



WINDOWS, WIND AND WINDBORNE DEBRIS: How to Protect Your Business from Hurricanes

Windows are a building's "eyes to the world." For many businesses they provide the first direct link to through welcome signs, fashion displays, views of diners, and other glimpses of what lies within. While forgotten in planning for elaborate fenestration, however, is that just as windows provide a visual of from the outside, they also may be the pathway for water and wind to enter your building if they are broken or breached during a hurricane. Water streaming through a broken window can wreak havoc on building's interior. Wind also can lead to massive destruction of an entire structure if the roof or wall way to provide an outlet for internal pressure that can build up under certain circumstances.

*This article provides information to assist business owners in protecting their windows during hurricanes. It is important to remember that when protecting a building from wind and windborne debris, **all** windows and glass in doors should be protected because the failure of any opening can lead to significant water intrusion and increased wind-induced internal pressure. Nevertheless, the highest priority should be given to protecting the largest windows.*

There are practical limitations to the performance of any typical commercial glass system. While windows can be rated for a particular wind pressure, there is a certain probability (usually 5 in 1,000 for typical design wind) that a window will fail if it is exposed to that magnitude pressure.



WINDOW SELECTION

Beyond the look of windows or glass doors, important considerations in hurricane-prone regions are the pressure rating of windows and how they will be protected from windborne debris. There are many products and systems available that provide windborne debris impact protection for windows. However, impact rated windows are the only window systems that are designed and certified to protect your building from both wind pressure and windborne debris without any additional exterior protection system such as shutters. A key advantage of impact rated windows is that they are passive protection systems that are in place 24/7. They do not need to be activated when you are busy with other storm preparations and they also provide protection against unexpected weather events.

TYPES OF WINDOWS

- **Single pane** windows are easily identifiable because there is only one piece of glass in the frame. While these windows may be found in many older buildings, they generally are being phased-out in favor of more thermally efficient double pane windows.
- **Double pane** windows include two pieces of glass with an air gap in between. Advantages include better insulation, noise reduction, and UV control. However, double pane windows are not designed to withstand windborne debris and should be protected just like single pane glass when a hurricane is threatening.
- **Laminated glass** windows consist of two pieces of glass sandwiching a sheet of clear polyvinyl butyryl (PVB) plastic laminate. Although glass layers may break if subjected to significant force, they remain bonded to the laminate and thus are unlikely to shatter, which reduces the likelihood of injury. However, laminated glass alone is not rated to provide protection against windborne debris that may occur during a hurricane.
- **Impact rated** window systems are a combination of laminated glass and reinforced window frames. They are the only window systems that are tested and designed to protect against wind pressure AND windborne debris. It is important to note that all impact resistant windows are laminated glass systems, but not all laminated glass systems are impact rated. Simply because a product is labeled "laminated" does NOT mean it has passed the large and/or small missile impact tests necessary for an impact rating.

- **Impact rated double pane** windows have entered the market as building owners have looked for energy efficiency along with windborne debris impact protection. These systems usually include a third pane of glass on the outside surface of the window and an impact rated laminated glass panel on the inside with an air space between the outer pane and the laminated inner panel.

COMMERCIAL WINDOW TESTING STANDARDS

For a window protective system to be certified as impact-resistant, it must meet testing standards established by the American Society for Testing and Materials (ASTM). Although a window's impact rating is not etched on the glass, reputable window manufacturers and dealers should be able to provide appropriate documentation and labels that can be applied to the window frames. The documentation will indicate that the window is consistent with one of the following standards:

- ASTM E 1886, E 1996
- AAMA 506
- Florida Building Code TAS 201, 202, 203
- Miami-Dade Protocols PA 201, 202, 203

As a general matter, meeting any of the above test standards will provide adequate protection. Check with your local governing municipality to ensure that local requirements are being met. The International Building Code references only the ASTM standards listed above.

COMMON MISCONCEPTIONS ABOUT COMMERCIAL WINDOWS

Unfortunately, because of the similar appearance among different window systems, many building owners confuse the protections of double pane, laminated, and impact rated window systems, especially if they have been told that they meet a "high wind speed." Regardless of verbal assurances, only windows that are certified as impact rated can be expected to protect your interior from wind and windborne debris.

The major defining feature of a laminated impact resistant glass panel is the two panes of glass with a relatively thick membrane between the panes. When you tap on a laminated glass, it will sound solid as compared to single panes of glass separated by a ½-inch air barrier. However, the easiest way to identify how many layers of glass are in the window and how far apart they are is to shine a laser pointer through the window at a slight angle to the surface. You should be able to identify a reflection from each surface of each glass pane. Because glass panes are rarely more than ¼-inch thick, you

can usually identify whether the panes are close together or separated by a ½-inch air space.

