How fire races to the eaves

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Building Construction
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Last November I wrote about tactical considerations for managing fires involving vinyl-siding clad structures. Since then, additional information regarding the combustibility of vinyl siding has come to my attention.

As my previous article reflects, many in the fire service have long believed that vinyl siding is very combustible and has been the primary culprit responsible for rapid fire propagation up exteriors.

However, the latest research by both the National Institute of Standards and Technology and UL regarding the combustibility of vinyl-clad structures indicates additional fuels behind the vinyl siding may contribute significantly to rapid exterior fire spread, rather than the vinyl itself.

Vinyl plays a role but not alone according to Steve Kerber, director with UL Fire Safety Research Institute. The combination of vinyl and foam insulation board seems to be the bigger issue as it pertains to having fast-moving vertical fires that become attic fires.

There is also a big difference between the typical vinyl siding and vinyl siding that is meant to look like cedar planking or shake, Kerber said. There is more material and mass in the latter and the fire spread is more powerful.

According to Matthew Dobson, the Vinyl Siding Institute's senior director of code and regulatory, who wrote in his article "Siding with Design" in the October 2007 issue of The Construction Specifier magazine, that vinyl siding is composed mainly of polyvinyl chloride or PVC, which is inherently flame-retardant. PVC resists ignition from another flame until approximately 730 degrees Fahrenheit, will self-ignite at about 850 degrees, and is recognized for approved use by the International Building Code.

Dobson further notes the ignition temperature for vinyl is significantly higher than typical wood framing, which self-ignites at approximately 770 degrees.

Melting vinyl
Fire officials understand very well, however, that fire exposure temperatures to vinyl siding can far exceed those temperatures noted for auto-ignition. Vinyl siding softens and sags and will often drop out of the way when exposed to flame.

The combustible underlayment is then exposed to direct flame contact, which is a significant factor. According to Dan Madrzykowski, a fire-protection researcher with NIST, typically the exposed underlayment consists of weather wrap over oriented strand board, or it could be expanded polystyrene, or poly isocynurate foam board, all of which are very combustible and are not to be installed in an exposed manner as per the labeling on the product.

The vinyl siding is supposed to serve as a fire-resistant barrier to the underlayment materials. However, with direct flame or heat exposure, the vinyl siding will be quickly breached, thus allowing the combustible underlayment material to ignite. Rapid fire extension can then occur upwards into the eave and attic space.

The attached video shows eave fire experiments conducted by UL Firefighter Safety Research Institute as part of the 2011 DHS grant evaluating fire service attic fire dynamics and suppression tactics. A series of three large-scale experiments were conducted that examined exterior fire spread into the eaves and how and the speed at which exterior fires transitioned to attic fires.

Kerber said the results of these UL experiments will be published in the next few months.

To the firefighter on the street it may make little difference exactly which fuels are involved. However, my intent is to put forth only factual information, based on solid fireground experience and current science-based fire research.

From a tactical perspective, the end result on how to effectively manage this type of fire threat remains the same. A rapid developing fire on the exterior of a vinyl-clad structure can pose a serious risk to firefighters and occupants alike if not quickly and properly dealt with.

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