



Forest Service
U.S. DEPARTMENT OF AGRICULTURE

FOREST PRODUCTS LABORATORY



Fire Science Team

Wood is a common building material that is increasing in use with the development of innovative timber products, including mass timber. Wood is also a flammable material that changes properties as it burns and can fuel fire growth.

The Fire Science Team works to reduce loss from wildland and structure fires across the country, with an overarching goal to advance scientific understanding of what happens to wood and wood-based materials in a fire. Their cutting-edge research explores smoldering combustion, material properties at high temperatures, and flammability and fire growth. In the course of this research the Fire Science team has developed new non-standard measurement techniques, and methods for testing innovative wood products.

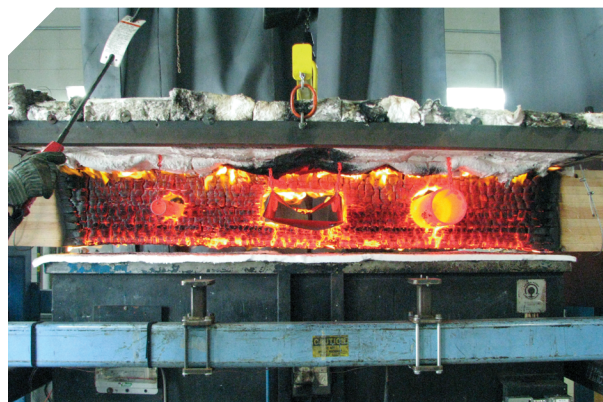
Current Research

Ensuring adequate performance of engineered wood products in fires:

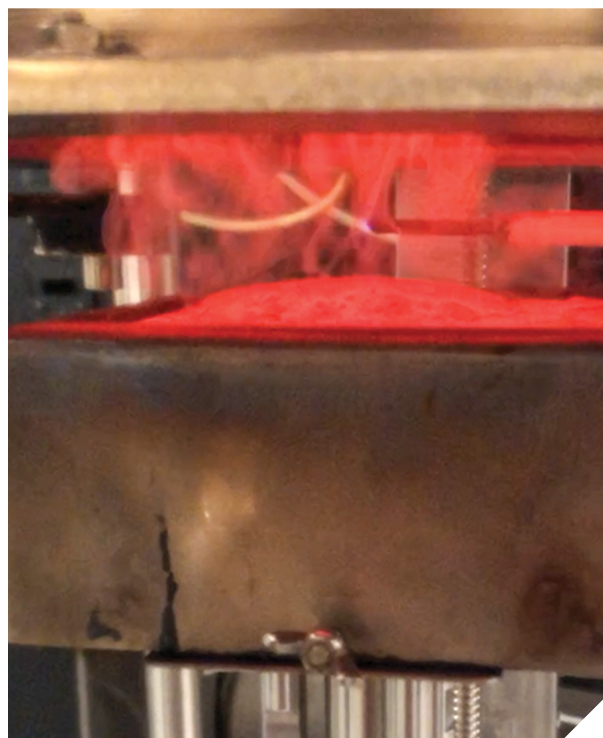
Fire team scientists developed mass timber char rate models that inform safer structural designs. They have also refined high-temperature adhesive test protocols and adhesive formations that prevent delamination and failure of engineered wood products during a fire.

Characterization of wood material properties during and after pyrolysis:

Researchers have identified and are using innovative techniques to characterize wood materials, revealing previously unknown dynamic properties present during pyrolysis. Incorporating this information into fire models can improve our ability to design safer wood-based structures and understand the precursors to smoldering combustion in wildfires.



A glulam beam recently removed from a furnace shows how fire moves through the material. USDA Forest Service photo by Laura Hasburgh.



A weathered cedar shingle coated in fire retardant is tested in a cone calorimeter to evaluate flammability. USDA Forest Service photo by Laura Hasburgh.



A vertical gas burner and vertical array of microphones used to characterize sound during a non-standard fire measurement study in the fire lab. USDA Forest Service photo by Kara Yedinak



Full-scale structure fire experiments conducted, in part, to investigate emissions and mass timber performance. USDA Forest Service photo by Kara Yedinak.

Development of non-standard fire measurement techniques: Combustion emits a large amount of energy in the form of light, heat, and sound. Scientists are measuring variations in sound occurring during fire to learn more about changes in heat release rate of a fire as it persists, interactions between fire and the atmosphere, and interactions between fire and the material (wood or other vegetation) that is burning. These novel fire measurement techniques also have strong potential application as a remote monitoring technique that is not impinged by smoke and can be deployed at safe distances from a fire.

Improving public safety at the wildland-urban interface: The fire team works with the National Technology and Development Center to help improve structure resilience to fire in the wildland-urban interface. Researchers have also created scaled-down screening tests for assessing effectiveness of fire-retardant chemicals and are investigating other methods to protect structures and characterize emissions that result from burning homes.

Supporting wood building standards backed by science: Research results are often directly applied and adopted into fire standards and building codes. Recent examples include the development of a new fire test standard for decking materials in the wildland-urban interface and adoption of a new char rate model applicable to cross-laminated timber. These standards and methods impact building codes throughout North America.

More information about the USDA Forest Products Laboratory's Fire Test Lab can be found at <https://research.fs.usda.gov/fpl/labs/locations/fire-lab>

Questions? Contact the Forest Products Laboratory at sm.fs.mailroomfpl@usda.gov.

