

# **The Masonry Advantage**



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## **The Masonry Advantage**



### **Forum Educates for Resilient Construction**

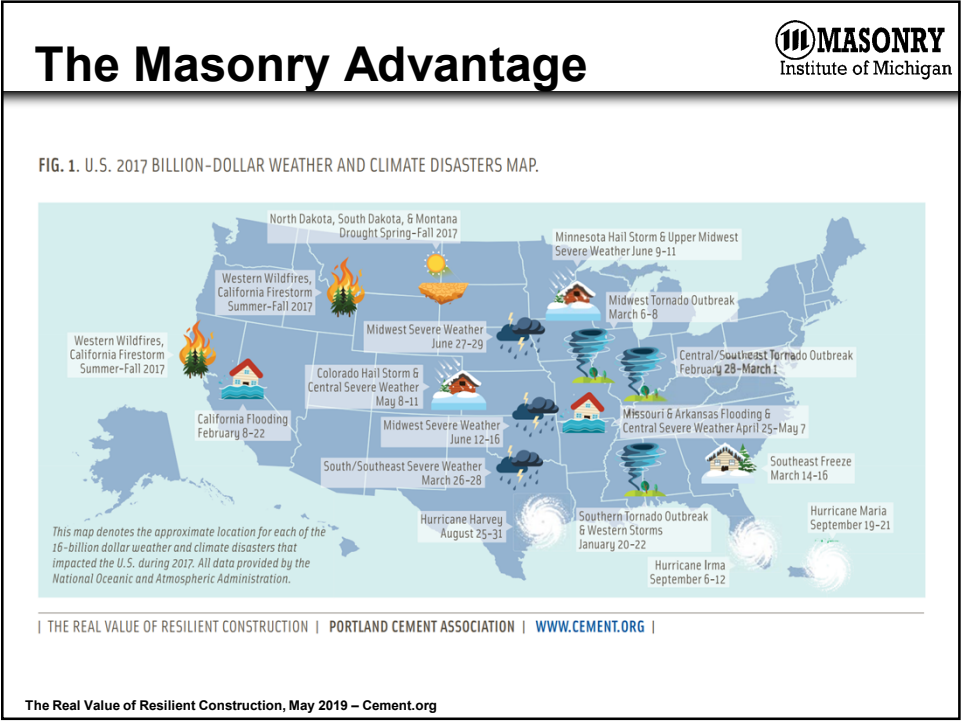
**The event also served as the launchpad for the Coalition's new Make America Resilient Again (MARA) campaign, aimed at ensuring resiliency standards are prioritized when designing the future of U.S. infrastructure. View the Make America Resilient Again [VIDEO](#).**

NCMA eNews June 15, 2017 - <https://forum.buildstrongamerica.com/>

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TABLE 1: COMPARISON OF RESILIENCE CHARACTERISTICS BY STRUCTURAL SYSTEM

Structural system	Resistant to penetration by wind-borne debris	Non-combustible (2-4-hour fire resistance)	Resistant to storm surge	Flood resistant	Mold and pest resistant
Cast-in-place concrete (CIP)*	✓	✓	✓	✓	✓
Precast concrete*	✓	✓	✓	✓	✓
Tilt-up concrete*	✓	✓	✓	✓	✓
Insulating concrete forms (ICF)*	✓	✓	✓	✓	✓
Concrete masonry units (CMU)*	✓ (grouted & reinforced)	✓	✓	✓	✓
Insulated Concrete panels (ICP)*		✓ (requires noncombustible finish)		✓	✓
Wood frame		For 2-hr, code requires 1-2 layers of Type X drywall		Damaged by moisture	
Manufactured wood/mass timber		For 2-hr, code requires 1-2 layers of Type X drywall	✓	Damaged by moisture	✓

\*Concrete systems are assumed to be reinforced, properly designed and detailed with specified concrete compressive strength of 2500 to 4500 psi (17 to 31 MPa) for low-rise and residential construction and 6000 psi (42 MPa) for mid-rise up to 10 stories

\*\*Manufactured wood includes cross-laminated timber (CLT), nail-laminated timber (NLT), glulam, etc.

