

Asphalt Shingle Roofing for High-Wind Regions



FEMA

HURRICANE HARVEY IN TEXAS

Recovery Advisory 2, April 2018

Purpose and Intended Audience

The purpose of this Recovery Advisory is to recommend practices for installing asphalt roof shingles that will enhance wind resistance in high-wind regions. For the purpose of this advisory, a high-wind region is considered to be an area where the basic (design) wind speed for Risk Category II buildings (as defined in American Society of Civil Engineers [ASCE] 7, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures*) is greater than 115 miles per hour. The primary audience for this advisory includes contractors and design professionals, but the practices presented here may also be helpful for homeowners and other building owners.

This Recovery Advisory supersedes Technical Fact Sheet No. 7.3 in FEMA P-499. The primary change is the inclusion of ASTM D7158, which was published after FEMA P-499 was published.

Key Issues

- Various types of asphalt shingle wind performance problems are discussed and shown in FEMA P-55, *Coastal Construction Manual: Principles and Practices of Planning, Siting, Designing, Constructing, and Maintaining Residential Buildings in Coastal Areas*, 4th Edition (2011).
- The FEMA Hurricane Harvey Mitigation Assessment Team (MAT) observed many asphalt shingle wind performance problems, similar to those shown in FEMA P-55.
- The damaged shingle roof coverings included shingles that had recently been installed.
- In instances where the MAT made detailed observations, the installations did not incorporate the best practices described in Technical Fact Sheet No. 7.3 in FEMA P-499, *Home Builder's Guide to Coastal Construction* (2010).

This Recovery Advisory Addresses

- Construction Guidance
- Fastener Guidelines
- Weathering and Durability
- Wind-Resistance Ratings

Key Actions for Achieving Good Wind Performance

- Use special installation methods described in this advisory for asphalt roof shingles used in high-wind regions.
- Use wind-resistance ratings to choose among shingles, but do not rely on ratings for performance.
- Consult the local building code for specific installation requirements. Requirements may vary locally.
- Always use underlayment (see Technical Fact Sheet No. 7.2 in FEMA P-499 [2010] for installation techniques in coastal areas).
- Pay close attention to roof-to-wall flashing and use enhanced flashing techniques (see Technical Fact Sheet No. 5.2 in FEMA P-499).

Construction Guidance

1. Follow shingle installation procedures for enhanced wind resistance, including the asphalt roof cement and nailing guidance shown in Figure 1.
2. Consider shingle characteristics and physical properties (Tables 1 and 2). Note that higher pull-through resistance may need to be specified.
3. Ensure that the fastening equipment and method results in properly driven roofing nails for maximum blow-off resistance (Figure 2).

