Severe Duty Louver Testing & Certifications

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Webinar Moderator

- Joined AMCA in 2017
- Leads development and publication of technical articles, white papers and educational materials.
- Editor-in-chief of the award-winning AMCA *inmotion* magazine.

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- Participation Guidelines:
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  - Questions can be submitted anytime via the GoToWebinar platform and will be addressed at the end of the presentation.
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  - To earn PDH credit for today, please stay clicked onto the webinar **for the entire hour**.
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Q & A

To submit questions:

- From the attendee panel on the side of the screen, select the “Questions” drop down option.
- Type your question in the box, starting with the name of the presenter for whom your question is for.
- Click “Send”.

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Doug Petty

Product Manager – Louvers, AMCA Member Company

- BS in Engineering Technology
- Seven years with a prominent HVAC product manufacturer
- Previous quality and systems engineering experience in the automotive industry

Severe Duty Louver Testing and Certifications

Purpose and Learning Objectives

The purpose of this presentation is to review the different types of severe duty louvers and the testing protocols that pertain to them.

At the end of this presentation you will be able to:

1. Identify what geographic areas are located within the hurricane prone and wind-borne debris regions.
2. Understand the difference between the FEMA guidelines and ICC-500.
3. Describe the different ‘hurricane’-type testing protocols.
4. Understand the difference between ICC-500 impact testing and AMCA-540 impact testing.

Severe Duty Louver Testing and Certifications

MIAMI-DADE COUNTY

amca INTERNATIONAL

Taking Shelter from the Storm

Building a Safe Room for Your Home or Small Business

Includes Construction Plans

FEMA P-320, Fourth Edition / December 2014

FEMA

U.S. DEPARTMENT OF HOMELAND SECURITY

FEMA

UL

Agenda

- Testing, Listing, and Certifying agents
- Hurricane Louvers
- FEMA Grilles
- Severe Weather Testing

Testing, Listing, and Certifying agents

AMCA

Air Movement and Control Association; the main certifying agent for louvers. The most common louver testing protocols, as defined in AMCA 500-L are:

- Pressure Drop
- Airflow
- Water Penetration
- Wind-Driven Rain

They have also recently developed testing protocols for severe weather louvers. They are as follows:

- Impact Resistance (540)
- Hurricane Wind-Driven Rain (550)

Testing, Listing, and Certifying agents

UL (Underwriter Laboratory)

Acts as a third-party testing agent for certain louver testing protocols. Severe duty louvers and grilles are generally listed as Wind-storm rated assemblies and are tested in accordance with one or more of the following:

- ASTM E330
- ASTM E331
- ASTM E283
- ASTM E1996
- AAMA/WDMA/CSA 101/I.S.2/A440
- AMCA 540
- ICC-500
- FEMA guidelines
- TAS tests

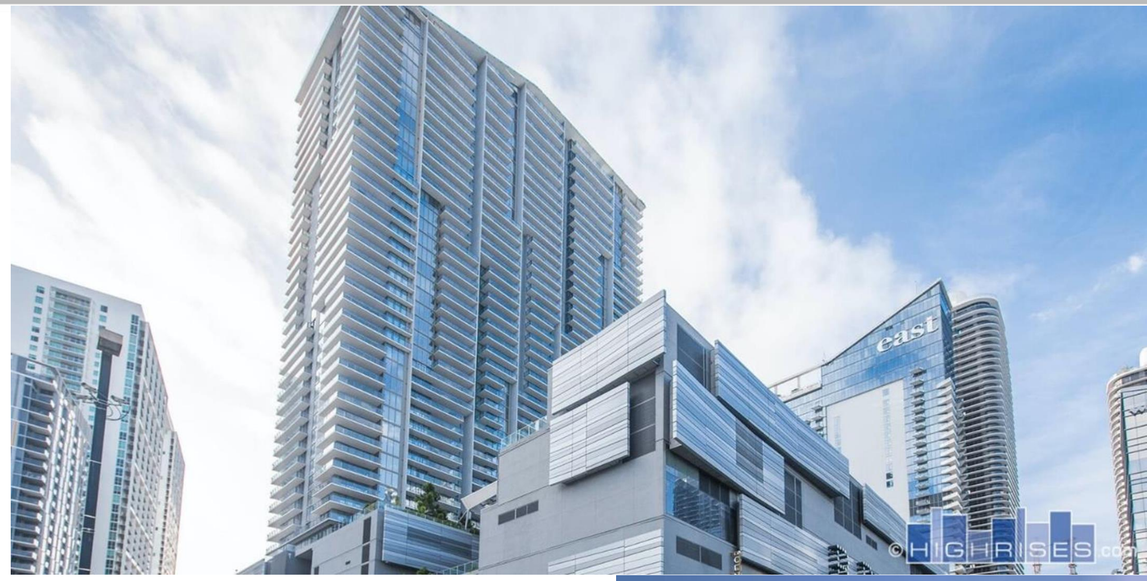
Testing, Listing, and Certifying agents

Others

- **Intertek**– One of the largest testing agents in the US. Used for severe duty testing with louvers.

- **Texas Department of Insurance**– Required for commercial buildings in the Texas Gulf Coast.

Hurricane Louvers



Hurricane Louvers

Hurricane Andrew ravaged much of Florida, and much of the gulf coast, in 1992.

- One of only (5) category 5 hurricanes to make landfall in the US.
- Caused $25.3 billion in property damage ($46.23 billion when adjusted for inflation).
- Resulted in 65 deaths.
- Led to building code reforms intended to strengthen building resilience.