The Real Value of Resilient Construction, May 2019 – Cement.org

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### PRODUCER PRICE INDICES - COMPETITIVE BUILDING MATERIALS

(BASE: 2009 = 100)

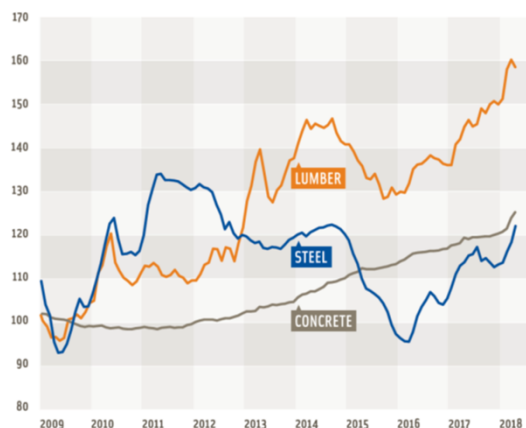


FIG. 4. Cost of lumber has increased more than 50% since 2009 levels. As shown here, lumber prices experience more fluctuations than concrete, which has very stable prices over long time periods, making it easier to estimate construction costs.

The Real Value of Resilient Construction, May 2019 – Cement.org

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## AMERICA IS BURNING

Fires of combustible materials are reducing apartment buildings to ashes and putting lives at risk.

The recent spate of fires in low- and mid-rise structures throughout the country is raising questions and concerns about the safety of wood-frame buildings. It's clear that codes and inspections are failing to keep residents and communities safe. It's time for builders, politicians, developers, fire departments and residents to come together to find the new solutions that embrace non-combustible materials like steel and concrete.

**LYNNWOOD, WA | 1.25.17**  
Two high-rises were simultaneously hit at an apartment complex project, leaving it completely destroyed.  
[NEWS ARTICLE: cny.cnn.com](#)

**LAS VEGAS, NV | 3.27.17**  
A three-story fire raged in a 16-unit wood-frame townhouse apartment building.  
[NEWS ARTICLE: cny.cnn.com](#)

**MADISON, WI | 8.4.16**  
Fire destroys wood-frame four-story apartment building, killing three, causing apartment fire across the state.  
[NEWS ARTICLE: cny.cnn.com](#)

**DETROIT, MI | 8.8.17**  
Fire people die in warehouse fire.  
[NEWS ARTICLE: cny.cnn.com](#)

**CINCINNATI, OH | 8.22.16**  
A three-story fire destroyed a "significant" portion of an apartment building with residents.  
[NEWS ARTICLE: cny.cnn.com](#)

**EDGEWATER, NJ | 1.21.16**  
A massive fire destroyed the multi-story building, leaving apartment complex disabled for 1,000 people. The same building had been down during construction in 2005.  
[NEWS ARTICLE: cny.cnn.com](#)

**MAPLEWOOD, NJ | 2.4.17**  
A fire alarm fire destroyed over 100 units in a newly constructed wood-frame apartment complex.  
[NEWS ARTICLE: cny.cnn.com](#)

**PORTLAND, OR | 8.8.15**  
Fire alarm fire destroyed a four-story wood-frame apartment building under construction. It took 100 firefighters and 1.5 million gallons of water to fight the fire.  
[NEWS ARTICLE: cny.cnn.com](#)

**BRANSON, MO | 12.4.16**  
High fire at hotel resort at a 10-story condo building under construction.  
[NEWS ARTICLE: cny.cnn.com](#)

**BROKEN ARROW, OK | 1.20.16**  
A wood-frame apartment complex off under construction was completely destroyed by fire.  
[NEWS ARTICLE: cny.cnn.com](#)

