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Special Section on Structure Ignition in Wildland-Urban Interface (WUI) Fires

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Wildfires that spread into communities, commonly referred to as WUI fires, are a significant problem in Australia, Canada, Europe, South America, and the United States. WUI fire spread is extraordinarily challenging and presents an emerging problem in fire safety science. While it is accepted that WUI fires are an important societal problem, little understanding exists on how to contain and mitigate the hazard associated with such fires. The recent WUI fire in Fort McMurray, Canada in 2016 captured the world's attention to the devastation WUI fires may bring to communities.

Hardening, or making structures more resistant to ignition in WUI fires, is an accepted approach to lessen the devastation produced by WUI fire exposures [1]. Building codes and standards already exist that provide requirements for the construction of new buildings in areas known to be prone to WUI fires [2–5]. Proven, scientifically based retrofitting strategies are required for homes, and other buildings, located in areas prone to such fires. The objective of codes and standards is to reduce the risk of structural ignition. They have been developed based on the best information at the time they were developed. The provisions generally focused on flame contact and radiant heat exposures. This workshop opened with the question: *Based on current research, are these current codes and standards adequate*?

A workshop entitled *Structure Ignition in Wildland-Urban Interface (WUI) Fires* was held on June 18–19, 2015 in Anaheim, CA. The presentations of the workshop were separated into four topic areas: post-fire studies, structure ignition/firebrand accumulation and generation studies, WUI modeling, and evaluation of mitigation strategies. The interested reader is referred to a NIST Special Publication that documents all the presentations at the workshop [6]. In total, 12 presentations were delivered at the workshop. Authors that delivered accepted presentations were invited to submit papers as part of a special section for publication in *Fire Technology*. As discussed below, 6 papers were ultimately accepted for publication.

In this special section, review papers were presented that discussed the pathways for fires to spread to structures in WUI fires [7], and subsequent potential ignition mitigation strategies [8]. These papers are an important *first step*, but in general, the ignition mitigation

discussion was very USA-focused, underscoring the need for a more global perspective on WUI fires.

Experimental studies focused on developing the needed science to understand firebrand ignition of structures in WUI fires were presented [9–10]. While it is well established that firebrands are a major factor in WUI fire spread and structure ignition, there remain many unanswered questions, and these experimental studies are attempting to bridge the gap regarding the lack of science in WUI fire research. In an interesting study from Portugal, the fire hazards of campsites are considered. This is an overlooked area and fires produced in campsites may easily lead to destructive WUI fires [11].

In another study, conducted by the USDA Forest Service, a simple model to evaluate fire exposures to structures from nearby vegetation was developed [12]. While the model was focused only on radiant heat, and not firebrand exposure, the study also attempts to bring more science to the WUI fire problem.

In summary, a main finding from the workshop was that current WUI codes and standards are not adequate to provide protection since they reflect the present lack of understanding of how WUI fires can ignite structures. In every presentation and paper, firebrands were identified as a major cause of ignition in these fires. This finding has been observed in numerous post-fire studies, yet nearly all the prior firebrand research was focused on transport and not structure vulnerabilities to firebrand showers. Fundamental quantification of firebrand ignition of vegetation and building materials is lacking. As there is a lack of understanding in the WUI fire science, it is not surprising the current codes and standards do not adequately address these issues.

Another finding was the opinion that there was a communication barrier between the standards and codes community and the fire safety science research community in the WUI fire area. It was quite apparent at the workshop that *more interaction* was needed between these communities to effectively address the WUI fire problem. It is hoped that this workshop will begin these discussions in a more regular fashion.

The workshop was sponsored by ASTM International Committee E05, and was under the direction of Dr. Samuel L. Manzello of the Fire Research Division, part of the National Institute of Standards and Technology’s (NIST) Engineering Laboratory, and Dr. Stephen L. Quarles of the Insurance Institute for Business & Home Safety (IBHS). This workshop was dedicated to the memory of Dr. Robert Hawthorne White, a scientist at the US Department of Agriculture, Forest Service, Forest Products Laboratory for 39 years. Dr. White made significant contributions to fire safety science and ASTM in particular.

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