FIRE PROTECTION AND SAFETY

Changing Construction Practices in Wildfire-Prone Areas to Reduce Building Ignition

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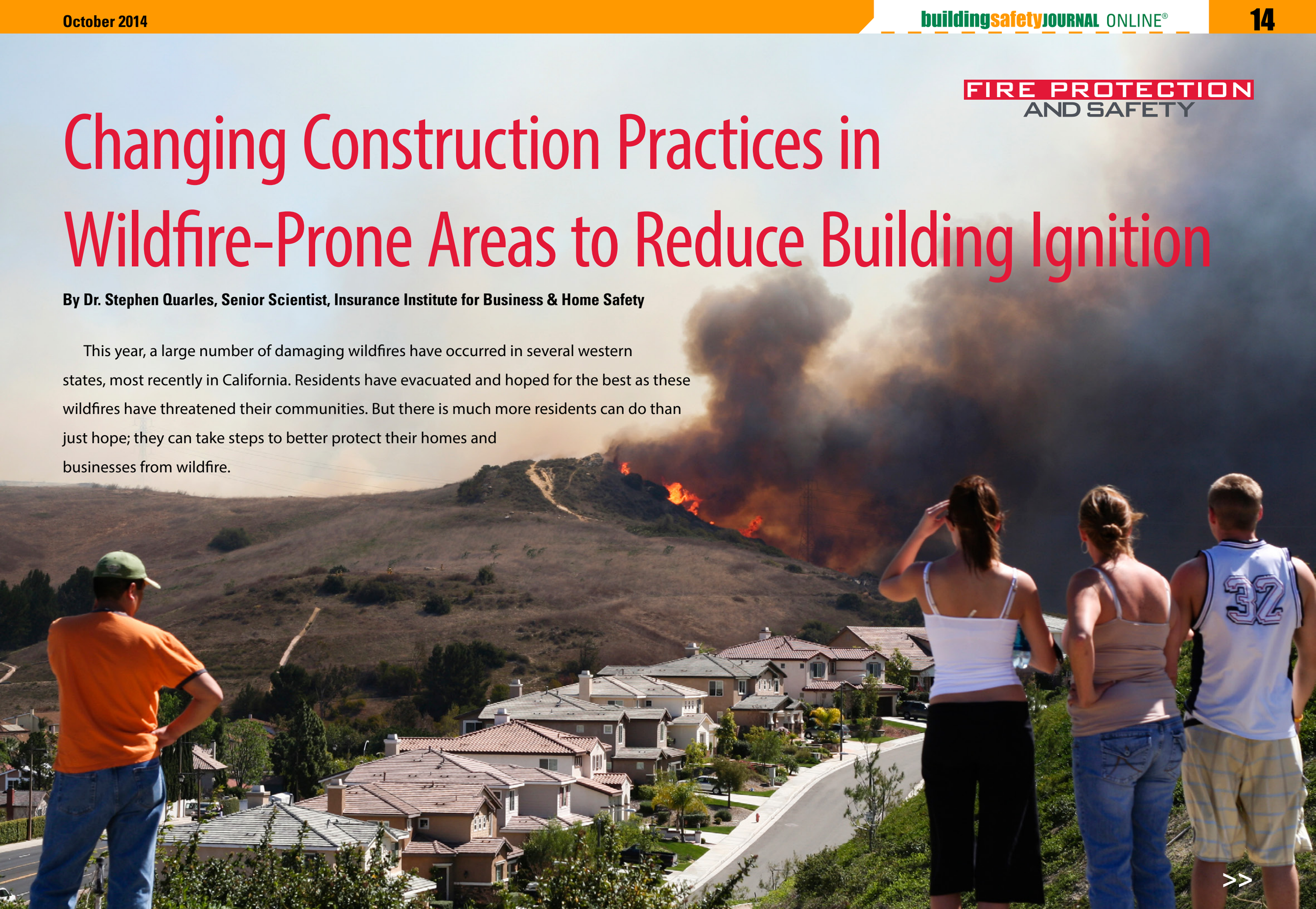
This year, a large number of damaging wildfires have occurred in several western states, most recently in California. Residents have evacuated and hoped for the best as these wildfires have threatened their communities. But there is much more residents can do than just hope; they can take steps to better protect their homes and businesses from wildfire.



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Building codes and standards specify a strategy to improve the ability of a home or business to survive wildfires, including:

1. Developing and maintaining an effective "defensible space" around a building. The focus is where vegetation and other combustible materials (e.g., wood piles) are carefully selected, located and grouped to minimize the opportunity for fire to spread to the home and reduce the opportunity for embers to ignite combustible items near the home; and
2. Using appropriate construction materials and incorporating appropriate designs and materials in new construction and retrofitting projects.

The long-term performance of each of these strategies depends on effective and regular maintenance. Post-fire studies show most buildings that ignite during a wildfire will be destroyed. In addition, the chance of firefighters defending a given home or business during a wildfire is low. Consequently, it is critical for home and business owners to help protect their properties by taking actions that reduce the potential for building ignition.

Wildfire studies conducted at the IBHS Research Center are done primarily to better understand buildings' vulnerabilities, as well as to develop and evaluate strategies that have the potential to reduce the risk of property damage from wildfire exposures. Research has focused on evaluating ember intrusion and ember ignition because of the importance of such wind-blown exposures to homes and businesses.