Hurricane Louvers

IBC

- The International Building Code (2018)
- ***1609 – In wind borne debris regions … Louvers protecting intake and exhaust ventilation ducts, assumed to be open that are located within 30 feet of grade shall meet the requirements of AMCA-540.***

IMC

- The international mechanical code (2018)
- ***401.4/501.4 – Louvers that protect air intake/exhaust openings in structures located in hurricane-prone regions, as defined in the International Building Code, shall comply with AMCA-550.***

Hurricane Louvers

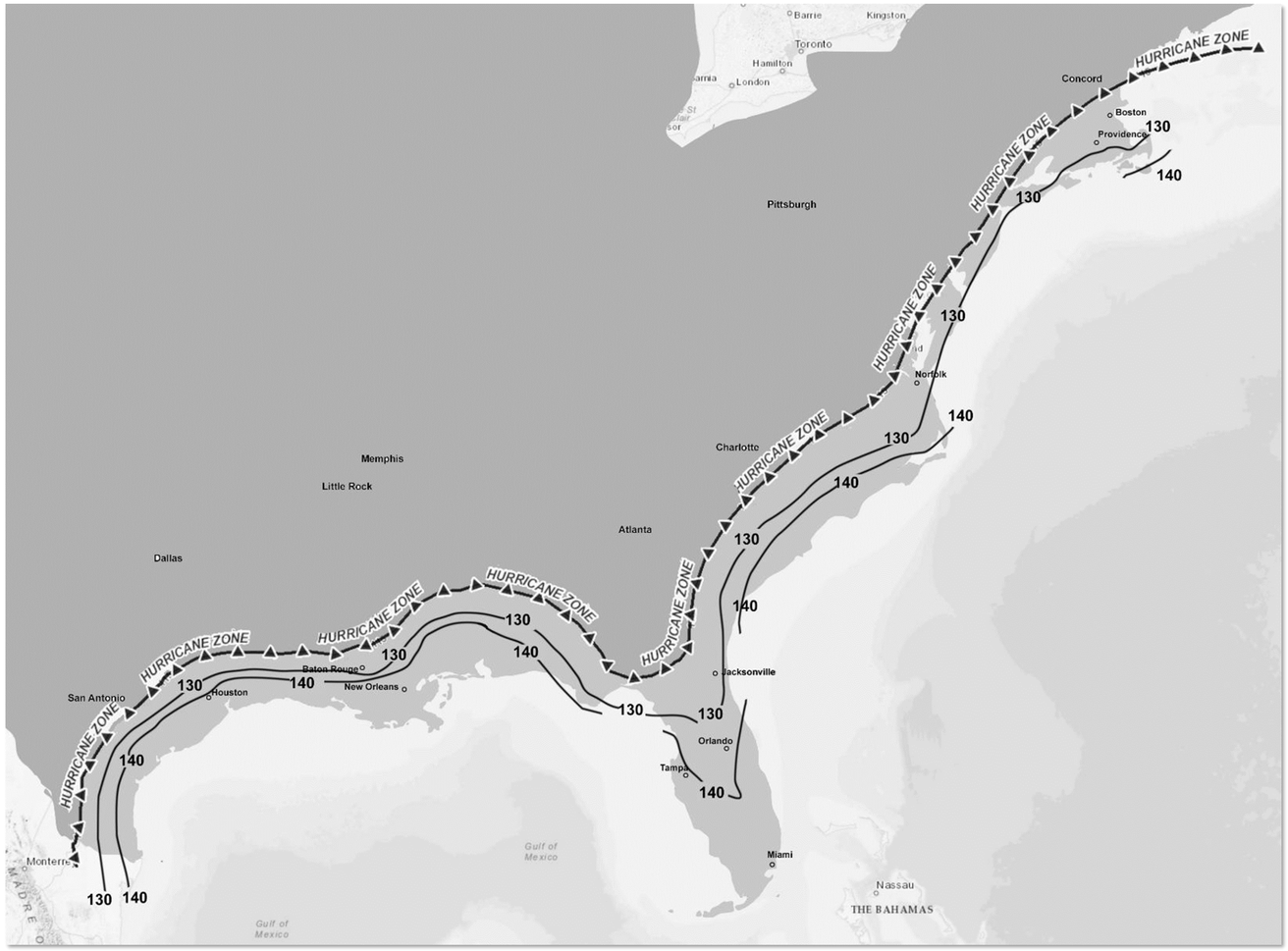
Definitions:

- **Hurricane prone regions**– Defined as any risk category II building along the Atlantic and gulf coast, design wind-load is 115 mph or greater.

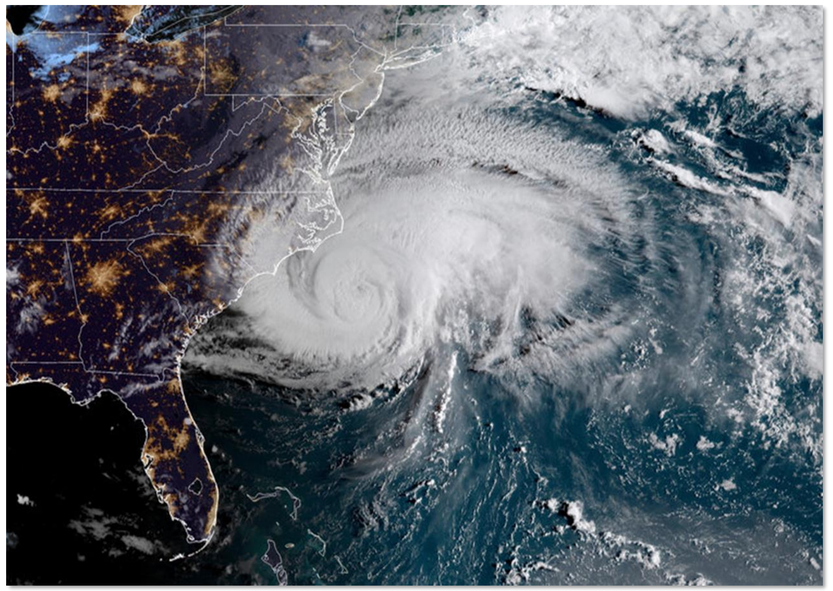
Hurricane Louvers

Definitions:

- **Wind Borne Debris Regions–** Areas within the hurricane prone regions located:
  - Within one mile of the coastal high-water line, where the ultimate design speed is 130 mph or greater.
  - In areas where the ultimate design load is 140 mph or greater.



