TABLE 3.7
MAIN I-BEAM PIER SPACING

For NEW homes produced by manufacturers listed in **Appendix A**, and all USED homes installed not using the Manufacturer's Installation Instructions, pier design shall comply with all the requirements of **Section 3.7** of this Code and main I-beam pier spacing shall be in accordance with **Table 3.7** for a given soil bearing capacity and footing size, OR the entire stabilizing system shall be designed by a North Carolina registered engineer or architect. For NEW homes produced by manufacturers NOT listed in **Appendix A**, pier design and spacing shall be in accordance with the Manufacturer's Installation Instructions, subject to the limitations of **Section 3.7.1.1**.

The maximum pier spacings in this Table are calculated such that the tributary area of the roof, wall, and floor carried by the pier multiplied by the following design loads (assumed to act simultaneously), plus the pier and footing weight, does not exceed the maximum footing capacity:

Roof Dead Load: 10 psf
Wall Dead Load: 5 psf
Floor Dead Load: 10 psf

Roof Live Load: 20 psf
Floor Live Load: 40 psf

Pier and footing weights are based on an assumed 40" single stacked pier with 24x24x6 footing, or an 80" double stacked pier with 24x24x4 footing.

SOIL CAPACITY (psf)	MINIMUM FOOTING SIZE (in. x in.) or minimum diameter in inches**	MAXIMUM FOOTING CAPACITY (lbs.)	MINIMUM CONCRETE FOOTING THICKNESS		MAXIMUM I-BEAM PIER SPACING (See Notes 2 and 3)					
			Single Stacked Pier	Double Stacked Pier	12' Wide Section		14' Wide Section		16' Wide Section	
					Single Stacked Pier	Double Stacked Pier	Single Stacked Pier	Double Stacked Pier	Single Stacked Pier	Double Stacked Pier
1000*	20 x 20 (24")	2778	4"	4"	4'-2"	3'-0"	3'-8"	2'-7"	3'-3"	2'-3"
	24 x 24 (28")	4000	4"	4"	6'-5"	5'-2"	5'-7"	4'-6"	4'-11"	4'-0"
	30 x 30 (34")	6250	5"	4"	10'-6"	9'-3"	9'-2"	8'-1"	8'-1"	7'-2"
1500	16 x 16 (20")	2667	4"	4"	4'-0"	2'-9"	3'-6"	2'-5"	3'-1"	2'-2"
	20 x 20 (24")	4167	4"	4"	6'-8"	5'-6"	5'-10"	4'-9"	5'-2"	4'-3"
	24 x 24 (28")	6000	5"	4"	10'-0"	8'-10"	8'-9"	7'-8"	7'-9"	6'-10"
	30 x 30 (34")	9375	6"	4"	12'-0"	12'-0"	12'-0"	12'-0"	12'-0"	11'-7"
2000	16 x 16 (20")	3556	4"	4"	5'-7"	4'-5"	4'-10"	3'-10"	4'-4"	3'-5"
	20 x 20 (24")	5556	4"	4"	9'-3"	8'-0"	8'-0"	7'-0"	7'-2"	6'-2"
	24 x 24 (28")	8000	6"	4"	12'-0"	12'-0"	11'-11"	10'-11"	10'-7"	9'-8"
2500	16 x 16 (20")	4444	4"	4"	7'-2"	6'-0"	6'-2"	5'-3"	5'-7"	4'-8"
	20 x 20 (24")	6944	5"	4"	11'-9"	10'-7"	10'-3"	9'-2"	9'-1"	8'-2"
	24 x 24 (28")	10000	6"	4"	12'-0"	12'-0"	12'-0"	12'-0"	12'-0"	12'-6"
3000	16 x 16 (20")	5333	4"	4"	8'-10"	7'-7"	7'-8"	6'-8"	6'-10"	5'-11"
	20 x 20 (24")	8333	5"	4"	12'-0"	12'-0"	12'-0"	11'-5"	11'-1"	10'-1"
3500	16 x 16 (20")	6222	4"	4"	10'-5"	9'-3"	9'-1"	8'-1"	8'-1"	7'-2"
	20 x 20 (24")	9722	5"	4"	12'-0"	12'-0"	12'-0"	12'-0"	12'-0"	12'-0"
4000	16 x 16 (20")	7111	4"	4"	12'-0"	10'-10"	10'-6"	9'-6"	9'-4"	8'-5"
	20 x 20 (24")	11111	6"	4"	12'-0"	12'-0"	12'-0"	12'-0"	12'-0"	12'-0"

* **Foundations in soil with a bearing capacity of less than 1,000 PSF must be designed by a North Carolina registered engineer or architect familiar with the site conditions.**

** ***The minimum diameter circular footing with double stacked piers is 24".***

NOTES to Table 3.7:

1. Main I-beam pier spacing shall be determined using the predetermined soil bearing capacity as described in **Section 3.5.3**, the selected footing size, and whether the pier is required to be single or double stacked in accordance with **Sections 3.7.4** and **3.7.5**. Footings shall fully comply with **Section 3.5**.

