

A PROGRAM OF IBHS

FORTIFIED

HOME

TM

HURRICANE STANDARDS



2019



2.2.3 Existing Home; New Roof (Re-Roofing). Designation: FORTIFIED Roof – New Roof

2.2.3.1 Roof deck thickness

The minimum allowable deck thickness for wood structural panels to be eligible for a FORTIFIED designation is $\frac{7}{16}$ in.

2.2.3.2 Addressing deteriorated or damaged roof decking on an existing home

2.2.3.2.1 Evaluate roof deck and remove damaged or deteriorated decking

Inspect the roof deck after the old roofing materials have been removed to identify and replace any damaged or deteriorated decking (damage or deterioration could be from moisture, weathering, or insect infestation). Damaged or deteriorated decking would generally be marked by one or more of the following characteristics: soft or spongy wood, wood swelling or buckling, delaminating (plywood), or crumbling and flaking of the wood. Do not cut or notch supporting wood members when removing damaged/deteriorated decking. If the roof deck is damaged, there is a possibility that the wood roof framing members (rafters or truss top chords) below the damaged deck are damaged as well.

2.2.3.2.2 Requirements for replacement of roof decking

1. If a section of the roof deck is damaged or deteriorated, remove and replace the entire damaged sheet or board.
2. Inspect the roof framing members below the removed decking. If more than $\frac{1}{4}$ in. of the surface is deteriorated or damaged, follow the requirements for deteriorated or damaged wood roof framing members (see section 2.2.3.4).

Best Practice (Recommendation): Add a minimum 2- x 4-in. scab, (A), to the side of existing roof framing member along the edges of new decking such that the new decking can be fastened to the added 2- x 4-in. scab instead of the existing roof framing member (to prevent the additional roof deck fasteners from damaging the existing framing members). Fasten the new 2- x 4-in. scab to existing framing member with 16d nails (or 3-in.-long, #8 wood screws) at 4 in. o.c. (See Figure 2-8).

Fasten the new decking to the supporting roof framing members and the newly added 2- x 4-in. scab if any, (A), in accordance with Table 2-6 (boards) or Table 2-7 (sheathing) as appropriate.

