DECKS
Fire Safe or Not?

by Stephen L. Quarles

With the seemingly yearly occurrence of large wildfires and the resultant loss of homes, many people living in the urban wildland interface are looking at their house and wondering what they can do to improve the chance that it would survive the next wildfire.

Can an attached deck make your house more vulnerable when a wildfire strikes? The answer is yes. If ignited, your deck could ignite your exterior cladding, and even lead to the breakage of a window or sliding glass door. Either of these could result in flame or burning embers entering your house, probably resulting in its loss.

How can a wildfire ignite your deck? Creeping ground fire could result in the ignition of materials stored under a deck, and burning embers could ignite flammable items on top of it, and possibly even the deck boards themselves.

Currently deck boards are made from either wood, pure plastic, or are a fiber-plastic composite product. The composite lumber products are popular these days because of their ability to resist rot and their low maintenance requirements. But will they burn? To answer these questions, researchers at the University of California-Berkeley recently completed testing, where we evaluated how well deck board materials performed under simulated wildfire conditions. The results of these tests can help you decide what materials are best for your deck.

There are two common kinds of attached decks found on homes. The first is commonly called an "open frame" deck this is one where you can see gaps between the deck boards, and also see the lumber or steel support framing on the underside. The second kind is an enclosed deck – one that has a solid walking surface, such as a concrete slab, or tiles (both are non-combustible). The enclosed deck can also be enclosed on the underside, but unless it is also serving as the flat roof of your house, with living space below it, it would usually have some vents on the underside to help dry out the enclosed space in case the deck develops a water leak.

A composite deck board with channeled configuration was used in this 'open framed' deck.

In an enclosed deck the supporting framework does not show.

This article will focus on materials used in open frame decks, because the structural support members are exposed, and the deck boards are combustible.

We tested a number of decking products, including a 2-inch thick 'Deck Heart' grade of redwood. We chose redwood because it is a common decking material in California. The 'Deck Heart' grade is similar to the more common 'Construction Heart' grade. This lumber would have knots, and could have a little sapwood. We did not test any preservative treated lumber. We tested a number of commercially available composite products. Composite lumber products are available in different shapes, and are either 1- or 2-inches thick. Examples of the different shapes - solid, hollow, and channeled - are shown in Figure 3a, 3b, and 3c. The 1-inch boards and the hollow and channeled configurations make the board lighter, but don't affect the required support joist spacing.

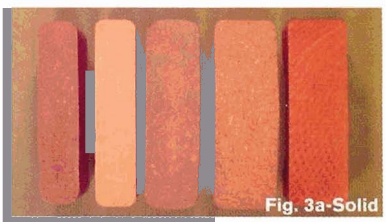


Fig. 3a-Solid

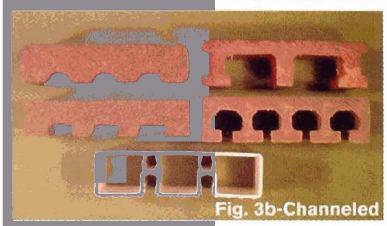


Fig. 3b-Channeled

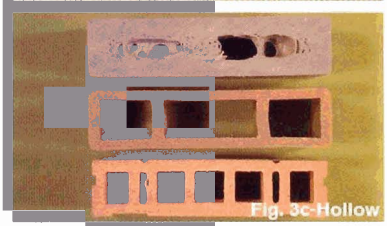
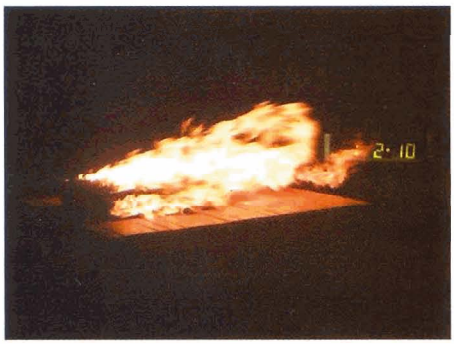