2. The maximum spacing for main I-Beam piers shall be the **LESSER** of 8'-0" for 8" deep I-Beams, 10'-0" for 10" deep I-Beams, 12'-0" for 12" deep I-Beams OR the spacings given in this Table.

3. When a pier is required to be double stacked, the spacing to the next pier on either side shall be taken from the appropriate "Double Stacked Piers" column above, whether or not the adjacent piers are required to be double stacked.

4. Spacing of piers is measured from the center of one pier to the center of the next pier.

5. Spacing of piers shall be as even as practical along the length of the I-beams.

6. Pier spacings may be exceeded by up to 10% of tabulated values so long as the average pier spacing does not exceed tabulated values.

7. Piers shall extend at least 6 inches on both sides of the supported I-beam.

8. The maximum distance to the centerline of the first pier at each end of the home shall be 2'-0".

9. Alternate footing materials (see **Section 3.5.4**) shall be utilized and installed in accordance with their listing.

Examples

1. For a 14' wide section with 10" deep I-beams, if the soil capacity is 3000 psf, a 16" X 16" footing is used and the piers are single stacked, space piers at 7'-8" center to center.

2. For a 12' wide section with 8" deep I-beams, if the soil capacity is 2500 psf, a 20" X 20" footing is used, and the piers are double stacked, space piers at 8'-0" center to center. (See Note 2 above).

3.7.10 Procedure for Determining Footing Size for Marriage Line and Perimeter Piers
This procedure is to be followed for all NEW homes produced by manufacturers listed in **Appendix A**, and for all USED homes installed not using the Manufacturer's Installation Instructions. For NEW homes produced by manufacturers NOT listed in **Appendix A**, pier design and footing sizes for marriage line and perimeter piers shall be in accordance with the Manufacturer's Installation Instructions, subject to the limitations of **Section 3.7.1.1**.

1. Determine the ridge beam or perimeter header span using **Figure 3.7.10** as a guide.

2. Find the span in the column entitled "Ridge Beam or Header Span" in **Table 3.7.10A**. The required height of the pier will determine whether it is single stacked or double stacked, in accordance with **Sections 3.7.4.2** and **3.7.5.2**. From the appropriate column designating the width of the home and whether the pier is single stacked or double stacked, read the load for which the footing must be sized. **NOTE: FOR PERIMETER PIERS, USE ONE-HALF OF THE LOAD GIVEN IN THE TABLE.**

3. Using the predetermined soil bearing capacity as specified in **Section 3.5.3**, enter **Table 3.7.10B** and find the first number in the column "Maximum Footing Capacity" that is equal to or greater than the load determined in step 2 above. On this same line, the Minimum Footing Size and Minimum Footing Thickness (depending on whether the pier is single or double stacked) is given.

