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The Voice of the Western Roofing Industry

**WESTERN STATES ROOFING CONTRACTORS ASSOCIATION
(WSRCA)
TECHNICAL BULLETIN No. 2009-2
Summer 2009**

To: Roofing Contractor Members, Design Professionals, and the Building Industry

From: WSRCA's Steep-Slope Roofing Committee

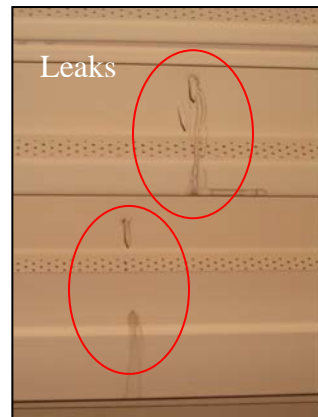
Subject: Cautions Regarding Laminated Shingles and Water-Shedding Roof Systems that are Specified on Lower Slopes

Greetings Members:

WSRCA wishes to advise you of technical information, along with some recent research data, in order to provide you with some prudent cautions regarding the use of laminated-asphalt shingles on roof slopes less than 4:12 (i.e., 4-inches of vertical rise per 12-inches of horizontal run [33.3%]). We trust that you will find this information helpful in your business.

An Industry Issue:

For many years there has been an issue with various "steep-slope" (i.e., water-shedding) roofing materials being promoted, by some select groups within the industry, on roofs with slopes less than 4:12 (i.e., 4-inches of vertical rise per 12-inches of horizontal run).



General Background Information:**Circa Latter 1990's**

During the late 1990's the National Roofing Contractor Association (NRCA) published information in *The NRCA Roofing and Waterproofing Manual*, specifically in the *NRCA Steep Roofing Manual* that suggested cautions when asphalt shingle roofing is specified by designers for application on slopes less than 4:12. A quote from that 1996 Asphalt Shingle Section of the Manual is as follows, which may be found under the heading "Roof Slope Limitations and Underlayment Requirements":

"B. Asphalt Shingles may be applied:

On roof decks having a slope of 4 inches per foot (33%) or more, if a minimum of one layer of No. 15 asphalt saturated (non-perforated) ASTM D-226 or ASTM D-4869 felt is applied horizontally (in "shingle" fashion) to serve as the underlayment.

On roof decks having a slope of 3 inches per foot (25%) or more, if two layers of No. 15 asphalt saturated non-perforated ASTM D-226 or ASTM D-4869 felt are applied in 'shingle' fashion as the underlayment, with 17 inch (432mm) exposure and 19 inch (483) side lap.

Note: NRCA does not recommend application of asphalt shingles, at maximum exposure, on slopes less than 3 inches per foot (25%). Some manufacturers will allow application of asphalt shingles on lesser slopes. However, more stringent underlayment specifications and reduced shingle course exposures, as well as careful consideration of roof layout, valley details and climatic conditions are thought necessary by NRCA.

Note: NRCA suggests that interlocking shingles, laminated shingles, and no cut-out-strip shingles be applied on roofs with slope of 4 inches per foot or greater."

Circa 2005

As the *NRCA Steep Roofing Manual* progressed from the 4th Edition to the 5th Edition, those statements of cautions are more strongly worded. For example:

"Ice dam protection membranes should not be relied upon to keep leaks from occurring...

"Some manufacturers....., but NRCA does not recommend use of asphalt shingles on slopes less than 4:12...."

However, in conflict with the concept of NRCA's written cautions when specifying or applying shingles on slopes less than 4:12, the first (1st) through fourth (4th) Editions of the Asphalt Roofing Manufacturers Association (ARMA) *Residential Roofing Manual* stated that asphalt shingle roofing could be installed on slopes as low as 2:12. For many years that document has not made a distinction regarding the roof slope(s), various types of asphalt shingles, and the potential performance differences of various shingles (e.g., 3-tab, laminated, t-lock, no cut-out, strip shingles, etc.) in relation to roof slope.

This conflicting industry information between manufacturers' set criteria and experienced contractor-based suggestions and/or recommendations may be relatively new for some individuals in the United States roofing industry. However, the Western States Roofing Contractors Association's technical committees have, over time, monitored various reports of asphalt shingle and other steep-slope water-shedding roofing issues. At this time WSRCA's Steep-Slope Roofing Committee wishes to advise the industry of problem jobs where laminated-asphalt shingles, and

even some cases with 3-tab shingles -- have been specified on minimal sloped roofs -- and problems have developed.