Hurricane Louvers



Definitions:

- **Miami-Dade County Approved Louvers–** Louvers that have been approved for use in hurricane zones, specifically in Miami-Dade and Broward Counties in Florida. Miami-Dade approved louvers must be tested to several test standards that are designed to simulate severe weather conditions.
  - TAS Tests
  - AMCA 550
  - Higher than ‘standard’ wind loading

- **Florida Building Code Approved Louvers–** Louvers that have been approved for use in the state of Florida. Florida utilizes their own building codes that are based on the IBC.
  - AMCA 540
  - AMCA 550
  - Higher than ‘standard’ wind loading

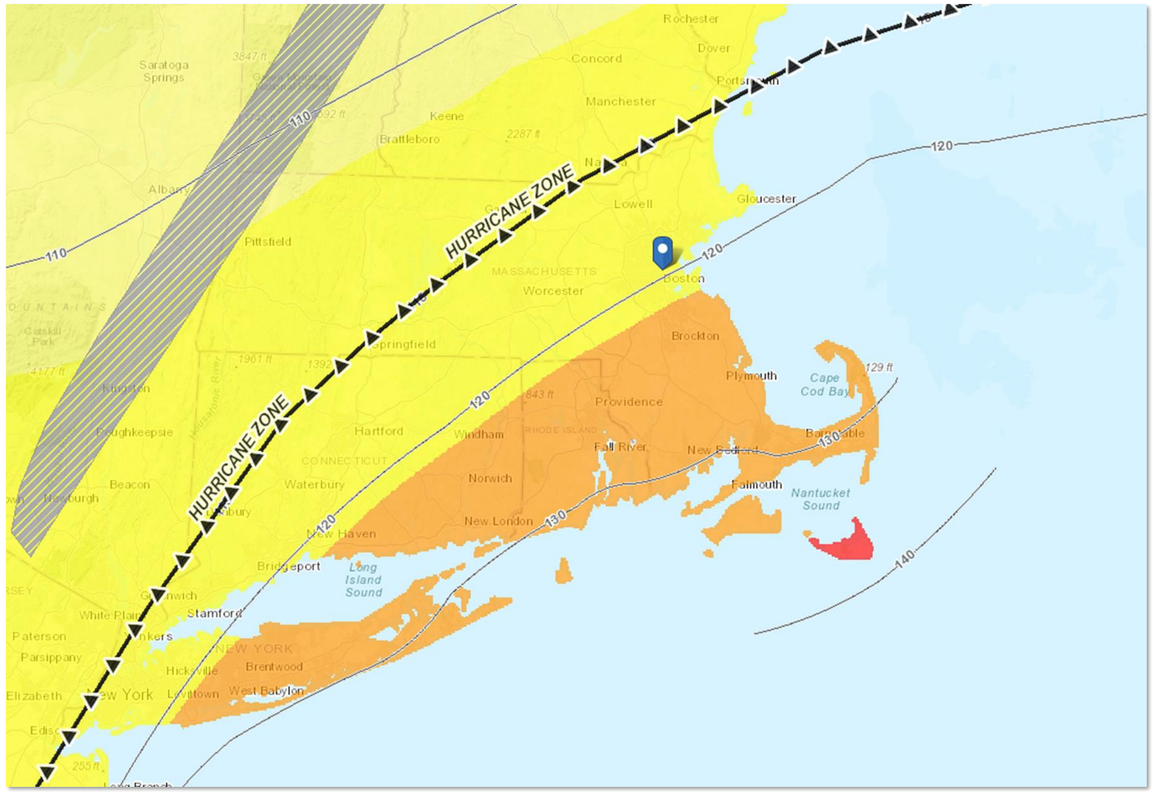
All ‘MD’ louvers are ‘FBC’ listed, but not all ‘FBC’ louvers are ‘MD’ listed.

MIAMI-DADE COUNTY

Hurricane Louvers

Example- Massachusetts

- According to Dodge Analytics, there were 626 biddable jobs in 2019 that had ‘louvers’ in the specifications or drawing package. Of those, 533 were in counties located in the Hurricane Prone Region.



