What Is A FIRE SAFE ROOF?

by Stephen L. Quarles

"If you live in a wildfire prone area, make sure you have a 'Class A' or noncombustible roof on your house."

How many times have you heard that statement? After almost every wildfire where homes are destroyed, we hear about the problems caused by wood shake roofs. Are there other materials you should be concerned about? Understanding the rating system for roof coverings and the difference between a "stand alone" and "assembly" Class A rating is key to making your home more fire safe.

A number of organizations, including Underwriters Laboratories (UL), the American Society for Testing and Materials (ASTM), the International Code Council (ICC), and the National Fire Protection Association (NFPA) have developed test procedures for performance ratings. The test procedures specified by each of these organizations are very similar, with each requiring an evaluation of 1) flame penetration through the roof covering, 2) flame spread over the surface of the roof covering, and 3) a test that evaluates the propensity for material to become dislodged and lofted into the air. Some organizations only specify the latter test for wood shakes or shingles. Some products, including fire retardant treated wood shakes, must also undergo a weathering test to evaluate the longevity or durability of the treatment. For example, fire retardant treated shakes sold in California have passed the weathering tests mandated by the California Office of the State Fire Marshal. I will limit discussion to the "burning brand test" that evaluates flame penetration through the roof covering (the first item mentioned earlier in this paragraph). This test simulates the ease with which fire can penetrate through the roof covering and into your attic space, or ceiling cavity if you have a cathedral ceiling.

In order to evaluate a roof covering, a small test deck is built that represents the roof covering as it would be if a small rectangular section were cut in your roof and then removed. Therefore, it consists of roof framing, sheathing, roofing felt, and the roofing material. The roof deck to be tested is placed at the end of a small wind tunnel and a 12 mile per hour (mph) wind is blown over the deck during the test. The burning brand is the fire source that is used to evaluate how well a roofing material performs. 'Class A' and 'B' brands use a three layer sandwich of square sticks that are nailed together. The 'Class A' brand is fairly large (12" by 12"), and Class B is smaller (6" by 6"). A 'Class C' brand consists of a single piece of wood about the size of an ice cube.

As might be expected based on the size of the brands, a 'Class A' roof covering provides the best protection in terms of preventing flame penetration through the roof and into the attic or ceiling

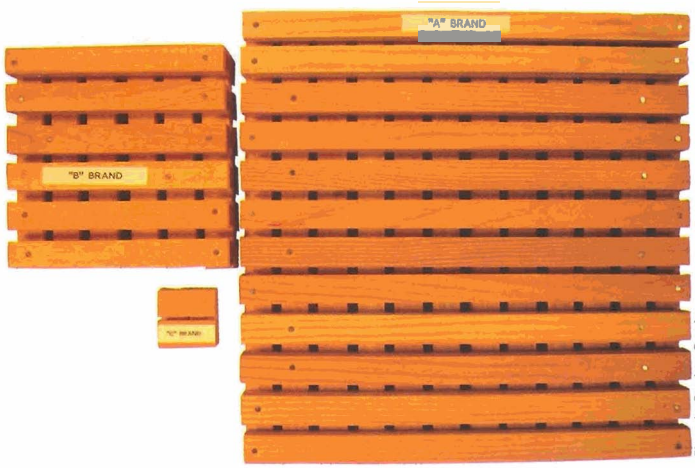

Photo by Stephen Quarles

The Class A and B brands consist of a three-layer sandwich of ¾" square sticks that are nailed together. The Class C brand is much smaller, consisting of an individual piece of wood about the size of an ice cube.

Photo by Stephen Quarles

At the beginning of the fire test, a burning "A" brand is placed on top of the roof deck. The test continues until the brand and material in the deck stops burning, or until flame penetrates through to the underside of the deck.

