Institute for Business & Home Safety®

Where building safety research leads to real-world solutions.

# Research Center

## Frequently Asked Questions

### What is the purpose of this facility?

The mission of the IBHS Research Center is to identify, evaluate, and promote effective methods of property loss reduction and prevention. Real world application of IBHS scientific research findings will lead to more durable, sustainable communities. Research findings also will provide an objective, sound foundation for the development of solid public policy (such as enhanced building codes), as well for improving building products and systems. The building science conducted will demonstrate the effectiveness, affordability and true long-term cost-savings of better-built structures for individual homeowners and society at large.

### What will be learned from the research?

Short-and long-term goals for the IBHS Research Center include:

- Fostering public acceptance and consumer demand for better-built homes and other structures
- Enhancing property risk modeling
- Providing a scientific basis for improving the quality of building products and components in practical applications
- Providing credible ways to favorably inject loss prevention into broader public policy discussions (e.g., ‚green/environmental issues)
- Increasing availability of reliable, affordable retrofit options for existing homes and businesses
- Strengthening and improving residential building codes and land use policies
- Improving current product and system testing standards

### What is the initial focus of the research?

- Developing relationships between current test standards and performance of roofs in simulated windstorms
- Identifying effective methods to provide back-up water intrusion protection when primary roof cover is damaged
- Identifying fixes for water intrusion and wind-borne firebrand intrusion via roof venting systems
- Simulating wind-driven hail events and evaluating associated damage to roof covers, as well as identifying solutions
- Initiating research into aging effects on roof performance in extreme events
- Developing cost-effective methods for retrofitting various roofing systems to mitigate damage and losses

### Who sponsored the facility and how much did it cost?

The construction of the Research Center was wholly funded by property insurers and reinsurers. The facility's cost is approximately $40 million for construction and initial outfitting.

### How does the facility work?

The IBHS Research Center campus includes a large test building, small laboratory building, an office/classroom building, test specimen construction areas, electrical substation, and a very large water tank. The huge clear span test chamber is attached to an array of 105 individually controlled electric fans housed in a towering inlet structure specially designed to contract and speed the flow of air, and an observation and control wing. Full-scale homes and commercial structures will be built and transported into the test chamber using a customized movement system. The specimen then will be bolted down to a remotely controlled turntable and subjected to one or more natural hazards. Within the test chamber it will be possible to generate realistic Category 1, 2, and 3 hurricane-force winds, extra-tropical windstorms (those associated with the passage of a frontal system or Nor'easter), thunderstorm frontal winds, wildfires, and hailstorms. Variable droplet-sized rain, hailstones, burning embers and various types of "debris" also can be introduced into the wind stream through a series of special ducts and other mechanical systems.

### How many fans are there and how strong are they?

- There are 105 fans, each one is 300 horsepower and has a diameter of 5 ft. 6 in.
- Fans similar to these are typically used in the mining industry to provide ventilation for large underground shafts.
- When all 105 fans are turned on, they will be drawing the same amount of power as 9,000 individual homes (30 megawatts of power).
- Each fan individually is capable of pushing 230,000 cubic feet of air per minute through the test section and together they can push 24 million cubic feet per minute through the test chamber. This flow volume is 20 times the flow going over Niagara Falls, or the same amount of air that would flow through the air conditioning systems of 10,000 homes when they are all running.
- The top speed of the wind generated in the test chamber is 140 mph. Later renovations to the facility could increase that speed to 175 mph.

## How big is the turntable that holds the buildings being tested?

- The turntable has a 55 foot diameter and a surface area of 2,375 square feet.
- There are 52 anchor points embedded in the surface for bolting down test buildings.
- The motor and structural design of the turntable is similar to those used for locomotive roundhouses.

## How are full-sized buildings placed on the turntable?

A custom movement system was specially designed for the test buildings, which consists of two power dollies, two follow-along dollies, hydraulic jacks, and a truss support system. The test buildings will be constructed in an outdoor fabrication area on a reusable steel foundation. The building mover will attach to this steel foundation and carry the building into the test chamber, then place it down on the turntable.

## How is rain created in the lab?

The rain system will consist of an array of sprinklers mounted at the inlet structure. This will allow researchers to create accurate, appropriate patterns of various sized rain droplets equivalent to a rainfall rate of up to 8 inches per hour.

## How are hailstones made and realistic hailstorms created?

Importantly, real hail varies in density; the density of pure ice is about 0.9 grams per cubic centimeter, but hail can range from 0.5 g/cc to 0.9 g/cc. Denser hailstones can be made by freezing water in a mold layer by layer, and IBHS researchers will experiment with soda water and different temperatures to create the softer hailstones. The hail making equipment, storage, and machines to release the hailstones so that they reach terminal velocity before striking the test buildings, are currently under development and will be fully engineered once construction of the large test chamber at the Research Center is completed this summer.

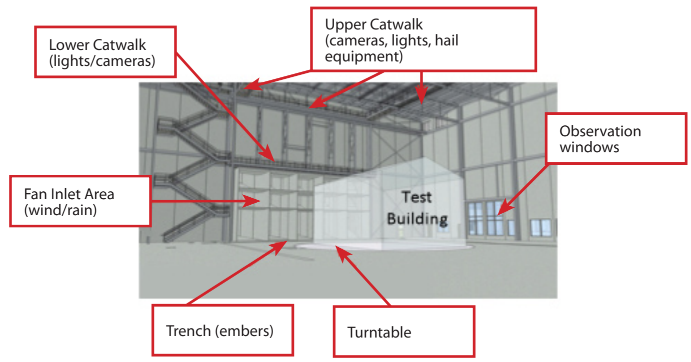
## How are wildfire effects created?

IBHS is interested in studying two aspects of wildfire effects on structures: ember attack and torch vegetation/structure.

Ember Attack occurs when small burning embers or firebrands driven by wind penetrate attic vents, soffits, and other openings or collect on complex roof surfaces. These embers can smolder, undetected, and can eventually cause the building to burn from the inside out. There is a long, deep trench in the test chamber, just in front of the fan inlet area, where mulch burning equipment will be placed to create embers typical of a wildfire. These embers will be ducted into the wind stream to create realistic, windy conditions surrounding a structure when a wildfire passes through a community.

Torch Vegetation/Structure occurs when a shrub, bush, tree, attachment, or outbuilding burns and thus creates a source of heat and flame that can ignite a nearby building. A system of natural gas lines and burners will be installed just outside the large test chamber where typical torch structures can be simulated while the flames and radiant heat from these torch sources are allowed to be affected by the wind from the fans. This will enable researchers to keep the larger flame outside of the test building, but still use the wind generated by the fans to study how the ignition potential of the primary structure is affected by the interaction of the wind and the torch source.

## Where are all these elements inside the test chamber?




## Other interesting facts about the facility:

- The test chamber is as tall as a six-story building and has more than 21,000 square feet under the roof (equivalent to one-half acre or four and one-half basketball courts).
- The chamber is big enough to accommodate nine 2,300 square foot homes at the same time.
- The amount of concrete underneath the fan tower is enough to fill up a 2,300 square foot home to the ceiling.
- The water tank holds 750,000 gallons, which is more water than in an Olympic size swimming pool.

*IBHS is a non-profit applied research and communications organization dedicated to reducing property losses due to natural and man-made disasters by building stronger, more resilient communities.*

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