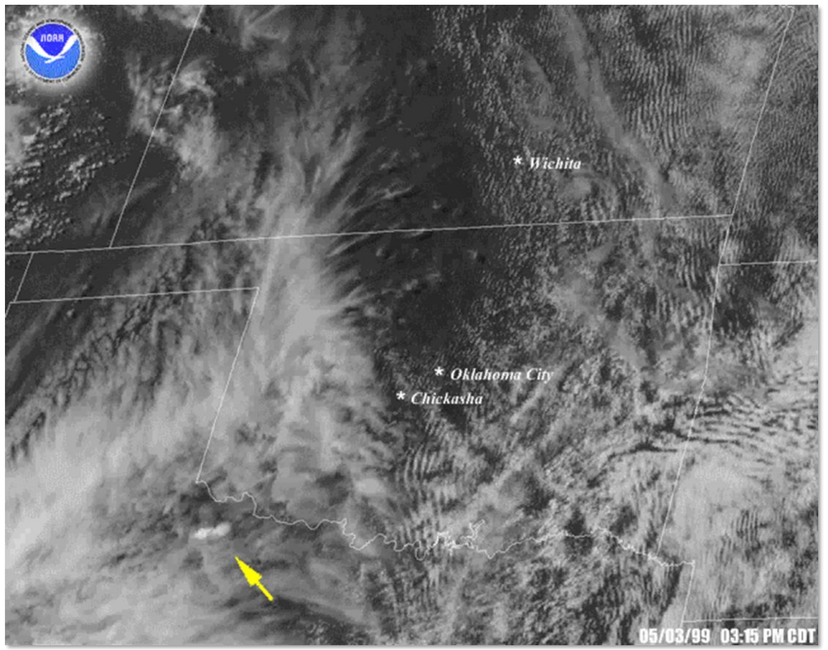
FEMA Grilles

FEMA

FEMA Grilles

Destructiveness of Tornados

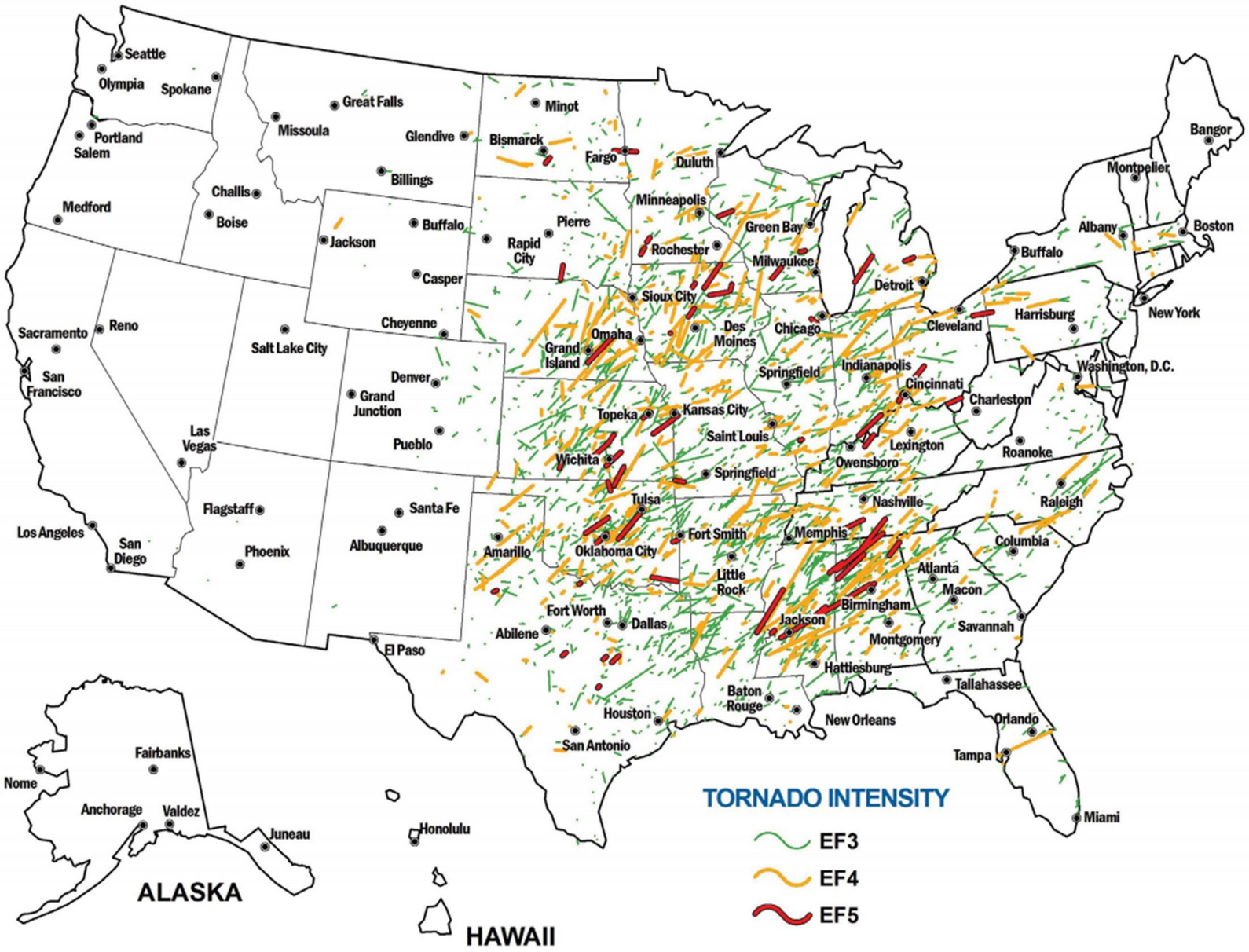
- Since the National Weather Service began record-keeping in 1950, there have been 5,600 fatalities due to tornados.
- The single deadliest tornado to date occurred on May 22, 2011, which resulted in 161 fatalities.
- Since the National Weather Service began keeping records, the fatalities resulting from tornados have been greater than those resulting from hurricanes and earthquakes combined.