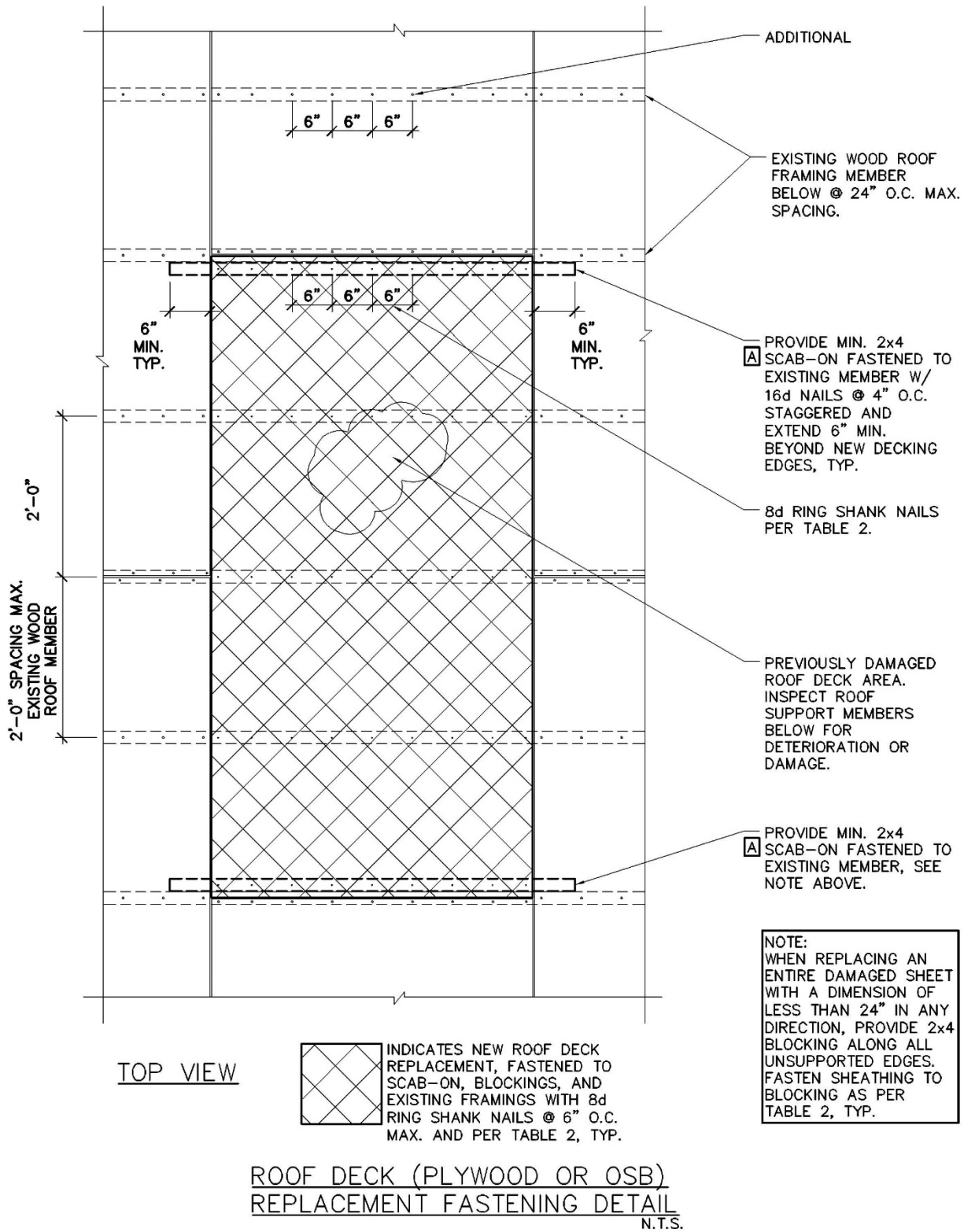


Figure 2-8. Roof deck replacement best practice detail.

