Insurance Institute for Business & Home Safety

Where building science leads to real-world solutions.

2012 Commercial Wind Test Summary

Stronger versus Common Masonry Construction

High Wind Demonstration Highlights Ways to Improve Commercial Building Performance with Relatively Low-Cost Mitigation Measures

Wind-related damage is quickly rivaling fire as the leading source of loss for commercial properties. In 1989, $7 billion in commercial losses were due to fires compared to $2 billion in losses due to wind; by 2009 wind losses had surpassed $7 billion, while fire losses were approaching $8 billion, according to data from ISO's Property Claim Services®. By focusing on several key components when constructing a new business, including the roof, the doors, and the walls, business owners can significantly improve commercial building performance in high-wind events through relatively low-cost mitigation measures.

In July 2012, IBHS conducted its first full-scale, high-wind test of commercial structures at its Research Center. The test compared and contrasted performance in high-wind conditions between two full-scale commercial strip mall-type masonry structures: the "common practice" test specimen was built using construction practices that were widely used 20 years ago and are still used in areas that are not following up-to-date code requirements for masonry construction; the "stronger" test specimen was built using current code requirements for masonry construction.

The two buildings used the same basic roofing materials and roll-up doors except that stronger, safer wind-resistant details and installation techniques were used on the "stronger" building. Both specimens were lightly furnished to resemble small restaurants, but were similar in overall construction to many retail and service establishments typical in small towns and suburban locations throughout the U.S.

The two test specimens above were used in the first full-scale high-wind test of commercial structures at the IBHS Research Center.

Objectives for IBHS' first commercial high-wind research project included demonstrating the following:

- Better built structures are needed to protect consumers and workers in commercial buildings.
- Small business owners, who want to stay in business and quickly recover from catastrophes, should lease, buy or build stronger, safer structures.
- Carefully following high-wind construction guidance and choosing slightly more expensive products and systems can produce significantly stronger, safer buildings.
- For less than 5% of the total cost of the building used in the IBHS test, business owners can have a stronger, safer structure that is more disaster-resistant than if they chose to construct a building using common practice construction.

About the Testing

For the test, IBHS placed the two one-story masonry specimens side by side on a 55 ft. diameter turntable in the Research Center's large test chamber, then subjected them both to wind conditions that scientifically recreated actual thunderstorm and hurricane conditions.

Highlights of Test Sequence Results

Severe Thunderstorm Scenario

- During 70 mph wind gusts, the equivalent of 57 mph one-minute sustained winds, pieces of flashing failed. In a real-world event, this could lead to loss of roof cover, water penetration, and significant interior damage.
- During 110 mph wind gusts, which data from the National Oceanic Atmospheric Administration reports have occurred historically during derecho events (straight line wind storms), the roll-up door failed. In a real-world event, this would have lead to significant loss of inventory stored at the rear of the building and could lead to structural failures depending on the size and layout of the building.

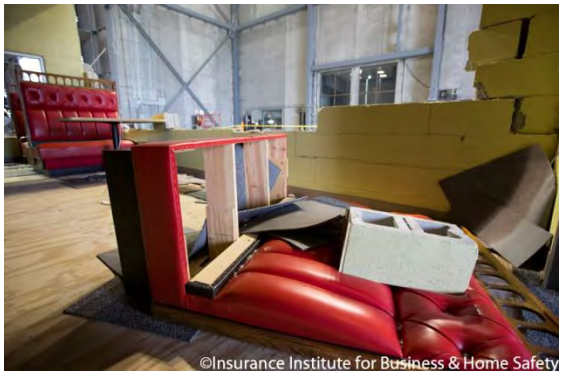
Hurricane Scenario

- Both structures survived the initial peak wind speeds of the hurricane test record, which included wind gusts of 127 mph or the equivalent of 103 mph one-minute sustained winds, although the "common practice" building continued to accumulate flashing and roofing damage.
- After exposing the buildings to this initial peak wind gust, a 2" x 4" piece of wood – intended to simulate a tree branch - was launched as a projectile to shatter the front window of both buildings, as often happens with flying debris during a severe windstorm. With damage to the front window allowing wind to pressurize the inside of the building, the "common practice" specimen suffered significant damage.
- At a 105 mph wind gust, the equivalent to 85 mph one-minute sustained winds, the wall separated from the "common practice" building and the masonry side wall collapsed. By contrast, the "stronger" building would have lost some inventory after the 2" x 4" purposely shattered the window, but the roof and walls remained firmly intact, even against peak gusts of 127 mph, the equivalent of 103 mph one-minute sustained winds.

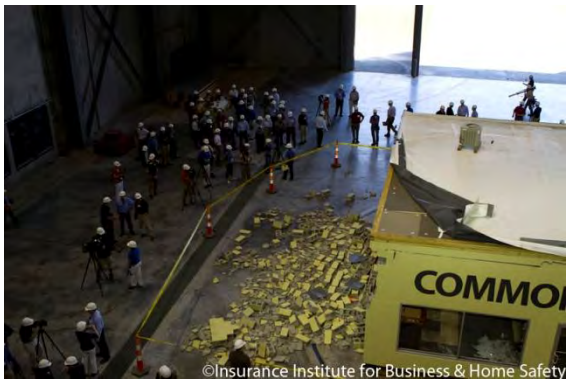
The images above show the side wall of the "common practice" building failing after the front window was shattered.

Property Loss Cost Estimates

- Property loss cost estimates assembled by an experienced catastrophe claims adjuster immediately after the test found almost 10 times more physical damage to the "common practice" building than to the "stronger" building: $44,769 vs. $4,660.
- This comparison does not take into account contingent business interruption or other losses associated with a longer shut down – or worse, business failure due to significant damage and a long period of inactivity.



Inventory and furnishings in the "common practice" building were substantially damaged after the wall failed increasing repair costs.



IBHS members and the media survey the damage after the commercial high-wind test was completed.

Conclusions and Recommendations

This test demonstration showed the importance of not only using the right building components, but also installing them correctly to improve performance during high winds.

While some differences in construction, such as reinforcing masonry walls, must be implemented at the time of construction, others (e.g., roll-up door locks or improved roof cover and flashing anchorage) can be put in place as part of a periodic repair or retrofit project.

Also, both test structures would have benefited from stronger window protections that could have prevented the 2" x 4" from breaking the front window glass, although damage sustained in the "common practice" building was much worse.

Additionally, the demonstration underscores the power of wind and the importance of business continuity planning, even for businesses housed in stronger buildings. That is why IBHS makes the Open for Business® program freely available to all businesses.