Wind Loads and GFRC

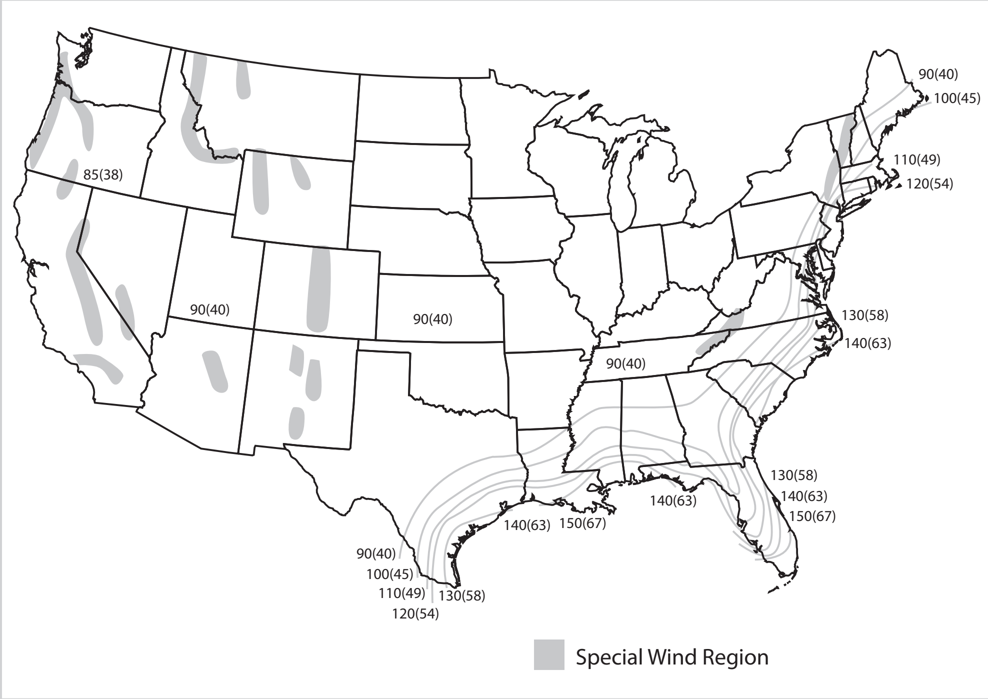
WIND LOADS

We've all seen the damage done by hurricanes, tropical storms, thunderstorms and high winds. Building owners, architects, builders, code officials and insurers are all aware of the need to build strong, wind-resistant structures. Stromberg has a 25-year track record of successful Glass Fiber Reinforced Concrete (GFRC) installations, some of which have been through multiple hurricanes (including a Category 5 hurricane) with no damage other than a few minor scratches from flying debris. Per the International Building Code wind speed map, the highest listed wind speed for all 50 states in the USA is 150 mph. For special applications, Stromberg GFRC components have been designed and tested for wind speeds in excess of 240 mph. The main constraint for wind load resistance in GFRC elements and cladding panels is usually the attachment to the structure. For attachment, metal stud frames can be cast into GFRC panels. Special "flex anchors" are used to attach the GFRC to the light gauge metal stud frames. Other options include threaded inserts, weld plates, wedge anchors and bolts cast into the GFRC. Stromberg's and their engineers will be happy to work with you to design the GFRC system connection that meets your needs.

BUILDING CODES

Stromberg GFRC (Glass Fiber Reinforced Concrete) has proven itself, both in the testing lab and in the real world in Category 5 hurricanes. The International Building Code (IBC) has now been adopted in most areas of the United States. It sets up certain standards of wind resistance. All US building codes use the engineering standard published by the American Society of Civil Engineers, ASCE7 "Minimum Design Loads for Buildings and Other Structures" as the basis for wind load design and calculations.

Both the International Building Code and ASCE7 include a wind speed map. The wind speed map is based on data compiled by the National Weather Service (NWS) from information gathered at airfields around the United States.



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GLOSSARY

INTERNATIONAL BUILDING CODE (IBC)
A model building code developed by the International Code Council. Most of the U.S. has adopted this building code (some areas with minor, locally adopted variations). The wind load provisions in this code specifically calls out the use of ASCE7 in wind load calculations.

ASCE7
The American Society of Civil Engineers design standard: "Minimum Design Loads for Buildings and Other Structures". Section 6 deals with wind loads. ASCE7 is the basis for wind load calculations used by all major building codes. The wind loads calculated by ASCE7 are then used as the basis for the design of our GFRC panels and elements.

DESIGN PRESSURE
The measurement of wind resistance in both positive and negative (suction) forces that a GFRC cladding panel or architectural element must withstand. Design Pressures are usually expressed in both positive (PSF+) and negative (PSF-) values. Also known as design load. Because glass fiber reinforced concrete is often used for three dimensional shapes, calculating the loads on a given GFRC element is usually done by approximation, with a healthy safety factor.

THREE-SECOND GUST
The National Weather Service measurement of wind speed. The data for this measurement is taken from measuring devices set 33' above the ground at airfields across the USA. This data is then compiled into wind maps found in both ASCE7 and the International Building Code. The wind speed maps are based on a yearly 2% probability of occurrence (50-year average peak wind).

SAFETY FACTOR
The margin of safety added to the calculations when designing for Glass Fiber Reinforced Concrete (GFRC) cladding panels or elements.

MEAN ROOF HEIGHT
MRH is the height above grade level of the midpoint of a roof. Mean Roof Height is used as part of design pressure calculations in both ASCE7 and the International Building Code, and is calculated by averaging the roof eave and ridge heights.

WIND VELOCITY
The actual measured speed of airflow, wind velocity is usually expressed in MPH.

WIND LOAD
Pressures placed on a structure or component during a severe weather event. Wind Load is both a positive and negative force depending on the direction of the wind in relation to the orientation of the structure. GFRC components should be designed and anchored to withstand both the positive pressure, and the suction.

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NOTES:

1. Values are nominal design three-second gust wind speeds in miles per hour (m/s) at 33 ft (10 m) above ground for Exposure C category.

2. Linear interpolation between wind contours is permitted.

3. Islands and coastal areas outside the last contour shall use the last wind speed contour of the coastal area.

4. Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions.

Wind Speeds in other areas in mph (m/s) are: Hawaii 105 (47) Puerto Rico 145 (65) Guam 170 (76) Virgin Islands 145 (65) American Samoa 125 (56)