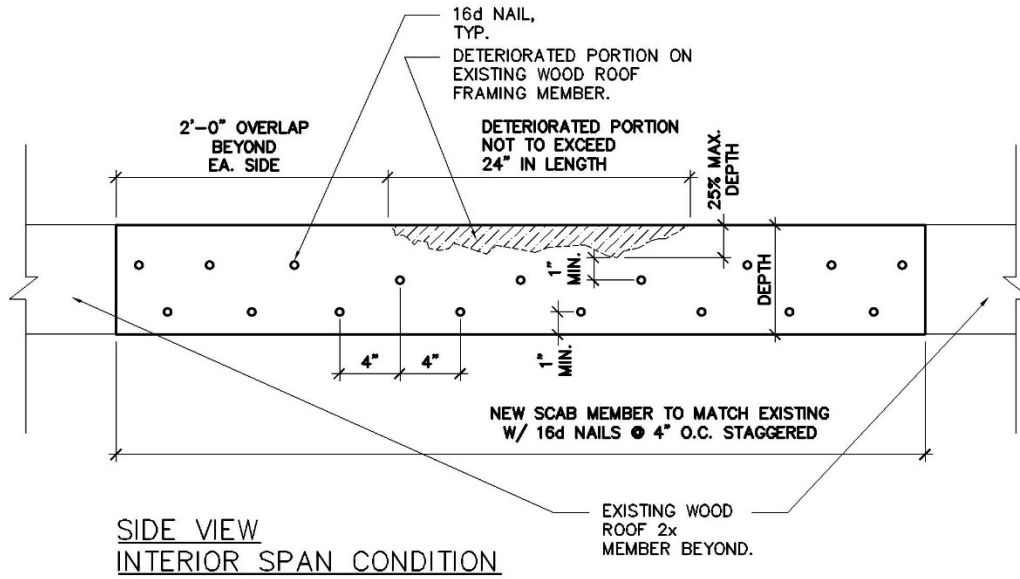


2.2.3.3 Deteriorated or damaged wood roof framing

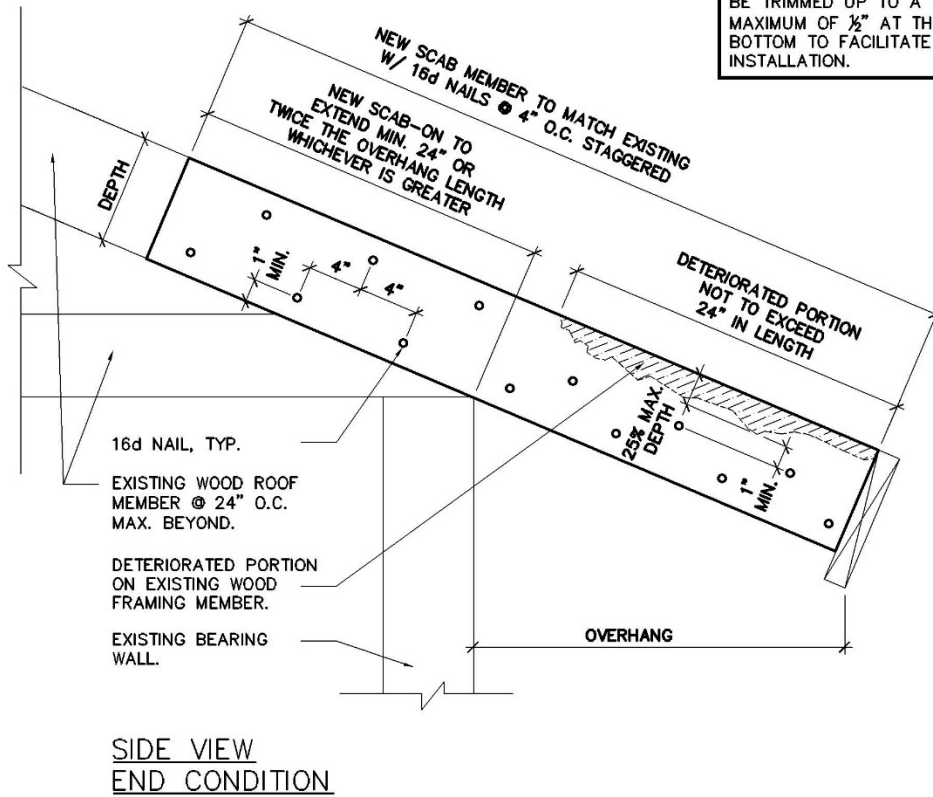
If the roof deck is damaged, there is a possibility that the wood roof framing members below the damaged decking are deteriorated or damaged as well. The guidelines listed below provide guidance for repairing wood roof framing members with relatively minor damage/deterioration as described. If the damage is greater than the conditions listed, consult a licensed professional engineer to provide engineering details to repair the damage.

1. The damaged or deteriorated portion of a roof framing member must meet all of the following conditions in order to be repaired instead of being replaced:
 - a. The roof framing member must be nominal 2-in.-thick lumber and be spaced no more than 24 in. o.c.
 - b. Damaged/deteriorated area must be less than 25 percent of roof framing member depth.
 - c. Damaged/deteriorated area must not exceed 25 percent of member length up to an absolute maximum length of 2 ft.
 - d. Damaged/deteriorated area must be a minimum of 6 in. away from any mechanical connections (truss/rafter hangers, truss connector plates, etc.).
2. If all conditions in Section 1 are met, a scab can be used to repair the damaged roof framing member. The scab should match the size of the damaged roof framing member. For example, a 2- x 4-in. roof truss top chord with damage meeting the conditions listed would require a 2- x 4-in. scab; a 2- x 10-in. rafter with damage meeting the conditions would require a 2- x 10-in. scab. Each scab member must be a continuous piece, extend beyond the damaged portion, as shown in Figure 2-9, and be fastened to the existing roof framing member with (2) rows of 16d nails (or 3-in., #8 wood screws) at 4 in. o.c. The scab may be trimmed up to ½ in. to facilitate installation.
3. The roof decking should be fastened to the new scab as indicated in Table 2-6 (boards) or Table 2-7 (sheathing) as appropriate.