Recently, reported post-roofing issues have developed and caused problems for roofing contractors and others involved in several of the projects -- as such, Western States Roofing Contractors Association desires to relay pertinent news to its members and others in the design and construction industry.



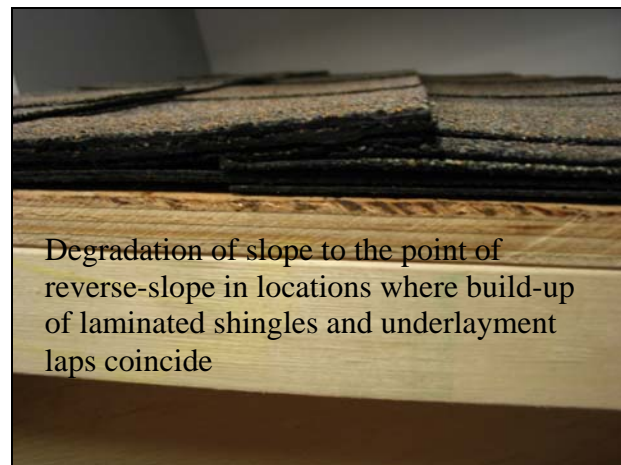
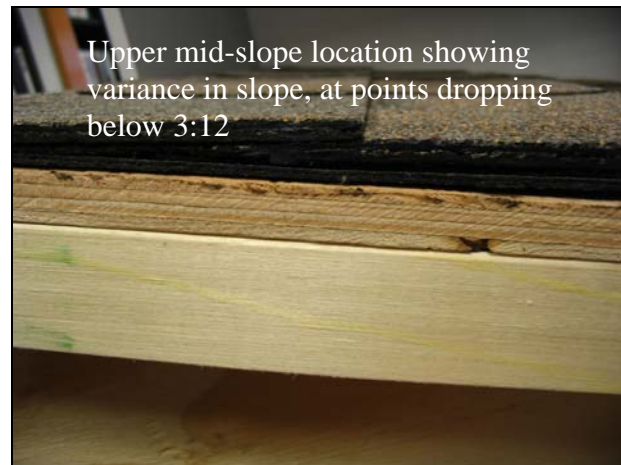
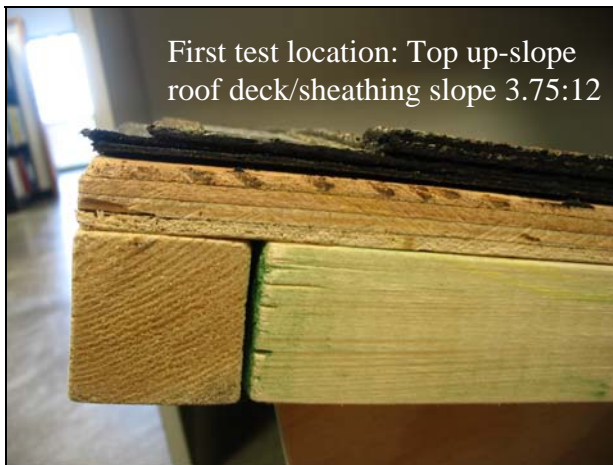
This technical bulletin explains general background information, the nature of the research that WSRCA and others have undertaken, and the results of that testing and research. Thus WSRCA offers new recommendations to architects, designers, general contractors, and roofing contractors that work in the Western Regions of the United States.

Recent Laboratory Testing:

Because of recent problem jobs, where asphalt shingles or other water-shedding roofing materials have been specified on generally low-sloped roofs, and leaks have developed, WSRCA and others undertook research to study the issue. The testing included construction of mock-up roofs, which proved that a build up of overlapping materials, including underlayment layers, and shingle layers, coincided to lower the slope of the already low-slope roofs.



