

# Building a Deck

City of Appleton  
Public Works Inspection Division  
920-832-6411

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## Regulations Governing Deck Construction

The building code of the City of Appleton requires that your home and any accessory structures on your property comply with the State of Wisconsin Uniform Dwelling Code.

The Uniform Dwelling Code (UDC) sets standards for the structural, electrical, mechanical, plumbing and fire protection components of construction. By reviewing plans, issuing permits, and performing field inspections for alterations and improvements to your property, your Public Works Department helps you comply with the provisions of the law.

The City of Appleton implements the State Uniform Dwelling Code [SPS 320 -325], which incorporates by reference the National Electric Code and the State Plumbing Code.

## Zoning Requirements

You may call the Inspection Division to determine minimum yard and other zoning-related requirements. Minimum yard (setback) requirements, as set forth in the Appleton Zoning Ordinance, represent the minimum distance from the property's boundary lines that are required for the location of any deck. The zoning permit application is integrated into the building permit application and is processed simultaneously.

## Covenants and Deed Restrictions

Many of the subdivisions and developments in the City of Appleton have private deed restrictions and covenants regulating the construction of decks beyond the limitations contained in City Ordinances. These amount to contractual agreements. The City does not enforce covenants and deed restrictions and is not aware of their specific requirements. Compliance with private restrictions is the responsibility of the property owner.

## Utility Lines and Meters

When deciding the location of a deck, first check with local utility companies to verify that utility lines or meters are not being covered. Meters must be accessible. The City may not verify this for you.

## What Permits are Required

A building permit is required for all decks that are supported by footings regardless of the height above grade. Paved, grade level patios do not require a building permit.

For decks constructed with stairway illumination or hot tubs, spas, etc., electrical permits may also be required.

## Chapters SPS 320 to 325

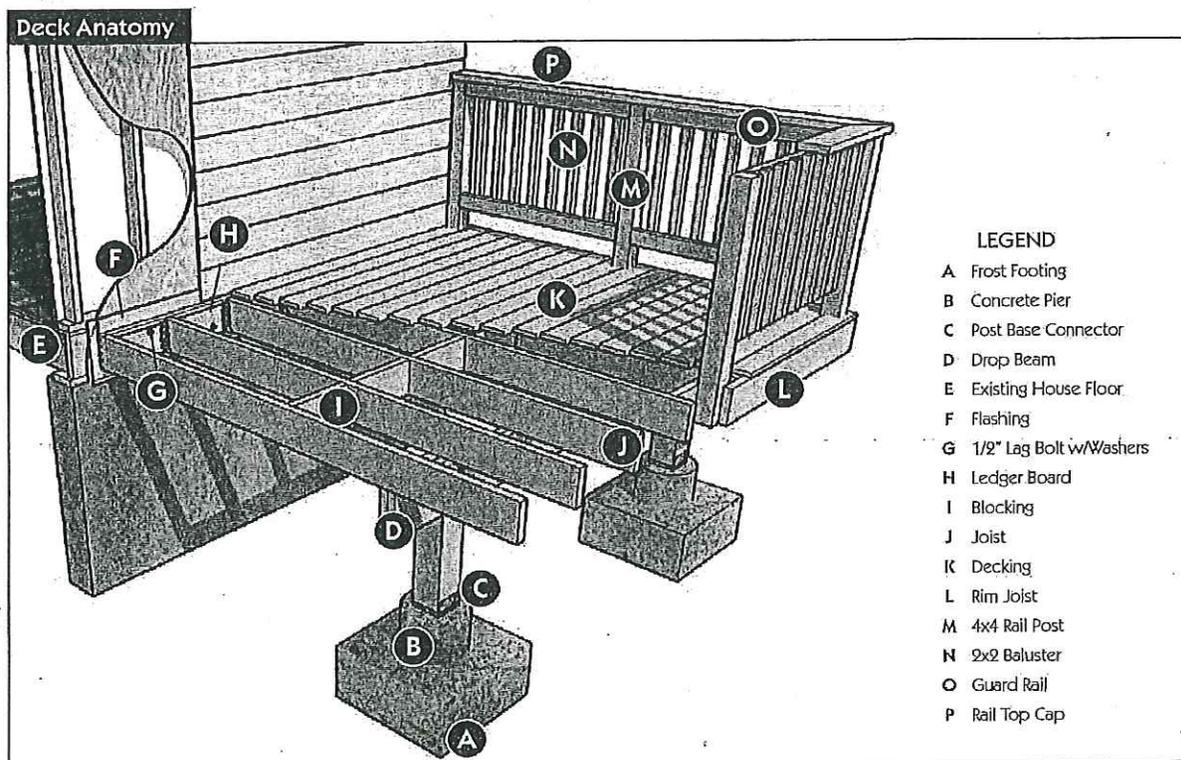
### APPENDIX B

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### SECTION 1: GENERAL REQUIREMENTS

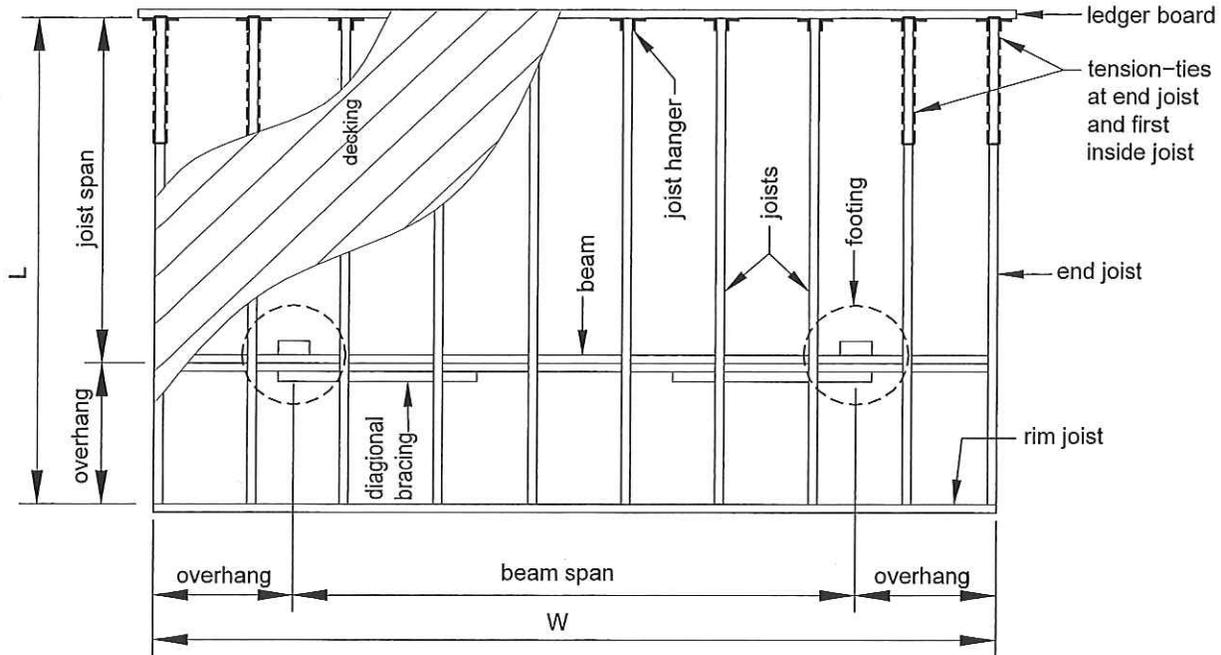
- All lumber, including for decking, must be pressure-preservative-treated and must be either douglas fir/larch, hemlock/fir, spruce/pine/fir (SPF), or southern pine, of grade #2 or better – unless a naturally durable species such as a western red cedar is used. Lumber in contact with the ground must be rated as “ground-contact.” The lumber must be identified by the grade mark of, or certificate of inspection issued by, a professional lumber-grading or inspection bureau or agency ([www.alsc.org](http://www.alsc.org)).

**Note:** Not all treated lumber is rated for ground contact. See Table C-1 in Appendix C for further information.



- Wood-plastic composites must bear a label indicating their performance criteria and compliance with ASTM D7032.

**Figure 35  
TYPICAL DECK FRAMING PLAN**



**Decking:**  2x4  2x6  five-quarter board  wood-plastic composite (per ASTM D 7032)  
 Other decking, evaluation report number: \_\_\_\_\_

**Joists:** size:  2x6  2x8  2x10  2x12 spacing:  12 in.  16 in.  24 in.  
 joist span dimension: \_\_\_\_\_ ft. - \_\_\_\_\_ in.  
 overhang:  Yes  No overhang dimension: \_\_\_\_\_ ft. - \_\_\_\_\_ in.  
 rim joist:  2x6  2x8  2x10  2x12

**Beam(s):** number of plies:  2  3 size:  2x6  2x8  2x10  2x12  
 overhang:  Yes  No overhang dimension: \_\_\_\_\_ ft. - \_\_\_\_\_ in.