Note: When the fascia or sub-fascia is the roof framing member that is damaged or deteriorated, remove and replace the damaged/deteriorated section plus at least 2 ft beyond that section on each side.



NOTE:
 SCAB WOOD MEMBERS MAY BE TRIMMED UP TO A MAXIMUM OF 1/2" AT THE BOTTOM TO FACILITATE INSTALLATION.



NEW SCAB MEMBER DETAIL FOR DETERIORATED OR DAMAGED WOOD FRAMING MEMBER

N.T.S.

Figure 2-9. New scab member fastening detail.

2.2.3.4 Strengthening roof sheathing attachment (re-nailing the roof deck)

2.2.3.4.1 Sawn lumber or wood board roof decking

- Add fasteners as required to ensure that roof decking consisting of sawn lumber or wood boards up to 1 in. thick are secured with at least two (2) nails, having a minimum diameter of 0.131 in. and a minimum length of 2½ in., (three [3] nails if the board is wider than 8 in.) to each roof framing member it crosses. Framing members must be spaced no more than 24 in. apart. Clipped-head, D-head, or round-head nails shall be acceptable provided they have the required minimum diameter and length. The nailing requirements are summarized in Table 2-6.
- For wood boards greater than 1 in. thick and up to 2 in. thick, add fasteners as required to ensure that the decking is secured with at least two (2) nails, having a minimum diameter of 0.131 in. and sufficient length to penetrate a minimum of 1⅝ in. into the roof framing, (three [3] nails if the board is wider than 8 in.) to each framing member it crosses. Framing members must be spaced no more than 24 in. apart. Clipped-head, D-head, or round-head nails shall be acceptable provided they have the required minimum diameter and length. The nailing requirements are summarized in Table 2-6.

Table 2-6. Fasteners Required for Wood Board Decking Attachment

Wood Board/Lumber (Roof Decking) Width	Number and Minimum Dimensions of Nails per Board for Each Framing Member it Crosses	Maximum Spacing of Framing Members
Up to 8 in.	Two (2) 0.131 in. minimum diameter with 1⅝-in. penetration into roof framing members	24 in.
Larger than 8 in.	Three (3) 0.131 in. minimum diameter with 1⅝-in. penetration into roof framing members	24 in.

2.2.3.4.2 Structural wood panel (plywood or oriented strand board [OSB]) roof sheathing

The number and spacing of additional fasteners needed to adequately strengthen the connection of structural wood panel roof sheathing depends on the size, type, and spacing of the existing fasteners. With these considerations in mind, the re-nailing requirements outlined in Table 2-7 are based on using ring-shank nails with full round heads as the additional nails. The specific required minimum dimensions and characteristics for the additional ring-shank nails to be used to strengthen the roof deck attachment (see Figure 2-10) are:

- Full round head diameter (minimum 0.281-in. diameter; no clipped-head nails allowed)
- 2¾ in. minimum nail length
- 0.113 in. in diameter

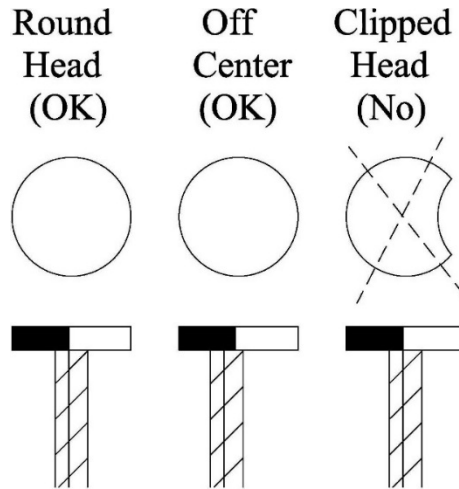


Figure 2-10. Use 8d ring-shank nails as the added fasteners when re-nailing roof sheathing. Research indicates that ring-shank nails have about twice the uplift capacity of the same size smooth-shank nails.

- Only full round-head ring-shank nails are acceptable.
- Off-center ring-shank nails with full round heads are acceptable.
- Clipped-head ring-shank nails are not acceptable for structural wood panels.



