

Compartment Fire Testing of Cross-Laminated Timber Structures

In 2016, the International Code Council (ICC) board of directors established an ad hoc committee to study the issue of tall wood buildings and their potential future permissibility in the ICC International Building Codes. A fire work group was established by the ad hoc committee to examine issues pertaining to the fire safety of tall wood buildings and carry out research that addresses information gaps in our understanding of the performance of tall wood buildings, specifically buildings made with cross-laminated timber (CLT).

Background

In a previous research needs assessment sponsored by the National Fire Protection Association (NFPA) Fire Protection Research Foundation, understanding the fire dynamics in CLT compartment fires, in particular, to develop a comparison between mass timber compartment fires and noncombustible compartment fires was identified as one of the biggest research needs for property underwriting (Gerard et al. 2013). Understanding the role of CLT compartment fires was identified as a key issue by the ICC ad hoc committee. This research project represents a collaboration between the American Wood Council; the USDA Forest Service, Forest Products Laboratory; and the Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF) to perform compartment fire tests to address these knowledge gaps in the fire performance of CLT buildings.

Objective

The objective of this research is to perform several large-scale compartment fire tests on a two-story CLT building to better understand the contribution of CLT to the compartment fire, life safety of occupants, firefighter safety, and property protection.



Figure 1. Superstructure of the CLT building in the ATF laboratory.

Approach

A photograph of the shell of the building is shown in Figure 1. The second floor of the building floor plan is shown in Figure 2; the first floor is nearly identical. The building will be instrumented with more than 500 different sensors, including thermocouples, differential flame thermometers, heat flux gauges, and velocity probes. Five different tests will be run on the two apartments. The different tests will examine different levels of encapsulation with gypsum, the effect of exposed walls and ceilings, and the effects of an automatic sprinkler system.

Expected Outcomes

Results of this testing will be shared with the ICC Ad Hoc Committee on Tall Wood Buildings. The ad hoc committee was created by the ICC Board to explore the building science of tall wood buildings and investigate the feasibility of developing code changes for tall wood buildings. The results of this testing will allow the committee to evaluate occupant and firefighter safety in realistic fire scenarios.



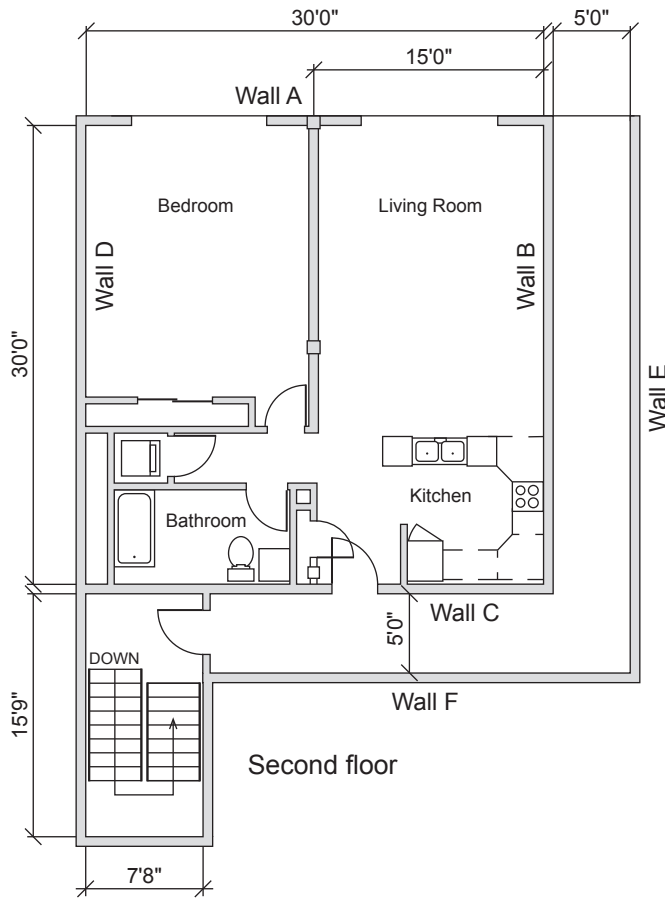


Figure 2. Floor plan of the second floor of the building.

Timeline

Testing is expected to begin in May 2017 and be completed by June 2017. The data will be shared with the ICC ad hoc committee shortly thereafter. A final Forest Service report is expected to be issued by December 2017.

Cooperators

Bureau of Alcohol, Tobacco, Firearms, and Explosives
 American Wood Council
 USDA Forest Service, Forest Products Laboratory

Contact Information

David T. Sheppard
 Bureau of Alcohol, Tobacco, Firearms, and Explosives
 Amundale, Maryland
 (202) 648-6209; David.T.Sheppard@usdoj.gov

Kuma Sumathipala
 American Wood Council
 Leesburg, Virginia
 (202) 463-2763; KSumathipala@awc.org

Samuel L. Zelinka
 USDA Forest Service, Forest Products Laboratory
 Madison, Wisconsin
 (608) 231-9277; szelinka@fs.fed.us

Reference

R. Gerard, D. Barber, A. Wolski. Fire safety challenges of tall wood buildings, National Fire Protection Research Foundation, 2013.