**KNOXVILLE, TN | 4.10.17**  
Apartment complex fire killed a 3-year-old child and injured the mother while sleeping 30 residents.  
[NEWS ARTICLE: cny.cnn.com](#)

**CAMBRIDGE, MA | 12.4.16**  
A massive fire destroyed a large of a large building housing a university.  
[NEWS ARTICLE: cny.cnn.com](#)

**KANE, PA | 1.3.17**  
A massive fire destroyed a large building housing a university.  
[NEWS ARTICLE: cny.cnn.com](#)

**BALTIMORE, MD | 1.12.17**  
One of the city's deadliest fires in recent history engulfed a wood-frame building, killing a woman and injuring 10 residents.  
[NEWS ARTICLE: cny.cnn.com](#)

**LANHAM, MD | 1.17**  
200 firefighters battled a city-wide fire that destroyed many of the 100 units in the building's four-story apartment complex.  
[NEWS ARTICLE: cny.cnn.com](#)

**SILVER SPRING, MD | 8.19.16**  
A three-story fire destroyed 21 units in an apartment complex.  
[NEWS ARTICLE: cny.cnn.com](#)

**PHOENIX, AZ | 3.18.17**  
Three fires consumed a 3-story office building. The estimated cost of damage could be around \$1 million.  
[NEWS ARTICLE: cny.cnn.com](#)

**GILBERT, AZ | 4.23.16**  
A "monster" fire alarm fire destroyed a wood-frame apartment building under construction.  
[NEWS ARTICLE: cny.cnn.com](#)

**HOUSTON, TX | 3.26.17**  
A fire alarm fire destroyed a wood-frame apartment building under construction.  
[NEWS ARTICLE: cny.cnn.com](#)

**OVERLAND PARK, KS | 3.20.17**  
A fire alarm fire destroyed the newly wood-frame apartment complex at City Plaza Apartments and attached at least 22 nearby homes.  
[NEWS ARTICLE: cny.cnn.com](#)

**EVANS, GA | 6.2.15**  
Marshall Square Retirement Resort, a fully occupied retirement complex was destroyed. One elderly woman died in the fire.  
[NEWS ARTICLE: cny.cnn.com](#)

**RALEIGH, NC | 3.16.17**  
It took 130 firefighters to put out one of the worst fires in the city's history. A building went up in flames and damaged 100 apartment structures.  
[NEWS ARTICLE: cny.cnn.com](#)

**NORFOLK, VA | 2.13.16**  
Northfolk fire department crews began to clear up the morning after a massive fire tore through four condominium and apartment buildings.  
[NEWS ARTICLE: cny.cnn.com](#)

**BUILD WITH STRENGTH**  
A DIVISION OF THE MASONRY INSTITUTE OF MICHIGAN

To learn more, please contact Kevin Lawlor of Build with Strength at [klawlor@buildwithstrength.com](mailto:klawlor@buildwithstrength.com) or 202-253-6402 or visit [BuildwithStrength.com](http://BuildwithStrength.com).

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Institute of Michigan

## Structure Fires

March 2017  
Raleigh, SC

<http://abc11.com/news/monstrous-fire-destroys-building-in-downtown-raleigh/1804792/>

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### Structure Fires

December 2014  
Los Angeles, CA



LA Times — <http://www.trbimg.com/img-54937923/turbine/la-me-in-investigators-conclude-massive-downtown-la-fire-was-arson-20141218>

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### Structure Fires

January 2015  
Edgewater, NJ



<http://newyork.cbslocal.com/photo-galleries/2015/01/21/fire-rages-in-edgewater-n-j/>

