



High Wind Testing and Certification on Fans

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- Leads development and publication of technical articles, white papers and educational materials.
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Q & A

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- Six Sigma Black Belt
- Over 20 years experience in all phases of manufacturing, and international program management



High Wind Testing and Certification on Fans

Purpose and Learning Objectives

The purpose of this presentation is to provide a basic understanding of the process for High Wind certification on Roof Mechanical Equipment such as Fans.

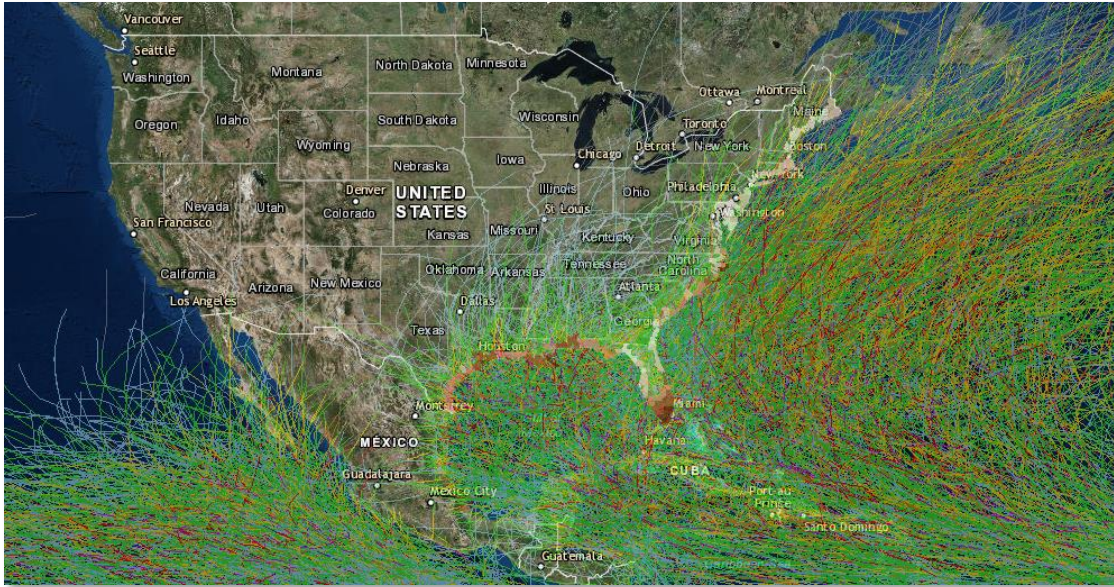
At the end of this presentation you will be able to:

1. Explain the test protocols required for High Wind Hurricane Zone Certification.
2. Outline the guidelines for wind loads established by the Florida Building Code.
3. Identify the characteristics and relevant information in a product NOA.
4. Correlate equipment design pressure specification to wind load requirements.

Agenda

- Why High Wind Certification?
- Test Protocols
- Main Regulatory Agencies
- What to look for on a NOA
- Wind Loads and Design Pressure
- Curbs and Roof Anchoring
- Q&A

