

WOOD EXIT STAIRS IN MID-RISE BUILDINGS

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ABSTRACT

The 2015 National Building Code of Canada (NBCC) permits mid-rise combustible (wood-frame) construction up to six stories, however the provinces of Ontario and Québec still restrict the use of combustible construction in exit enclosures. Fire research has demonstrated that wood construction can adequately meet all necessary fire safety requirements for exit stairs and provide an equivalent or better level of fire performance as compared to similar assemblies of noncombustible construction. Structural fire-resistance, flame spread rating, fire stopping, and real-scale building performance have been sufficiently evaluated.

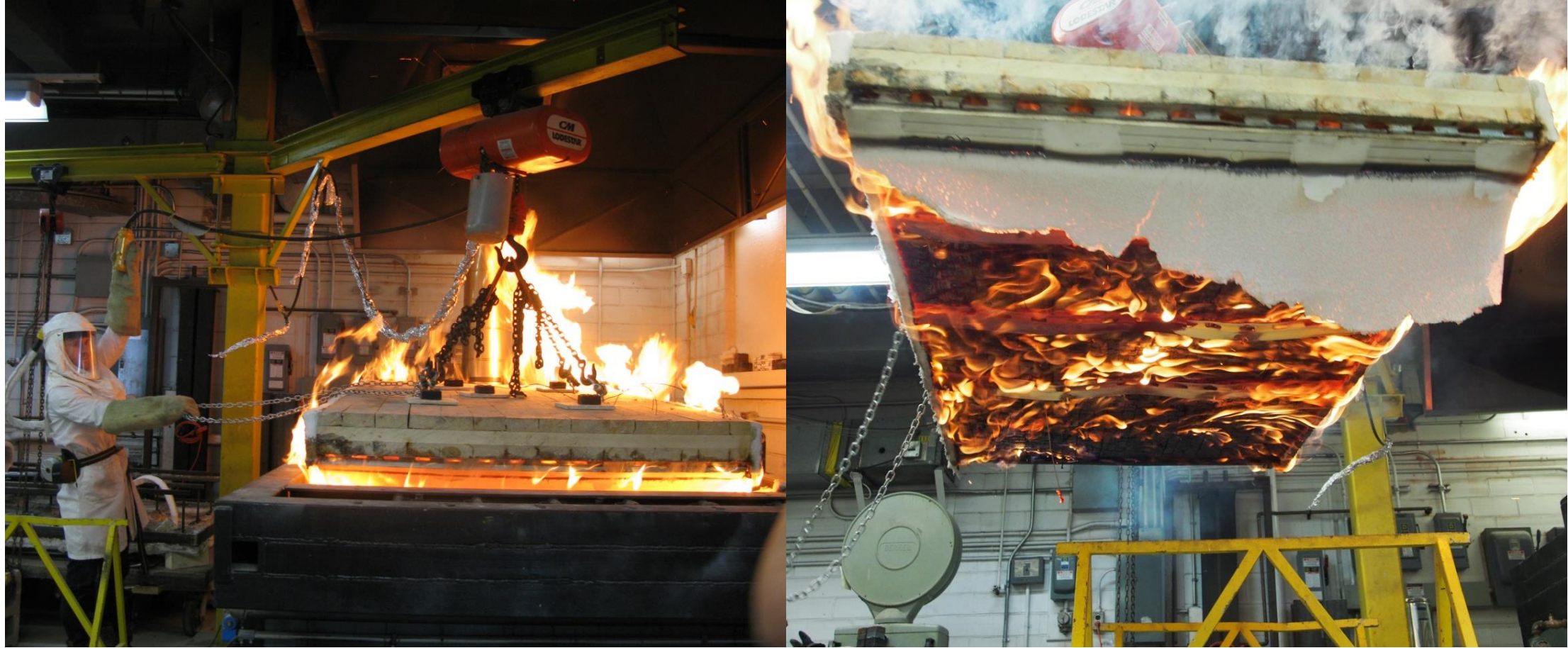
FIRE RESISTANCE

CAN/ULC S101/ASTM E119: up to 2 hr fire resistance ratings are easily achieved by wood-frame and mass timber assemblies.