General Test Results:



Design, Construction, and Related Legal Developments or Issues:

1. Water-shedding Roof Systems Need Sufficient Slope to Shed Runoff:

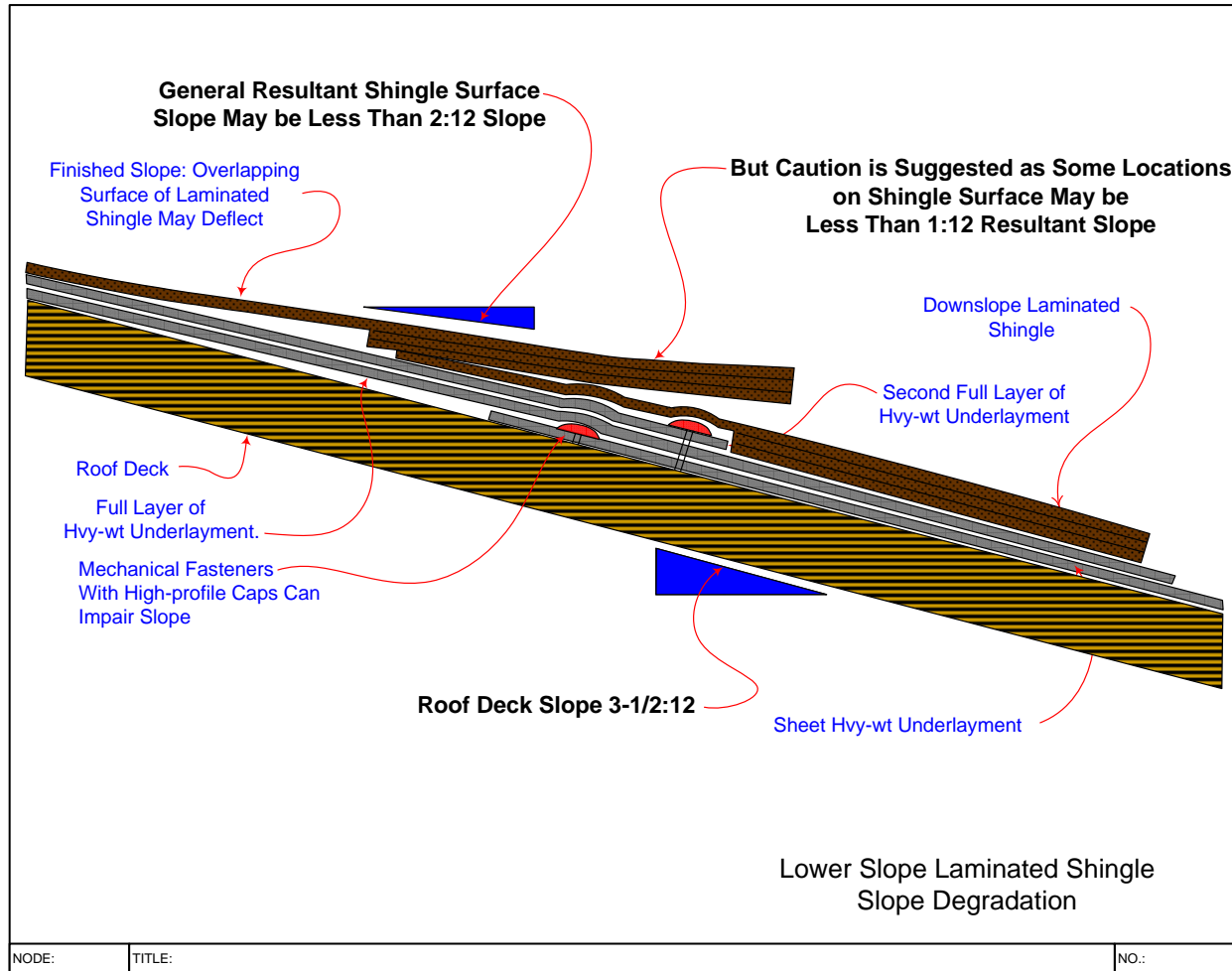
Deck-design slope and deck-constructed slope can have matching attributes in that they may be constructed as designed with respect to materials, methods and slope; however, when these slopes approach 3:12 the water-shedding asphalt shingle roofing system is minimally prepared to shed water before wind-driven rain and capillary action combine to overcome the water-shedding capabilities of the asphalt shingle roofing system.

2. Relatively Thick Laminate Shingles Result in Loss of Slope:

In most cases laminated shingles are multiple layers of asphalt-based material assembled with two-to-three layers on the downslope portion of the shingle, and only one layer on the upslope half, generally to facilitate installation. The effect of this “wedged-shaped” water-shedding element installed on a lower-sloped roof deck results in a loss of slope and impairment of the roof’s water shedding performance. This loss of slope on a roof system with a 6:12 sloped roof deck may be insignificant, as to the shingles performance. However, when the resultant loss of slope occurs on a 3:12 sloped roof system, which is already approaching the lower limits of its ability to shed water rapidly, the slope degradation can be significant enough to allow wind-driven rain, snow melt, and even rain water to enter the roof assembly.