Photo by Stephen Quarles

A fire retardant treated wood shake roof with Type 72 roll roofing as a fire barrier material located between the wood shakes and the oriented strandboard sheathing.

cavity of your home. 'Class B' and 'C' (and un-rated) roof coverings provide less protection. During the course of the test, several 'Class C' brands would be placed on the roof, whereas only one 'A' or 'B' brand would be used. A non-fire retardant treated wood shake roof is considered "unrated" since it cannot withstand even the 'Class C' brand exposure. Most professionals agree that homes in wildfire prone areas should have a 'Class A' roof.

After the wind tunnel fans are turned on, the flaming 'brand' is placed on top of the roof deck. If flame eventually comes through the bottom side of the roof deck, then the roof covering fails. If not, the covering passes, and it receives the given "Class" rating. A burning "A" brand will burn out in about 12 to 14 minutes when placed on a non-combustible material, so that is the minimum time that it takes to run a test. When placed on a combustible material, the test will last longer, but if the brand and roof deck material self-extinguishes before flame penetrates to the underside of the deck, it will still received the "Class A" rating.

The 12 mph wind used in these tests sometimes surprises people because in a real wildland fire, much higher wind speeds are recorded. Research conducted at the University of California Forest Products Laboratory showed that higher wind speeds actually cause the brand to burn out more quickly, and therefore the 12 mph exposure provides a more severe test. Use of higher wind speeds would provide more severe conditions with regard to the brand lofting part of the test.

Photo by Stephen Quarles

Flame penetration occurred on the bottom of this deck, therefore, the roof covering failed to meet the requirements for a Class A rating. Flame through occurred at a sheathing joint between two panels.

Some roof coverings rely on an additional fire barrier material, or installation techniques, to improve their fire rating. If required by the roofing manufacturer to obtain the fire rating, then they must be included in this test. For example, fire retardant treated wooden shakes have a Class B rating, but if a fire barrier material is also used, they can meet the requirements for a Class A roof. Common fire barrier materials include a Type 72 roll roofing material (also known as 72 pound felt, or 72 pound capsheet material) and a panelized gypsum product called DensDeck. In addition to treated wood shakes, other roofing materials, such as aluminum metal roofs, use a fire barrier material to obtain a Class A rating. Even though aluminum is considered a non-combustible material, it needs the fire barrier material to achieve the Class A rating because of its relatively low melting point. Roof coverings that rely either on a fire barrier material or special installation to achieve the Class A rating have an "assembly" rating. The rating is dependent on the covering itself, plus other special materials or installation procedures that were used. Our research has shown that roof coverings having an assembly rating can be sensitive to material changes within the assembly. Therefore, it is important to follow installation instructions carefully when using these materials – seemingly minor changes in materials, for example, can alter the performance of the assembly.

Roof coverings that achieve the 'Class A' rating based only on the covering itself have a "stand alone" Class A rating – fire performance won't depend on underlying materials (although they may be required for structural, or moisture reasons). With the exceptions of the roof coverings mentioned above, non-combustible materials have a "stand alone" Class A rating.

Regardless of whether your roof has a "stand alone" or "assembly" fire rating, the long-term performance will depend on timely maintenance and replacement of the roof at the conclusion of its useful service life. Localized problems, such as broken tiles and missing

Photo by Stephen Quarles

Properly placed bird stops at the end of clay barrel-type roofing can limit the entry of burning embers into the area under the tiles. In this case, dislodged bird stops significantly increases the vulnerability of this roof.

Photo by Stephen Quarles

Worn out shingles loose their effectiveness as both fire and moisture resistant materials. Roof coverings must be replaced once they have reached the end of their useful service life.

or out of place bird stops that would allow for easier entry of burning embers during a wildfire, should be repaired. Missing or worn out shingles should be replaced.

For additional information about roofing materials, and protection of structures located in the urban interface, please visit *www.cnr.forestry.structures.edu*.

Steve Quarles is a University of California Cooperative Extension Advisor in Wood Building Durability. His research and extension program focuses on wildfire and moisture durability issues as related to the in-service performance of wood-framed buildings.