FEMA

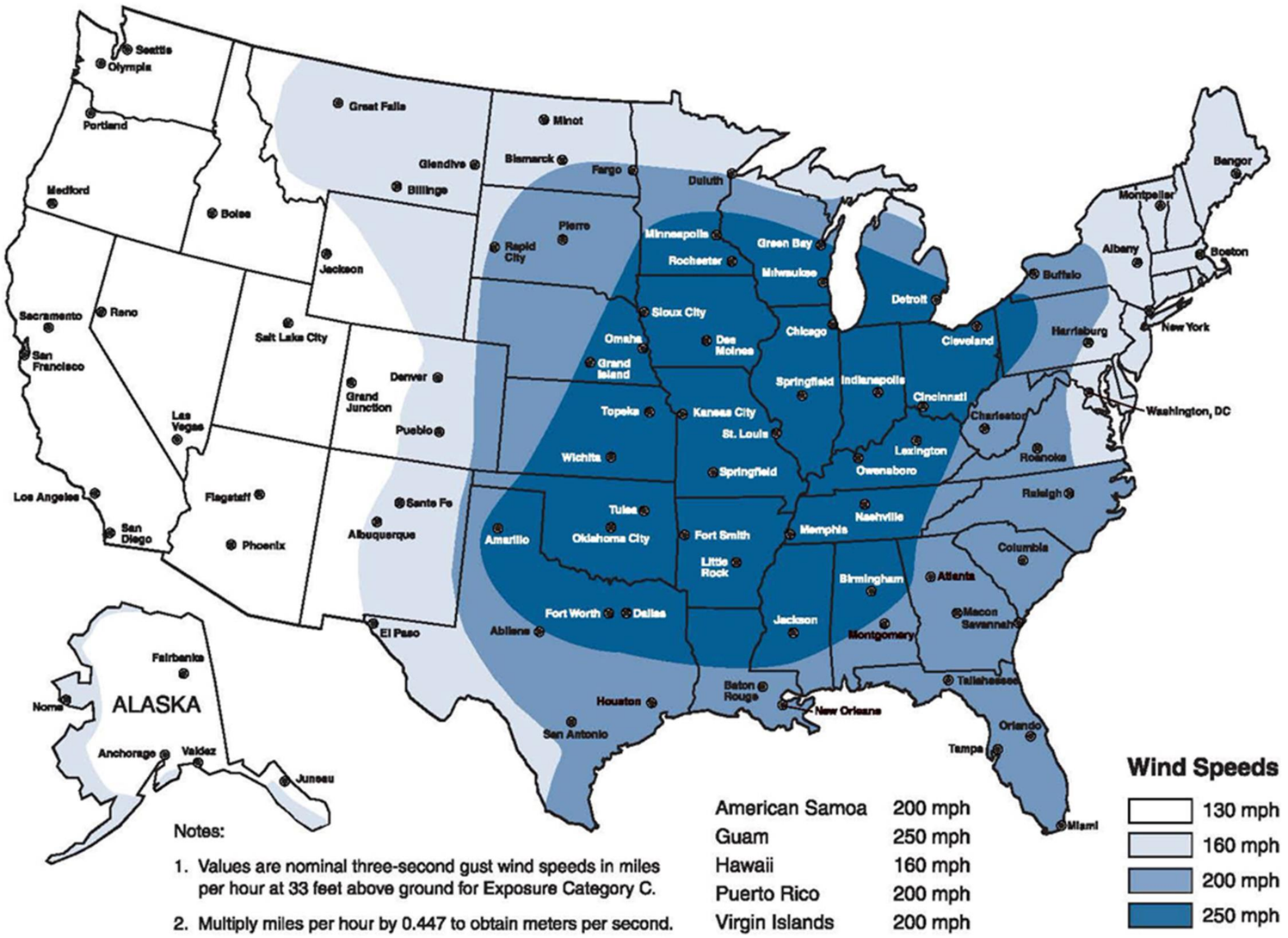
FEMA Grilles

Recorded EF3, EF4, and EF5 tornados from 1950-2013



FEMA Grilles

The 250-mph wind zone encompasses 22 states

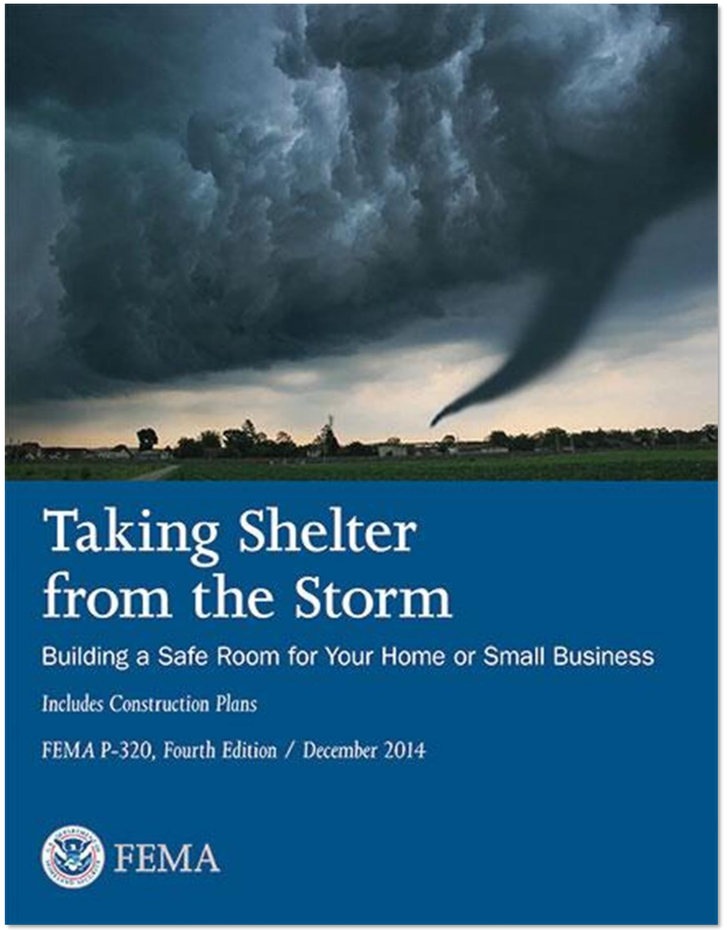


FEMA 320

FEMA 320:

- First published in 1999 and was intended to provide best practices for the construction of safe rooms. It also provides recommendations for emergency management.

- Intended to be used for residential or small business (Less than 16 occupants).



FEMA

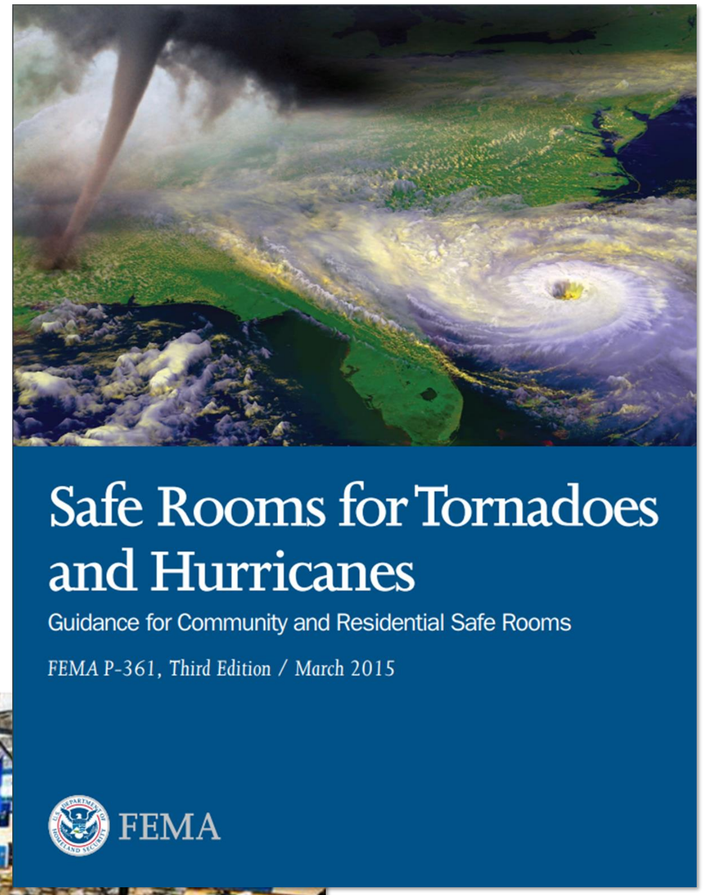
FEMA 361

FEMA 361:

- First published in 2000 and was intended to provide best practices for the construction of safe rooms. It also provides recommendations for emergency management.

- Intended to be used for community shelters (More than 16 occupants).

