Building Technology Research Unit 2010 Annual Report

State Farm Insurance Companies®

A. Overview and Organization

The Building Technology Research Unit (BTR) of State Farm® was organized in 1995 to investigate residential construction issues related to loss experiences. Insured losses may arise out of natural disasters, such as hurricanes, earthquakes, hail, and wildfires, as well as non-catastrophic events such as fire, water damage, and theft. The unit resides in the Technology Research Division of State Farm's Strategic Resources Department.

B. Research Projects & Activities

Water Loss Mitigation Testing – Engineers from the unit continue to review common household fixtures and appliances to acquire information regarding the risks, limitations, and advantages of the different types that are commonly available. Information obtained by this research is used to develop loss mitigation information messages for homeowners.

Freeze Review for PEX Piping – Utilizing the Environmental Chamber at the BTR Lab, engineers reviewed freezing PEX piping in a sequential manner to determine whether pressures would rise above the bursting limits of the piping. The extreme elasticity of the piping allowed the internal pressure to rise to over 400 psi, well below the anticipated bursting pressure of approximately 700 psi.

Roofing Material Study – Continued involvement with the American Society for Testing and Materials (ASTM) impact test protocol committee. Roofing materials were installed on permanent exposure racks for a long-term durability (weathering) study in Austin TX and Bloomington, IL. The Unit completed its assessment of roof covering systems at the 5-year interval. The assessment included tear-resistance and impact-resistance testing. We will continue to test the products, with the next interval at 10 years.

Fire Suppression Device Testing –Tested a number of different Spray Aerosol Fire Extinguishers on cooking grease fires. No test standard currently exists for these devices and labeling on these devices is misleading suggesting these are listed UL devices. Use of these type extinguishers on cooking grease fires may result in personal injury if user is as close to the fire as instructed. Additionally, continued testing of residential-grade stovetop fire suppression devices.

Wind Mitigation – BTR laboratory staff constructed a 2 x 4 cannon and have begun conducting impact testing. A variety of items have been tested, such as safe room components, standard doors and impact resistant windows. Engineers from the unit completed a series of tests on storm resistant wall panels designed for use as an in-home tornado shelter.

Seismic Research – BTR continues participation in and support of the New Madrid Earthquake Scenario Workshop in St. Louis. The creation of a scenario (which is planned to commemorate

the 1811-1812 earthquake events) will assist in educating governmental leaders, business leaders and the public to the potential seismic risks.

Liaison activity with USACERL – Met with Thomas R. Napier, of the Construction Engineering Research Laboratory, US Army Corps of Engineers regarding its Resilient Home Program. Discussed SE U.S. hurricane damage, IBHS, FLASH, public outreach efforts and research regarding the quantification of wind and rain damage to structures.

Wall Sheathing Attachment Testing – Baseline tests were completed on sample walls attaching standard sheathing panels to a 2 x 4 stud frame wall section. Additional baseline tests were conducted to establish individual staple fastener strength in relation to vertical pullout and horizontal shear are currently in progress.

C. Other Activities:

- **University Collaborations**

University of California, San Diego (UCSD) Jacobs School of Engineering. State Farm engaged with UCSD in preliminary work to establish a Feasibility Study for Soft Story Seismic Testing. This project utilizes interns from both UCSD and the University of Illinois. Preliminary field research was completed to identify common soft story designs in residential construction. Future testing, using UCSD's shake table, may be conducted in the future. As of 2010 State Farm has taken a position on the UCSD Advisory Board and is exploring UCSD's research capabilities for potential future collaboration with the Structural Engineering faculty.

Texas Tech University (TTU). State Farm has obtained one of TTU's StickNet Wind Towers as a display item in the BTR laboratory to help visitors understand the critical role of field research. The wind research equipment (portable wind towers) is designed to capture wind data during hurricanes and tornadoes.

University of Illinois (U of I). BTR continued involvement with the State Farm Research and Development Center at University of Illinois' Research Park. Students and faculty work alongside State Farm employees researching initiatives important to State Farm. Our work together creates real-world educational opportunities allowing for collaboration on a variety of important research initiatives. Students from other universities can also work through this venue.

University of Illinois (U of I) / (IFSI) Illinois Fire Service Institute. BTR members continue to engage with faculty and staff at the Illinois Fire Service Institute. Several attended the annual open house and toured the new research, library, and educational facility under construction.