**Posts:** size:  4x4  4x6  6x6 height: \_\_\_\_\_ ft. - \_\_\_\_\_ in.

**Footings:** size: \_\_\_\_\_ in.  square  round thickness: \_\_\_\_\_ in.

**Ledger:** ledger board size:  2x8  2x10  2x12  Not applicable (free-standing deck)  
 fastener:  Through bolt  Lag screw  Wood screw  
 Expansion anchor  Adhesive anchor

**Lateral support:**  Tension-tie  Diagonal bracing, size:  2x  
 (not permitted for free-standing deck)

**Deck size:** L= \_\_\_\_\_ ft. - \_\_\_\_\_ in. W= \_\_\_\_\_ ft. - \_\_\_\_\_ in.

2. Footing size and thickness must be in accordance with Table 1. (See sections 4 and 5 for determining post spacing and joist length.)
3. Post attachments must be in accordance with Figure 1 except expansion anchors are also permitted – and any instructions from the manufacturer of the anchor must be followed.
4. Post anchors must include a 1-inch–minimum base plate. Steel plates are not required.
5. Each post must bear directly over the middle one–third of a footing.
6. Footings must bear on solid ground below the frost penetration level or at least 48 inches below finished grade, whichever is deeper. Bearing onto unprepared fill material, organic soil, alluvial soil, or mud is prohibited. The bearing capacity of the soil is presumed to be at least 2000 pounds per square foot (psf), and must be verified by a building inspector prior to placement of concrete.
7. If the edge of a deck footing is closer than 5 feet to an existing house wall, the footing must bear at the same elevation as the existing footing for that wall.
8. Construction of footings over utility lines or any service pipe is prohibited.

Note: Call the utility provider before digging.

**Table 1**  
**FOOTING SIZE (In Inches)<sup>1,2,3</sup>**

Joist Length		Post Spacing (Measured Center to Center)										
		4'	5'	6'	7'	8'	9'	10'	11'	12'	13'	14'
6'	Corner Footing	8	9	10	11	11	12	12	13	14	14	15
	Intermediate Footing	10	11	12	13	14	15	15	16	17	17	18
	Footing Thickness	6	6	6	6	6	6	6	6	6	6	8
7'	Corner Footing	9	10	11	11	12	13	13	14	15	15	16
	Intermediate Footing	11	12	13	14	15	16	17	17	18	19	19
	Footing Thickness	6	6	6	6	6	6	6	6	8	8	8
8'	Corner Footing	10	10	11	12	13	14	14	15	15	16	17
	Intermediate Footing	12	13	14	15	16	17	18	19	19	20	21
	Footing Thickness	6	6	6	6	6	6	8	8	8	8	8
9'	Corner Footing	10	11	12	13	14	14	15	16	16	17	18
	Intermediate Footing	12	14	15	16	17	18	19	20	20	21	22
	Footing Thickness	6	6	6	6	6	8	8	8	8	8	8
10'	Corner Footing	10	12	12	13	14	15	16	16	17	18	18
	Intermediate Footing	13	14	15	17	18	19	20	21	21	22	23
	Footing Thickness	6	6	6	6	8	8	8	8	8	8	10
11'	Corner Footing	11	12	13	14	15	16	16	17	18	19	19
	Intermediate Footing	13	15	16	17	19	20	21	22	22	23	24
	Footing Thickness	6	6	6	6	8	8	8	8	8	10	10
12'	Corner Footing	11	12	14	15	15	16	17	18	19	19	20
	Intermediate Footing	14	15	17	18	19	20	21	22	23	24	25
	Footing Thickness	6	6	6	8	8	8	8	8	10	10	10
13'	Corner Footing	12	13	14	15	16	17	18	19	19	20	21
	Intermediate Footing	14	16	17	19	20	21	22	23	24	25	26
	Footing Thickness	6	6	6	8	8	8	8	10	10	10	10
14'	Corner Footing	12	13	15	16	17	18	18	19	20	21	22
	Intermediate Footing	15	17	18	19	21	22	23	24	25	26	27
	Footing Thickness	6	6	8	8	8	8	10	10	10	10	10
15'	Corner Footing	12	14	15	16	17	18	19	20	21	22	22
	Intermediate Footing	15	17	19	20	21	23	24	25	26	27	28
	Footing Thickness	6	6	8	8	8	10	10	10	10	10	12
16'	Corner Footing	13	14	15	17	18	19	20	20	21	22	23
	Intermediate Footing	16	18	19	21	22	23	25	26	27	28	29
	Footing Thickness	6	8	8	8	8	10	10	10	10	12	12

<sup>1</sup>All footing sizes are base diameters<sup>2</sup>.

<sup>2</sup>For square footings, insert the diameter (d) into the following formula:  $\sqrt{((d/2)^2 \times \pi)}$ . This number will give you the square dimension and must be rounded up to the nearest inch.

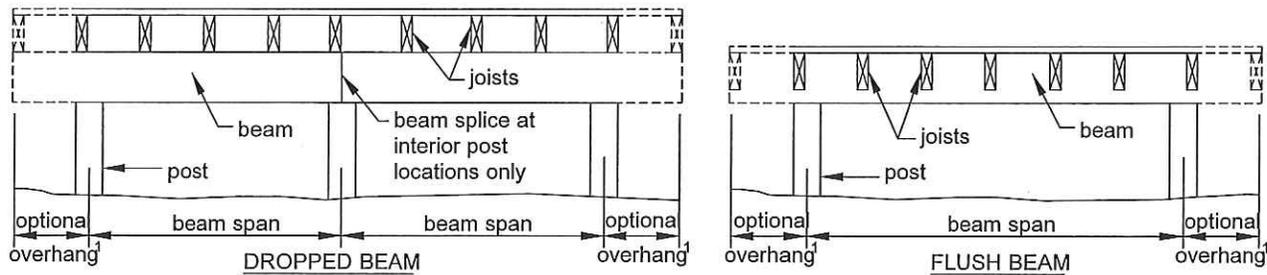
<sup>3</sup>Joist length is the joist span plus any overhang beyond a beam. See section 5.4.

**SECTION 4: BEAMS**

Beams must comply with all of the following:

1. As shown in Figure 3, the beam-span length is measured between the centerlines of 2 adjacent posts and does not include the overhangs.
2. Beam size is determined using Table 3A or 3B. The depth of flush beams must be greater than or equal to the joist depth.
3. Beams may overhang past the center of the post up to one-fourth of the actual beam span, as shown in Figure 3.
4. Where multiple 2x members are used to assemble a beam, the plies of the beam must be fastened in accordance with Figure 4.
5. Pressure-preservative-treated glulam beams are permissible for spans longer than those shown in Table 3. However, a design and plan submission is required during the permit application process.

**Figure 3  
BEAM TYPES**



<sup>1</sup>The maximum length of the overhang is equal to one-fourth of the actual beam span length (0.25 x beam span).

**Table 3A  
MAXIMUM BEAM-SPAN LENGTH<sup>1</sup> FOR DOUGLAS FIR/LARCH<sup>3</sup>, HEM/FIR<sup>3</sup>, SPRUCE/PINE/FIR  
(SPF)<sup>3</sup>, WESTERN CEDAR, PONDEROSA PINE<sup>4</sup>, AND RED PINE<sup>4</sup>**

Joist Span	(Number of Plies) Beam Size <sup>2</sup> – Inches											
	3x6 (2)2x6	3x8 (2)2x8	3x10 (2)2x10	3x12 (2)2x12	4x6	4x8	4x10	4x12	(3)2x6	(3)2x8	(3)2x10	(3)2x12
≤ 6'	5'-5"	6'-10"	8'-4"	9'-8"	6'-5"	8'-5"	9'-11"	11'-5"	7'-4"	9'-8"	12'-0"	13'-11"
≤ 8'	4'-8"	5'-11"	7'-3"	8'-5"	5'-6"	7'-3"	8'-7"	9'-11"	6'-8"	8'-6"	10'-5"	12'-1"
≤ 10'	4'-2"	5'-4"	6'-6"	7'-6"	4'-11"	6'-6"	7'-8"	8'-10"	6'-0"	7'-7"	9'-4"	10'-9"
≤ 12'	3'-10"	4'-10"	5'-11"	6'-10"	4'-6"	5'-11"	7'-0"	8'-1"	5'-6"	6'-11"	8'-6"	9'-10"
≤ 14'	3'-6"	4'-6"	5'-6"	6'-4"	4'-2"	5'-6"	6'-6"	7'-6"	5'-1"	6'-5"	7'-10"	9'-1"
≤ 16'	3'-1"	4'-1"	5'-1"	5'-11"	3'-11"	5'-2"	6'-1"	7'-0"	4'-9"	6'-0"	7'-4"	8'-6"
≤ 18'	2'-9"	3'-8"	4'-8"	5'-7"	3'-8"	4'-10"	5'-8"	6'-7"	4'-6"	5'-8"	6'-11"	8'-1"

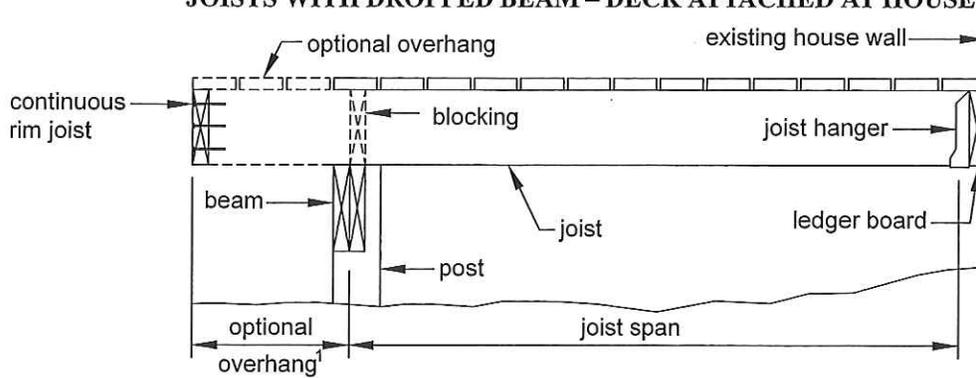
<sup>1</sup>Spans are based on 40 psf live load, 10 psf dead load, normal loading duration, wet service conditions, and deflections of  $\Delta = L/360$  for main span and  $L/180$  for overhang with a 220 lb. point load.