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### Wildfires



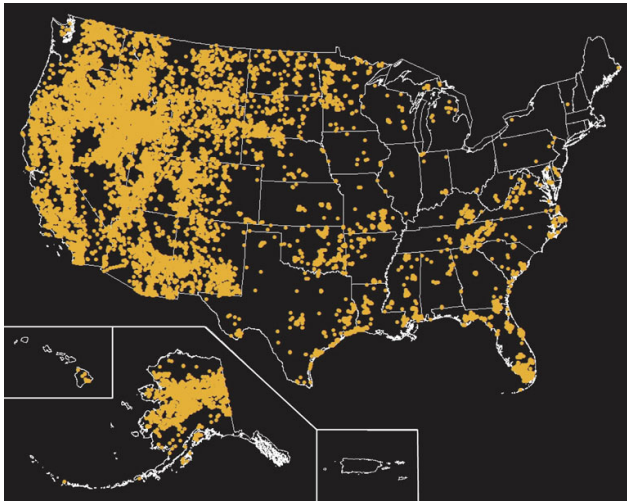
[http://www.denverpost.com/recommended/ci\\_20935254](http://www.denverpost.com/recommended/ci_20935254)

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### Wildfires



[http://www.nasa.gov/centers/goddard/news/topstory/2006/wildfire\\_threat.html](http://www.nasa.gov/centers/goddard/news/topstory/2006/wildfire_threat.html)

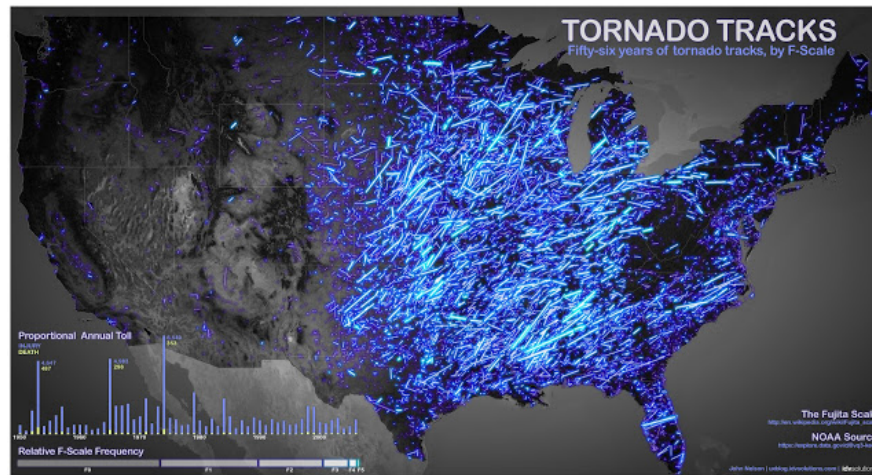
This map shows locations that experienced wildfires greater than 250 acres, from 1980 to 2003.

*Credit: Bureau of Land Management/U.S. Forest Service/U.S. Fish and Wildlife Service/Bureau of Indian Affairs/National Park Service/USGS*

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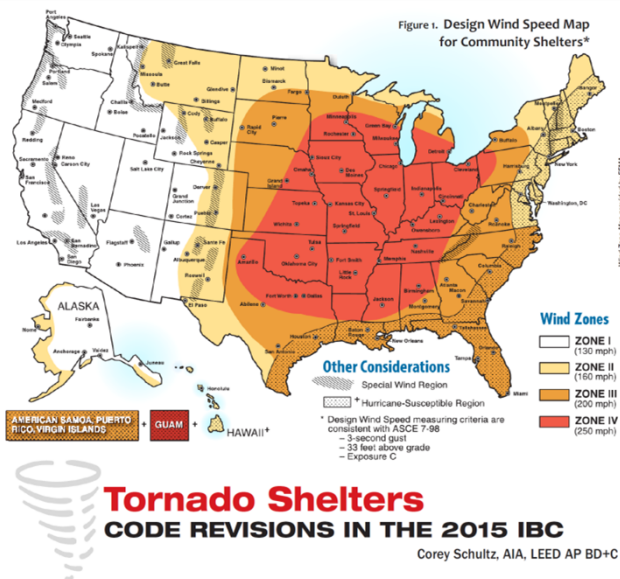
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<http://uxblog.idvsolutions.com/2012/05/tornado-tracks.html>

