



# Fire Retardant Gels: Effects of Weathering on Dehydration and Fire Performance

## Executive Summary

January 2019

In a study conducted in collaboration with the University of North Carolina at Charlotte, IBHS evaluated the long-term effectiveness of fire-retardant gels when applied to a wood-based substrate. These gels are a type of coating meant to provide protection over a period of a few hours and are typically applied manually just prior to the arrival of a wildfire. The gels act as a protective heat sink on the material they are applied to, reducing the effects of thermal exposure and therefore potential to ignite.

The operating principle of these fire-retardant gels is based on hydration and their effectiveness is reduced as the gels lose moisture. Wind speed and relative humidity affect the dehydration rate. High wind speed and low relative humidity are common conditions when wildland fires threaten homes. These conditions caused gels to dehydrate more than 10 times faster than moderate conditions (low wind speed and high relative humidity).

Two products were tested in this study: Gel Type A used a vegetable cooking oil-based mixing agent; Gel Type B used a petroleum-based mixing agent.

### Key Findings

- Fully hydrated, both gels tested can increase the time-to-ignition from 15 seconds to over 7 minutes.
- At 50% dehydration from initial mass, the time-to-ignition was reduced by nearly half: from over 7 minutes to 4 minutes for Gel A, and less than 3 minutes for Gel B.
- In a realistic wildland fire scenario of 10% relative humidity and a wind speed of 10 m/s (22 mph) both gels reach 50% dehydration in less than 1.5 hours and full dehydration<sup>1</sup> in 7 hours.
- A completely dehydrated petroleum-based mixing agent gel may create a hazardous condition more susceptible to ignition than untreated T1-11 plywood.
- During application, the gel can clog the spray nozzle which may be difficult to clean and adds additional time to the process.
- Removal and cleanup of fire-retardant gels after a fire has been reported to pose some challenges for homeowners. However, once dehydrated the products tested could be peeled off easily.

A detailed report of this research is available at [ibhs.org](http://ibhs.org).

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<sup>1</sup> Full dehydration is when the mass loss had reached a steady-state, where no further reduction in mass was observed with additional weathering time.