH BACKSPAN AT LEAST 2:1		
JOIST SIZE	SPACING O.C.	MAX. CANTILEVER
2X8	12"	34"
2X8	16"	29"
2X10	12"	49"
2X10	16"	42"
2X10	24"	34"
2X12	16"	57"
2X12	24"	47"

★ Joists must bear on a beam, ledger strip, or joist hangers. Joist hangers must be installed in accordance with the manufacturer's recommendations. **Fill all nail holes in joist hangers.**



CONCEALED FLANGE HANGER



CONVENTIONAL HANGER

GUARDS

Guards are required for portions of decks more than 30" above grade. The height of the guard must be a minimum of 36". Open guards must have intermediate rails or an ornamental pattern that a 4" sphere cannot pass through. Guards must continue down stairs where the stair is more than 30 inches above grade. The height of guards on stairs must be 34 inches minimum.

STAIRS

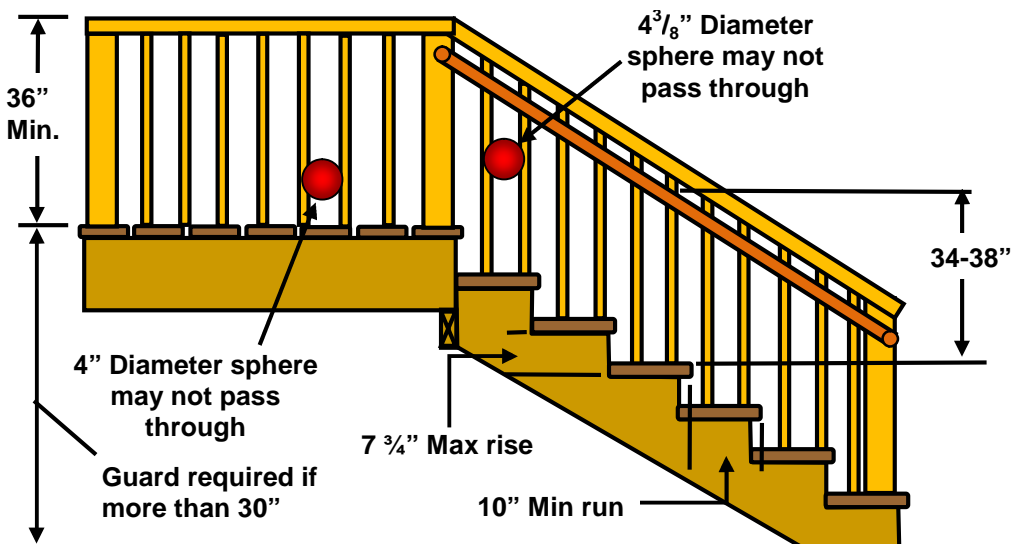
★ **Stairs must have a maximum rise of $7\frac{3}{4}$ inches and a minimum run of 10 inches.** The run is measured from the nosing of one tread to the nosing of the next. The greatest riser height within any flight of stairs shall not exceed the smallest by more than $\frac{3}{8}$ inch. The greatest tread depth within any flight of stairs shall not exceed the smallest by more than $\frac{3}{8}$ inch.

