



# How to Minimize Buckling of Asphalt Shingles

Of all the residential roofs in the U.S., 95 percent are sheathed with wood structural panels. This is because the panels are easy to install and form an excellent substrate for finished roofing, such as asphalt shingles. Proper installation is important, however, to ensure optimum performance of the shingle roofing and reduce roof callbacks and complaints. Roof coverings, such as asphalt shingles, may show some waviness when moisture conditions cause the roof deck substrate to move. To prevent buckling, follow these simple guidelines:

**1. Ventilate Attics.** Energy-efficient building designs call for construction features that prevent moisture buildup in attics. Significant amounts of moisture vapor introduced into living spaces (e.g., showers, dishwashers, humidifiers, clothes dryers, etc.) must not be ducted into attics. Vent such moisture sources through the roof to outside air.

The most effective attic ventilation system is a combination of both eave/soffit vents and ridge vents. The eave/soffit vents act as the intake and the ridge vents act as the exhaust. The International Building Code (IBC) and International Residential Code (IRC) offer different approaches for meeting the total net free ventilation requirements. In the 2012 IBC Section 1203.2, the minimum net free ventilating area is required to be 1/150 of the area of the space ventilated except that the ventilation may be reduced from 1/150 to 1/300 if one or more of the following is provided:

- Not less than 50 percent and no more than 80 percent of the required ventilating area is provided by ventilators located in the upper portion of the space to be ventilated at least 3 feet above eave or cornice vents with the balance of the required ventilation provided by eave or cornice vents,
- A Class I or II vapor barrier is installed on the warm-in-winter side of the ceiling, or
- Attic ventilation shall not be required when determined not necessary by the building official due to atmosphere or climatic conditions.

In addition, the 2012 IBC contains general provisions that require the placement of blocking and bridging in such a way as to not interfere with the movement of air.

In the 2012 IRC Section R806.2, the minimum net free ventilation area may be reduced from 1/150 to 1/300 of the ceiling area, providing one or more of the following is provided:

- In climate zones 6, 7 and 8, Class I or II vapor retarder is installed on the warm-in-winter side of the ceiling, or
- At least 40 percent and not more than 50 percent of the required ventilating area is provided by ventilators located in the upper portion of the attic or rafter space. Upper ventilators shall be located no more than 3 feet below the ridge or highest point of the space, measured vertically, with the balance of the required ventilation provided by eave or cornice vents. Where the location of wall or roof framing members conflicts with the installation of upper ventilators, installation more than 3 feet below the ridge or highest point of the space shall be permitted.

The 2012 IRC includes expanded provisions for unvented attic assemblies (Section R 806.5). It does not appear that there are provisions for this type of construction in the 2012 IBC. **Because of limited field experience, APA is unable to recommend these systems at this time.**

**2. Install a Vapor Barrier/Retarder.** In cold climates, a vapor barrier/retarder on the warm side of the ceiling minimizes the amount of water vapor entering the attic and reduces the ventilation requirements as noted above. Openings in the ceiling created for electrical fixtures and plumbing stacks should be sealed so there is no air leakage between the living area and the attic space. A vapor barrier/retarder should also be used on the ground in crawl-space houses.

**3. Store Panels on Stringers or Supports.** It is good practice to acclimate panels prior to installation whenever possible. Prior to installation, the sheathing should be protected against direct exposure to inclement weather. Panel bundles should be stored on level 4x4 stringers or other supports, so they are not in direct contact with the ground. At least three stringers should be used to support 8-foot panels – one centered and the other two approximately 12 to 16 inches from the ends. Cut banding on panel bundles to prevent edge damage. If plastic sheets or tarps are used, keep them open and provide ample space on top and all sides to ensure good air circulation around the panels. Even though the weather will not affect the structural integrity of APA Rated Sheathing, it should be covered when stored outside to keep it clean and to prevent uneven accumulation of moisture.

**4. Space Panels 1/8 Inch.** Due to the manufacturing process, sheathing may be very low in moisture content when produced. Because panels will increase in length and width as they absorb moisture from humid air or from rain, it is recommended that panels be spaced 1/8 inch at ends and sides when fastened to framing at the time of installation.

Fasten panels to framing with 8d common nails (0.131 x 2-1/2 inches). Space nails 6 inches o.c. along panel ends and supported edges, 12 inches o.c. along intermediate framing<sup>(a)</sup> Staples may be used in accordance with code approvals for size and spacing. To further minimize unevenness in the sheathing, be sure to align framing properly and block any warped framing to ensure panels will be smooth and flush at joints.

**5. Stand Over Rafters or Truss Chords When Installing Panels.** Standing between supports may bend a panel noticeably. Fastening it while bent can “lock” the bent shape into the panel. Although the roof is not harmed structurally, these depressions between the supports can telegraph through the finish roofing and lead to callbacks.

**6. Store Shingles** according to manufacturer’s recommendations.

**7. Install Shingle Underlayment Over Dry Sheathing.** The underlayment felt should be installed as soon as practical to avoid direct rain on the panels. Panels that get wet should be allowed to dry before applying felt. The felt should be installed smooth and any wrinkles that develop should be removed prior to application of the shingles. If the felt is wrinkled, the shingles may not lie flat, causing appearance issues. Underlayment should conform to ASTM D226 Type I, ASTM D4869 Type I or ASTM D6757. Self-adhering polymer modified bitumen sheet underlayment should conform to ASTM D1970.

(a) 6 inches when spans are 48 inches or greater. Check building code for proper nail size and spacing requirements in high-wind areas.

**8. Considerations for Asphalt Shingles.** Shingles vary considerably in their weight, surface texture and composition. The IBC and IRC require that asphalt shingles meeting ASTM D225 or ASTM D3462 standards be used. Minor surface imperfections in the substrate are more likely to affect the appearance of thin, lightweight untextured shingles. Heavier-weight shingles, including those that are laminated or textured, or varicolored should be considered in order to mask imperfections in the substrate. Darker color shingles also tend to better mask surface imperfections by camouflaging shadows that can make imperfections more noticeable. Selection and proper installation of appropriate underlayment materials can also help to minimize telegraphing.

Postpone application of shingles as long as practical to allow roof sheathing time to acclimate.<sup>(b)</sup> Sustained high humidity will allow dry panels to equalibrate more rapidly than lower humidity. In order to ensure proper performance of the roof assembly, it is important that asphalt shingles be installed in accordance with the shingle manufacturer's installation recommendations.

**Suggestions for repair of roof shingle buckling are provided by shingle manufacturers or the Asphalt Roofing Manufacturers Association ([www.asphaltroofing.org](http://www.asphaltroofing.org)).**

(b) Refer to shingle manufacturer's recommendations.

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