<sup>2</sup>Beam depth must be equal to or greater than joist depth if joist hangers are used (see Figure 8, Option 3).

<sup>3</sup>Incising is assumed.

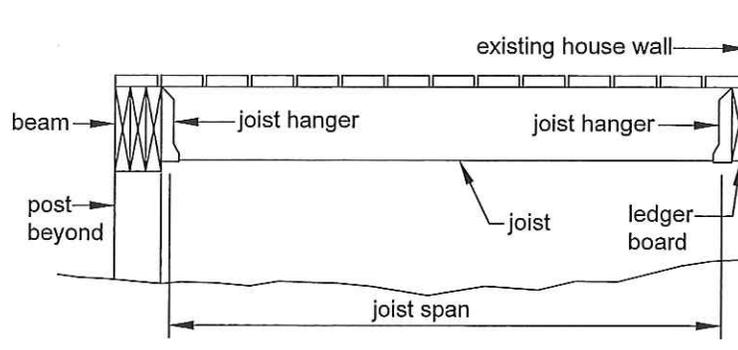
<sup>4</sup>Design values based on northern species with no incising assumed.

**Figure 5**  
**JOISTS WITH DROPPED BEAM – DECK ATTACHED AT HOUSE**

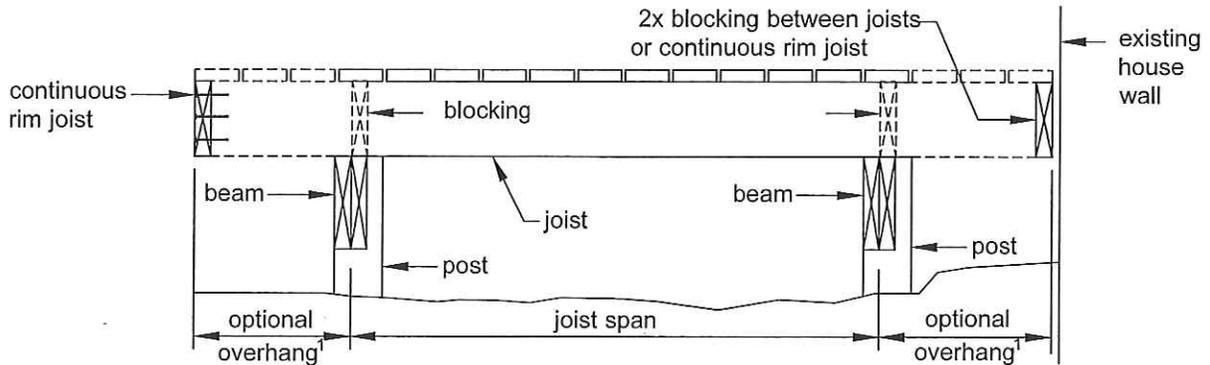


<sup>1</sup>The maximum length of the overhang is equal to one-fourth of the actual joist span length (0.25 x joist span).

**Figure 6**  
**JOISTS WITH FLUSH BEAM – DECK ATTACHED AT HOUSE**



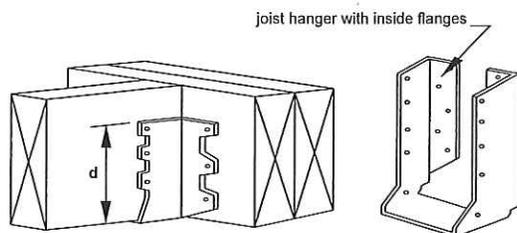
**Figure 7**  
**JOISTS WITH TWO DROPPED BEAMS/FREE-STANDING DECK**  
(See section 10 for more information.)



<sup>1</sup>The maximum length of the overhang is equal to one-fourth of the actual joist span length (0.25 x joist span).

4. For joist hangers that are fastened to a ledger board, screws which are recommended by the manufacturer must be used. All other fasteners are permitted to be nails. The number of fasteners and the manner in which they are used must be as specified by the manufacturer.
5. Use joist hangers with inside flanges if clearances to the edge of the beam or ledger board dictate.
6. Clip-angles or brackets used to support framing members in lieu of joist hangers are prohibited.
7. Joists must not frame in from both sides of the same beam. Engineering analysis is needed if more beams are needed than are shown in Figures 5 to 7.
8. Each joist hanger must have the minimum capacity listed in Table 5.

**Figure 9**  
**JOIST HANGERS**



**Table 5**  
**JOIST HANGER DOWNLOAD**

Joist Size	Minimum Capacity, lbs
2"x6"	500
2"x8"	500
2"x10"	600
2"x12"	700

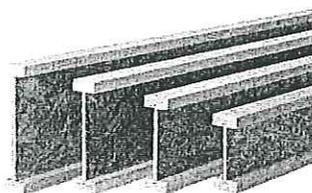
## SECTION 8: LEDGER ATTACHMENTS

**General requirements.** Ledger boards must be attached to the existing house in accordance with all of the following and section 9. Compliance is critical to ensure the safety and structural stability of your deck.

1. The ledger-board depth must be greater than or equal to the depth of the deck joists, but not less than a 2"x8".
2. The ledger board must be attached in accordance with one of the conditions shown in Figures 11 through 13 – except if metal-plate-connected wood floor trusses were used in the house, see the text below for manufactured wood trusses.
3. The existing band board on the house must be capable of supporting the deck. If this cannot be verified or if existing conditions differ from the details here, then a free-standing deck or an engineered design is required.
4. The top of the ledger board and the top of the deck joists must be at the same elevation.

**Wood I-joists.** Many homes are constructed with wood I-joists, as shown in Figure 10. Rather than utilize a 2x band board, these systems are often constructed with a minimum 1-inch-thick engineered wood product (EWP) band board capable of supporting a deck. If a minimum 1-inch EWP or 2x band board is not present, then a free-standing deck is required, as addressed in section 10.

**Figure 10: WOOD I-JOISTS**

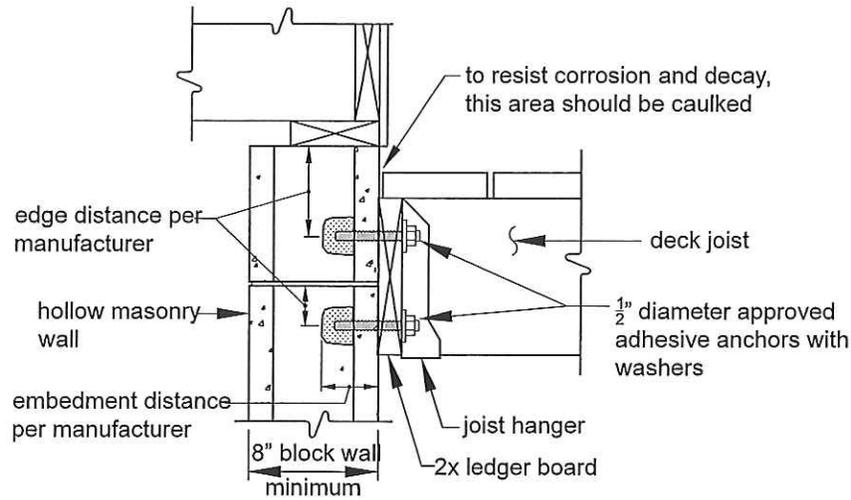


**Manufactured wood trusses.** A metal-plate-connected wood truss (MPCWT) is an engineered, prefabricated structural component that is designed for each specific application. MPCWT systems that are used in residential floors are often installed with a 2"x4" lumber "ribbon" board at the ends of the trusses to tie the ends of the trusses together (see Detail 1 in Appendix C.). The ribbon board, by itself, is not intended to support the deck ledger and deck. Installing a residential deck where the floor for the house uses a MPCWT system must be in accordance with a standard detail provided by the truss designer, a corresponding detail in section 7 of Appendix C, or a full plan submission – unless the deck is free-standing as addressed in section 10.

