Wildfire Mitigation

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The overall number and severity of fires in the U.S. has diminished dramatically over the past 20 years. In 1980 there were almost three million reported fire incidents; in 2000 that number had dropped almost in half to 1.7 million. Similarly, the number of fire deaths has fallen from about 6,500 in 1981 to just over 4,000 in 2000 (not including those related to the World Trade Center tragedy). It is safe to say that there are many reasons for these improvements, not the least of which being the evolution of modern fire and building codes.

Although there are a lot of good things happening in the world of fire prevention, there is at least one disturbing trend: the growing problem with wildfires. There is documented evidence that they are becoming more severe, destroying immense quantities of our natural resources and leaving behind the possibility of mudslides and other problems that must be addressed. The cost of fighting wildfires now runs in the billions of dollars each year, and mitigation and recovery costs can be many times the direct cost of containment.

Congress acknowledged the need for federal intervention by passing the Healthy Forests Restoration Act, which was signed into law by President Bush last year. This new law will result in changes in the way the federal government manages our forests and how they respond to the threat of fire. One of the most important concepts adopted by the act is one that promotes the reduction of wildfire fuel sources by clearing underbrush and thinning forests, among other activities. Of particular interest to fire fighters is the recognition of the need for special attention to urban-wildland interface areas but lack of requirements for regulating construction in such areas. Enter the International Code Council with the *International Urban-Wildland Interface Code*™ (IUWIC™).

The genesis of the IUWIC was California State Fire Marshal Ron Coleman's desire to find a way to proactively address the fire problem in the interface following a devastating series of wildfires in late October of 1993. The balance of this article will look at the philosophy employed in the IUWIC and how the code can play an important part in achieving the same kinds of successes in the urban-wildland interface that we have experienced in other areas.

Mitigation Strategies

The IUWIC provides three general mitigation strategies which can significantly reduce losses due to wildfires: the maintenance of defensible space, vegetation management and the use of fire-resistive construction techniques. There are costs associated with each of these strategies, but if people are going to continue to build in urban—wildland interface areas, the added effort and expense is a worthwhile investment-not just in the safety of the

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structures and the people who occupy them, but in the emergency personnel who respond to protect them both when fire threatens. And as in most prevention strategies, the cost associated with mitigating the impact of fire before the event is significantly less than the cost when a fire occurs.

The key is to use a systems approach to mitigating the fire problem in the interface. Because not every situation is the same, the IUWIC requires that the user first identify the level of hazard in the area in question. There are several steps in assessing the level of hazard and many characteristics to consider, including topography, fuel load, density, etc. Appendix C of the IUWIC provides a process for assessing hazard potential and designating a rating of "moderate," "high" or "extreme." Once the level of hazard has been established, decisions are made directing the remainder of the project.

A look at a community's infrastructure is necessary in order to asses the ability of emergency responders to protect buildings in the interface. For example, adequate street widths are necessary—usually 20 feet or wider depending on their use—so that fire trucks can turn around on longer streets. Adequate street and address signage are also important because many of the responders to a wildfire come from outside of the area and do not have the level of familiarity and access to detailed, up-to-date maps that local responders have. Water also needs to be accessible, whether from fire hydrants, cisterns, pools, or lakes and streams.

Defensible Space

Creating a defensible space around structures and the prescriptive removal of vegetation in and around a community to promote healthy natural areas are critical to the success of firefighting efforts in the urban-wildland interface. Governmental entities have supported annual spring clean-up projects for years. Sometimes these efforts are billed as "clean community" initiatives. No matter what the stated reason is, if the effort results in eliminating combustible plants and other materials around structures, it is helpful in fire suppression/prevention efforts.

Higher wildfire hazard levels demand greater distance between structure and surrounding vegetation. Section 405; Appendix A, Section A104; and Appendix G of the IUWIC address fire protection plans and indicate maintenance of 30 feet of defensible space in low hazard areas. In extra hazardous situations, 100 feet of clearance may be required by the local Fire Chief. This allows for the variations of slope steepness and lengths and whether the slope is below or above a structure. Other factors include weather and fuel types. In some cases, a property owner may wish to clear more than 100 feet if conditions warrant, especially if several owners are working together.

Vegetation Management

More general vegetation management also provides significant mitigation to the hazards of wildfire. Research and experience have shown that prescriptive burning is beneficial for removing excess combustible vegetation on the ground, replenishing vegetation where fire is part of the reproduction cycle, and in general providing for healthier wildland habitats and forests. Where prescriptive burns are inappropriate other methods of vegetation management can be utilized, from mechanical removal to the use of livestock.