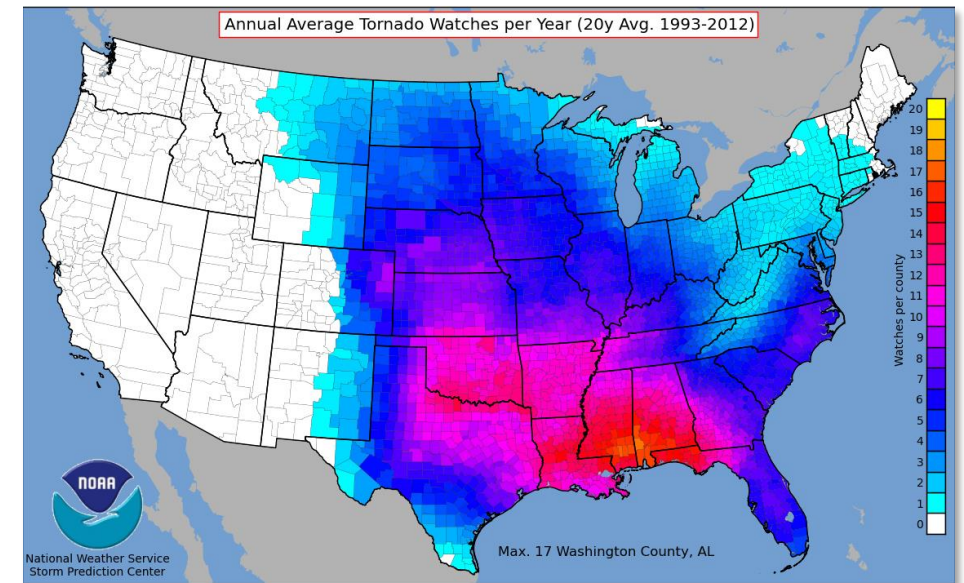
Why High Wind Certification?



Historical Hurricane Tracks

Source: oceanservice.noaa.gov

- Causes of damage from a Hurricane/Storm:
 - Wind-borne debris
 - Forceful winds



Annual Average Tornado Watches

Source: spc.noaa.gov

Test Protocols

- **High wind testing done according to Florida Building Code**
 - Developed and maintained by the Florida Building Commission
 - Nine main volumes
 - Test Protocols for High Velocity Hurricane Zone
 - Updated every three years
 - Current: *Florida Building Code*, 7th Edition (2020)
- **Checklist #0463 for the approval of Rooftop Mechanical Equipment** (Revised: 9-1-12)
 - Testing Application Standard (TAS) 201-94
 - Covers procedures for conducting the impact test of materials
 - Testing Application Standard (TAS) 202-94
 - Covers procedures for conducting a uniform static air pressure test for materials and products
 - Testing Application Standard (TAS) 100(A) – Optional
 - Covers the determination of the water infiltration resistance of a soffit ventilation and a continuous or intermittent ridge area ventilation system

Testing Application Standard (TAS) 201-94

- Larger Missile Impact Test procedure
- To determine sufficient resistance to wind-borne debris
- This test employs launching a 2" x 4" dry Southern Pine beam (about 8' long).
- Missile shot from an air cannon @ 50 feet per second
 - Section 1626.2.4 of the *Florida Building Code, Building*
- Damage to not exceed specific tolerances per Section 1626.2.8
 - No crack forming longer than 5" inches and $\frac{1}{16}$ " wide through which air can pass.
 - Fasteners, when used, shall not become disengaged during test procedure.

