Testimony of Dr. Stephen Quarles
University of California Advisor Emeritus and IBHS Chief Scientist, retired
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Thank you Chairman Grijalva, ranking member Bishop, and members of the committee. I am pleased to join you today to discuss how ember and fire-resistant construction can help promote wildfire resistant homes and buildings that can help in developing fire resilient communities.

I am a University of California Cooperative Extension Natural Resources Advisor Emeritus and retired Chief Scientist for Wildfire and Durability for the Insurance Institute for Business & Home Safety (IBHS). I am currently a consultant to IBHS. IBHS is an independent, nonprofit, scientific research and communications organization supported solely by property insurers and reinsurers. IBHS's building safety research leads to real-world solutions for home and business owners, helping to create more resilient communities.

During a wildfire, most homes are ignited by wind-blown embers and not a wildfire front or wall of flames as most people envision.[1] In this photograph (Image 1) you will note that this home, located in South Lake Tahoe, California and destroyed during the 2007 Angora Fire, has unburned vegetation surrounding it. This provides evidence that the wildland fire did not burn directly to the home, but rather embers generated from the fire ignited combustible materials either on, near, or in the home.

In the last several years several fast moving, wind-driven wildfires have occurred – examples you will likely remember include the 2012 Waldo Canyon Fire in Colorado, the 2016 Chimney Tops 2 fire in eastern Tennessee and the 2017 and 2018 fires in California. Wind-blown embers are important because of what they can do directly – ignite a wood shake roof or wood deck, or indirectly – ignite bark mulch or a wood pile located next to the home. Ignition of these items would result in either flames contacting the home or a radiant heat exposure, both of which can result in the ignition of the home. During a wildfire, the homeowner has likely been evacuated and fire fighters are involved with many life safety and suppression activities. It is unreasonable to expect fire fighters to suppress every home that ignites. The home must be able to survive without intervention.

A demonstration recently conducted at the IBHS Research Center located in Richburg, South Carolina (Image 2).[2] The entire test building was subjected to wind-blown embers generated by equipment located in the test chamber wind tunnel. You will note that the left end of the test building is burning, and the right end isn't. The left end of this test building had a wood mulch product applied on the ground near it. A combustible siding product and single pane windows were installed. A fiber-cement siding product was applied to the right-hand end of the building

and the dual pane windows with the more fire resistant tempered glass were used. A rock mulch product was installed on the ground around that end of the building.

It is important to note that the flame contact exposure to and ignition of the siding on the left end of the duplex resulted from the ignition of the wood mulch from the ember exposure. The burning wood mulch ignited some vegetation located close to the building and the wood siding. Once ignited, flames from the burning siding spread vertically up and laterally across the siding, impinging on the window, on the gable end vent (that you can't see) and in the area immediately under the roof. Flames impinging on the vent and in the under-roof area ultimately entered the attic space. All of this happened within 10 minutes after ignition of the wood mulch.

On the right end of the test building, embers found nothing to ignite. Rock mulch and fiber-cement siding all prevented ignition and made the home wildfire-resistant. Vegetation was far enough away from the home that it didn't pose a threat. Homes built with materials and design features used on the right-hand end of the test building are more wildfire-resistant.

Image 3 shows a real-life example from the 2018 Camp Fire in Paradise California. The home on the left was completely destroyed. It is difficult to say exactly what the vulnerability of this home was. It had a Class A roof covering and a noncombustible siding material but the vents incorporated a larger mesh screen. Other combustible materials have, of course, burned. The home on the right survived and had many wildfire resistant materials and features that are part of Chapter 7A of the California Building Code, including: Class A roof covering, noncombustible siding, flame and ember resistant vents. Use of rock mulch next to the home, and a noncombustible zone between the ground and the start of the siding went beyond language in the current building code. Communities using such wildfire-related codes can reduce their wildfire risk.

As a researcher, I can say that we know more now than we knew 10 years ago, but there is still more to learn. we definitely know more about the vulnerabilities of homes and buildings, and mitigation strategies, than we did 10 years ago and we are, collectively, working hard to make building codes and testing standards better. Work we recently completed with Headwaters Economics provided evidence that it doesn't have to cost more.[3] All of these materials are also available on the market right now. This may be a good time to interject that building codes typically only apply to new construction. Retrofitting existing homes represent a challenge that must also be addressed.

To summarize, home survival depends on a coupled approach where vegetation and other combustible materials on the property are carefully selected, located and maintained and construction materials, and design and installation features are also selected after considering the anticipated wildfire exposures. Other combustible materials on the property include things like a wood pile, storage sheds and where bark and other combustible mulch products are used. This slide provides a good visual to talk about vegetation and home issues. The goal of managing vegetation and other combustibles on the property is to make it difficult for the

wildfire to burn directly to the home. In this example, you can envision fire burning to the home. A home that can resist elevated and extended levels of radiant heat and flames are homes we don't live in. Even if all the vegetation is removed from the property of this house, if it is threatened by a wildfire, it will experience embers, as they can be blown upwards of a mile from the fire front or buildings, if structures have ignited. Most residents don't own enough land to manage enough vegetation, and therefore the home must also be built to resist embers. When homes are situated close to one another, the whole community needs be involved in maintaining and reducing the amount of combustible material on the property. In the previous slides you have seen some of the material and details than can be used to make homes more resistant to ember ignitions. Thank you for your attention.

[1] Quarles, S. L., Y. Valachovic, G. M. Nakumura, G. A. Nader, M. J. DeLasaux. 2010. Home survival in wildfireprone areas: Building materials and design considerations. University of California Agriculture and Natural Resources Publication 8393. 22 pages. https://anrcatalog.ucanr.edu/pdf/8393.pdf

[2] Insurance Institute for Business & Home Safety, 2019. Wildfire Demo. https://ibhs.org/wildfire/wildfire-demo-2019/

[3] Headwaters Economics, 2018. Building a Wildfire-Resistant Home: Codes and Costs. https://headwaterseconomics.org/wildfire/homes-risk/building-costs-codes/

Image 1

USDA FS, R5-TP-015

Image 2

Camp Fire (2018)

Non-ignition resistant

Ignition resistant

Home Survival: A Coupled Approach

Selection, location and maintenance of vegetation and other combustibles on the property.

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Construction materials and design features of a home.

Image 4
Stephen Quarles