Compartment Fire Testing For Exposed Wood in Tall Timber Structures

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TWB Ad Hoc Objectives

TWB identified performance objectives to be met:

1. No collapse & complete burn-out of fuel (even ignoring sprinklers!)
2. No undue radiation exposure to adjoining properties
3. Check adverse response to radiation from adjacent properties
4. Fire department accessibility
5. Egress systems protect building occupants during design escape time
6. Enhanced fire suppression system reliability
The TWB Committee created fire test scenarios to study and validate their code change proposals

- Large test structure (multi-story)
- 30’ x 30’ interior dimensions
- Fuel load of 570 MJ/m²; 85th percentile for residential
- Tests 2 & 3: Exposed mass timber on ceiling and walls
  - Exposed areas targeted safe levels based on materials available at the time
  - Code limits were established based on these tests
  - However, materials have evolved since the tests, and exhibit better fire performance now

**Question:** Can increased areas be justified, given improved fire performance?
Testing and Research at RISE

Funded by USDA grant

Similar to compartment tests in 2018, EXCEPT:

- Using PRG 320-18 compliant CLT
  - Enhanced fire performance

- Increased areas of exposed mass timber
Testing and Research at RISE

Objective:
- Determine whether increased areas of exposed mass timber are justifiable using CLT compliant with PRG 320-18

Test results currently under analysis
<table>
<thead>
<tr>
<th>Test Number</th>
<th>Description</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test 1</td>
<td>Two openings; ceiling exposed</td>
<td>No fire re-growth; “passing” criteria met</td>
</tr>
<tr>
<td>Test 2</td>
<td>Two openings; ceiling and two opposing walls exposed</td>
<td>No fire re-growth; “passing” criteria met</td>
</tr>
<tr>
<td>Test 3</td>
<td>Two openings; ceiling, two opposing walls exposed (protection only on back wall)</td>
<td>Fire re-growth at 3.5 hours; “passing” criteria not met</td>
</tr>
<tr>
<td>Test 4</td>
<td>Six openings; ceiling, two opposing walls exposed (protection only on back wall)</td>
<td>No fire re-growth; “passing” criteria met</td>
</tr>
<tr>
<td>Test 5</td>
<td>Repeat of Test 3, but with small, strategically placed areas of protection on walls</td>
<td>No fire re-growth; “passing” criteria met</td>
</tr>
</tbody>
</table>
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