

"Brick, Block & Beers" is a quarterly structural masonry Q&A hosted by Masonry Association of Florida's Don Beers, PE, GC.

# BRICK, BLOCK & BEERS

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Why does masonry perform so much better than other light frame products during high-wind events, such as hurricanes and tornadoes?



## Masonry's Many Strengths : Don Beers, PE, GC

Long time South Florida residents who have weathered a severe hurricane often express a heartfelt thankfulness that they were in a concrete masonry structure. Structures built of many lesser products have weathered hurricanes but block homes provide the secure comfort of rock solid construction. This is not just anecdotal—its common sense. After reading this article perhaps you will have a better understanding of concrete masonry's built in strength.

It's all about the "safety factor". Simply stated the "safety factor" is the difference between what engineers expect will be the largest wind load a structure will ever be exposed to --- and the wind load that they calculate would rip the structure apart. Structural engineers always like a good safety factor – usually around 3 times or 300%. Poor construction and material deficiencies erode safety factors but if you have sufficient safety factor there is some room for error.

Light framing such as wood or light gauge steel fight hard for sufficient safety factors to meet the required codes which specify what those factors will be. One of the reasons is weight. If your structure is light then it is completely dependent on how each individual member connects to the member next to it. The weight of concrete and block decreases the connection strength necessary to hold everything together. That is because its heavy, compact nature makes it more stable in high winds.

Individual connectors such as nails or screws are the next stumbling block to light frame safety factors. Wood has a high strength to weight ratio – which is a positive. The problem comes in trying to connect the hundreds and hundreds of individual wood pieces together in a typical home. A tree branch can be very strong – but if you saw it off you will have a real problem on your hands to nail it back on to its original strength. Individual nails and screws have a relatively low connecting strength of 100 to 200 pounds where the connections between members may require 1000 or 2000 pounds of connection. Dozens of nails may be required for a single connection. The reserve strength of concrete and masonry is in steel reinforcing bars. The most typical bar used in residential block construction is a #5 bar (5/8" diameter). The allowable connecting strength of a single #5 bar is 9920#. This is not a special bar, it is the typical bar used everywhere. A connection requiring 1000# of connecting force would have a safety factor of almost 10 with the use of a single standard #5 connector.

It is a legitimate question to ask if higher safety factors – beyond minimum code requirements – make a difference in hurricane and tornado damage levels. The answer is a resounding yes. All structural types incur damage during major storm events. But the percentage of damaged structures of a particular construction type and the severity of that damage is clearly related to safety factor. This fact is being recognized in the current push for resilient structures. Code officials and community governments across the Country are recognizing the value of a little extra safety factor in reducing catastrophic storm damage. Many Florida residents have learned that lesson well and insist on concrete masonry for added piece of mind.

## Additional Resources

- NCMA Structural Design Software  
<http://ncma-br.org/sw-nbs.asp>
- 35% increase in Concrete Masonry Strength  
<http://bit.ly/2no94iK>
- CA Website on Enhanced Resilience  
<http://www.cement.org/advocacy/codes/structural-design/enhanced-resiliency>

## Attend the \*Live\* Webinar

### Masonry vs. Hurricanes & Tornadoes (1 Hour CILB & FBPE)

April 18, 2017 @ 11:00 AM - 12:00 PM

To register: <http://bit.ly/2nocO3P>

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