LOCATION, LOCATION, LOCATION

Window damage related to hurricanes is most frequently attributed to windborne debris. The International Building Code (IBC) requires window protection for new construction in "windborne debris regions," which are defined as locations within one mile of the coast where the ASCE 7-05 basic wind speed is 110 mph or greater; other locations where the basic wind speed is equal to or greater than 120 mph; or anywhere in the state of Hawaii. While not required by the IBC, non-impact rated windows on existing buildings in these locations should be protected (e.g., by shutters as discussed below) as well.

While not required by the IBC, for best practices, consider protecting windows if the building is located in an *inland* area where the design wind speed is 110 mph or greater; there is little tree cover; and buildings in the area have roof gravel, shingles, or building components that may become windborne debris and potentially hit your building during a hurricane.

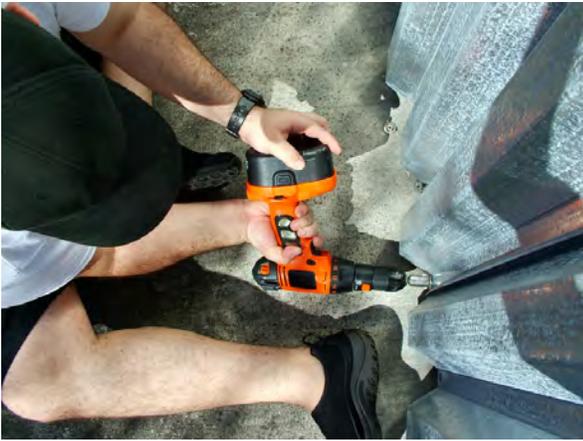
ADDITIONAL CONSIDERATIONS FOR IMPACT RATED WINDOWS

- When contemplating replacement of existing windows with an impact rated window system, the walls should be analyzed to ensure they meet the demands of additional frame securement.
- Even impact rated windows will not protect your property if they are left open during a storm. It is a myth that windows should be left open so that air pressure doesn't explode the building. Open windows allow wind and water to enter the building without any protective shield.

OPTIONS FOR PROTECTING EXISTING, NON-IMPACT RATED WINDOWS

If the installation of impact rated windows is not feasible, there are several practical and economical options for protecting the windows of commercial buildings located in the windborne debris regions described above. Remember that when it comes to wind-borne debris, all windows and glass in doors must be protected for the safety of the entire structure.

- Roll-down or accordion shutters are the easiest to activate since they are always in place. However, they are also more expensive than some of the other options. Since roll-down shutters require a “rectangular box” above the window and accordions require the “stack” to fold up on the side of the window, aesthetics should be included in the decision making.
- Other protective options requiring installation prior to a storm include metal or polycarbonate panel shutters, plywood, and various fabric and screen panels. To be effective, these protective layers must be cut to fit the window openings and be firmly attached to the building.
- Taping glass does nothing to address the main point of protection, which is to keep the glass intact, in its frame, and securely attached to the structure.
- Are the windows readily accessible within 24 hours of a storm?
- Are extra actions and equipment, such as a ladder or man lift needed to access windows?
- Is the building’s construction compatible with installing pre-mounted anchors and bolts?
- Is there enough storage space for shutters or plywood? (Corrugated shutters should be pre-labeled and stored flat or properly secured to a wall to prevent them from falling over. Plywood should be pre-labeled, predrilled, and stored lying flat.)
- When is it practical to conduct a dry run/installation exercise?



When preparing for an oncoming storm (shown above), be sure there is sufficient staff and time available to install shutters, plywood, or panels.

For additional assistance in choosing the right protection, see the [IBHS Shutter Selection Guide](#). This guide provides a comparison of protection options that include description of products, pros/cons, advance deployment time needed, water resistance, operation, and information about DIY versus professional installation.

Window protection is a key aspect of hurricane readiness and business owners must do their planning, purchasing, and initial preparations well in advance of a storm. Equally important is to apply these protections to all glass windows and doors that link the inside of your business to the outside world. Finally, remember that the only effective window protection is one that is used – this includes activation of shutters, panels, and plywood, and the complete closing of all windows and doors.

In order to determine what may be the best option for a facility, the following considerations regarding advanced deployment are important:

- Is there sufficient staff available and capable of installing shutters, plywood, or panels within 24 hours of an impending storm?