Testing Application Standard (TAS) 201-94 Demo



Unit Impact Demo



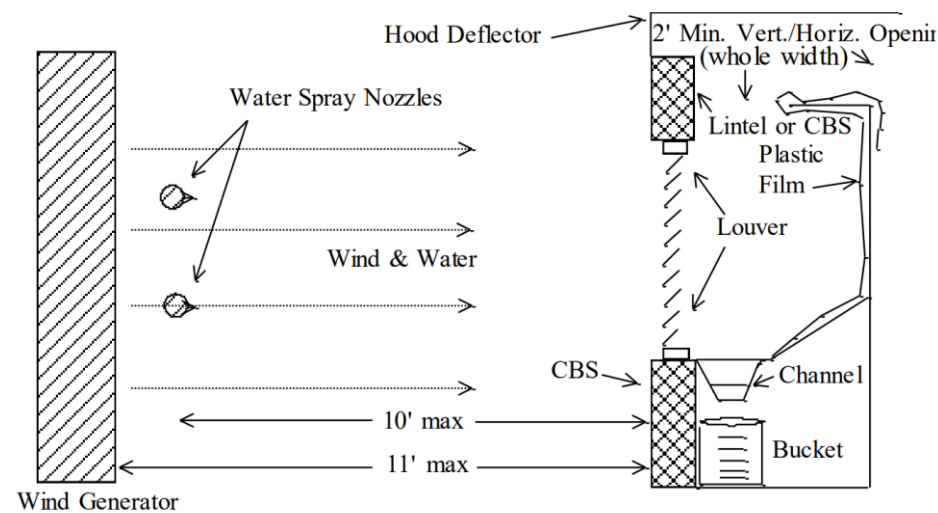
Curb Impact Demo

Testing Application Standard (TAS) 202-94

- Uniform Static Air Pressure Test
- To determine sufficient resistance to wind forces
- This test employs a sealed pressure envelope both inside and outside the test product
 - Both positive and negative pressure tests.
- Product needs to provide enough resistance to wind forces as required by Section 1620
 - Wind velocity (3-second gust) used in structural calculations shall be as follows:
 - Miami-Dade County
 - Risk Category I Buildings and Structures: 165 mph
 - Risk Category II Buildings and Structures: 175 mph
 - Risk Category III Buildings and Structures: 186 mph
 - Risk Category IV Buildings and Structures: 195 mph