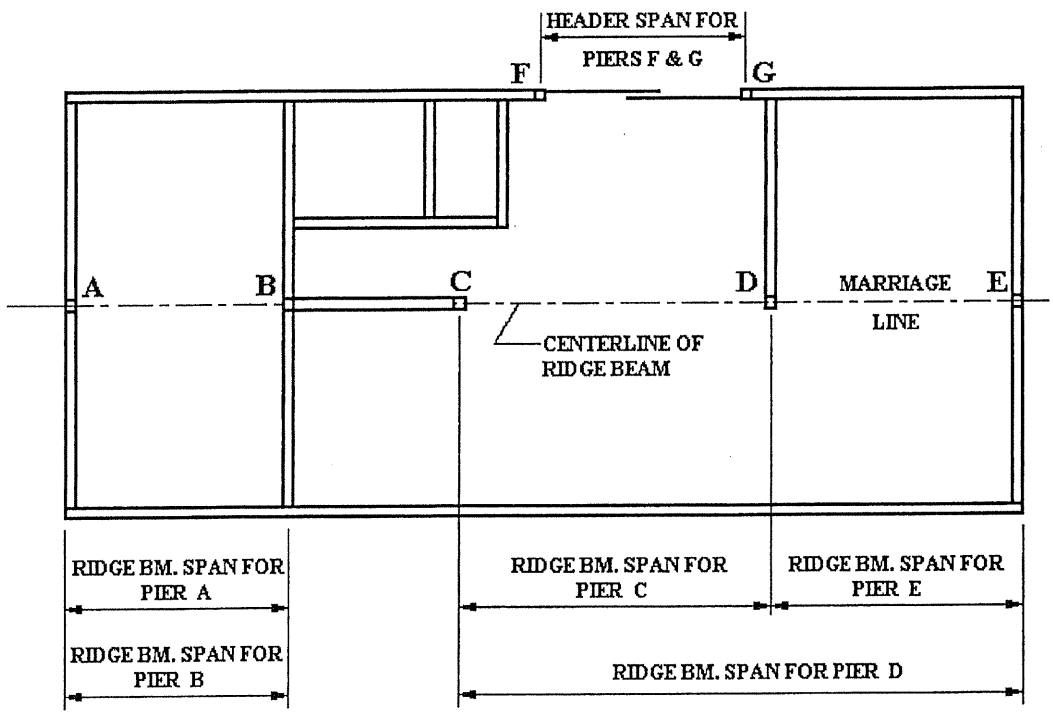


FIGURE 3.7.10
Ridge Beam and Header Spans for Marriage Line and Perimeter Piers

TABLE 3.7.10A
COLUMN LOADS FOR USE IN DETERMINING FOOTING SIZE FOR MARRIAGE LINE AND PERIMETER PIERS

The footing loads in this Table are calculated using the tributary area of roof carried by a ridge beam or perimeter header multiplied by the following design loads, plus the pier and footing weight:

Roof Dead Load: 10 psf
Roof Live Load: 20 psf

Pier and footing weights are based on an assumed 56" single stacked pier with 24x24x6 footing, or a 96" double stacked pier with 24x24x4 footing.

RIDGE BEAM OR HEADER SPAN (ft.) See Fig. 3.7.10	LOADS FOR SIZING OF FOOTINGS (lbs.)					
	24' WIDE		28' WIDE		32' WIDE	
	Single Stacked Pier	Double Stacked Pier	Single Stacked Pier	Double Stacked Pier	Single Stacked Pier	Double Stacked Pier
Over 4 to 8	2122	2880	2362	3120	2602	3360
Over 8 to 12	2902	3660	3262	4020	3622	4380
Over 12 to 16	3682	4440	4162	4920	4642	5400
Over 16 to 20	4462	5220	5062	5820	5662	6420
Over 20 to 24	5242	6000	5962	6720	6682	7440

NOTES to Table 3.7.10A:

1. For **perimeter** piers, use **one-half** the load given in this Table.
2. Single stacked and double stacked piers shall be in accordance with the height limitations of **Sections 3.7.4.2** and **3.7.5.2**.

TABLE 3.7.10B
Marriage Line and Perimeter Pier Footing Size and Thickness

SOIL CAPACITY (psf)	MINIMUM FOOTING SIZE (in. x in.) or minimum diameter in inches**	MAXIMUM FOOTING CAPACITY (lbs.)	MINIMUM FOOTING THICKNESS	
			Single Stacked Pier	Double Stacked Pier
1000*	20 x 20 (24")	2778	4"	4"
	24 x 24 (28")	4000	4"	4"
	30 x 30 (34")	6250	5"	4"
1500	16 x 16 (20")	2667	4"	4"
	20 x 20 (24")	4167	4"	4"
	24 x 24 (28")	6000	5"	4"
	30 x 30 (34")	9375	6"	4"
2000	16 x 16 (20")	3556	4"	4"
	20 x 20 (24")	5556	4"	4"
	24 x 24 (28")	8000	6"	4"
2500	16 x 16 (20")	4444	4"	4"
	20 x 20 (24")	6944	5"	4"
	24 x 24 (28")	10000	6"	4"
3000	16 x 16 (20")	5333	4"	4"
	20 x 20 (24")	8333	5"	4"
3500	16 x 16 (20")	6222	4"	4"
	20 x 20 (24")	9722	5"	4"
4000	16 x 16 (20")	7111	4"	4"
	20 x 20 (24")	11111	6"	4"

* **Foundations in soil with a bearing capacity of less than 1,000 PSF must be designed by a North Carolina registered engineer or architect familiar with the site conditions.**

** **The minimum diameter circular footing with double stacked piers is 24".**

NOTE to Table 3.7.10B:

