The FM Global Research Campus

NATURAL HAZARDS LABORATORY

FM Global

Natural Hazards Laboratory

- A 72,000-ft.² (6,700-m²) facility for testing building material
- Ability to replicate wind force of up to 175 mph (282 km/h), a Category 5 hurricane
- Testing services, including tests of wind uplift, wind-driven rain, hail, impact resistance, weathering, shingle uplift, fatigue and dynamic analysis

Windstorm, flood and earthquake all pose a major threat to property, but the loss potential of these natural hazards can be greatly reduced. FM Global research following Hurricane Andrew in 1992 led to recommendations that proved effective when Hurricane Katrina struck 13 years later. Statistics from Katrina showed an 80-percent reduction in loss costs when comparing exposed locations that had no outstanding risk improvement recommendations (all recommendations were completed) with those locations with open recommendations remaining. Today, the expanded Natural Hazards Laboratory continually helps researchers further understand what causes building material to fail and the best ways to design buildings to resist the effects of Mother Nature.

Researchers can now replicate even the toughest weather phenomena, and recreate hurricane-force wind of 175 mph (282 km/h). Wind this strong truly tests the strength of glass and the endurance of building material, particularly roof and exterior wall systems.

Inside the laboratory, a hail gun launches ice balls of varying sizes to simulate moderate and severe hail storms, and a debris cannon shoots simulated wind-blown wood projectiles at speeds matching those of a real hurricane to determine impact resistance of doors, windows and wall panels.

At left: Engineers at the Natural Hazards Laboratory prepare to perform a wind-uplift test on a roof membrane to determine if it meets FM Global property loss prevention standards. Above: 1. The wind-uplift test in progress. 2. The debris cannon is loaded with a stud to be fired at a target for windstorm impact-resistance testing. 3. The wind machine churns up hurricane-force wind to test the durability and strength of roofing shingles.

Natural Hazards Laboratory [CONTINUED]

- 100-ft.² (9.3-m²) earthquake motion simulation table for conducting research and product testing
- Can move 5-ton (4.5-metric ton) load with an acceleration of up to 3 g (three times the acceleration due to gravity)
- Table sits on a 13-ft. (4-m) deep, 2 million-lb. (910,000-kg), 34-ft. x 36-ft. (10-m by 11-m) wide foundation

To address the seismic risk, a 100-ft.² (9.3-m²) earthquake shake table can move a five-ton (4.5-metric ton) payload with an acceleration of up to 3 g (three times the acceleration due to gravity). The shake table can replicate three-dimensional earthquake motions of all intensities at the ground surface and on various floors of a multi-story building, thus allowing scientists to study the effects of earthquake shaking on structures and nonstructural systems such as equipment, piping and storage racks. A thousand-ton (910,000 kg) reinforced concrete reaction mass absorbs the vibrations generated by the table.

The Natural Hazards Laboratory also is equipped with a powerful xenon arc ultraviolet (UV) accelerated weatherometer to measure the effects of the sun's UV radiation on building material that has been exposed for long periods. And, testing includes accelerating the weathering of all types of building material to determine more precisely how to design and install for long-term performance.

At left and Above: 1. The earthquake simulation table, with six degrees of freedom, can recreate ground motion from large earthquakes and/or motion on upper floors of multi-story buildings, and is the only table of its kind in the insurance industry. 2. FM Global research led to the design of unique bracing systems to protect sprinkler system piping. 3. Water flows through a cracked pipe, illustrating a potential hazard to the sprinkler system when piping systems are inadequately braced or not braced for earthquake motion.

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