 - Wind loads on rooftop equipment and other structures shall be in accordance with Chapter 29 of ASCE 7

Testing Application Standard (TAS) 100(A)

- Wind Driven Rain Test (optional)
- To determine water infiltration resistance using simulated rainfall
- This test is optional on fans (checklist #0463) but a "must" on other products, like louvers.



Main Regulatory Agencies

- **Miami-Dade County**

- Department of Regulatory and Economic Resources
- Issues Notice of Acceptance (NOA #)



- **Florida Building Commission**

- Department of Business and Professional Regulation
- Issues Product Approvals (FL#)



- **Texas Department of Insurance**

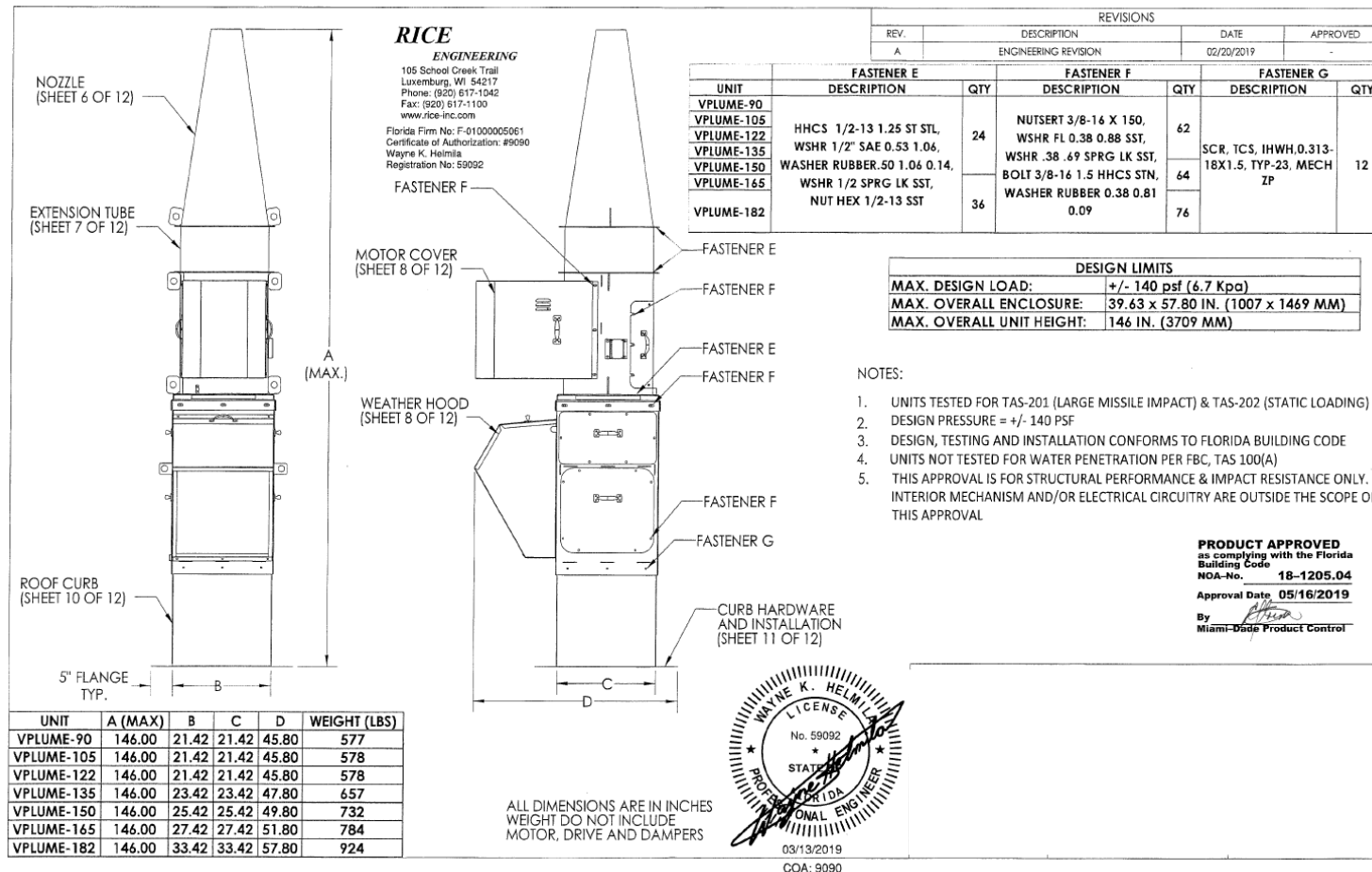
- Regulatory Policy Division – Engineering Services Program
- Issues Product Approvals (RV-##)