- Used as basis for ICC-500



FEMA/ICC-500

ICC 500:

- First published in 2008, used FEMA 361 to standardize and codify the construction of tornado and hurricane shelters.
- Per ICC-500 the following structures must include a storm shelter when located in the 250-mph wind speed zone:
  - 911 call stations
  - Emergency operation stations
  - Fire, rescue, and ambulance stations
  - Police stations
  - K-12 school buildings with a capacity of 50 or more occupants

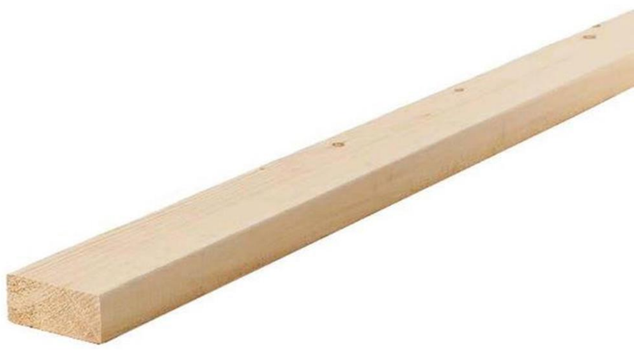
ICC
INTERNATIONAL CODE COUNCIL®

Severe Weather Testing

Severe Weather Testing

TAS-201: Large Missile Impact

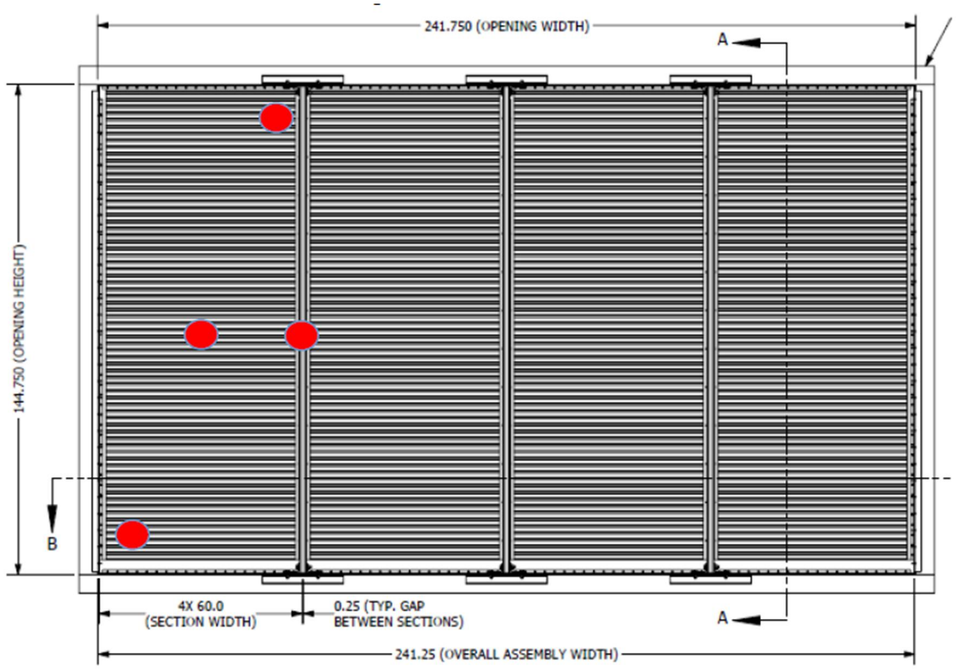
- Simulates a louver's ability to withstand impacts from wind borne debris.
- Testing consists of firing a 9-pound, 2 x 4 traveling at 50 feet per second (34 mph) at the specimen. Manufacturers test their largest specimen against several impacts to gain the certification.



Severe Weather Testing

AMCA 540: Large Missile Impact

- Like TAS-201, this test simulates a louver's ability to withstand impacts from wind borne debris.
- Testing consists of firing a 9-pound, 2 x 4 traveling at 50 feet per second (34 mph) at the specimen for Basic Protection, and 80 feet per second (55 mph) for Enhanced Protection. In addition to testing their largest spans, AMCA 540 also requires the testing of the smallest louver size to be offered.



amca INTERNATIONAL LISTED

IMPACT
RESISTANT
LOUVER
Basic Protection Level D

See www.AMCA.org for all certified or listed products

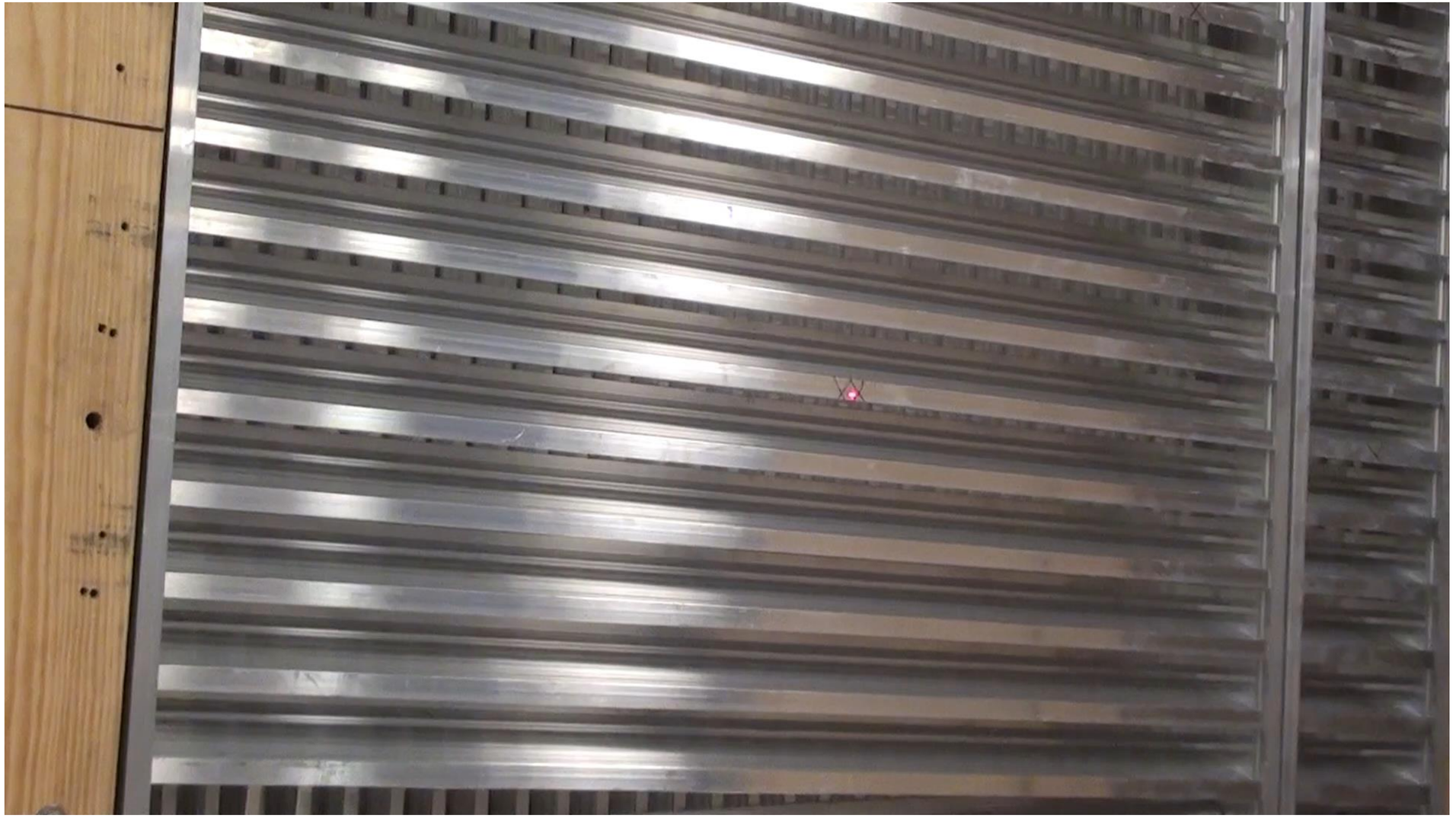
This label does not signify AMCA airflow performance certification.