3. Build-up of Layered Underlayments and Multi-layer Underlayments Reduce Slope:

Multi-layer underlayment laps can reduce slope even further on this already challenged water-shedding roof system. When laminated-asphalt shingles are utilized on roof decks with a 3:12 slope, there are areas of the roof where the designed and constructed 3:12 slope has degraded, due to build-up of materials and shingle deflection or distortion resulting from exposure to the sun, to approximately 1:12 (as well as some isolated locations that may be less than 1/2:12). Rooftop conditions, such as described above, can compromise the basic capabilities of a water-shedding roof system, and should be recognized as inappropriate design, and not representative of good roofing design practices.

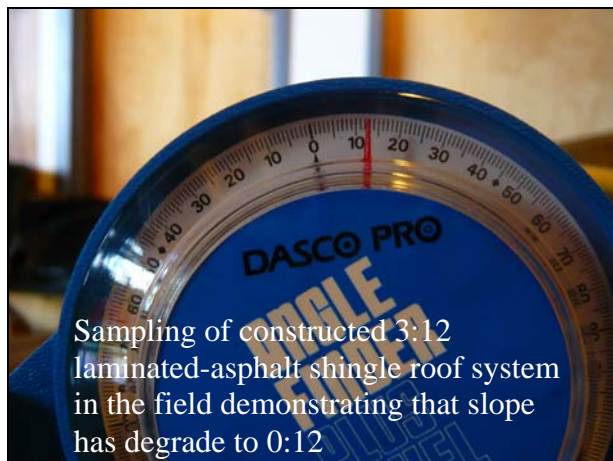
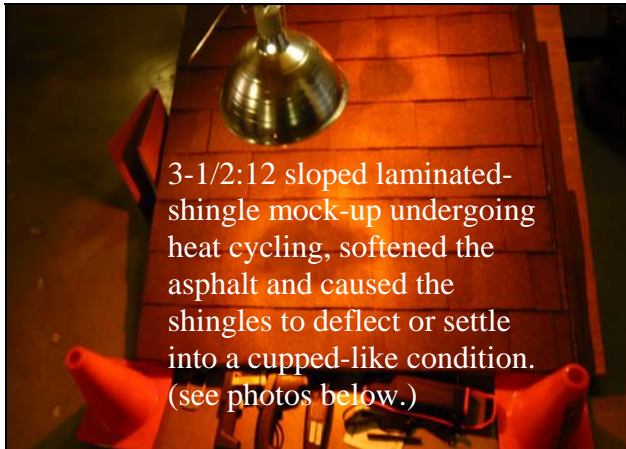


4. Relatively Thick- and/or High-profile Capped Nails Reduce Slope:

High profile capped (e.g., relatively thick or raised-profile plastic capped) nails sometimes used in underlayment attachment design and underlayment application further reduce the slope as they create raised areas on a water-shedding roofing system already operating in the lower ranges of its functional capabilities.

In Conclusion:

WSRCA believes that this account of lack of roof slope, and the specification of laminated-asphalt shingles on slopes less than 4:12, and the testing and information regarding same, will help to eliminate confusion in the industry regarding current roof-related documents that have had conflicting recommendations for slopes less than 4:12.



In the lab



In the field

WSRCA's Current General Recommendations:

Roofing contractors are being pulled into litigation even though roofs were installed per the Architect's design and *ARMA Residential Roofing Manual* and shingle manufacturer's recommendations.

As a result, WSRCA honors NRCA's 5th Edition Steep-Slope Roofing Manual and furthermore suggests that build-up of multi-layers of underlayment combined with heavy-weight laminate shingles only be considered on steeper-sloped roofs -- after contemplation of climate, roof dimensions, the roof's downslope eave-to-ridge dimension(s), etc. At a minimum, WSRCA recommends that laminated-asphalt shingles not be specified for roof slopes less than 4:12. If valley lengths are excessive (e.g., over 15 feet) and/or eave-to-ridge dimensions exceed 18 feet carefully, well thought-out designs, respective of climate (e.g., exposure to wind-driven rain and/or snow and icing conditions) may indicate 4:12 or greater slopes are prudent for all water-shedding roof systems.