The IBHS Research Center consists of a wind tunnel large enough to hold a building with a floor area of approximately 1,500 square feet. The ability to conduct experiments on full-sized buildings, coupled with the ability to generate embers and inject them into a wind stream, make it possible to evaluate common design features and exterior-use components in a real-world setting.

IBHS' 2011 wildfire study demonstrated the importance of wind-blown embers in igniting fine fuels on and near the home. A summary of the findings, and some comments regarding implications from this study, are outlined below:

- Wind-blown embers ignited various kinds of combustible mulch products, including bark mulches and rubber mulch. Once ignited, the burning mulch resulted in a flame impingement exposure to the siding and other components that make up the exterior wall, such as windows, doors and even the under-eave area. This is one reason why IBHS, and organizations whose main

The IBHS Research Center in South Carolina allows IBHS to develop and evaluate better building practices to reduce property damage as a result of a variety of extreme weather events, including wildfire, hurricanes, wind-driven rain and hail.

Shown above is a 2014 wildfire ember test that focused on ember intrusion through vents. With the capability to recreate real-world ember storms, IBHS can test and determine the best building practices for reducing property damage risks in wildfire-prone regions.

focus is educating individuals living in wildfire-prone areas, advocate creating and maintaining a near-home noncombustible zone as part of their plan to create a "defensible space" on the property.

- This defensible space zone is typically about 5-feet wide, extending out from the home or business. This guidance provides an additional zone to the traditional 0- to 30-foot and 30- to 100-foot zones that commonly comprise the vegetation management in the "defensible space" of a property.
- Use of a non-combustible mulch product, such as a rock mulch, would reduce the vulnerability of an ember accumulation next to the home or business. Even if a non-combustible siding product is used, a low ground-to-siding clearance could still result in a flaming exposure to the underlying wood-based sheathing.

- The large surface area of a roof arguably makes it the most vulnerable component of a building to wildfire embers. Having a Class A fire-rated roof covering is an important step in protecting a building. Replacing a roof that has a non-fire retardant treated wood shake should be a priority for homes in wildfire-prone areas. However, even with a fire-rated covering, a roof can still be vulnerable. Ignition of debris on the roof, particularly one with a complex design such as dormers or a split-level design, can result in flames impinging against combustible siding and under-eave areas. This condition would potentially by-pass the protection offered by a fire-rated roof covering, making the vulnerable part of the roof the siding adjacent to it.
- Use of a metal drip edge (at the roof-to-fascia interface) provides and effective means to minimize ember entry through gaps at the roof edge that would allow for ember entry into a boxed-in eave. In IBHS' tests, the use of a drip edge resulted in a noticeable reduction in embers that accumulated on the top surface of the soffit material.
- Wind-blown embers can easily ignite pine needles and other vegetative debris that can accumulate in the gutter or on the roof. Burning debris in a metal gutter will result in a flaming exposure to the edge of the roof, including any combustible components such as roof sheathing and fascia; another reason for installing a metal drip edge is to protect these components. Burning debris in a vinyl gutter will result in detachment of the gutter, which will continue to burn on the ground, along with the debris. This is another reason to create a near-home noncombustible zone within 5 feet of the home.
- Window screens, even those made from plastic-clad fiberglass, are effective in keeping wind-blown embers out of the occupied space of a building. The fiberglass screens, however, are vulnerable to flame contact exposures. These screens quickly failed when subjected to flame exposure, allowing wind-blown embers to enter the building.

Ember-ignited debris results in flame contact to the siding and soffit area on this dormer during testing at the IBHS Research Center in 2011.

Recent studies conducted at the IBHS Research Center focused on the vulnerability of vents to the entry of wind-blown embers. The goal was to better understand the types of vents and vent locations that were

more vulnerable to the entry of wind-blown embers. Embers can enter a building through vents and ignite combustible materials in the attic or crawl space of a home or business. If ignited, the resulting fire can burn the house or business from the inside out. Vulnerable vent types and/or locations would result either in the need for additional protection, for example by change in vent design, or by moving the vent to a different location, such as from the end of a gable to a ridge or off-ridge location on the roof.

Embers ignited debris in the gutter and mulch near the test building. Studies at IBHS show the accumulation of debris on a roof, in gutters, near vents and close to a home can greatly increase the risk of property damage due to wildfire embers.

While analysis of IBHS vent research is still being conducted, qualitative results have indicated the preliminary findings below:

- Finer mesh screens at vent openings reduce the size of embers that can enter the attic or crawl space; however, screens do not *eliminate* the entry of embers.
- Vents with openings perpendicular to the wind flow (i.e., those having a vertical orientation) are more vulnerable to the entry of wind-blown embers than vents with openings parallel to the wind flow (i.e., those having a horizontal orientation). This would argue for creating boxed-in soffited eave vents over vents placed in the between-rafter blocking common in an open-eave design.

- Even in the worst cases of observed ember entry into the attic space, wood members (trusses and plywood) do not ignite as a result of the exposure. If embers were able to accumulate next to combustible items commonly stored in attics, such as old magazines and cardboard boxes, ignition would be more likely. Minimizing the amount of combustible items stored in the attic (or crawl space) would reduce the chance of an ember ignition.

As wildfire risks continue to climb throughout the country, IBHS aims to continue innovative research to try to reduce the risk for wildfire-prone communities. Find additional information and IBHS resources at www.DisasterSafety.org/wildfire. **bsj**