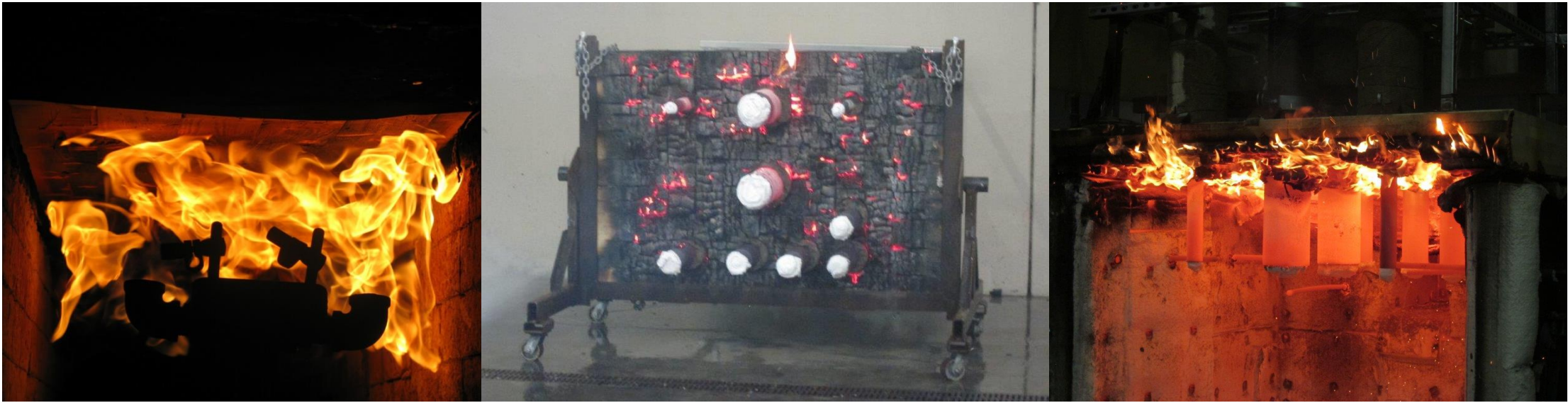
ENCAPSULATION

Gypsum board encapsulation improves fire resistance by delaying ignition time of wood components and limiting contribution to fire growth. Two layers of 5/8" Type X gypsum board provides at least 60 min of protection.



FLAME SPREAD RATING

CAN/ULC S102/ASTM E84: FSR of wood assemblies can be ≤ 25 with the use of Intumescent coatings or encapsulation. Mass timber has low surface flammability, CLT has a FSR as low as 35.