1. Soil bearing capacity shall be determined as specified in **Section 3.5.3.**

Section 3.7.10 Procedure Examples

1. A 28' wide home on a site with a soil bearing capacity of 1500 psf has a 48" high marriage line pier with openings on both sides (**Pier "D" in Figure 3.7.10**). The opening on one side of the pier has a span of 9'-8", and the other opening has a span of 11'-0". The ridge beam span for the pier is therefore 9'-8" + 11'-0" = 20'-8". Per **Section 3.7.4.2**, a 48" marriage line pier may be single stacked. In **Table 3.7.10A**, go to the last line in the left column ("Over 20 to 24"), and under the 28' wide, single stacked pier column, read a footing load of **5962** lbs. In **Table 3.7.10B**, go to 1500 psf in the left column and, in the "Maximum Footing Capacity" column, find the first value in the 1500 psf section that equals or exceeds 5962 lbs. This value is 6000 lbs. On the 6000 lbs. line, read 24x24 in the "Minimum Footing Size" column and 5" in the "Minimum Footing Thickness, Single Stacked Pier" column. The required minimum footing size for this pier is therefore **24"x 24"x 5"**.

2. A 32' wide home on a site with a soil bearing capacity of 2000 psf has a 64" high perimeter piers on either side of an opening that spans 8'-0" (**Piers "F" and "G"** in **Figure 3.7.10**). Per **Section 3.7.5.2**, a 64" perimeter pier must be double stacked. In **Table 3.7.10A**, go to the line in the left column that reads "Over 4 to 8" (since the span is exactly 8'), and under the 32' wide, double stacked pier column, read a footing load of **3360** lbs. Since these are perimeter piers, use **one-half** of the **Table 3.7.10A** load. The required load is **3360 divided by 2**, or **1680** lbs. In **Table 3.7.10B**, go to 2000 psf in the left column and, in the "Maximum Footing Capacity" column, find the first value in the 2000 psf section that equals or exceeds 1680 lbs. This value is 3556 lbs. On the 3556 lbs. line, read 16x16 in the "Minimum Footing Size" column and 4" in the "Minimum Footing Thickness, Double Stacked Pier" column. The required minimum footing size for the piers is therefore **16"x 16"x 4"**.

3.7.11 Marriage Line and Perimeter Piers -- Interference with Outriggers

Marriage line and perimeter piers may be shifted slightly to avoid interference with outriggers, so long as no part of the column above extends beyond the edge of the pier. Footings shall be centered under the piers.

3.8 MULTI-SECTION CONNECTIONS

3.8.1 Multi-Section Homes -- General Provisions

3.8.1.1 New Manufactured Homes

For NEW multi-section homes produced by manufacturers listed in **Appendix A**, marriage line connections shall be in accordance with **Section 3.8** of this Code. Marriage line connections for NEW multi-section homes produced by manufacturers NOT listed in **Appendix A** shall be in accordance with the Manufacturer's Installation Instructions.

3.8.1.2 Used Manufactured Homes

Marriage line connections for all USED manufactured homes installed not using the Manufacturer's Installation Instructions shall comply with all the requirements of **Section 3.8** of this Code.

3.8.2 Preparation for Marriage Line Connections

Prior to joining the sections of a multi-section home, the home shall be prepared according to the following:

1. Remove all shipping materials from the marriage line floor, wall, and roof areas between the sections so that there are no exposed or protruding fasteners, material scraps, or other protrusions on either side of the marriage line.
2. Install an air infiltration barrier on the mating edges of the floor, end walls, and ceiling consisting of closed cell foam, sill seal, or a durable, non-porous caulking that is capable of expansion and contraction. If sill seal is used, it shall be a minimum of 5 1/2" wide and shall be doubled over and attached with fasteners staggered at 6" on center. The air infiltration barrier shall be installed such that no gaps occur at any point along the mating edges of the floor, end walls, and ceiling.

3.8.3 Prescriptive Marriage Line Connections for Manufactured Homes

For homes produced by manufacturers listed in **Appendix A**, and for all USED manufactured homes installed not using the Manufacturer's Installation Instructions, the methods described in the following Sections are acceptable. Alternate methods may be accepted at the discretion of the local building official provided they are structurally equivalent to or better than the methods in this Section.

3.8.3.1 Ridge Connections

Ridge connections may be accomplished by any of the following methods:

3.8.3.1.1 Ridge Connection Method 1

Space 3/8"x 6" minimum lag screws with washers on each side of ridge at a maximum of 36" o.c. for Wind Zone I, 20" for Wind Zone II, and 16" for Wind Zone III. Stagger the lags on each side of the ridge, making sure that the lag screw engages the top chords of the ridge beams on each section and the web of the opposite ridge beam (in the case of I-joist type ridge beams), or that the lag screw fully penetrates the thickness of the ridge beams on each section (in the case of solid or multi-ply ridge beams).
See Fig. 3.8.3.1.1.