Fig. 3c-Hollow

In our tests, we simulated the under-the-deck ground fire with a propane gas burner. We used a burning assembly of nailed together sticks, called a "brand", to simulate burning embers landing on top of the deck. The brand is a standard item used in evaluating the fire performance of roofing materials (for example, the Class 'A' rating). We used it in our deck tests because we assumed that if it could land on your roof, it could also land on your deck. If your house isn't in an urban wildland interface (UWI) area, then this test may be too severe, and therefore these results may not be applicable to your situation. But for urban wildland interface homes, these exposures seemed reasonable. In our under-deck, gas burner tests, we adjusted the flame height so that it touched the bottom side of the boards, and we turned the burner off after three minutes. We evaluated the performance of the decking materials by observing whether the flaming continued, or even got bigger when the gas burner was turned off, or whether the deck boards collapsed. We also noted if small pieces of the burning deck boards dropped during the testing. Dropping of flaming debris could serve as additional fire sources. We didn't measure or evaluate any of the combustion by-products that might become volatile when the decks were burning.



A 12" X 12", 3-layer sandwich, 'brand' used for the above-deck exposure tests. Each Douglas-fir stick is 3/4-inches square.

In addition to the different shapes that composite deck boards can have, they could also be made of types of plastic and even different kinds of fiber. Of the deck boards that we tested, wood was the most common kind of fiber used in the boards, but one product contained fiberglass and another used fiber from rice hulls. Polyethylene is the most common type of plastic, but polypropylene, polyvinyl chloride (PVC, or 'vinyl'), and other plastic materials are also used. Most, but not all of these products, use recycled plastic and fiber.

So how did these materials perform?

In both the above- and below-deck exposures, the 2 x 6 redwood performed as well as any of the other solid composite products tested. Although we didn't test it, 1-in redwood probably would not have performed as well. Composite lumber with a 'hollow' form always failed with the 'above-deck' brand exposure, and the 'channeled' form always failed with the 'under-deck' gas burner exposure. There currently isn't much you can do to improve the performance of the hollow composite products. Changes in product form that increase the top flange thickness or improve the inherent fire resistance in the formulation will be needed for these product types to pass current tests. If you have a composite with a channeled shape, you may want to consider enclosing your deck with a fire-resistant cladding that extends to the ground to protect the underside from ground fire. If you choose to do this, you should be very careful to provide adequate ventilation, and perhaps other protection, from moisture-related degradation problems that will develop if construction products get wet and aren't allowed to dry. There are a number of under-deck moisture management products currently on the market. Use of these products may allow you to enclose the underside of the deck with a stucco cladding (or other protective material) – solving both the wildfire and moisture problems. A lattice enclosure would not provide sufficient protection from fire to consider this as an alternative.

A burning plastic composite deck experiences accelerating combustion while at the same time dropping flaming debris. The mirror on the right shows a view from the top of the deck.

Pure PVC deck products collapsed fairly quickly after the burner was turned on or the burning brand was placed on the deck, so even though this kind of plastic doesn't continue burning when the fire is removed, it probably isn't a good selection for UWI decks. We know that addition of fibers to a pure plastic decking material greatly improves performance, so results from pure plastic will be different from a fiber plastic composite. Some of the solid products performed well under both exposures, so these would be your best bet if you wanted protection from both exposures. For complete details of how we conducted our tests and our results go to http://nature.berkeley.edu/forestry/structures.

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Under Deck Flame Impingement Test Results

Time (min)	0	5	10	15	20	25	30	35	40
BURNER ON	■								
PRODUCTS									
WORSE ↓									
Eon	🔥								
Maxituf	🔥								
Evernew	▼								
TimberTech	🔥	🔥	▼						
Choice Dek	🔥	🔥	▼						
Nexwood			🔥 ▼						
Bedford (NR)	🔥			🔥					
Ecoboard	🔥				🔥				
Trex					🔥				
Rhino Deck					▼				
SmartDeck	No degradation effects during test								
WeatherBest (S)	No degradation effects during test								
WeatherBest (H)	No degradation effects during test								
Bedford (R)	No degradation effects during test								
BETTER ↓ Redwood	No degradation effects during test								

▼ Board collapse

🔥 Began dropping flaming debris

🔥 Combustion accelerated

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