FIRE STOPS & SERVICE PENETRATIONS

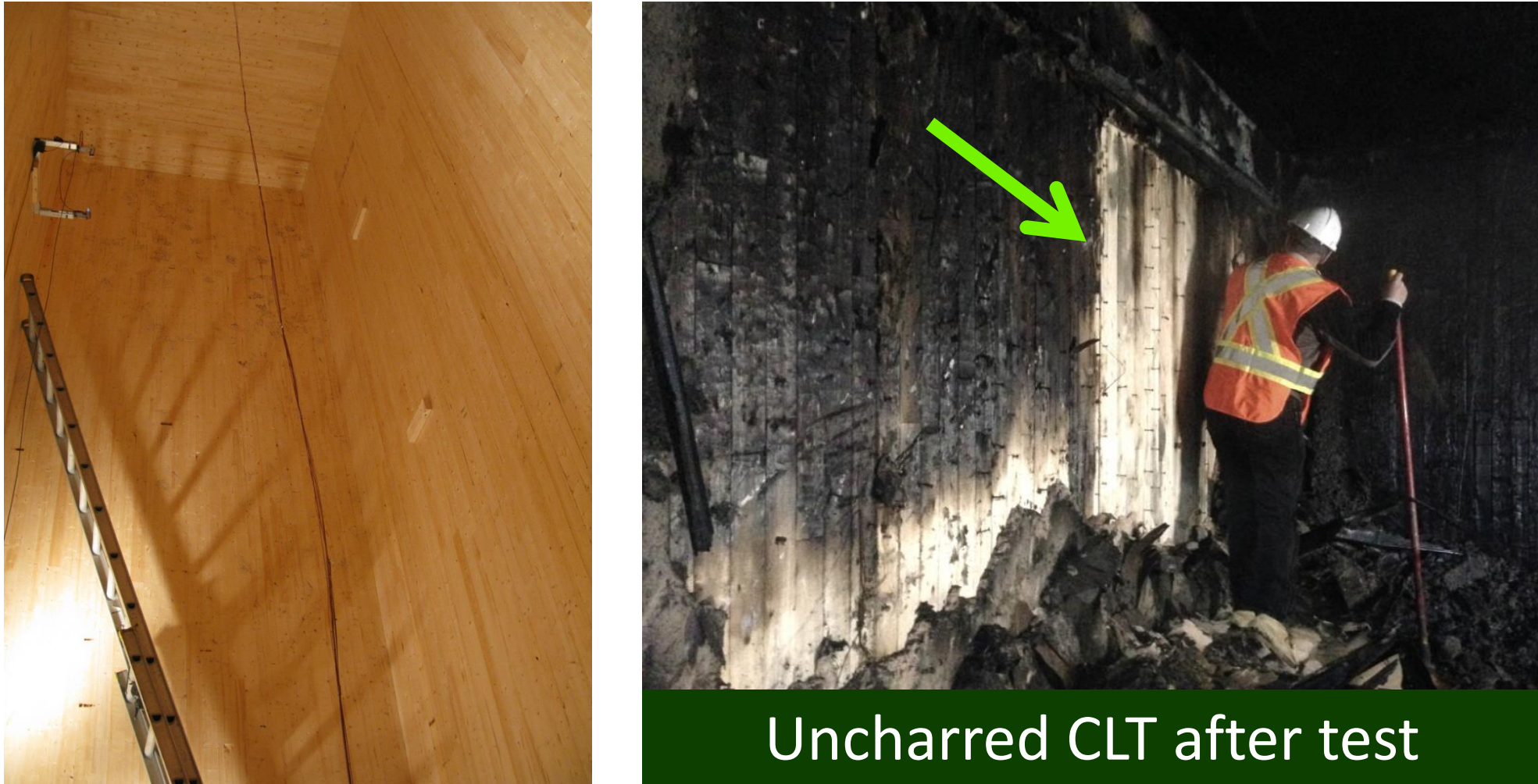
CAN/ULC S115/ASTM E814: some commercially available fire-rated joint fillers for concrete can achieve the same FT-ratings when used with mass timber, such as 1.5 hrs.

SPRINKLERS

Fire risk is lower in mid-rise wood buildings because of NFPA 13 sprinklers installed at the top of the shaft and beneath all floor landings. Significantly less active fire protection is required in shafts of noncombustible construction.

LARGE-SCALE FIRE TEST

A large-scale test assessed the performance of a CLT apartment and exit shaft. A severe 2 hr fire burned in a room adjacent to a 3 storey unprotected stair shaft. No effect was observed in the shaft whatsoever, including no temperature increase or presence of smoke. Some of the CLT wall remained uncharred in the compartment. Funded by Québec MFFP.



EGRESS & FIRE SERVICES

Fires typically do not spread beyond the room of fire origin. Wood stair shafts are expected to maintain their structural integrity even if affected by fire and collapse is unlikely, allowing occupants sufficient time to evacuate and fire services to perform their duties safely.

CONCLUSION

This extensive multi-faceted fire testing program has encouraged the adoption of wood mid-rise buildings in North America. Wood buildings, in particular using mass timber, can easily be designed to adhere to all code requirements related to fire resistance, flame spread, fire stopping, and safety of occupants fire services. As such, combustible construction should be permitted in exit stairs for mid-rise buildings across Canada, as is currently recognized in the model NBCC.

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