Severe Weather Testing

Large Missile Impact Test

Test Standard	AMCA 540 Basic	AMCA 540 Enhanced	TAS 201
Missile Material	2 x 4 Timber	2 x 4 Timber	2 x 4 Timber
Missile Weight	9 lbs.	9 lbs.	9 lbs.
Velocity of Missle	34 mph	55 mph	34 mph
Minimum Sample Size	Smallest section to be offered	Smallest section to be offered	NA
Maximum Sample Size	Maximum unsupported blade span x Maximum height	Maximum unsupported blade span x Maximum height	Maximum unsupported blade span x Maximum height

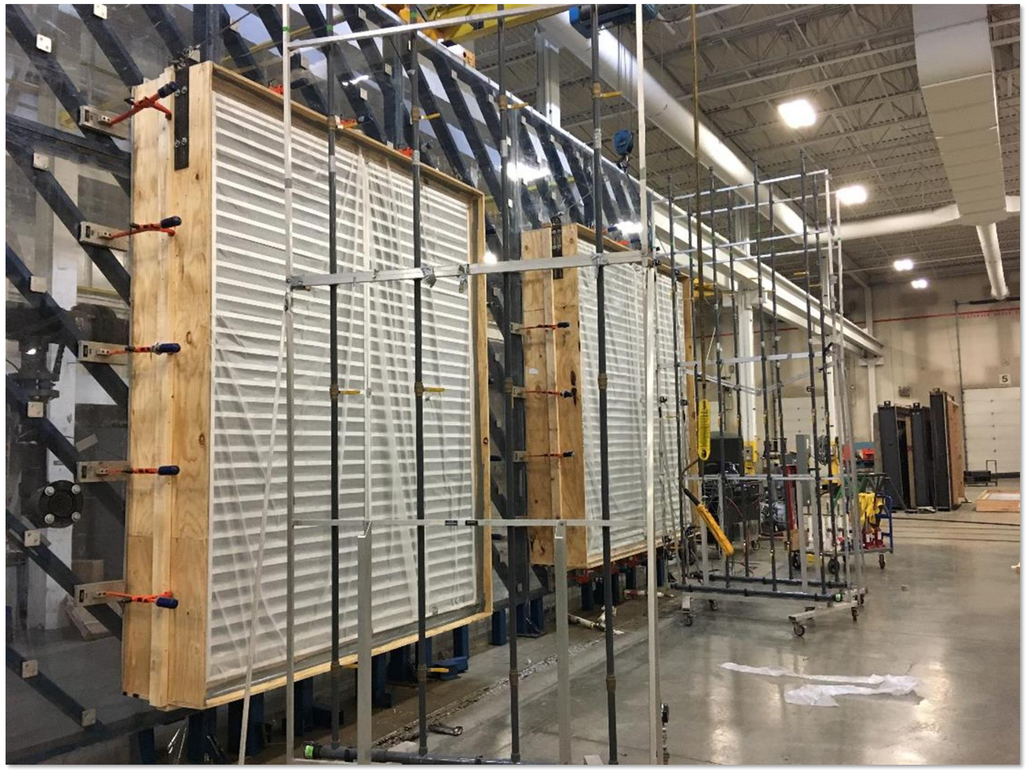
Severe Weather Testing- Large Missile Impact Video



Severe Weather Testing

TAS-202: Uniform Static Air Pressure Test

- Simulates a louver's ability to resist pressure from hurricane force winds.
- Testing consists of subjecting the louver to both positive and negative pressure for 60 seconds. They are tested at 75%, 100%, and 150% of the product's design load. Passing the test is dependent on the louvers ability to resist deflection and retain integrity.



Severe Weather Testing

TAS-203: Uniform Cyclic Air Pressure Test

- Simulates a louver's ability to withstand repeated hurricane force wind gusts.
- Testing consists of subjecting the louver to 671 five second maximum cycles ranging from 1/2 design load, to 1.3 times the design load.
- Is a requirement for any louver intended to be Miami-Dade Certified.
- TAS-203 is required if the specimen will be listed as TAS-201, and the TAS-203 test is always performed after the impact tests.

Test Load vs. Design Load	Positive Pressure Cycles	Negative Pressure Cycles
0 to 0.6	300	50
0.2 to 0.5	3500	335
0.5 to 0.8	600	1050
0.3 to 1.0	100	50
1.3	1	1

Severe Weather Testing

High Velocity Wind Driven Rain

Qualifies louver's ability to prevent water penetration under severe rainfall and hurricane force winds.

Test Conditions: AMCA 550/TAS100A

- 48" x 48" Sample
- Rainfall Rate = 8.8 Inches/Hour
- Duration = 15 Minutes
- Louvers that protect air openings in hurricane prone regions must comply with AMCA 550, per FMC.
- No more than 1% of the overall sprayed amount of water can penetrate the louver for a successful test.
- Wind Speed & Water Penetration
  - 35 mph
  - 70 mph
  - 90 mph
  - 110 mph

The most difficult of the severe weather tests to pass. The only louver models approved are either vertical blade units or 'dual-module' units. There are some horizontal models approved, but they stipulate that a control damper must be in the closed position behind the louver.

Severe Weather Testing- AMCA 550 Test Video

HIGH VELOCITY RAIN
RESISTANT WITH BLADES
FULLY CLOSED AND
IMPACT RESISTANT LOUVER
Enhanced Protection Level E
See www.AMCA.org for all certified or listed products

This label does not signify AMCA airflow performance certification.