Construction Techniques

The greatest number of opportunities for implementing advances in mitigation techniques is in the area of building construction itself. Openings in structures can be penetrated

by wind-driven debris, resulting in the ignition of interior materials. Exterior doors should therefore be solid wood or metal, and windows and other glazing can better resist penetration if they employ tempered materials or multi-pane assemblies. Vinyl window frames are be-coming very popular, and although vinyl materials melt at 375° F, it appears that they may be suitable for use in urban-wildland interface areas if properly constructed. The temperatures experienced in wildland fires can exceed 1600° F, and the time for the fire to burn through an area is usually expected to be 20 to 30 minutes (this does not include any preheating that may occur before the structure is actually exposed to the fire). Today, at least one manufacturer has documented the ability of its windows to withstand temperatures experienced in wildland fires for a minimum of 20 minutes.

It is also important that exterior siding materials be fire resistive. Two methods, use of a tested fire-resistive material or a three-coat stucco system per *International Building Code*® Table 720.1(2), item 15-1.3—which provides 1-hour protection—are available to achieve this goal.

Decking constructed adjacent to or as part of a structure is another significant concern in urban-wildland areas. Decks constructed primarily of wood pose a threat of combustion to the rest of the structure. A deck that is cantilevered from a structure over a down-sloping area is a perfect heat trap. Protecting the undersides of these types of decks is challenging, but may be accomplished through fire-resistive construction methods. Enclosing the space below a deck and constructing a wall will provide protection, but the top side of the deck remains an ignition problem.

Composite plastic and wood materials have been developed for use in place of traditional solid wood. Some of these materials are fire-resistive in nature and may be used to build decks. A number of such products have been tested at the University of California, Berkley, Forest Products Fire Laboratory under the direction of Dr. Frank Beall. The results indicated that the shape

of the material as extruded may affect a product's ability to resist fire and that, in general, solid materials perform better than hollow extruded materials and materials with a solid top and support structure open on the bottom.

Finally, fire-resistive roofing materials have been developed to provide any aesthetic look desired, but it is important to note that the covering alone does not provide complete protection. There is a need to provide a complete "Class A" assembly. Roof eaves should be boxed-in with a fire-resistive material to resist heat that may concentrate in the space underneath. In addition, there was evidence in last fall's Cedar Fire in San Diego County, California, of structures burning from the roof down due to ember penetration under the open ends of tile roofs. Without bird stops at the eaves, embers were able to move up under the tiles and start eave areas and roofs on fire.

The attic spaces of some structures damaged in the Cedar Fire were also affected by embers penetrating vents. One resident contacted the fire department to show them that the wind-driven fire had pushed embers through a turbo vent and ¼-inch mesh. Upon noticing a burning odor, the homeowner checked his attic and found a pile of ash and soot under a vent. He immediately installed his winter vent covers, which alleviated the problem.

It is said that changes occur in building construction requirements in two ways: a new idea is put forth and eventually finds its way into the codes, or the codes are changed and industry finds a way to meet the new requirements. Industry has answered the call in the areas of glazing, siding materials and roofing. Now the issue of vents is upon us. Besides looking at vent screen opening size, other alternatives such as placing vents on the sides of the structure away from likely fire exposure and the incorporation of fire shutters or baffles into vent assemblies should be evaluated.

Conclusion

There are a number of things that can be done to mitigate the problems associated with building in urban-wildland interface areas. To start with, the patchwork of related regulations currently in place in many jurisdictions can be streamlined in the same way as other building safety policies: by establishing a comprehensive foundation for compliance. For example, following the 1993 Laguna Fire in Orange County, California, a task force was assembled to produce a report that included recommendations of what to do in hazardous areas. Each jurisdiction in the county with interface issues was then

able to use the information to establish codes that developers knew were comparable throughout the area.

Another example, on a statewide scale, was California Assembly Bill 337 (also known as the Bates Bill after its sponsor, an assemblyman who lost his home in the 1991 Oakland Hills fire). The bill required the identification of all hazardous fire areas in the state and mandated that structures in these areas have fire-resistive roofs. It also gave local jurisdictions the ability to address defensible space issues.

In addition to protecting structures from wildfires, we also need to look at protecting wildland areas from fires emanating from buildings and facilities built in interface areas. Sprinkler systems, spark arresters and efficient building envelopes all contribute to the safety of the surrounding environment. Simply put, the techniques that protect structures provide "quid pro quo" protection to the natural habitat.

One thing is certain: we will continue to build in urban-wildland interface areas. If we do not provide adequate education and regulation, we will continue to see larger, deadlier and more costly fires. Along with the reduction in fuel that will take place as a result of the Healthy Forests Act, we should promote safety in all urban-wildland interface areas through the application of common-sense methods such as those contained in the IUWIC. ◆

ICC is currently offering electronic versions (in PDF format) of the *International Urban-Wildland Interface Code*™ to jurisdictions free of charge. Go to *www.iccsafe.org/news/uwic.html* to fill out an online request.