Table 2-7 : Additional Fasteners at Panel Edges and Intermediate Framing for Roof Deck

Wind Speed	Existing Fasteners	Existing Spacing	Required Additional Fastening	
			Within 48 in. of all roof edges and ridges	All other locations
100 mph (Vasd)/ 130 mph (Vult) OR LESS	Staples or 6d nails	Any	Add 8d ring-shank nails at 6 in. o.c. spacing along panel edges and intermediate framing	
	8d smooth-shank nails	6 in. o.c. or less along panel edges and intermediate framing	Add 8d ring-shank nails at 6 in. o.c. spacing along intermediate framing; no additional fasteners required at panel edges	No additional fasteners required
	8d smooth-shank nails	Greater than 6 in. o.c.	Add 8d ring-shank nails such that there is 6 in. o.c. spacing between existing and additional fasteners along panel edges; 6 in. o.c. spacing between additional fasteners along intermediate framing	Add 8d ring-shank nails such that there is 6 in. o.c. spacing between existing and additional fasteners along panel edges and along intermediate framing
	8d ring-shank nails	12 in. o.c. or less	Add 8d ring-shank nails such that there is 6 in. o.c. spacing between existing and additional fasteners along panel edges and intermediate framing	Add 8d ring-shank nails such that there is 6 in. o.c. spacing between existing and additional fasteners along panel edges and along intermediate framing
GREATER THAN 100 mph (Vasd) or 130 mph (Vult)	Staples or 6d nails	Any	Add 8d ring-shank nails at 4 in. o.c. spacing along panel edges and intermediate framing	
	8d smooth-shank nails	6 in. o.c. or less along panel edges and intermediate framing	Add 8d ring-shank nails such that there is 4 in. o.c. spacing between existing and additional fasteners along panel edges and 4 in. o.c. between additional fasteners along intermediate framing	No additional fasteners required along panel edges, 6 in. o.c. spacing between additional fasteners along intermediate framing
	8d smooth-shank nails	6 in. o.c. or greater	Add 8d ring-shank nails such that there is 4 in. o.c. spacing between existing and additional fasteners along panel edges and 4 in. o.c. between additional fasteners along intermediate framing	Add 8d ring-shank nails such that there is 6 in. o.c. spacing between existing and additional fasteners along panel edges and 6 in. o.c. spacing between additional fasteners along intermediate framing
	8d ring-shank nails	12 in. o.c. or less	Add 8d ring-shank nails such that there is 4 in. o.c. spacing between existing and additional fasteners along panel edges and along intermediate framing	Add 8d ring-shank nails such that there is 6 in. o.c. spacing between existing and additional fasteners along panel edges and along intermediate framing

Notes:

1. Roof sheathing panels must be minimum of 7/16 in. thick.
2. Roof framing members must be spaced at maximum of 24 in. o.c. and have a minimum 2 in. nominal thickness.
3. Existing 8d nails to be a minimum of 0.131 in. in diameter and 2½ in. long.
4. All additional fasteners are to be 8d ring-shank nails (0.113 in. x 2¾ in. with full round head).
5. Roof pitch must be 2:12 or greater.

2.2.3.5 Sealing the roof deck (roof slopes 2:12 or greater)

All new roof cover installations require a sealed roof deck system that keeps water out of the attic and the interior of the house in the event the roof covering is damaged during a hurricane. The following are qualified methods for sealing the roof deck.

2.2.3.5.1 Options for shingle or metal roof covers (roof slopes 2:12 or greater)

Sealed Roof Deck Option 1: Tape seams between roof sheathing that forms the roof deck. There are two material options for taping the seams on the roof deck:

- **Material Option 1:** Apply an ASTM D1970 compliant self-adhering polymer-modified bitumen flashing tape, at least 4 in. wide, directly to the roof deck to seal the horizontal and vertical joints in the roof deck.
- **Material Option 2:** Apply an AAMA 711-13, Level 3 (for exposure up to 80°C/176°F) compliant self-adhering flexible flashing tape at least 3¾ in. wide directly to the roof deck to seal the horizontal and vertical joints in the roof deck.