3.8.3.1.2 Ridge Connection Method 2

Space #8 x 4" screws at 32" o.c. max or 16d nails at 16" o.c. staggered side to side at the ridge. Place a 30 gauge x 6" wide minimum galvanized steel continuous strap the full length of unit fastened on each side of centerline with 7/16" x 16 GA staples or 1 1/2" galvanized roofing nails at 2" o.c. maximum through roof deck. Overlap strap a minimum of 4" at the splice overlap.
See Fig. 3.8.3.1.2.

3.8.3.1.3 Ridge Connection Method 3

Space #10 x 4" screws at 12" o.c. staggered from side to side at 30° from vertical. Place 26 GA x 1 1/2" strap attached with (8) 15 GA x 1 1/2" staples per end or (4) #10 x 1 1/2" screws per end over trusses at a maximum spacing of 96" o.c. for Wind Zones I & II and 80" o.c. for Wind Zone III. **See Fig. 3.8.3.1.3.**

Wind Zone	Max. Lag Spacing
I	36"
II	20"
III	16"

* LAG SPACING TABLE

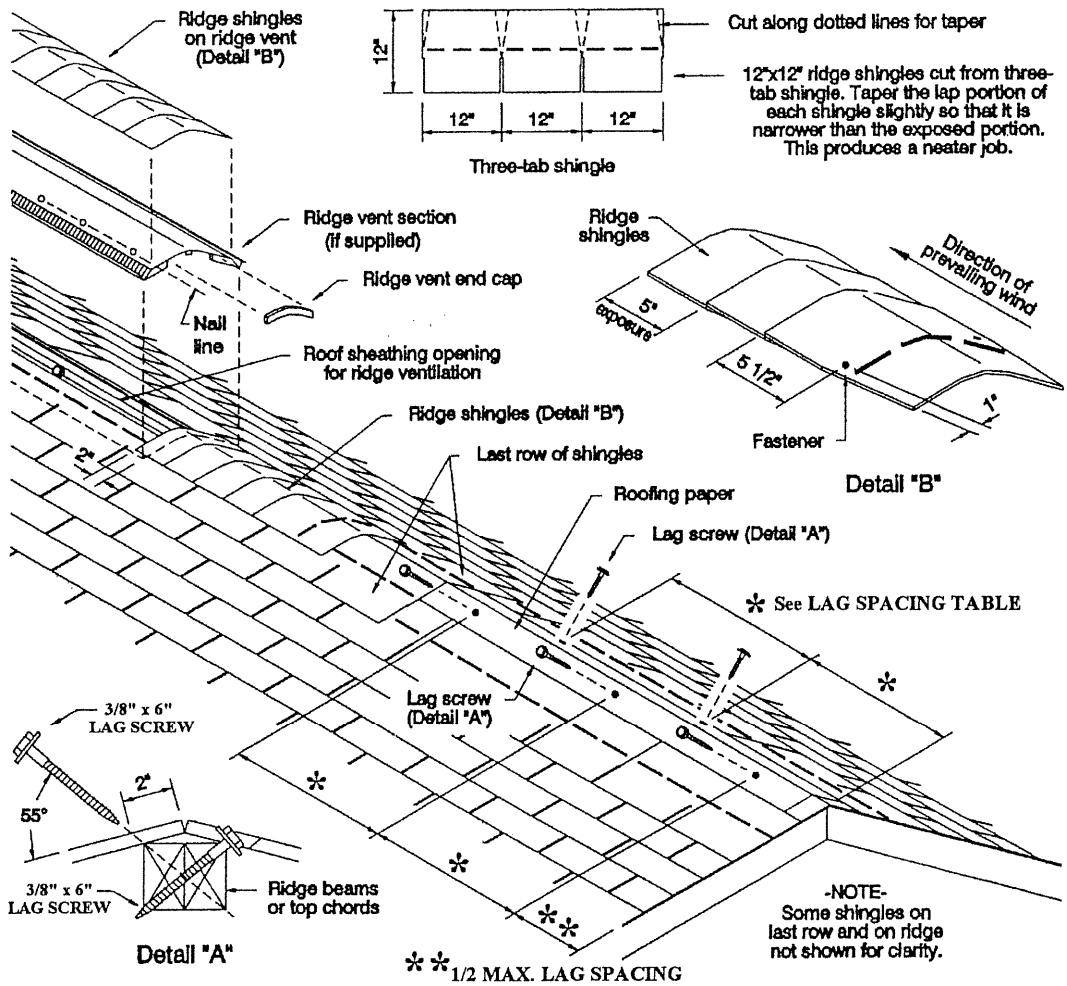


FIGURE 3.8.3.1.1
Ridge Connection Method 1

See **General Notes for Ridge Connections**, located after **Figure 3.8.3.1.3**.