HIGH VELOCITY RAIN
RESISTANT WITH BLADES
FULLY OPEN AND
IMPACT RESISTANT LOUVER
Enhanced Protection Level E
See www.AMCA.org for all certified or listed products

This label does not signify AMCA airflow performance certification.

Severe Weather Testing

ICC-500 Testing

- Much more stringent than the hurricane louver testing
- Most manufacturers test the 250-mph protocol
- Unlike the other impact testing protocols, no debris or splinters are permitted to penetrate behind the louver – For this reason the grilles are tested with screens and must be built with screens to keep its ratings.

TABLE 305.1.1
SPEEDS FOR 15-lb SAWN LUMBER 2 × 4 MISSILE FOR TORNADO SHELTERS

DESIGN WIND SPEED	MISSILE SPEED AND SHELTER IMPACT SURFACE
130 mph	80 mph Vertical Surfaces 53 mph Horizontal Surfaces
160 mph	84 mph Vertical Surfaces 56 mph Horizontal Surfaces
200 mph	90 mph Vertical Surfaces 60 mph Horizontal Surfaces
250 mph	100 mph Vertical Surfaces 67 mph Horizontal Surfaces

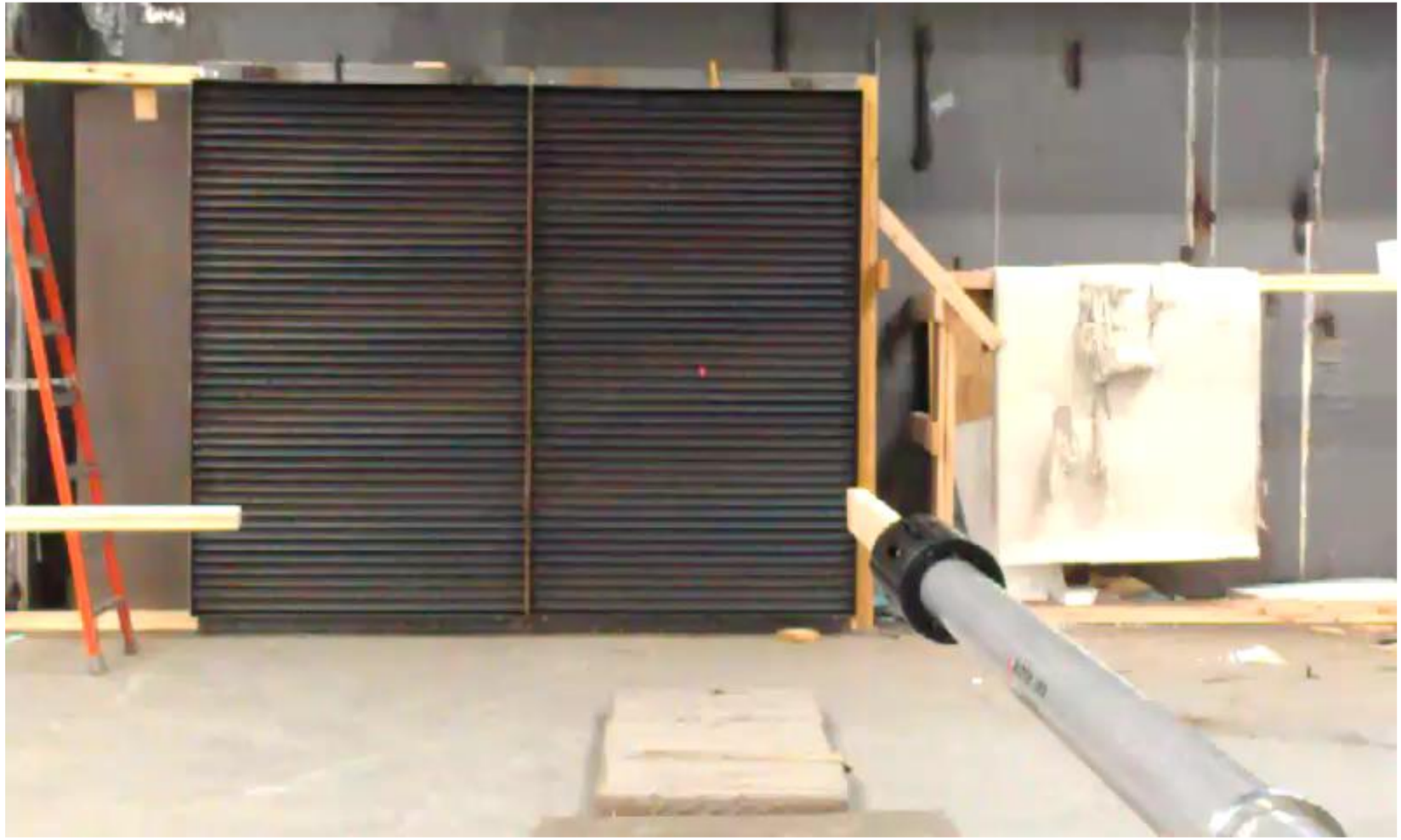
For SI: 1 mile per hour = 0.447 m/s.

Severe Weather Testing

ICC-500-2014
Impact Test

Severe Weather Testing

ICC-500-2014
Impact Test



Severe Weather Testing

ICC-500-2014
Pressure Test

Resources

- **AMCA International**: *www.amca.org*
- **2019 AMCA *inmotion* Magazine:** *http://bit.ly/AMCAinmotion2019*
  - **>** Improving Building Resilience with Severe-Duty Louvers
- **AMCA Standards** (Available for purchase)**:** *www.amca.org/store*
  - > **500-L-12:** Laboratory Methods of Testing Louvers
  - > **540-13:** Test Method for Louvers Impacted by Wind Borne Debris
  - > **550-15:** Test Method for High Velocity Wind Driven Rain Resistant Louvers
- **AMCA White Papers:** *https://www.amca.org/educate/ #articles-and-technical-papers*
  - **>** Understanding the ANSI/AMCA Standard 500-L Tests

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PDH credits and participation certificates will be issued electronically within 30 days, once all attendance records are checked and online evaluations are received.

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Questions?

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- Tuesday, July 14
- 12:00-1:00pm CDT
- ***TOPIC: Density Calculations: Calculating Density For Use In Fan Systems***
- Presenter: William Howarth, AMCA Consultant

>> For additional webinar dates go to: *www.amca.org/webinar*