What to look for in a NOA

All approved NOA's should:

- Contain seal of a licensed P.E. by the state of Florida
- Contain seal of compliance with the FBC
- Appear on official Miami-Dade County website



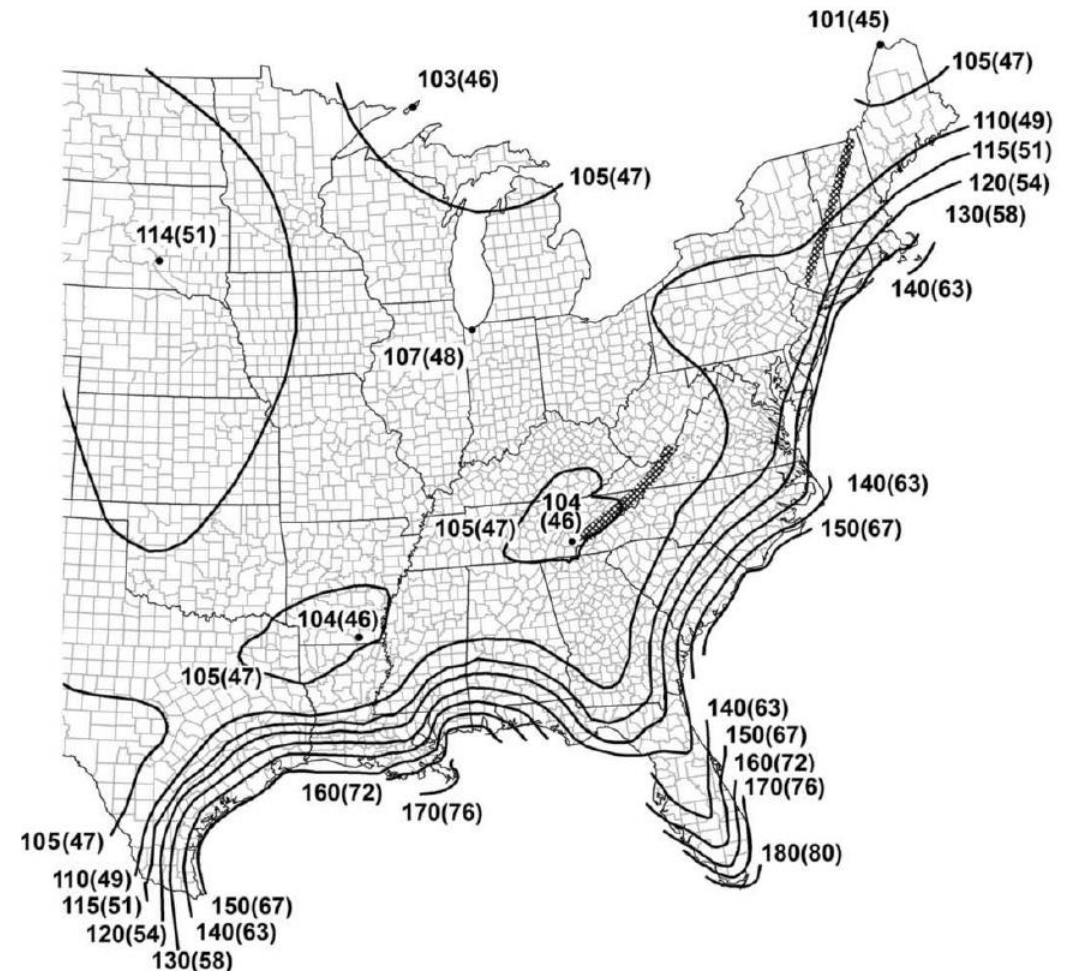
Wind Loads and Design Pressure

- **Risk Category I**

- Buildings and other structures that represent a low hazard to human life in the event of failure, including but not limited to:
 - Agricultural facilities.
 - Certain temporary facilities.
 - Minor storage facilities.

- **Risk Category II**

- Buildings and other structures except those listed in Risk Categories I, III and IV.



