RESEARCH in Progress

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

Constructing Severe Weather Safe Rooms Using Small-Diameter Timber

Throughout the United States, hundreds of tornados and a number of hurricanes impact people and homes each year, causing death and major structure damage. In an effort to increase the probability of surviving the high winds of a hurricane or a tornado, an escalating number of Americans are installing a "Safe Room" in their home.

Standards for Safe Rooms are set forth by the Federal Emergency Management Agency (FEMA). Using these standards, this research study is exploring the feasibility of using small-diameter timber in the form of small laminated logs as a primary building material for the construction of Safe Rooms.

Ann Bartuska, Deputy Chief for Research, Forest Service, is briefed on the Safe Room research study.

Background

Many U.S. forests contain a significant amount of small-diameter timber but it is usually not harvested because either it is not economical to remove or local capacity to process such material does not exist. An abundance of small-diameter timber in the forest increases the risk of insect, disease, fire, and drought damage.

Expanding on the research performed by the Wind Engineering Research Center at Texas Tech University, this study follows the standards set forth in FEMA publications 320 Taking Shelter from the Storm Building a Safe Room Inside Your Home, 361 Design and Construction Guidance of Community Shelters, and the National Performance Criteria for Tornado Shelters.

Objective

The objective of this study is to validate small laminated logs as a primary protective material in the construction of a Safe Room. The first tests conducted at the Forest Products Laboratory used small vertically laminated logs to determine if the logs would meet an acceptable force resistance in accordance with FEMA standards.

Approach

Using an air-pressurized debris launcher, Forest Products Laboratory researchers performed tests that follow FEMA standards. A 15-lb, No. 2 Southern Pine 2- by 4-in. missile is fired at 100 mph at a Safe Room wall to simulate tornado debris. A 9-lb, No. 2 Southern Pine 2- by 4-in. missile is fired at 34 mph to simulate hurricane debris. This wall is built using four-ply vertically laminated logs (nominal 6- by 8-in.) with tongue-in-groove joints. Various buffering and support systems are being tested in order to pass FEMA standards. Estimated completion is in 2009.

Initial results indicated that some reinforcement or impact cushioning to the wall is required to maintain

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Forest Products Laboratory's air-pressurized Debris Launcher.

integrity and provide sufficient safety for occupants. Improved results were shown when laminated logs were reinforced with a tempered or composite-enhanced hardboard on the inside of the test wall.

Expected Outcomes

When a consistent combination of laminated log size and reinforcement is determined, a Safe Room kit, including hardware, could be produced and made available to the public. An affordable Safe Room can save lives and provide another marketable use for small-diameter timber. With an economic value, small-diameter timber becomes more attractive to logging harvesters. In addition, if small-diameter trees are harvested, there will be less fuel for forest fires and fewer havens for insects and disease.

Timeline

This study began in early 2005 and has provided valuable information and prospects for the development of another practical use for small-diameter timber. Additional testing is required to develop a comprehensive database and determine the necessary wall configuration to meet FEMA standards.

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