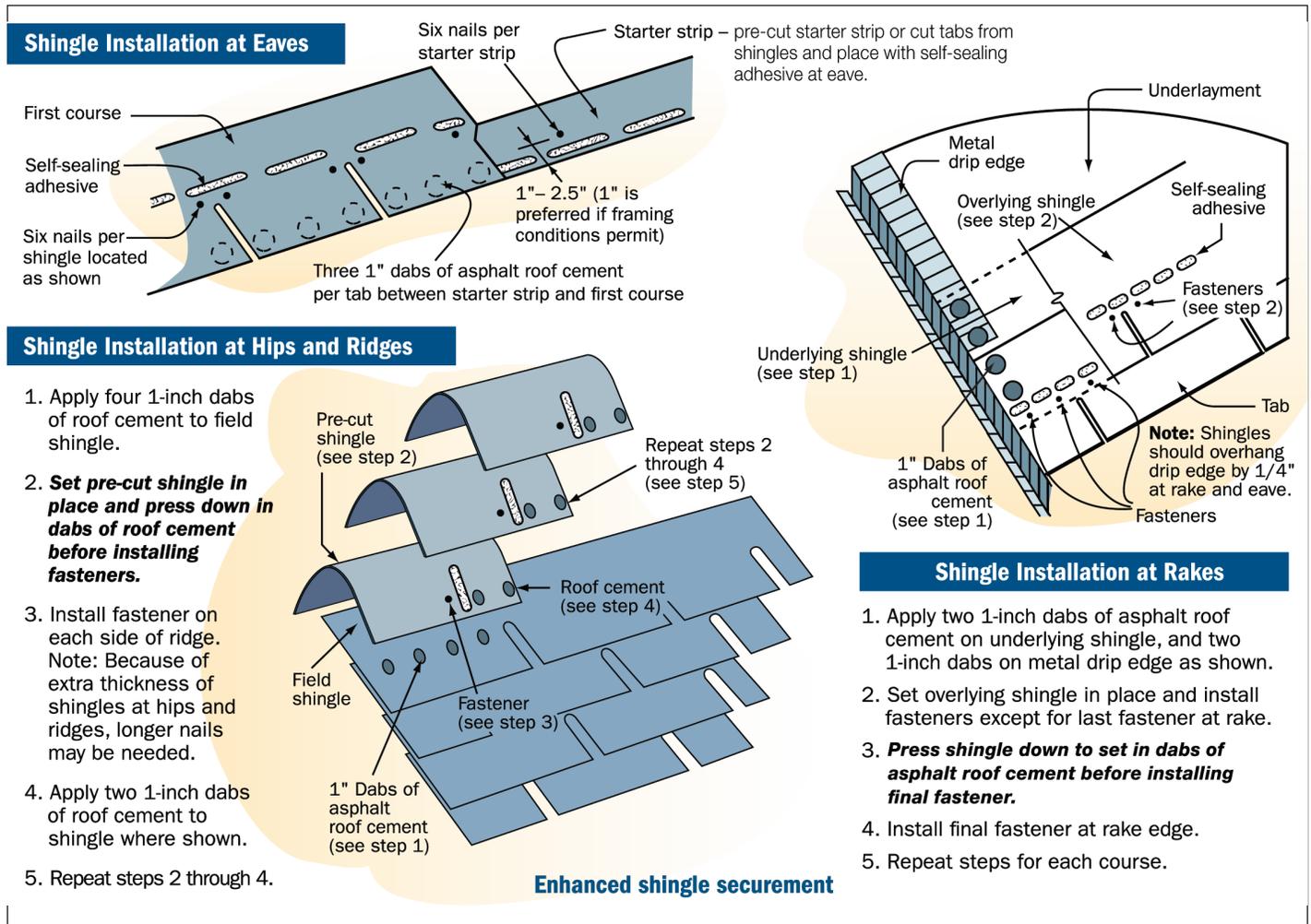


Figure 1: Enhanced shingle securement

Source: modified from FEMA P-499, 2010

Table 1. Shingle Types and Characteristics

Shingle Type	Product Standard	Characteristics
Fiberglass-Reinforced	ASTM D3462	Considerable variation in fastener pull-through resistance offered by different products.
Styrene-Butadiene-Styrene (SBS) Modified Bitumen	A standard does not exist for this product. It is recommended that SBS modified bitumen shingles meet the physical properties specified in ASTM D3462.	Because of the flexibility imparted by the SBS polymers, this type of shingle is less likely to tear if the tabs are lifted in a windstorm.

Table 2. Shingle Physical Properties

	Minimum Recommended: 25 lb at 73 degrees Fahrenheit (°F)	Minimum Recommended: 30 lb
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- 1 Design wind speed is an ultimate speed (as defined in ASCE 7), based on 3-second peak gust at 33 feet above grade in Exposure C (as defined in ASCE 7).
- 2 ASTM D3462 specifies a minimum fastener pull-through resistance of 20 lb at 73°F for single-layer specimens. If a higher resistance is desired, it must be specified.

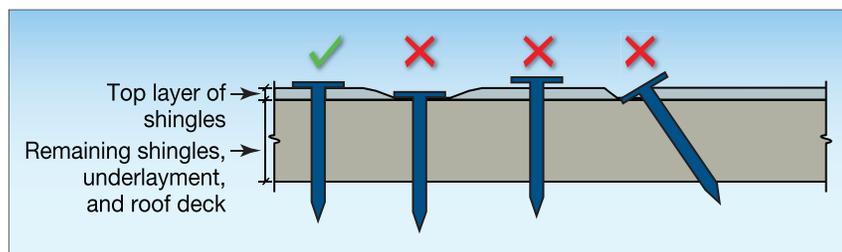


Figure 2: Examples of properly and improperly driven roofing nails

Fastener Guidelines

- Use roofing nails that extend through the underside of the roof sheathing, or a minimum of 3/4 inch into planking.
- Use roofing nails instead of staples.
- Use stainless steel nails for buildings within 3,000 feet of saltwater.

Weathering and Durability

Durability ratings are relative and are not standardized among manufacturers. However, a shingle with a longer warranty (e.g., 30-year instead of 20-year) should provide greater durability.

Modified bitumen shingles generally offer improved tear-off resistance of tabs.

Hail Resistance

Many high-wind regions also experience hail storms. Underwriter’s Laboratories (UL) Standard 2218 is used to evaluate the impact resistance of coverings. Products passing this test are classified as Class 1, 2, 3, or 4. Class 4 has the highest impact resistance.

Wind-Resistance Ratings

It is recommended that shingle wind resistance be determined by test method ASTM D7158. Shingles that have been evaluated in accordance with D7158 have a Class D (115 mph), G (150 mph), or H (190 mph) ultimate wind speed rating. Select shingles that have a class rating equal to or greater than the basic wind speed specified in the building code. If the building is sited in Exposure D, is more than 60 feet tall, or is sited on an abrupt change in topography (such as an isolated hill, ridge, or escarpment), consult the shingle manufacturer. (Note: for definitions of Exposure D and abrupt change in topography, refer to ASCE 7.)

References

- ASCE (American Society of Civil Engineers). 2016. *Minimum Design Loads and Associated Criteria for Buildings and Other Structures*. ASCE 7.
- FEMA (Federal Emergency Management Agency). 2010. *Home Builder’s Guide to Coastal Construction*. FEMA P-499. <http://www.fema.gov/library/viewRecord.do?fromSearch=fromsearch&id=2138>.
- FEMA. 2011. *Coastal Construction Manual: Principles and Practices of Planning, Siting, Designing, Constructing, and Maintaining Residential Buildings in Coastal Areas*, 4th Edition. FEMA P-55. <https://www.fema.gov/media-library/assets/documents/3293>.

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