**Siding and flashing.** Flashing must be installed in accordance with all of the following:

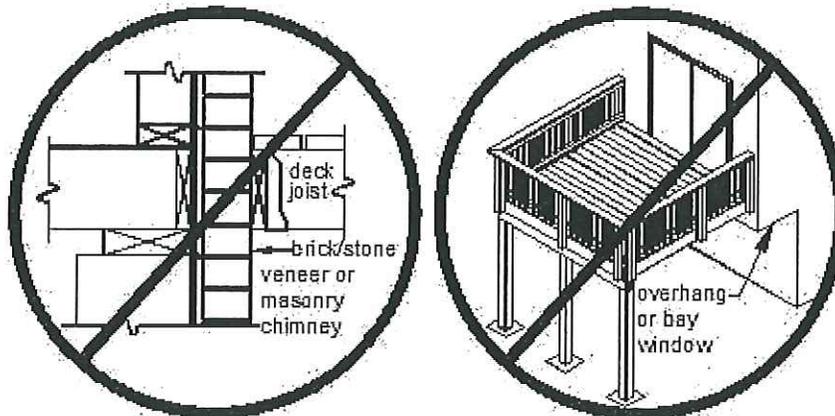
1. The exterior finish, such as house siding, must be removed in the area for the ledger board prior to the installation of the ledger board.
2. Continuous flashing with a drip edge, as shown in Figure 11, is required at a ledger board that is attached to wood-framed construction. Caulking is needed with the flashing at a threshold to prevent water intrusion due to splash from the deck or due to melting snow and ice.

**Figure 13**  
**ATTACHMENT OF LEDGER BOARD TO HOLLOW FOUNDATION**



**Prohibited ledger attachments.** Attaching a ledger board to or through an exterior veneer such as brick or stone, or to or through a masonry chimney, or to a house overhang – as shown below – are prohibited. In such cases, the deck must be free-standing, as addressed in section 10. Attaching a ledger board to a house overhang is allowed if supported by engineering.

**Figure 14**  
**PROHIBITED LEDGER ATTACHMENTS**



## SECTION 9: LEDGER-BOARD FASTENERS

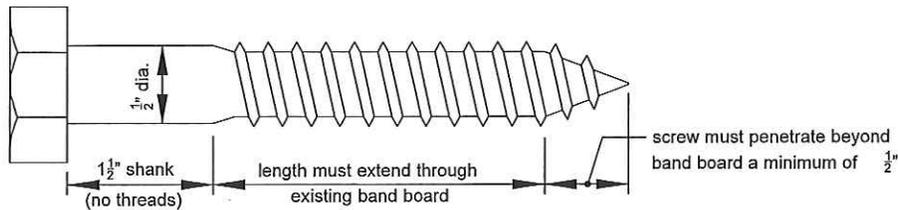
**General requirements.** Ledger board fasteners must be installed in accordance with this section. Placement and spacing must be in accordance with Figure 15 and Table 6. Only the fastener types listed here are approved for use; lead anchors are prohibited. Adequacy of connections may be verified by local inspectors.

solid masonry installations. Adhesive anchors must be installed in accordance with the manufacturer's instructions and must be equipped with washers. Adhesive cartridges should remain on the jobsite for inspector verification.

**Lag screws.** The diameter, length, and shank of lag screws must comply with Figure 16. Lag screws must be equipped with washers and be installed in the following sequence:

1. Drill a 1/2 inch-diameter hole in the ledger board and a 5/16 inch-diameter pilot hole into the solid-connection material of the existing house.
2. Insert the lag screw through the ledger board and into the pilot hole by turning. Do not drive with a hammer. Use soap or a wood-compatible lubricant if needed to facilitate tightening.
3. Tighten each lag screw snugly, but do not over-tighten so as to cause wood damage.

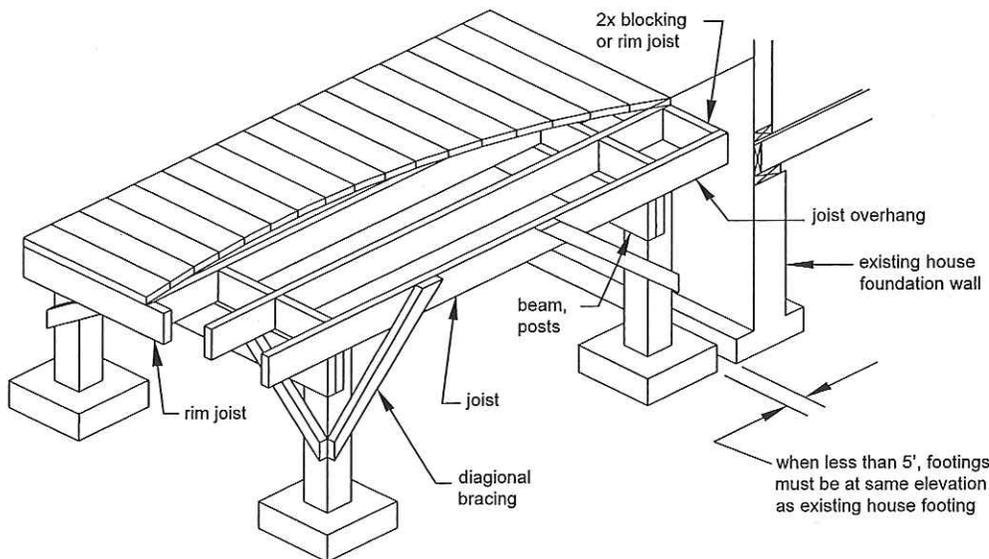
**Figure 16**  
**LAG SCREW**



### SECTION 10: FREE-STANDING

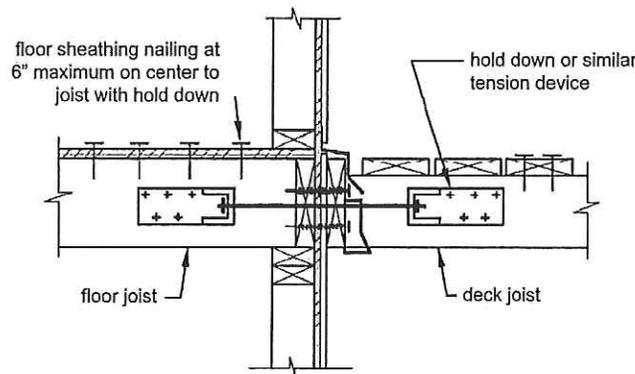
A deck that is free-standing does not utilize the exterior wall of the existing house to support vertical loads. Instead, an additional beam is provided at or offset from the existing house wall, as shown in Figure 17. If the edge of a deck footing is closer than 5 feet to an existing exterior house wall, the footing must bear at the same elevation as the existing wall footing as shown in Figure 17. For a house with a basement, a cylindrical footing (caisson) is recommended to minimize required excavation at the basement wall.

**Figure 17**  
**FREE-STANDING DECK**



5. Tension ties which are not available in a G-185 zinc coating require a barrier membrane separating the tension tie and the preservative-treated joist. The barrier membrane must be recommended for this location by its manufacturer.
6. Tension-ties must be attached to the underside of the joists in accordance with the manufacturer's instructions. Tension-ties must be attached to the exterior wall with lag screws as shown in Figure 19. Lag screws must penetrate a minimum of 3 inches into the sill plate or top plate of a wood-framed wall.
7. Where attaching to a concrete wall, lags screws may be replaced with adhesive or expansion anchors and a 1/2 inch threaded rod, with a withdrawal capacity of at least 750 pounds. The anchor must be installed in accordance with the manufacturer's instructions.

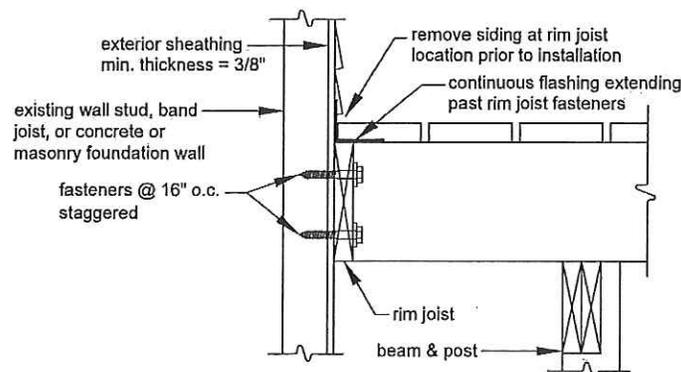
**Figure 20**  
**HOLD-DOWN TENSION DEVICE, WITH LEDGER BOARD**