Any flashing tape used to achieve a sealed roof deck must be fully adhered without voids (e.g., wrinkles) in order to be accepted. In some instances, the ability of self-adhered flashing tapes to adhere to oriented strand board (OSB) sheathing may be compromised by the level of surface texture or wax used in fabricating the OSB panels. In applications where flashing tape adhesion to OSB is marginal, apply a manufacturer-specified compatible primer to the OSB panels where the tape will be applied to ensure the proper attachment of the self-adhering tape to the sheathing. Do not nail or staple the tape to the roof sheathing. Refer to the manufacturer's recommendations for installation and primer requirements (if applicable).

Next, apply a code-compliant ASTM D226 Type II (#30) or ASTM D4869 Type III or Type IV (#30) underlayment over the self-adhering tape. As an alternative, apply a reinforced synthetic roof underlayment which has an ICC approval as an alternate to ASTM D226 Type II felt paper. The synthetic underlayment must have a minimum tear strength of 15 lbf in accordance with ASTM D4533 and a minimum tensile strength of 20 lbf/in. in accordance with ASTM D5035. These underlayments must be attached using annular-ring or deformed-shank roofing fasteners with minimum 1-in.-diameter caps (button cap nails) at 6 in. o.c. spacing along all laps and at 12 in. o.c. vertically and horizontally in the field or a more stringent fastener schedule if required by the manufacturer for high-wind and prolonged exposure installations. Horizontal laps must be a minimum of 4 in. and end laps must be a minimum of 6 in.

Caution: Be sure to check product labelling carefully. Not all products labelled ASTM D4869 are Type III or Type IV. Look for ASTM D4869 felt that is labeled Type III or Type IV. ASTM D4869 Type I or Type II will NOT be accepted.

Installation Notes:

- Best practice for drip edge installation at eaves: Install the drip edge on top of the underlayment at the eaves. Make sure the top surface of the drip edge is clean, free of oil, and, if required by the starter strip manufacturer, primed with ASTM D41 primer. For shingle roof installations, seal the drip edge, underlayment, and starter strip at the eave by either using a self-adhering starter strip or applying an 8-in.-wide layer of compatible flashing cement, maximum thickness $\frac{1}{8}$ in., over the drip edge and adjacent underlayment. For metal roof covers, apply a compatible manufacturer-approved sealant between the drip edge and adjacent underlayment to prevent water from accumulating under the drip edge. See Section 2.2.3.6 for further drip edge requirements.
- Lap underlayment with minimum 6-in. leg “turned up” at wall intersections; lap wall weather barrier over turned-up roof underlayment.



Figure 2-11. Installing a sealed roof deck system; taping the seams of roof sheathing.

Sealed Roof Deck Option 2: Install two (2) layers of ASTM D226 Type II (#30) or ASTM D4869 Type III or Type IV (#30) underlayment in a shingle-fashion, lapped 19 in. on horizontal seams (36-in. roll), and 6 in. on vertical seams.

Caution: Be sure to check product labelling carefully. Not all products labelled ASTM D4869 are Type III or Type IV. Look for ASTM D4869 felt that is labeled Type III or Type IV. ASTM D4869 Type I or Type II will NOT be accepted.