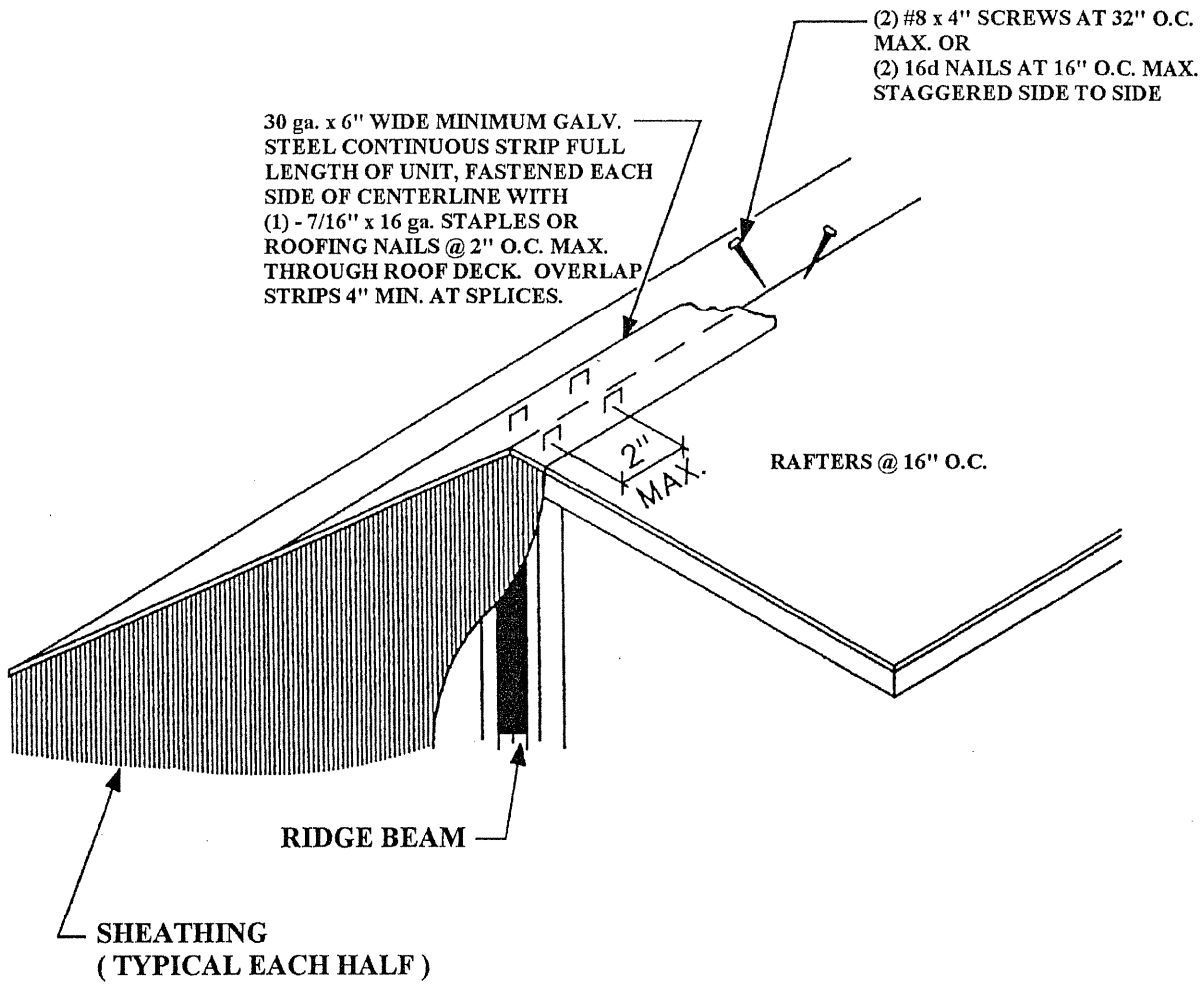


FIGURE 3.8.3.1.2
Ridge Connection Method 2

See **General Notes for Ridge Connections**, located after **Figure 3.8.3.1.3**.