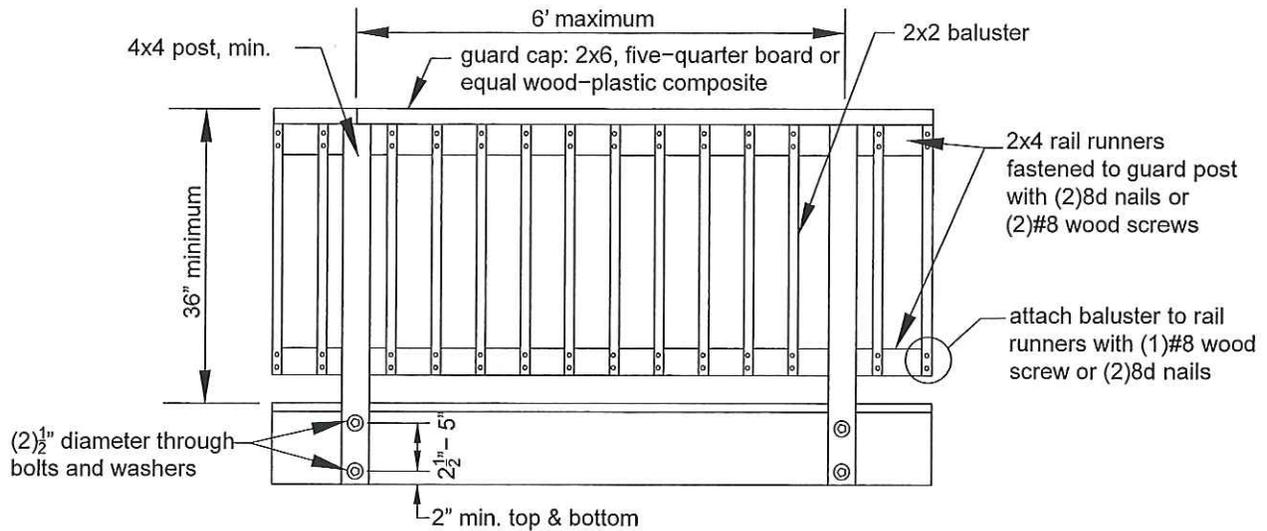
**Hold-down tension devices.** Hold-down tension devices, if used instead of perpendicular bracing as described above, must be provided in at least 2 locations per deck, and each device must have an allowable-stress-design capacity of at least 1,500 pounds.

**Free-standing deck – attachment to house.** Attach the deck's rim joist to the existing house exterior wall as shown in Figure 21 for a free-standing deck, if diagonal bracing parallel to the house is omitted, as described above. The wall must be sheathed with minimum 3/8 inch wood structural panel sheathing. Use lag screws or through-bolts if fastening to an existing band joist or wall stud; and use expansion or adhesive anchors if fastening to concrete or masonry. Do not attach to brick veneers. Verify this condition in the field prior to utilizing this method. Fasteners must be 16 inches on center and staggered in 2 rows. Flashing over the rim joist is required and must be installed in accordance with the flashing provisions in section 8.

**Figure 21**  
**ATTACHMENT OF FREE-STANDING DECK TO HOUSE FOR LATERAL SUPPORT**



**Figure 24**  
**GUARDS**



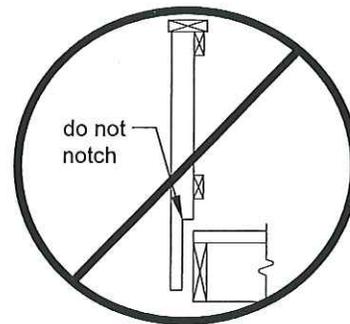
**Guard posts.** Guard posts must be attached to the deck structure in accordance with all of the following:

Notching guard posts, as shown in Figure 25, is prohibited.

1. Notching guard posts, as shown in Figure 25, is prohibited.
2. Hold-down anchors must have a minimum capacity of 1,800 pounds.
3. Guard posts may be attached to either side of the end joist or rim joist.
4. Bolt holes for a post must be at least 2 inches from the wood edge, at least 2 1/2 inches apart, and no more than 5 inches apart.
5. Hold-down anchors, as shown in Figures 26 and 27, must be used to attach the guard post to the end joist and rim joist, respectively.

**Figure 25**

**POST NOTCHING PROHIBITED**



4. Within a stairway flight, the largest tread depth may not exceed the smallest tread depth by more than 3/8 inch, and the largest riser height may not exceed the smallest riser height by more than 3/8 inch.
5. If the total vertical height of a stairway exceeds 12 feet, an intermediate landing is required and must be constructed as a free-standing deck with flush beams and with posts.
6. Any landing width must equal or exceed the total width of the stairway it serves.

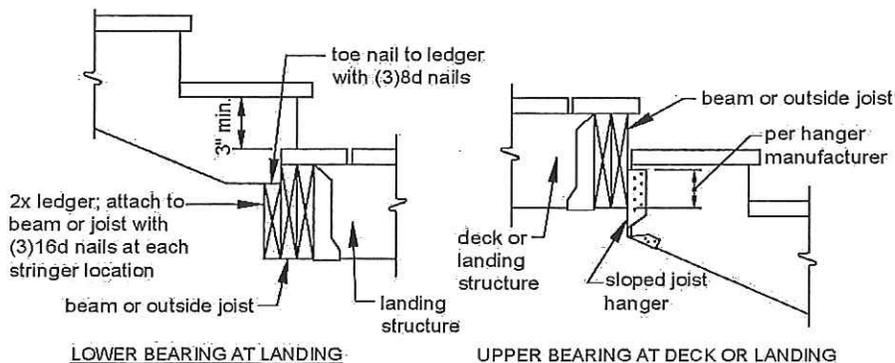
**Stair stringers.** Stringers must comply with all of the following:

1. Stringers must be sawn or solid 2"x12"s complying with the above tread and riser dimensions.
2. Cut stringers must be spaced no more than 18 inches on center.
3. Stringers must bear on a solid surface, a minimum of 3 1/2 inches thick and 8 inches in diameter, and attach to the deck or a landing in accordance with Figure 28. Prior to placement of solid surface, all loose or organic material shall be removed.
4. Stringer-span length is measured using the horizontally projected distance between the centerlines of bearing at each end.
5. The span length of a cut stringer must not exceed 6 feet-0 inches, and the throat size of cut stringers must not be less than 5 inches, as shown in Figure 29.

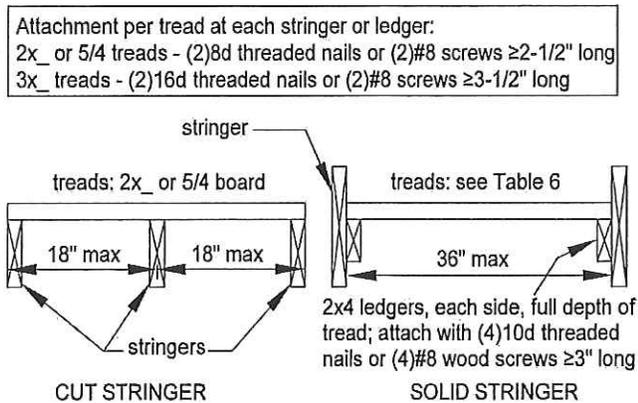
**Solid-stringer exception:** Stringers for a stairway that has a width of 36 inches may have a horizontally projected span of up to 13 feet 3 inches if the stairway is framed solely with 2 solid stringers.

**Intermediate-supported stringers:** If the total stringer length exceeds the above dimensions, a 4"x4" post may be provided to support the stringer and shorten its span length. The 4"x4" post must be notched and bolted to the stringer in accordance with Figure 2. The post must bear over the middle one-third of a footing that is constructed in accordance with Figure 29 and must be attached as shown in Figure 2. An intermediate landing as described above may also be provided to shorten the stringer span.

**Figure 28**  
**STRINGER BEARING**



**Figure 31**  
**STAIRWAY TREADS**



**Table 7**  
**MINIMUM TREAD SIZES<sup>1</sup>**

Species	Cut Stringer	Solid Stringer
Douglas Fir/ Larch, Hem/ Fir, SPF <sup>2</sup>	2x4 or 5/4	2x8 or 3x4
Southern Pine	2x4 or 5/4	2x8
Redwood, West- ern Cedars, Pon- derosa Pine <sup>3</sup> , Red Pine <sup>3</sup>	2x4 or 5/4	2x10 or 3x4

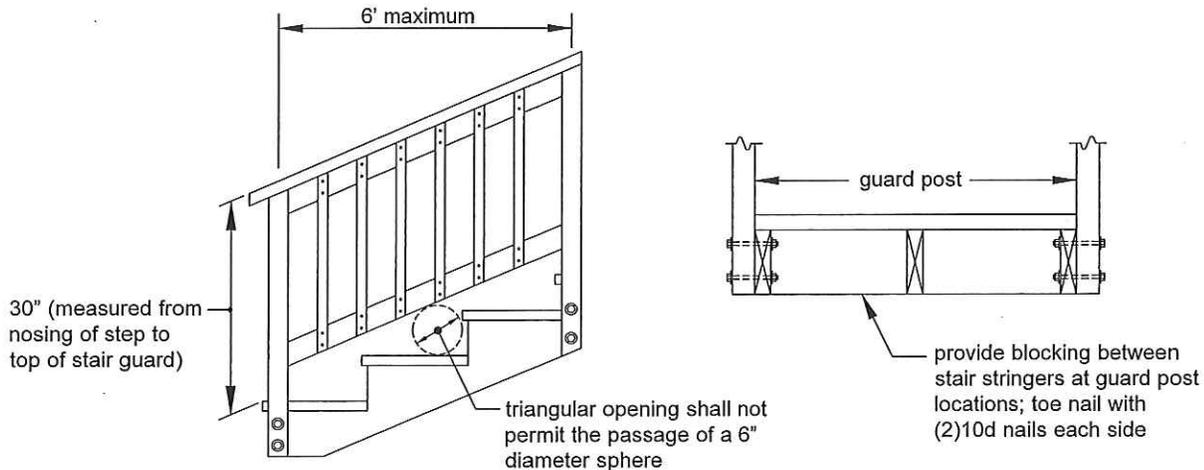
<sup>1</sup> Assumes 300 lb concentrated load, L/288 deflection limit, No. 2 grade, and wet service conditions.