The starter course of felt is to be installed as described below and shown in Figure 2-12. Cut 17 in. off one side of the roll and install the remaining 19-in.-wide strip of underlayment along the eave, safely tacked in place. Carefully install a 36-in.-wide roll of ASTM D226 Type II (#30) or ASTM D4869 Type III or Type IV (#30) underlayment over the 19-in.-wide course of ASTM D226 Type II (#30) or ASTM D4869 Type III or Type IV (#30) underlayment along the eave. Follow the same procedure for each course, overlapping the sheets 19 in. (leaving a 17 in. exposure). Fasten the bottom edge of the roll (horizontal lap) with a row of annular-ring or deformed-shank nails with 1-in.-diameter caps at 6 in. o.c. Since the bottom edge (horizontal lap) of the next layer of underlayment will be fastened approximately 19 in. above the horizontal lap below, install a row of annular-ring or deformed-shank nails with 1-in.-diameter caps with 12 in. o.c. horizontal spacing about 10 in. above the bottom lap. When the installation is completed, the resulting fastening of the two (2) layers of felt should consist of the same fasteners at approximately 6 in. o.c. along all laps and at not more than 12 in. o.c. in the field of the sheet between the side laps. Add fasteners along any exposed vertical laps so that the maximum spacing between fasteners is 6 in. o.c. For sites with design wind speeds less than 140 mph (Vasd: ASCE 7-05; IRC 2006; IRC 2009; and IRC 2012) or less than 160 mph (Vult: ASCE 7-10; IRC 2015; and IRC 2018), use annular-ring or deformed-shank nails with 1-in.-diameter caps (button cap nails). For sites with design wind speeds greater than or equal to 140 mph (Vasd: ASCE 7-05; IRC 2006; IRC 2009; and IRC 2012) or greater than 160 mph (Vult: ASCE 7-10; IRC 2015; and IRC 2018), use annular-ring or deformed-shank nails with 1-in.-diameter thin metal disks (“tincaps”).

Installation Notes:

- Best practice for drip edge installation at eaves: Install the drip edge on top of the double layer of underlayment at the eaves. Make sure the top surface of the drip edge is clean, free of oil, and, if required by the starter strip manufacturer, primed with ASTM D41 primer. For shingle roof installations, seal the drip edge, underlayment, and starter strip at the eave by either using a self-adhering starter strip or applying an 8-in.-wide layer of compatible flashing cement, maximum thickness $\frac{1}{8}$ in., over the drip edge and adjacent underlayment. For metal roof covers, apply a compatible manufacturer- approved sealant between the drip edge and adjacent underlayment to prevent water from accumulating under the drip edge. See Section 2.2.3.6 for further drip edge requirements.
- Lap underlayment with minimum 6-in. leg “turned up” at wall intersections; lap wall weather barrier over turned-up roof underlayment.

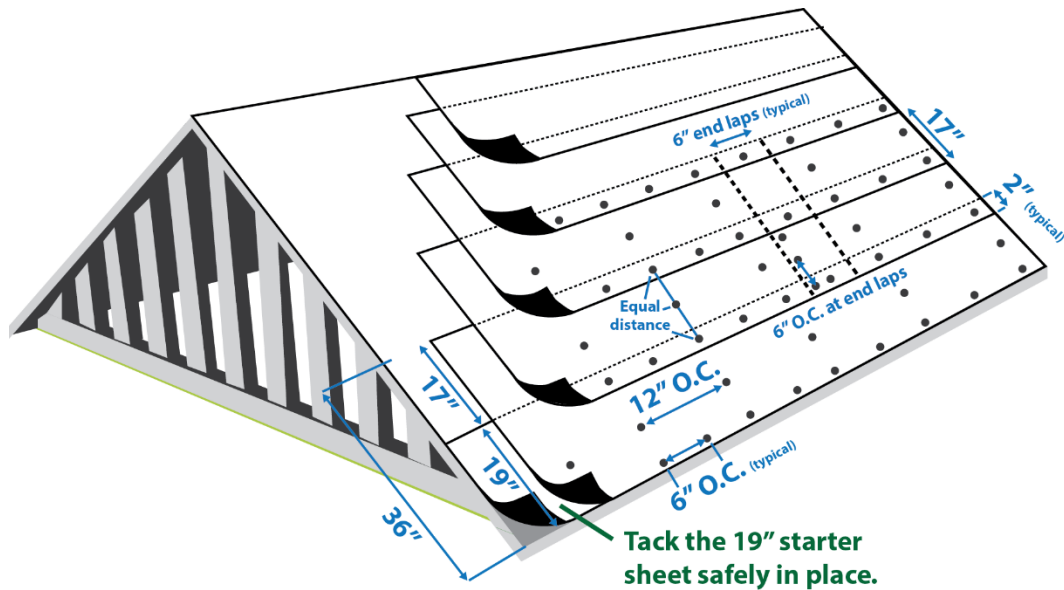


Figure 2-12. Installation of 19 in. starter course general notes.