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Tornado Shelter Code Revisions in the 2015 IBC, Corey Schultz, AIA, LEED AP BD+C, SMART[dynamics of masonry, V2.6 2016]

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## Tornados



<http://www.dailymail.co.uk/news/article-1369737/Joplin-MO-tornado-At-89-dead-twister-cuts-4-mile-swathe-Missouri-town.html>

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[http://www.disastersafety.org/high\\_winds/commercial-high-wind-test-resources/](http://www.disastersafety.org/high_winds/commercial-high-wind-test-resources/)

<http://www.nbm.org/exhibitions-collections/exhibitions/designing-for-disaster.html>

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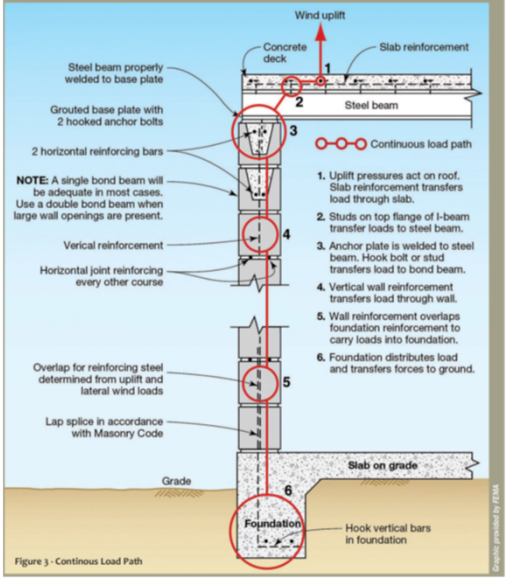
	Common Building	Stronger Building
<b>Amount of Vertical Reinforcement</b>	Contained #4 vertical reinforcement on both sides of openings and in the corners	Added #4 vertical reinforcement at a maximum spacing of 8' on center along all walls
<b>Connection of the bond beam to the vertical wall steel (Primary failure area)</b>	No hook bars extended into the bond beam. The vertical bars were allowed to extend into the bottom of the bond beam 1/4"	90° hook bars extended fully into the bond beam and extended down into the wall to lap with the vertical wall steel
<b>Corner bars for continuity of reinforcement in bond beams around corners</b>	No corner bars were used in bond beams	Corner bars in bond beams were used to fully connect the walls together at the top corners
<b>Bond Beam Depth</b>	Used an 8" deep bond beam at the top of the wall	The bond beam depth was increased to 16" (two courses). Both courses contained (2) #4 bars in the top of each course

Lateral Bracing of Top of Wall, Don Beers, PE, SMART[dynamics of masonry, Vol. 1 No. 4 (2014)]

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**NOTE:** A single bond beam will be adequate in most cases. Use a double bond beam when large wall openings are present.

1. Uplift pressures act on roof. Slab reinforcement transfers load through slab.
2. Studs on top flange of I-beam transfer loads to steel beam.
3. Anchor plate is welded to steel beam. Hook bolt or stud transfers load to bond beam.
4. Vertical wall reinforcement transfers load through wall.
5. Wall reinforcement overlaps foundation reinforcement to carry loads into foundation.
6. Foundation distributes load and transfers forces to ground.

Figure 3 - Continuous Load Path

Tornado Shelter Code Revisions in the 2015 IBC, Corey Schultz, AIA, LEEDAP BD+C, SMART[dynamics of masonry, V2.6 2016]

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### Tornados

Fairborn Primary to be first school in Ohio with tornado shelter to fit 1,200 students.

The building itself will be secure enough to where it will sustain 250 mph winds.