<sup>2</sup> Incising assumed for refractory species including Douglas fir-larch, hem-fir, and spruce-pine-fir.

<sup>3</sup> Design values based on northern species with no incising assumed.

**Stair guards.** Guards must be provided on all open sides of stairs consisting of more than 3 risers. Stair guards must comply with section 13 and Figure 32.

**Figure 32**  
**STAIR GUARDS**



**Stair handrails.** A flight of stairs with more than 3 risers must have at least one handrail that complies with all of the following:

1. The handrail must be located at least 30 inches, but no more than 38 inches above the nosing of the treads – except that a volute, turnout, starting easing, or transition fitting may depart from these dimensions. Measurement must be taken from the nosing to the top of the rail.
2. The handrail must be attached to a stair guard or exterior wall acting as a barrier as shown in Figure 33.
3. The handrail and connecting hardware must be decay- and corrosion-resistant.
4. The handrail must have a smooth surface with no sharp corners and must be graspable, as shown in Figure 34. Recessed sections may be shaped from a 2"x6" or five-quarter board, as shown there.
5. Handrails must run continuously from a point directly over the lowest riser to a point directly over the highest riser.
6. Handrails may be interrupted by guard posts.

## Chapters SPS 320 to 325

### APPENDIX C

Section	Page	Section	Page
1 Wood preservatives for ground contact . . . . .	233	4 Alternate beam and joist spans . . . . .	243
2 Sources of design values . . . . .	236	5 Framing around a chimney or bay window . . . . .	245
3 Joist spans for alternate wood species . . . . .	237	6 Attachment of ledger boards to metal-plate- connected wood floor trusses . . . . .	246

**1. Wood preservatives for ground contact.** The following Table lists common pressure-preservative treatments and retention levels, in pounds per cubic foot, for sawn lumber in ground contact – based on the American Wood Protection Association’s *Book of Standards*.

**Table C-1  
PRESERVATIVE TREATMENTS AND RETENTION LEVELS FOR  
GROUND CONTACT (IN POUNDS PER CUBIC FOOT)**

Species	ACQ-B	ACQ-C	ACQ-D	CA-B	CuN-W
Southern Pine	0.40	0.40	0.40	0.21	0.11
Douglas Fir-Larch	0.40	0.40	NR	0.21	0.11
Hem-Fir	0.40	0.40	0.40	0.21	0.11
Ponderosa Pine	0.40	0.40	0.40	0.21	0.11
Red Pine	0.40	0.40	0.40	0.21	0.11
Spruce-Pine-Fir	NR <sup>1</sup>	0.40	NR	NR	NR
Redwood	NR	NR	NR	NR	NR

<sup>1</sup>NR = treatment not recommended.

**2. Sources of design values.** The sources of the design values in Appendix B are as follows:

Table 1 – Minimum footing sizes: The Building Inspectors Association of Southeast Wisconsin, December 2014.

Table 2 – Maximum post heights: *Typical Deck Details, Based on the 2009 International Residential Code*, Fairfax County, Virginia, July 2013.

Tables 3A and 3B – Maximum beam spans: *Design for Code Acceptance 6*, American Wood Council, May 2013.

Table 4 – Maximum joist spans: *Design for Code Acceptance 6 (DCA 6)*, American Wood Council, May 2013; except for the 2x6 values, which are from the Building Inspectors Association of Southeast Wisconsin, December 2014.

Table 5 – Minimum joist-hanger download capacity: *Design for Code Acceptance 6*, American Wood Council, May 2013; except for the 2x6 values, which are repeated from the 2x8 values.

Table 6 – Ledger-board-fastener spacing: *Design for Code Acceptance 6*, American Wood Council, May 2013.

Figure 29 – Stringer span length, and Table 7 – Minimum tread sizes: *Design for Code Acceptance 6*, American Wood Council, May 2013.

Table C-2 – Maximum joist spans for redwood, western cedars, ponderosa pine, and red pine: *Design for Code Acceptance 6*, American Wood Council, May 2013; except for the

Beam and Footing Sizes with Overhangs												
Based on No. 2 or better Southern Pine, Douglas Fir-Larch2, and Ponderosa Pine												
		Post Spacing (Measured Center to Center)										
Joist Length (JL) <sup>1</sup>		4'	5'	6'	7'	8'	9'	10'	11'	12'	13'	14'
7'	Southern Pine Beam	1-2x6	1-2x8	1-2x8	2-2x8	2-2x8	2-2x10	2-2x10	2-2x12	2-2x12	3-2x12	3-2x12
	Douglas Fir-Larch Beam	1-2x6	1-2x8	2-2x6	2-2x8	2-2x8	2-2x10	2-2x10	2-2x12	3-2x10	3-2x12	3-2x12
	Ponderosa Pine Beam	1-2x6	1-2x8	2-2x6	2-2x8	2-2x8	2-2x10	2-2x12	2-2x12	3-2x10	3-2x12	Eng Bm
	Corner Footing	9   7   7	10   8   7	11   9   8	11   9   8	12   10   9	13   11   9	13   11   10	14   12   10	15   12   10	15   12   11	16   13   11
	Intermediate Footing	11   9   8	12   10   9	13   11   9	14   12   10	15   12   11	16   13   11	17   14   12	17   14   12	18   15   13	19   15   13	19   16   14
	Footing Thickness	6	6	6	6	6	6	6	6	8	8	8
8'	Southern Pine Beam	1-2x6	1-2x8	2-2x6	2-2x8	2-2x8	2-2x10	2-2x12	2-2x12	3-2x12	3-2x12	Eng Bm
	Douglas Fir-Larch Beam	1-2x6	1-2x8	2-2x8	2-2x8	2-2x10	2-2x10	2-2x12	2-2x12	3-2x12	3-2x12	Eng Bm
	Ponderosa Pine Beam	1-2x6	1-2x8	2-2x8	2-2x8	2-2x10	2-2x10	2-2x12	3-2x10	3-2x12	3-2x12	Eng Bm
	Corner Footing	10   8   7	10   9   8	11   9   8	12   10   9	13   11   9	14   11   10	14   12   10	15   12   11	15   13   11	16   13   12	17   14   12
	Intermediate Footing	12   10   8	13   11   9	14   12   10	15   12   11	16   13   11	17   14   12	18   15   13	19   15   13	19   16   14	20   16   14	21   17   15
	Footing Thickness	6	6	6	6	6	6	8	8	8	8	8
9'	Southern Pine Beam	1-2x6	1-2x8	2-2x8	2-2x8	2-2x10	2-2x12	2-2x12	3-2x10	3-2x12	Eng Bm	Eng Bm
	Douglas Fir-Larch Beam	1-2x8	1-2x8	2-2x8	2-2x8	2-2x10	2-2x12	2-2x12	3-2x12	3-2x12	Eng Bm	Eng Bm
	Ponderosa Pine Beam	1-2x8	2-2x6	2-2x8	2-2x8	2-2x10	2-2x12	2-2x12	3-2x12	3-2x12	Eng Bm	Eng Bm
	Corner Footing	10   8   7	11   9   8	12   10   9	13   11   9	14   11   9	14   12   10	15   12   11	16   13   11	16   13   12	17   14   12	18   14   13
	Intermediate Footing	12   10   9	14   11   10	15   12   11	16   13   11	17   14   12	18   15   13	19   15   13	20   16   14	20   17   15	21   17   15	22   18   16
	Footing Thickness	6	6	6	6	6	8	8	8	8	8	8
10'	Southern Pine Beam	1-2x6	1-2x8	2-2x8	2-2x8	2-2x10	2-2x12	2-2x12	3-2x12	3-2x12	Eng Bm	Eng Bm
	Douglas Fir-Larch Beam	1-2x8	2-2x6	2-2x8	2-2x10	2-2x10	2-2x12	3-2x10	3-2x12	3-2x12	Eng Bm	Eng Bm
	Ponderosa Pine Beam	1-2x8	2-2x6	2-2x8	2-2x10	2-2x10	2-2x12	3-2x10	3-2x12	Eng Bm	Eng Bm	Eng Bm
	Corner Footing	10   9   8	12   10   8	12   10   9	13   11   10	14   12   10	15   12   11	16   13   11	16   14   12	17   14   12	18   15   13	18   15   13
	Intermediate Footing	13   11   9	14   12   10	15   13   11	17   14   12	18   15   13	19   15   13	20   16   14	21   17   15	21   18   15	22   18   16	23   19   16
	Footing Thickness	6	6	6	6	8	8	8	8	8	8	10
11'	Southern Pine Beam	1-2x8	2-2x6	2-2x8	2-2x10	2-2x10	2-2x12	3-2x12	3-2x12	Eng Bm	Eng Bm	Eng Bm
	Douglas Fir-Larch Beam	1-2x8	2-2x8	2-2x8	2-2x10	2-2x10	2-2x12	3-2x12	3-2x12	Eng Bm	Eng Bm	Eng Bm
	Ponderosa Pine Beam	1-2x8	2-2x6	2-2x8	2-2x10	2-2x12	2-2x12	3-2x12	3-2x12	Eng Bm	Eng Bm	Eng Bm
	Corner Footing	11   9   8	12   10   9	13   11   9	14   12   10	15   12   11	16   13   11	16   14   12	17   14   12	18   15   13	19   15   13	19   16   14



# **Attachment of Residential Deck Ledger to Metal Plate Connected Wood Truss Floor System**

SRR No. 1408-01

Prepared for SBCA

**Report Written by:**

Jim Vogt, P.E.