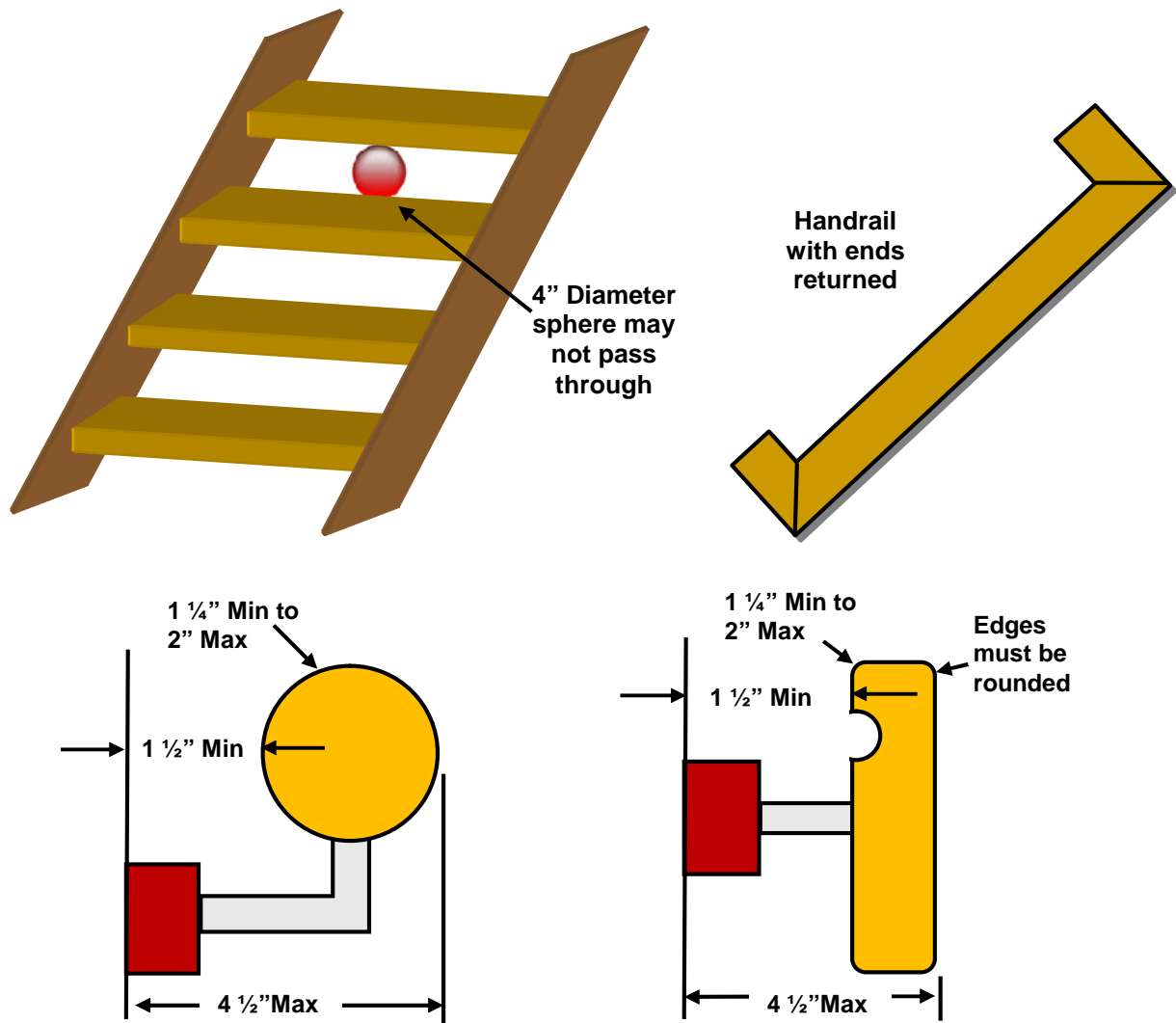
Open risers are permitted provided that a 4" diameter sphere will not pass between the treads.

★ Stairs must be a minimum of 36 inches wide above the handrail and 31½ inches below the handrail. **Handrails must be provided on at least one side when there are four or more risers. The top of handrails must be between 34 and 38 inches above the nosing of the treads. The gripping portion of a handrail must have a circular cross section of 1¼ inch to 2 inches. Handrails must have returns on each end or terminate in a newel post.** Other handrail shapes having an equivalent gripping shape may be used with prior approval of the Building Safety Division.

Handrails must be continuous for the entire length of the stairs and may not be interrupted by newel posts except at landings.

Hand rails and guards must be designed to support a 200 lb load applied in any direction at any point along the top of the guard or rail. The bottoms of the stringers should rest on a sound foundation such as a gravel bed, a concrete pad, pavers, or similar.





INSPECTIONS

The Building Safety Division will usually make two inspections of your deck. It is your responsibility to call for an inspection 1-2 days in advance of the time you need an inspection. When calling for an inspection you will be asked for your address, type of inspection you desire (footing, final), permit number (which is found on your building permit and inspection record card), and the time you want the inspection. We will make every effort to accommodate requests for inspections at specific times.

The first inspection will be of the footings. At the time of the inspection, the holes should be dug and all loose material should be removed but no concrete should be poured. The inspector will check the depth of the footing and its width at the base. They will also check the location of the footings for compliance with the zoning ordinance. If you are having problems with water seeping into the hole, you may wish to insert a large plastic garbage bag into the hole and pour the concrete into the bag to displace water without compromising the concrete.

The last inspection is the final inspection. The inspector will check the size and spacing of joists, beams and columns, the attachment to the dwelling including flashing, the type of fasteners and lumber being used, type of decking used, railings, stairs, and landings. If your deck will be built such that the underside of the deck will not be visible or accessible at the final inspection, you should call for a framing inspection prior to installation of decking.

The inspection record card and approved plans should be available whenever an inspection is made. The inspector will sign the record card if the work is approved and this will be your authorization to

proceed to the next step. If you will not be present for the inspection, place the record card and plans near the worksite where they can be found by the inspector. This record card will also provide documentation for you that your deck was inspected and approved. Common correction orders include lack of or improperly attached connectors; composite decking instructions not on site; composite decking used for stair treads in conflict with manufacturer's directions; lack of handrails; stair rise/run not compliant; no grippable handrail or discontinuous handrails; 4 inch spacing for guards and risers exceeded; no flashing at the ledger; beam splices not over column; and stair stringers not securely attached. Please make sure these issues are all addressed before calling for a framing or final inspection.

If a violation is detected, a notice will be prominently placed at the site noting the correction that must be made. The notice will also indicate if a re-inspection will be necessary. If a re-inspection is necessary, you must call for the inspection and have the correction approved before proceeding unless directed otherwise by the inspector.

Please do not hesitate to call the community development department at 218-326-7601 if you have questions. If necessary, we will be happy to meet with you on the site to help resolve any concerns or problems.