<https://abc6onyourside.com/news/local/fairborn-primary-to-be-first-school-in-ohio-with-tornado-shelter-to-fit-1200-students>

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### Tornados



<http://www.tornadohistoryproject.com/tornado/Michigan/>

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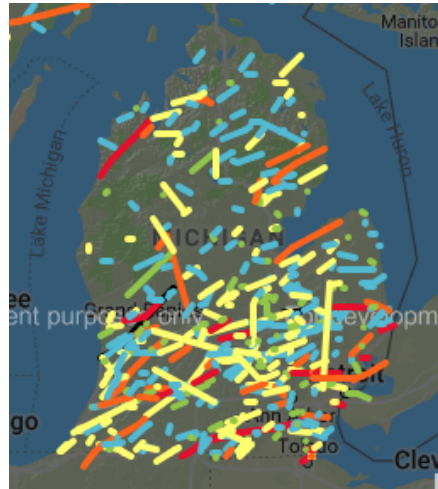
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### Tornados



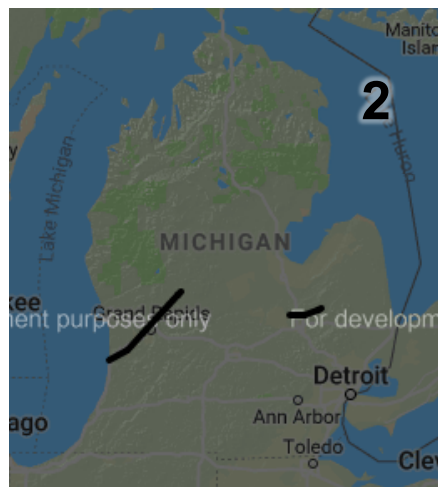
[www.spc.noaa.gov/wcm/#data](http://www.spc.noaa.gov/wcm/#data) and <http://www.tornadohistoryproject.com/tornado/Michigan/>

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### 2 - F5 Tornados



[www.spc.noaa.gov/wcm/#data](http://www.spc.noaa.gov/wcm/#data) and <http://www.tornadohistoryproject.com/tornado/Michigan/>

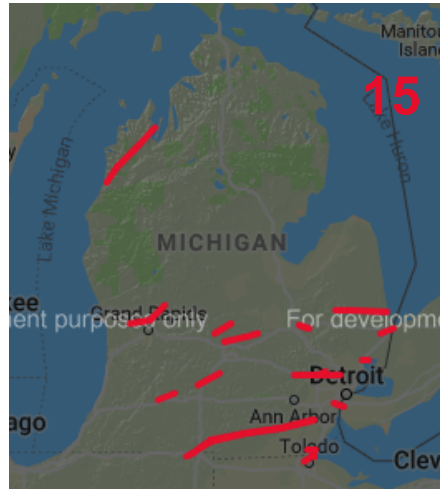
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### 21 - F4 Tornadoes



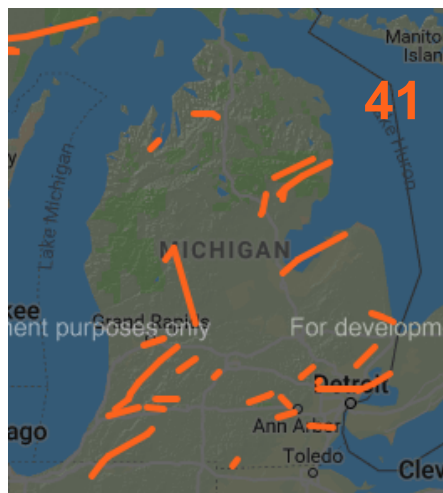
[www.spc.noaa.gov/wcm/#data](http://www.spc.noaa.gov/wcm/#data) and <http://www.tornadohistoryproject.com/tornado/Michigan/>

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### 46 - F3 Tornadoes



[www.spc.noaa.gov/wcm/#data](http://www.spc.noaa.gov/wcm/#data) and <http://www.tornadohistoryproject.com/tornado/Michigan/>