October 1, 2014

2. The minimum required penetration depth of four diameters (4D) is not met when using 1/2"-diameter lag screws into an 1 1/2"-thick band joist.

### Application:

The details and fastener spacing tables provided in this report for connecting a 2" nominal lumber deck ledger to a residential floor system constructed with MPCW trusses use a single shear reference lateral design value,  $Z$ , of 710 lbs. for a 1/2"-diameter bolt and 375 lbs. for a 1/2" x 6" lag screw. These lateral design values were developed from the VT and WSU testing, and assume the fasteners are installed in accordance with the *NDS* requirements for clearance holes, lead holes, edge distance and end distance.

Detail 1 includes construction information for attaching 2" nominal lumber deck ledgers to the ends of MPCW floor trusses spaced no more than 24" o.c. Table 1 provides the maximum on-center spacing for each 1/2"-diameter bolt or 1/2" x 6" lag screw used to attach the ledger to the floor truss system for deck joist spans up to 18', assuming a design deck load of 40 psf live load (or 40 psf snow load) and 10 psf dead load. Table 2 includes similar information as Table 1, except for a design deck load of 60 psf live load (or 60 psf snow load) and 10 psf dead load.

Detail 2 includes construction information for attaching 2" nominal lumber deck ledgers to the side of a MPCW floor ladder frame with 4x4 vertical webs spaced no more than 16" o.c. provides the maximum on-center spacing for each 1/2"-diameter bolt and 1/2" x 6" lag screw used to attach the ledger to the ladder frame for deck joist spans up to 18', assuming a design deck load of 40 psf live load (or 40 psf snow load) and 10 psf dead load. Table 4 includes similar information as Table 3Detail 3, except for a design deck load of 60 psf live load (or 60 psf snow load) and 10 psf dead load.

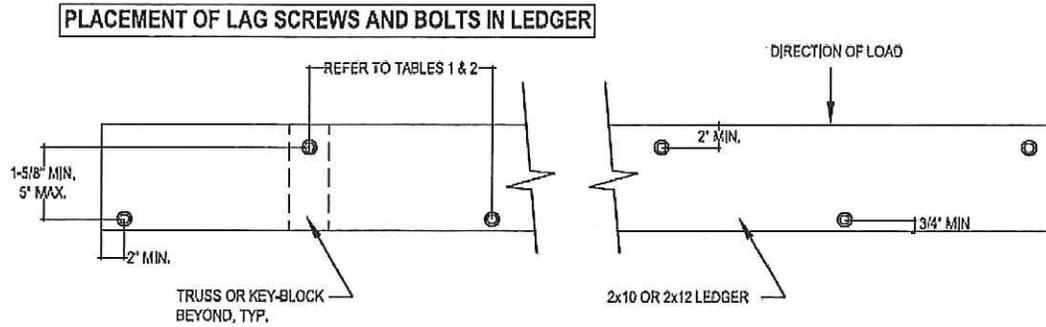
Detail 3 includes deck lateral load connection options capable of resisting the 1500 lbf lateral load requirement specified in 2009 and 2012 IRC Section 507.

Support of concentrated loads from deck beams of girders are beyond the scope of this report. Deck ledgers shall not be supported on stone or masonry veneer.

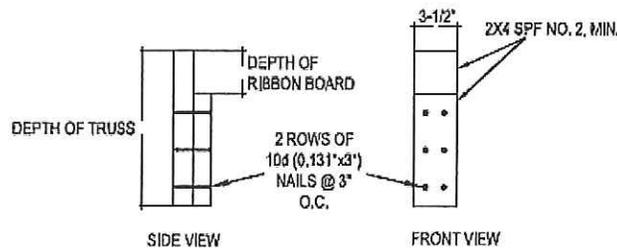
### Installation:

The following is a summary of the minimum requirements and limitations for installing a 2" nominal lumber deck ledger with residential floor systems constructed with MPCW floor trusses.

1. Ledger must be 2x10 or 2x12 PPT or code-approved decay-resistant lumber with a specific gravity,  $G \geq 0.43$ . Ledger shall be identified by the grade mark of, or certificate of inspection issued by, an approved lumber grading or inspection bureau or agency. PPT material must be pressure-treated with an approved process in accordance with American Wood Protection Association standards
2. Install ledger directly over wood structural sheathing ( $1^{5/32}$ " maximum thickness) fastened to the wall per the building code.
3. Attach ledger through wood structural sheathing into 2-ply 2x4 truss end vertical, 4x4 vertical web or key-block with 1/2" x 6" lag screws or 1/2"-diameter bolts with washers and nuts.
  - 3.1 Only one (1) fastener into each truss member or key-block.
  - 3.2 Install each fastener through the centerline of the truss member or key-block and position so as not to interfere with bottom and top chord joints and connector plates. Refer to Detail 1 and Detail 2 for spacing requirements
  - 3.3 Lag screws and bolts shall be installed according to 2005 *NDS* requirements. A "test" installation is recommended before drilling the lead holes, to ensure that the lead holes are neither too small nor too large.
    - 1/2" x 6" lag screws:
      - Lead holes for the threaded portion shall be  $5/16$ ".
      - Clearance holes shall be 1/2" and the same depth of penetration as the length of unthreaded shank.
    - 1/2" -diameter bolts:



**KEY-BLOCK DETAIL FOR LEDGER ATTACHED TO END OF TRUSSES**



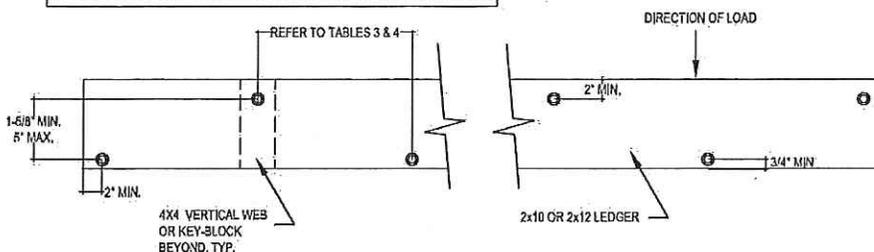
ATTACH TOP OF KEY-BLOCK TO INSIDE FACE OF RIBBON BOARD WITH 2 - 10d (0,131\" x 3\") THROUGH NAILS AND 2 - 10d TOE-NAILS. ATTACH BOTTOM OF KEY-BLOCK TO SILL PLATE WITH 4 - 10d TOE-NAILS

**Detail 1: Attachment of Deck Ledger to Floor System with MPCW Trusses**

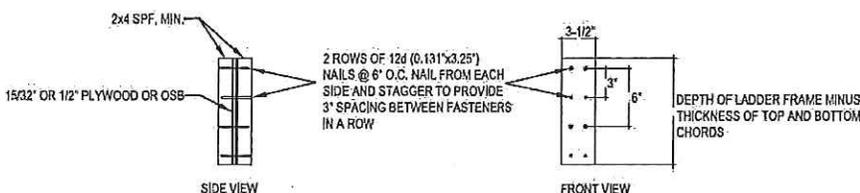
Joist Span	≤ to 6'	6'-1\" to 8'	8'-1\" to 10'	10'-1\" to 12'	12'-1\" to 14'	14'-1\" to 16'	16'-1\" to 18'
Connection Details	On-center Spacing of Fasteners (in.) <sup>4</sup>						
1/2\" x 6\" lag screw with 15/32\", max., wood structural panel sheathing	24	12 <sup>b</sup>	12 <sup>b</sup>	12 <sup>b</sup>	12 <sup>b</sup>	8 <sup>b</sup>	8 <sup>b</sup>
1/2\" diameter bolt with 15/32\", max., wood structural panel sheathing	24	24	24	24	24	12 <sup>b</sup>	12 <sup>b</sup>
5. Ledgers shall be flashed in accordance with applicable building code requirements to prevent water from contacting the exposed wood structural sheathing and floor truss. 6. Snow load shall not be assumed to act concurrently with live load. 7. Ledgers must be 2x10 or 2x12 PPT or code-approved decay-resistant lumber with specific gravity, G ≥ 0.43. Truss 2-ply 2x4 end verticals and key-blocks must have a G ≥ 0.42. 8. Stagger lag screws and bolts as shown in Detail 1. 9. Requires key-blocks at 24\" o.c., maximum. Attach ledger to 2-ply end vertical of each truss with one (1) fastener and to each key-block with one (1) fastener. Refer to Detail 1 for key-block construction and installation information. 10. Requires two (2) key-blocks at 8\" o.c., maximum, between each truss. Attach ledger to 2-ply end vertical of each truss with one (1) fastener and to each key-block with one (1) fastener. Refer to Detail 1 for key-block construction and installation information.							

