RESEARCH in Progress

Coalition for Advanced Wood Structures
a university, industry, government partnership

Fire-Retardant-Treated Structural Glued Laminated Timber (Glulam) and Laminated Veneer Lumber (LVL)

Interest in using engineered wood products in Type III construction in the United States has been rising in recent years. The wood industry has been heavily engaged in the promotion of multifamily and light commercial construction in which wood-frame Type III construction predominates. Type III construction, based on the definition of the International Building Code (IBC) is "that type of construction in which the exterior walls are of noncombustible materials and the interior building elements are of any material permitted by this code," except that fire-retardant-treated (FRT) wood framing complying with the IBC is permitted within exterior wall assemblies of a 2-hour rating or less.

Measuring the bending strength of a glulam beam.

Background

As part of the Type III construction, the exterior bearing walls of wood-frame construction must be FRT wood with a 2-hour fire rating, and the floor framing is required to be 1-hour fire rated. At the intersection of the 2-hour wall and 1-hour floor, where the floor framing is attached to the wall with joist hangers, a popular solution is to use solid structural rimboard or header to provide the needed load transfer mechanism. Due to the requirement for continuity on the 2-hour fire rating, the rimboard or wall header is a good fit for structural glued laminated timber (glulam) and structural composite lumber (SCL) products. Unfortunately, this market demand has faced a strong technical challenge due to the lack of consensus-based evaluation standards or product specifications for FRT glulam and SCL. ASTM and AWPA have published FRT test standards and FRT product specification for lumber and plywood, but not glulam and SCL. For SCL, due to the different treatment requirements and the market size, this study will focus on laminated veneer lumber (LVL).

Objective

The objective of this research is to develop ASTM standards for the evaluation of FRT glulam and LVL in support of wood-frame construction, especially Type III construction. This study is intended to cover the evaluation of FRT glulam and LVL in various sizes and will not be limited to the relatively small dimension glulam and LVL rim boards, even though it will be one of the targeted areas. ASTM D5516 and D6305 for plywood and ASTM D5664 and D6841 for lumber will be used as guides. It is also expected that the existing FRT chemicals for lumber and plywood could be used for glulam and LVL with limited

modifications. Collaboration with the FRT industry is expected. The glulam volume effect and the SCL depth effect will be considered in this study.

Approach

In this study, the fire-retardant treatment will be performed by a treater using the AWPA P49 standard, which was used in previous FPL studies. In addition, limited study will be conducted with treatment provided by another treater using the AWPA P50 standard for glulam.

Glulam—Matched samples for 302-24 end joints will be prepared for evaluation of treatment effects by full-scale tension tests under as-received moisture conditions. Additional matched samples for 302-24 end joints will be prepared for evaluation of treatment and hygrothermal effects by full-scale tension tests after hygrothermal conditioning on treated and control specimens. The hygrothermal effect is targeted at 150 + 4 °F and 50% or higher RH for 108 ± 3 days in accordance with ASTM D5664. Similarly, matched samples for 302-24 tension laminations will be prepared for evaluation of treatment and hygrothermal effects by full-scale tension tests. In addition, full-size glulam beams of four different sizes, ranging from 5-1/2 in. by 6 in. by 10 ft to 5-1/2 in. by 24 in. by 37 ft, will be prepared and tested in bending after FRT treatment to confirm the glulam volume effect. The glulam gluebond performance will also be evaluated after the FRT treatment.

LVL—Matched samples for 2.0E/DF LVL will be prepared for evaluation of treatment and hygrothermal effects by full-scale tension and edgewise bending tests. In addition, full-size LVL specimens of four different sizes, ranging from 1-3/4 in. by 3-1/2 in. by 6 ft to 1-3/4 in. by 9-1/4 in. by 14 ft, will be prepared and tested in edgewise bending after FRT treatment to confirm the LVL volume effect.

Expected Outcomes

It is expected that the results from this study will provide test data to support the development of ASTM standards for FRT glulam and LVL.

Timeline

The study plan was developed in July 2016, and materials were procured in August 2016. Fire retardant treatment and re-dry were completed in December 2016, hygrothermal conditioning was completed by June 2017, mechanical and gluebond testing were completed in October 2017. ASTM standard development is targeted for October 2018, with a final report prepared by December 2018.

Cooperators

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