Basic Wind Speeds for Risk Category II

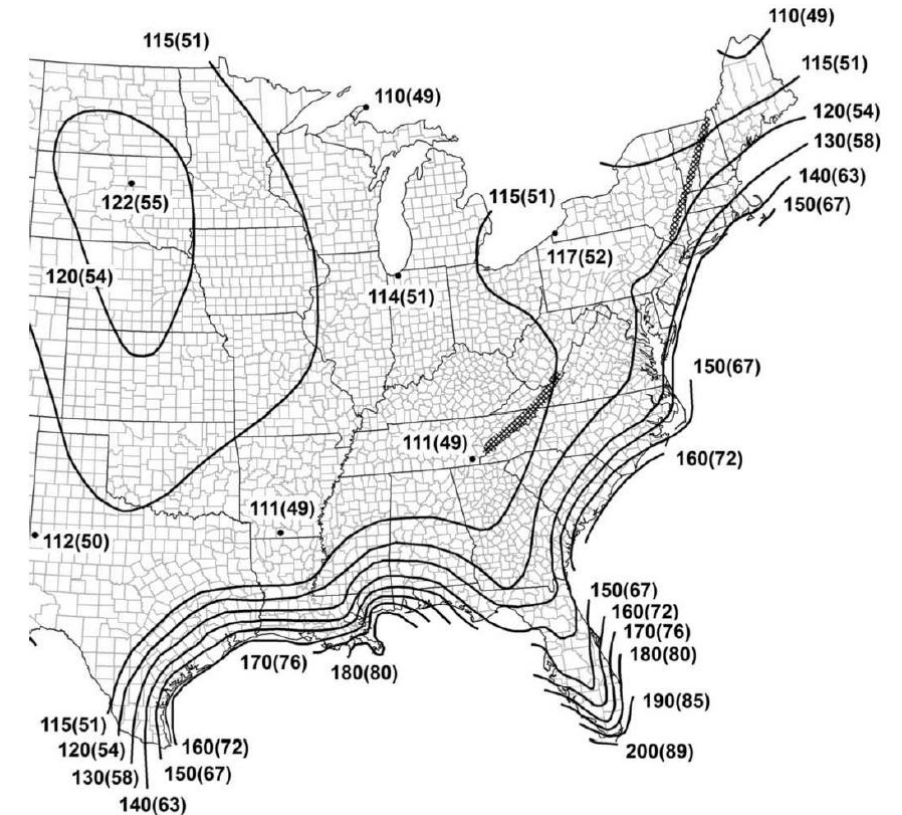
Wind Loads and Design Pressure

• Risk Category III

- Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to:
 - Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300.
 - Buildings and other structures containing Group E occupancies with an occupant load greater than 250.
 - Buildings and other structures containing educational occupancies for students above the 12th grade with an occupant load greater than 500.

• Risk Category IV

- Buildings and other structures designated as essential facilities, including but not limited to:
 - Group I-2 occupancies having surgery or emergency treatment facilities.
 - Fire, rescue, ambulance and police stations and emergency vehicle garages.
 - Designated earthquake, hurricane or other emergency shelters.



Basic Wind Speeds for Risk Category III

Wind Loads and Design Pressure

- How Design Pressure translates to Wind Load*

$$P = 0.00256 * V^2 \text{ (Imperial Units)}$$

P = Wind Pressure (PSF – Pounds per square foot)

V = Speed of wind in MPH – miles per hour

$$P = 0.613 * V^2 \text{ (SI Units)}$$

P = Wind Pressure (N/m²– Newton per square meter)

V = Speed of wind in mps - meters per second

**Using general values for air density and gravitational acceleration.*

Wind Loads and Design Pressure

- Some examples:

DESIGN LIMITS	
MAX. DESIGN LOAD:	+/- 140 psf (6.7 Kpa)
MAX. OVERALL ENCLOSURE:	78.50 x 57.80 IN. (1994 x 1469 MM)
MAX. OVERALL UNIT HEIGHT:	146 IN. (3709 MM)