Sealed Roof Deck Option 3: For homes located south of the North Carolina/South Carolina border, cover the entire roof deck with a full layer of self-adhering polymer-modified bitumen membrane meeting ASTM D1970 requirements. This approach provides a waterproof membrane over the entire roof and can greatly diminish the potential for leaks. In some instances, the ability of the self-adhered membranes to adhere to oriented strand board (OSB) sheathing may be compromised by the level of surface texture or wax used in fabricating the OSB panels. In applications where membrane adhesion to OSB is marginal, apply a manufacturer-specified compatible primer to the OSB panels to ensure the proper attachment of the self-adhering membrane to the sheathing. Also, roofers are finding that shingles are bonding to many of these self-adhered membranes and this could lead to damage of the sheathing when it comes time to replace the shingles. Consequently, the membrane should be covered with a bond break such as a #15 ASTM D226, Type I underlayment. This underlayment on shingle roofs only needs to be fastened well enough to keep it on the roof surface and provide safety to the roofers until the shingles are applied. **Note: For asphalt shingle installations, hold bond break material back 8 in. from roof edges to allow mastic and starter strip or self-adhered starter strip to be applied directly to drip edge.**

Note: Manufacturers emphasize the need for adequate attic ventilation when this type of membrane is applied over the entire roof. This is particularly important north of the North Carolina/South Carolina border. Also, some local building departments prohibit the use of this system. Check with the local building department for restrictions.

Installation Notes:

- Best practice for drip edge installation at eaves: Install drip edge on top of the underlayment. Make sure the top surface of the drip edge is cleaned, free of oil,



and, if required by the starter strip manufacturer, primed with ASTM D41 primer. For shingle roof installations, seal the drip edge, underlayment, and starter strip at the eave by either using a self-adhering starter strip or applying an 8-in.-wide layer of compatible flashing cement, maximum thickness $\frac{1}{8}$ in., over the drip edge and adjacent underlayment. For metal roof covers, apply a compatible 4-in.-wide self-adhesive tape to the top of the drip edge and adjacent underlayment to prevent water from accumulating under the drip edge. See Section 2.2.3.6 for further drip edge requirements.

- Lap underlayment with minimum 6-in. leg “turned up” at wall intersections; lap wall weather barrier over turned-up roof underlayment.

2.2.3.5.2 Options for concrete and clay tile roof covers (roof slopes 2:12 or greater)

The following options qualify as sealed roof decks under clay and concrete roof tiles. In option 2, the self-adhering tape provides a required barrier against water intrusion in case the roofing felt begins to lift.

Sealed Roof Deck Option 1: Cover the entire roof deck with an approved self-adhering polymer-modified bitumen underlayment complying with ASTM D1970, installed in accordance with both the underlayment manufacturer’s and roof covering manufacturer’s installation instructions for the deck material, roof ventilation configuration, and climate exposure for the roof covering to be installed. In some instances, the ability of the self-adhered membranes to adhere to oriented strand board (OSB) sheathing may be compromised by the level of surface texture or wax used in fabricating the OSB panels. In applications where membrane adhesion to OSB is marginal, apply a manufacturer-specified compatible primer to the OSB panels to ensure the proper attachment of the self-adhering membrane to the sheathing. Note: Some local building departments prohibit the use of this system. Check with the local building department for restrictions. Manufacturers emphasize the need for adequate attic ventilation when this type of membrane is applied over the entire roof. This is particularly important north of the North Carolina/South Carolina border.

Installation Notes:

- Best practice for drip edge installation at eaves: Install the self-adhered underlayment over the drip edge. Before installing the drip edge, prime the roof deck with a compatible primer or install a separator sheet that extends 2 in. past the deck flange of the drip edge. Make sure the top surface of the drip edge is clean, free of oil, and, if required by the membrane manufacturer, primed with ASTM D41 primer so that the self-adhering membrane adheres to the top of the drip edge. See Section 2.2.2.6 for further drip edge requirements.