**Table 1: Deck Ledger Connection to Ends of MPCW Floor Trusses Spaced 24\" o.c., Max.<sup>1,2,3</sup>**  
 (Deck Live Load = 40 psf, Deck Dead Load = 10 psf, Snow Load ≤ 40 psf)

**PLACEMENT OF LAG SCREWS AND BOLTS IN LEDGER**

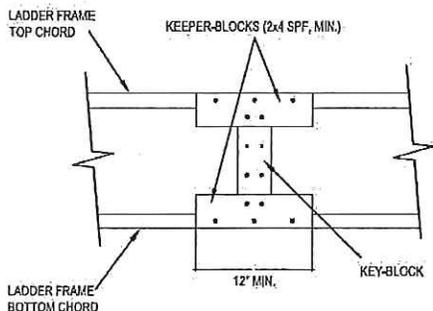


**KEY-BLOCK DETAIL FOR LEDGER ATTACHED TO SIDE OF FLOOR LADDER FRAME**



CUT KEY-BLOCKS TO FIT TIGHT BETWEEN TOP AND BOTTOM CHORDS OF LADDER FRAME. INSTALL AT REQUIRED LOCATIONS. ATTACH BLOCKS TO TOP AND BOTTOM CHORDS OF LADDER FRAME WITH 4 - 12d (0.131\"/>

**KEEPER-BLOCK DETAIL FOR LEDGER ATTACHED TO SIDE OF FLOOR LADDER FRAME**

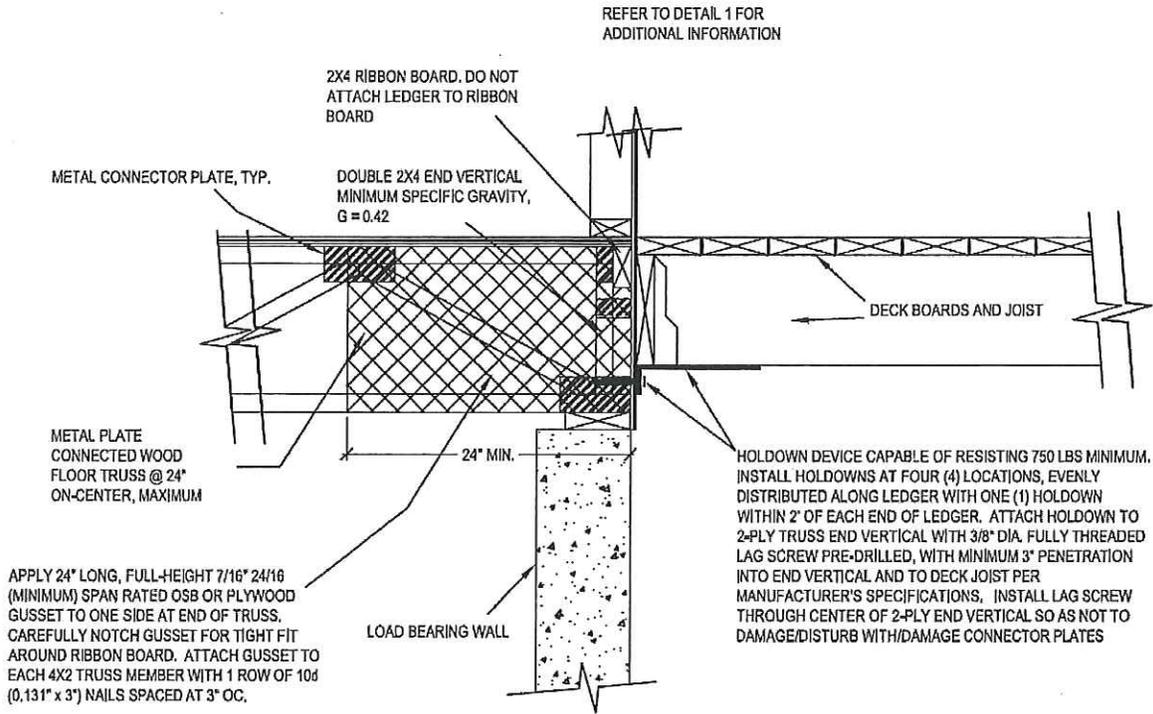


**Detail 2: Attachment of Deck Ledger to Floor System with MPCW Trusses,**  
When Ledger is Installed Parallel to Truss Span & Spacing of Screws is Less Than the Spacing of the Verticals

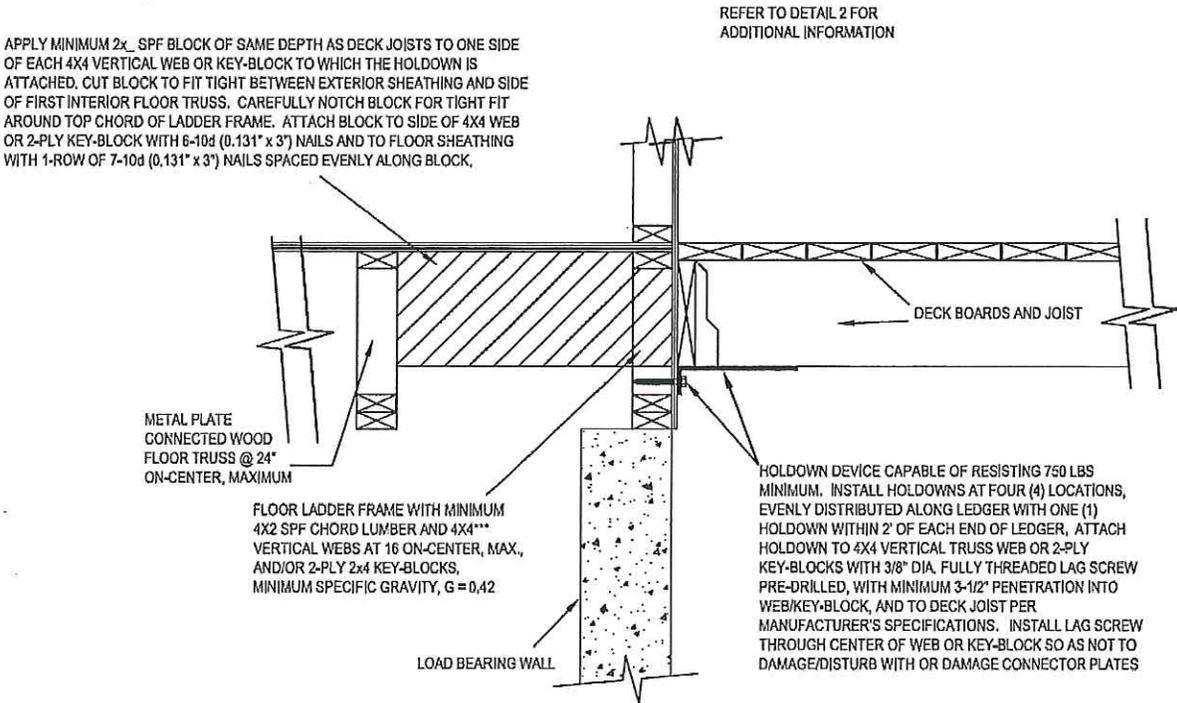
Joist Span	< 6' to 8'	8'-1" to 10'	10'-1" to 12'	12'-1" to 14'	14'-1" to 16'	16'-1" to 18'
Connection Details	On-center Spacing of Fasteners (in.) <sup>4</sup>					
1/2" x 6" lag screw with 15/32", max., wood structural sheathing	16	16	8 <sup>5</sup>	8 <sup>5</sup>	8 <sup>5</sup>	8 <sup>5</sup>
1/2" diameter bolt with 15/32", max., wood structural sheathing	32	32	16	16	16	16

1. Ledgers shall be flashed in accordance with applicable building code requirements to prevent water from contacting the exposed wood structural sheathing and floor truss.
2. Snow load shall not be assumed to act concurrently with live load.
3. Ledgers must be 2x10 or 2x12 PPT or code-approved decay-resistant lumber with specific gravity, G > 0.43. Truss 4x4 vertical web and key-blocks must have a G > 0.42.
4. Stagger lag screws and bolts as shown in Detail 2.
5. Requires key-blocks at 16" o.c., maximum. Attach ledger to each 4x4 vertical web with one (1) fastener and to each key-block with one (1) fastener. Refer to Detail 2 for key-block construction and installation information.

**LEDGER ATTACHED TO ENDS OF TRUSSES**



**LEDGER ATTACHED TO SIDE OF FLOOR LADDER FRAME**



**Detail 3: Deck Lateral Load Connection Capable of Resisting the 1500 lbf Lateral Load Requirement Specified in 2009 & 2012 IRC Section 507**