≈ 233 MPH

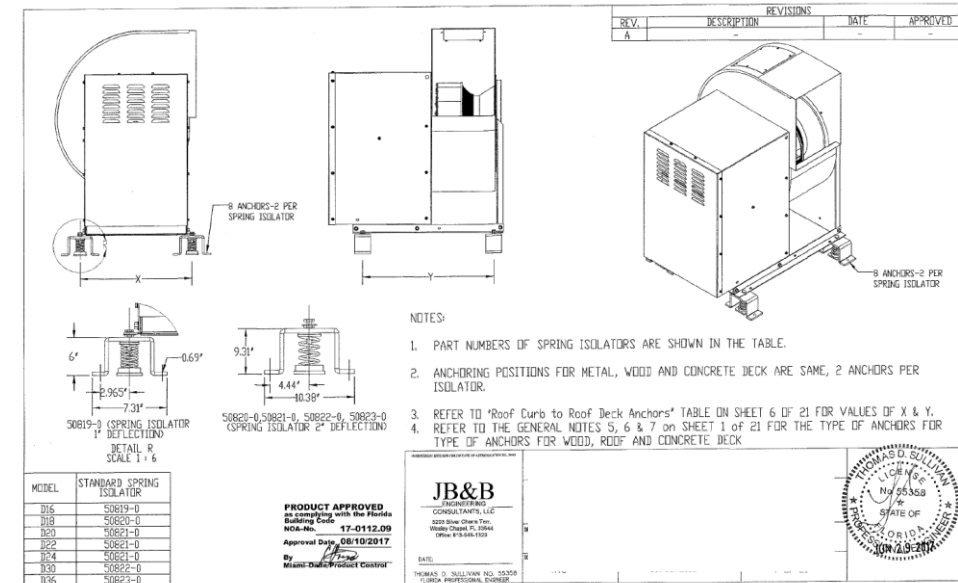
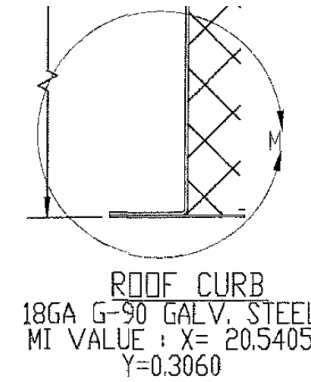
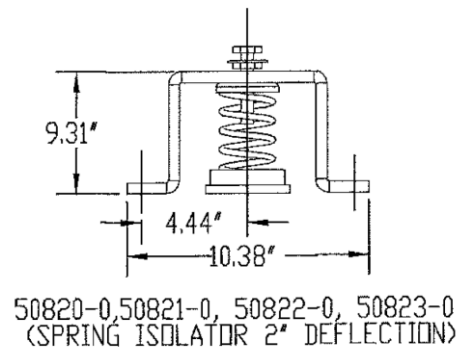
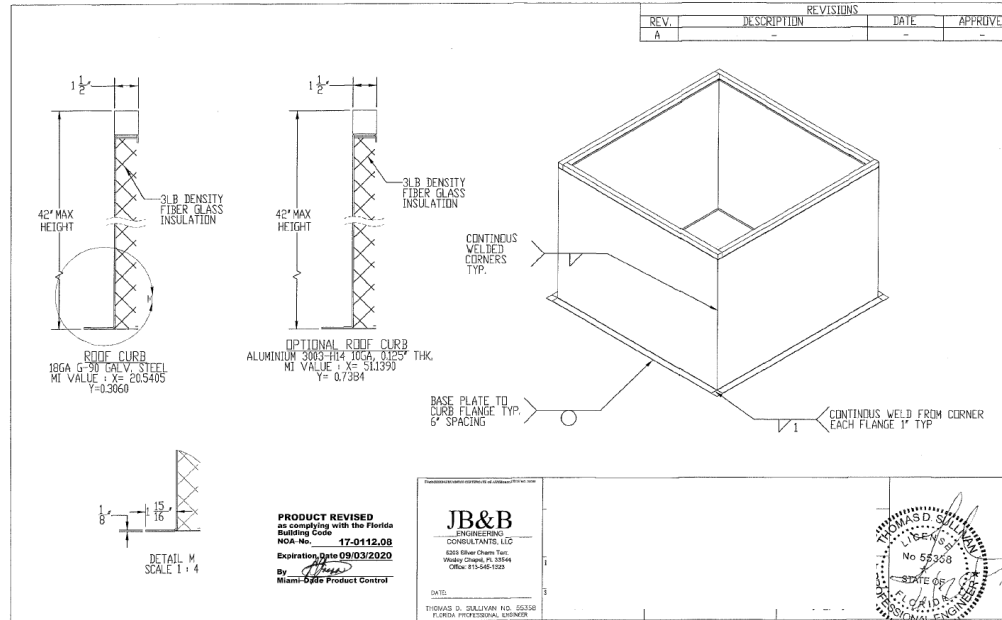
DESIGN PRESSURE RATING
± 70.0PSF