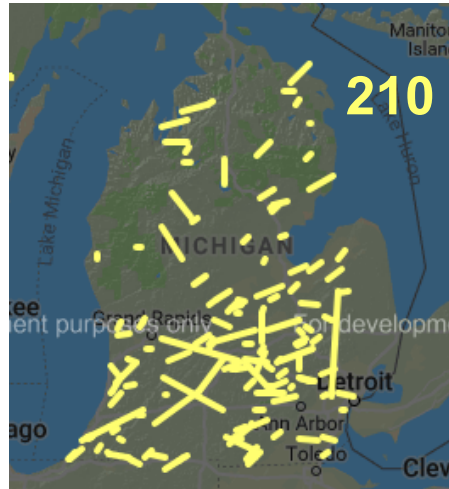
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### 218 - F2 Tornadoes



[www.spc.noaa.gov/wcm/#data](http://www.spc.noaa.gov/wcm/#data) and <http://www.tornadohistoryproject.com/tornado/Michigan/>

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### 418 - F1 Tornadoes



[www.spc.noaa.gov/wcm/#data](http://www.spc.noaa.gov/wcm/#data) and <http://www.tornadohistoryproject.com/tornado/Michigan/>

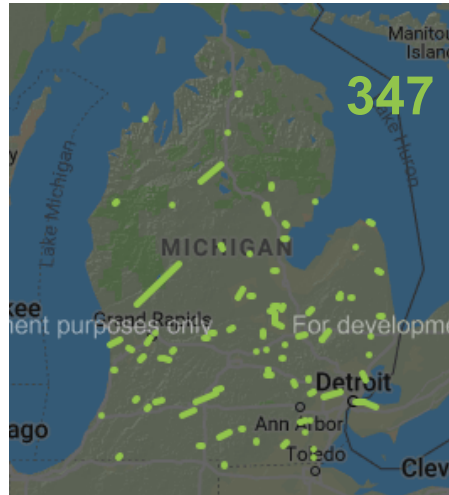
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### 344 - F0 Tornadoes



[www.spc.noaa.gov/wcm/#data](http://www.spc.noaa.gov/wcm/#data) and <http://www.tornadohistoryproject.com/tornado/Michigan/>

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### Tornadoes

F	Number	Fatalities	Injuries
0	347	0	12
1	414	5	127
2	210	16	346
3	41	12	312
4	15	50	1062
5	2	133	1136
<b>TOTAL</b>	<b>1029</b>	<b>216</b>	<b>2995</b>

[www.spc.noaa.gov/wcm/#data](http://www.spc.noaa.gov/wcm/#data)

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### Hurricanes (video)



www.blockstrong.com

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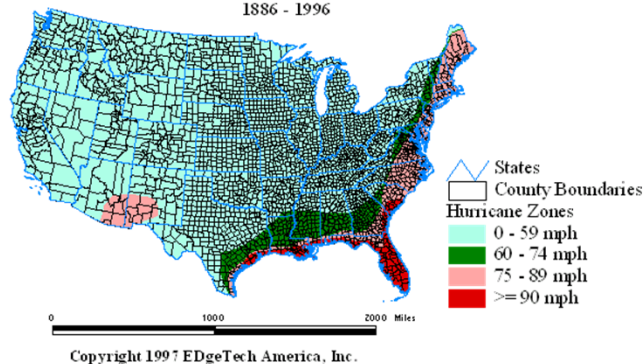
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### Hurricanes

#### Hurricane Winds

1886 - 1996




<http://www.discovergis.com/Map/MapHurriZone.htm>

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### Hurricane Sandy




[http://en.wikipedia.org/wiki/Hurricane\\_Sandy](http://en.wikipedia.org/wiki/Hurricane_Sandy)

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### Hurricane Michael



<https://www.nytimes.com/2018/10/14/us/hurricane-michael-florida-mexico-beach-house.html>

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