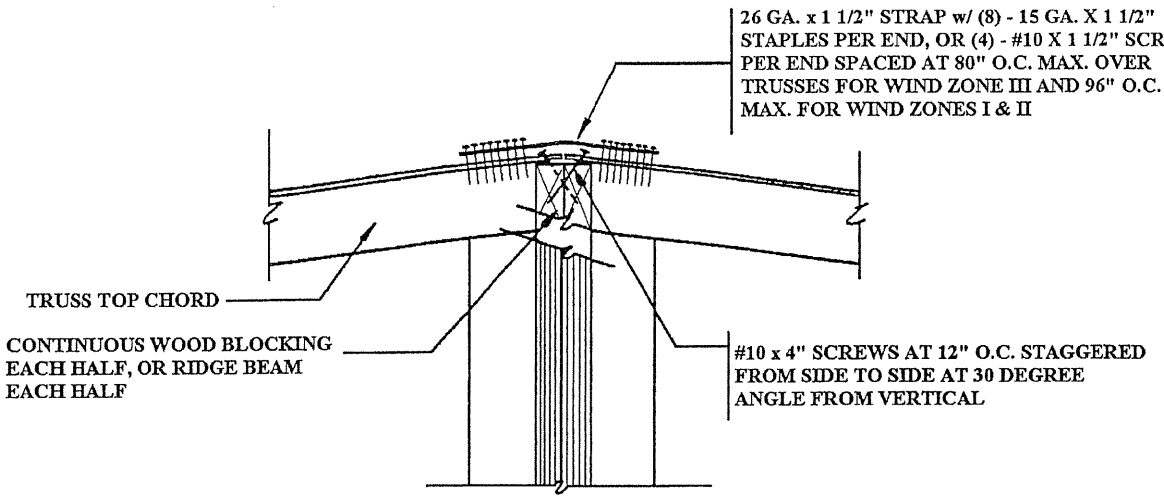


FIGURE 3.8.3.1.3
Ridge Connection Method 3

GENERAL NOTES FOR RIDGE CONNECTIONS (applies to **Ridge Connection Methods 1 through 3**)

1. A maximum gap of 1 1/2" is permitted between ridge beams or top chords. Such gaps shall be shimmed at each point where the beams or chords are fastened together.

2. Shims shall be plywood, dimension lumber, or equivalent and shall be a minimum of 6" wide, centered on the fastener, and shall beat least as deep as the ridge beam or top chord. Fastener length must be increased as necessary to maintain at least 1 1/2" penetration into the main member.

3. Where no ridge vent is installed, means must be provided to support the shingles at the ridge line.

3.8.3.2 Floor Connections

Floor connections may be accomplished by any of the following methods:
(See **General Notes for Floor Connections**, located after **Figure 3.8.3.2.4**)

3.8.3.2.1 Floor Connection Method 1

Space 3/8" x 6" minimum lag screws at approximately 30° to vertical staggered side to side through the floor sheathing from the top. Recess lag heads into the floor decking and fill with wood putty or water based putty. Space lags on each side at 36" o.c. for Wind Zone I, 20" for Wind Zone II, and 16" for Wind Zone III. **See Figure 3.8.3.2.1.**

3.8.3.2.2 Floor Connection Method 2

Same as Method (1) except attached from bottom of mating floor members. **See Figure 3.8.3.2.2.**

3.8.3.2.3 Floor Connection Method 3

Space 3/8" x 4" minimum lag screws in two staggered rows with each row spaced at 36" o.c. for Wind Zone I, 20" for Wind Zone II, and 16" for Wind Zone III. Bolts of sufficient length may be used in lieu of lags for floor connections only. Floors should be leveled between units to eliminate offsets in the floor. **See Figure 3.8.3.2.3.**

3.8.3.2.4 Floor Connection Method 4

Space 3/8" x 3 1/2" lag screws on each side at 24" o.c. staggered side to side at 45°angle from vertical. Attach a 26 GA x 1 1/2" steel strap over opposite unit joists with (1) 3/8" x 3 1/2" lag screw into each joist at the ends of the strap. Space straps 32" o.c. maximum. **See Figure 3.8.3.2.4.**