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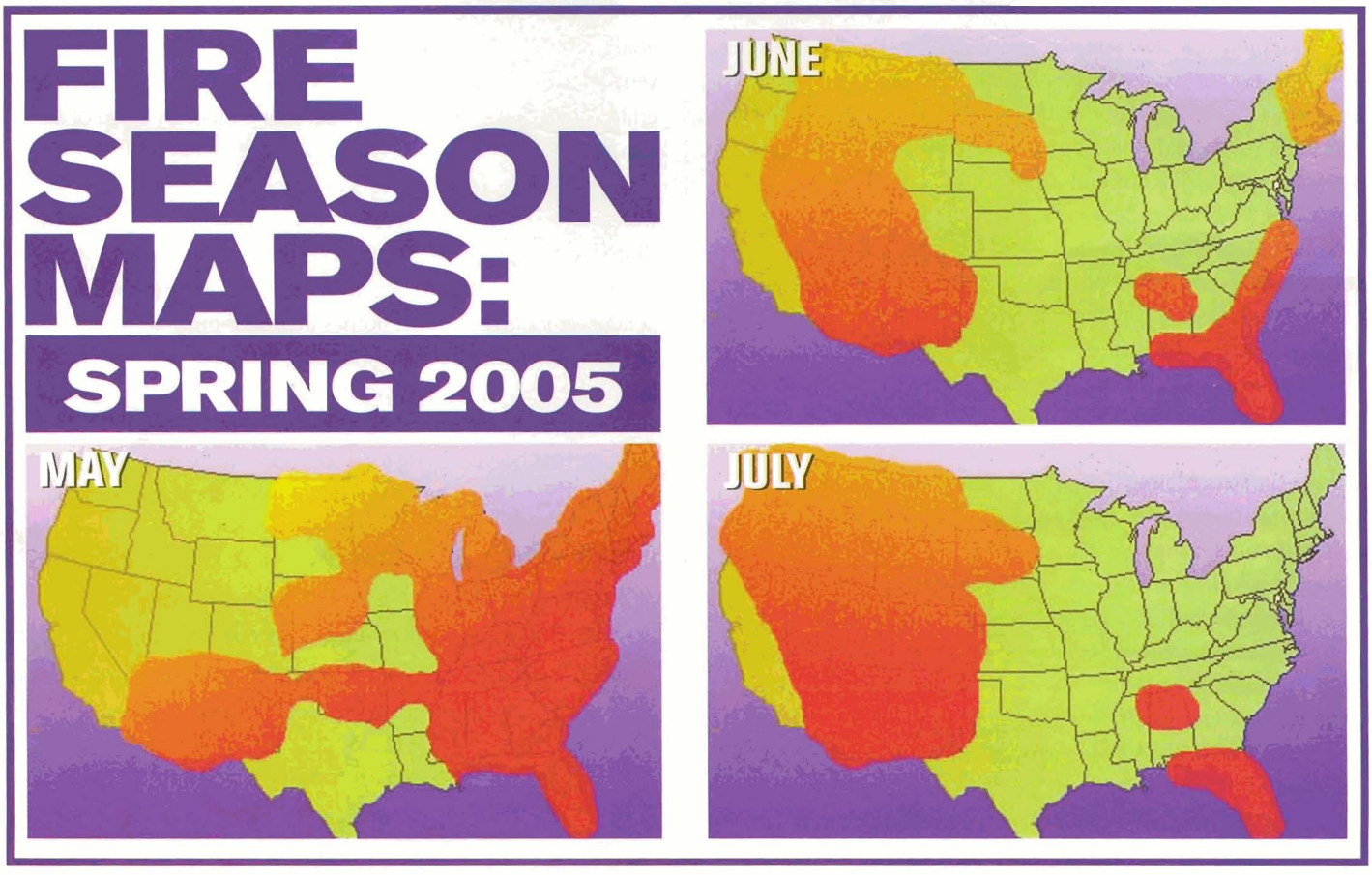

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