≈ 165 MPH

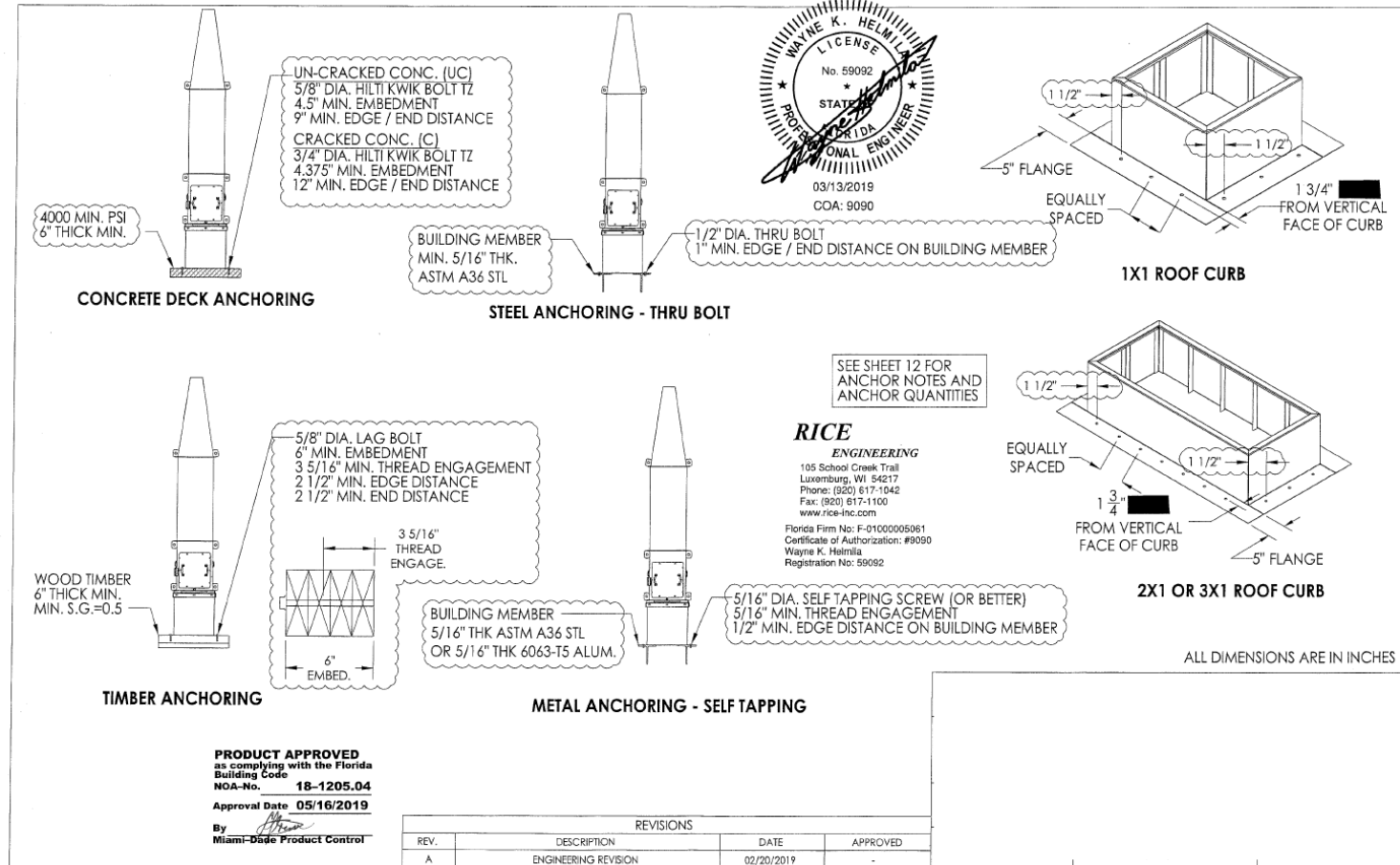
2) THIS PENTHOUSE SYSTEM IS APPROVED FOR APPLICATIONS WITH DESIGN PRESSURES OF +/- 110 PSF OR LESS.

≈ 207 MPH

Curbs and Roof Anchoring



Curbs and Roof Anchoring



- Anchoring of the unit varies per type of structure:

- Concrete
- Steel
- Timber

Thank you for your time!

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- Wednesday, December 9
- 1:00-2:00pm CT
- ***TOPIC: Louvers – Selection & Application***
- Presenter: Charles DiGisco, Sr. Sales Manager, AMCA Member Company

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