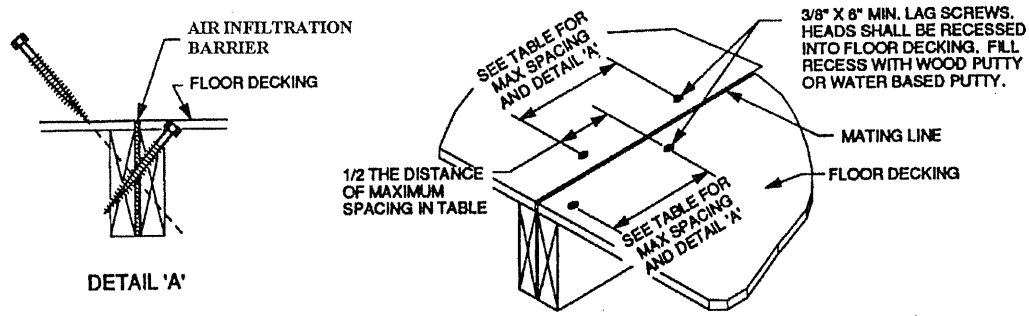
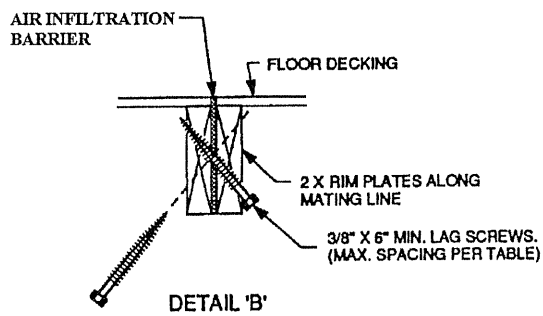


FIGURE 3.8.3.2.1
Floor Connection Method 1

LAG SCREW MAXIMUM SPACING	
WIND ZONE	MAXIMUM O.C. SPACING
I	36"
II	20"
III	16"

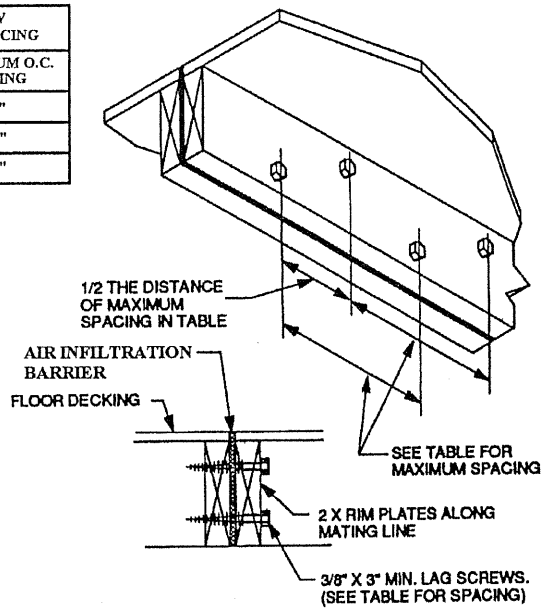


Note:

1. Bottom board not shown for clarity.
2. Holes in bottom board created by lag screws must be patched with a vinyl tape designed for repairing tears or holes.

FIGURE 3.8.3.2.2
Floor Connection Method 2

LAG SCREW MAXIMUM SPACING	
WIND ZONE	MAXIMUM O.C. SPACING
I	36"
II	20"
III	16"



Note:

1. Bottom board not shown for clarity.
2. Holes in bottom board created by lag screws must be patched with a vinyl tape designed for repairing tears or holes.

FIGURE 3.8.3.2.3
Floor Connection Method 3

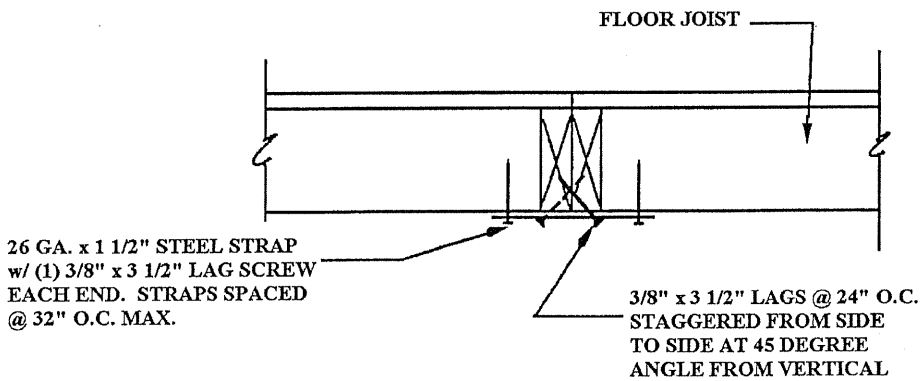


FIGURE 3.8.3.2.4
Floor Connection Method 4

GENERAL NOTES FOR FLOOR CONNECTIONS (applies to **Floor Connection Methods 1 through 4**)

1. A maximum gap of 3/4" is permitted between mate line rim joists. Such gaps shall be shimmed at each point where the rim joists are fastened together.

2. Shims shall be plywood, dimension lumber, or equivalent and shall be a minimum of 6" wide, centered on the lag, and shall be at least as deep as the mate line joist. Lag length must be increased as necessary to maintain at least 1 1/2" penetration into the main member.