University of Western Ontario. BTR sponsored research at the Three Little Pigs testing lab at the University of Western Ontario. The BTR Unit completed work at UWO including wind pressure tests on wall panels with foam sheathing with lightweight siding materials. The testing advanced our understanding of pressure equalization and "load sharing." This research will

advise further research at the IBHS Research Center where testing will look at the effect of surface air flow on lightweight siding materials.

- **Committee Work**

State Farm engineers and architects continue involvement in codes and standards organizations such as NFPA Fire Research Foundation, NIST, UL, ASTM, ANSI, ICC, as well as professional organizations, AIA, SEAOI, ASPE, etc.[1] Contributions include work on committee and technical panel level activities as well as facilitating discussion and learning opportunities (hosting meetings). Work also includes review of ICC code proposals, attending and testifying at the hearings. BTR staff members participate on: Underwriters Laboratories (UL) Standards Technical Panel for Household Electric Ranges (UL 858), the Arc Fault and Ground Fault Standards Technical Panels (STP), and NFPA's Aging of Residential Electrical Systems Project. Unit members serve on EERI's New Madrid Earthquake Scenario Executive Committee.

- **Public Outreach**

Holiday Safety - On December 2, 2010 the CBS "Early Morning Show" videotaped a segment at the BTR lab on Holiday Safety. This videotaping was organized by the Electrical Safety Foundation International to promote electrical safety issues during the holiday and involved a Christmas tree fire.

Cooking Fire Safety - During Fire Prevention and Safety Week BTR participated in an event at State Farm's Corporate Headquarters. The technical topic for the BTR booth was Liquid Spray Aerosol Fire Extinguishers and their use (and misuse) on Cooking Grease Fires.

BTR staff met with the National Institute of Science and Technology, the Consumer Product Safety Commission, and the Association of Home Appliance Manufacturers, to discuss collaborative solutions to kitchen cooking fire issues. State Farm helped sponsor a Vision 20/20 cooking fire public education strategies workshop in Baltimore to discus educating the public on Kitchen Fires and Smoke Detectors.

Water Loss Prevention - The BTR Unit presented an interactive sump pump display for the Home & Auto Safety showcase (an event at State Farm's Corporate headquarters). The display featured functioning primary and back-up (battery and water powered) sump pumps for consideration.

Seismic Safety and Hazard Mitigation - State Farm contributed $5000 to the New Madrid Chapter of the Earthquake Engineering Research Institute (EERI). The grant will be for the development and dissemination of the New Madrid Earthquake Scenarios (NMES). The purpose is provide to the local communities, regional planners, technical professionals and the general

[1] NFPA (National Fire Protection Association), NIST (National Institute of Standards and Technology), UL (formerly known as Underwriters Laboratories, Inc.), ASTM (ASTM International, formerly known as the American Society for Testing and Materials), ANSI (American National Standards Institute), ICC (International Code Council), AIA (American Institute of Architects), SEAOI (Structural Engineers Association of Illinois), ASPE(American Society of Plumbing Engineers), and EERI (Earthquake Engineering Research Institute)

public the hazards associated with likely earthquake impacts and hazard reduction information for the Central U.S. around the New Madrid and Wabash Valley Seismic Zones.

- **Insurance Industry Research Update**

IBHS Multi-Peril Research Facility: IBHS completed the construction of its new research facility. BTR participated in the initial concept phase and assisted on the facility planning committee. The primary purpose of the multi-peril research facility is to "identify effective methods of minimizing risk and loss to homes, businesses, and communities resulting from natural disasters." The research center was funded entirely by insurers and reinsurers. The research center will have the ability to subject 1,800 sq. ft., 2-story homes and light commercial construction to a variety of hazards, including realistic Category 3 hurricanes, wind-blown fire (mimicking wildfire embers), and hailstorms.

On October 19, 2010 the state-of-the-art, multi-peril applied research and training facility opened on a 90-acre parcel of land in Chester County, South Carolina. The facility has (105) 5 ½-foot diameter fans that can produce wind speeds up to 140-mph. There is also equipment in place to produce wind-driven rain. This opens many possibilities of full scale testing of materials and building systems for wind and wind-driven rain. A demonstration of the facilities abilities was conducted for attendees and included testing to failure (by wind) of a two story house.

Future work at the research center will include wildfire and hail. BTR members are engaged with IBHS staff on a variety of levels.

NOTE: IBHS is engaging with academic institutions and faculty in collaborative work. Contact is Anne D. Cope, Ph.D., P.E. Director of Research, IBHS Research Center

http://www.disastersafety.org/text.asp?id=research_center

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