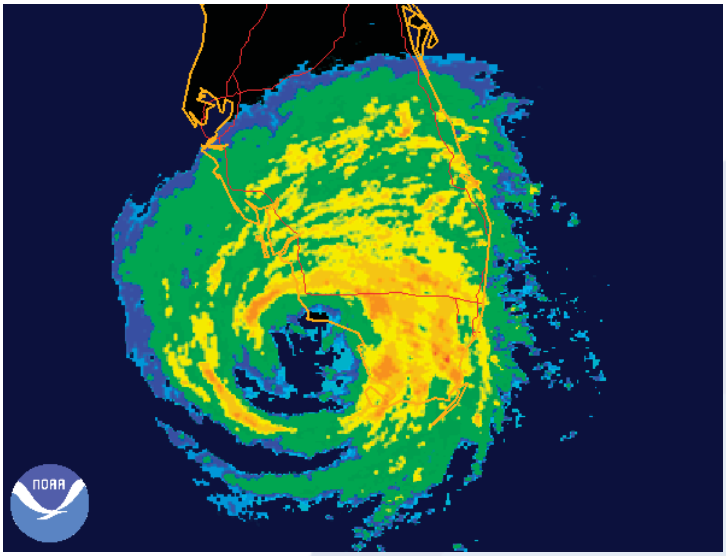
Roofing Failures Lessons Learned



Example 1

Hurricane Wilma made landfall on the west coast of FL near Cape Romano on October 24, 2005 with maximum sustained winds of 120 mph. Once the hurricane reached Jupiter, wind speeds had slowed to approximately 110 mph.

Per the Building Code in place at the time, the design wind speed for Miami Dade County was 146 mph (32% higher than the highest wind speed measured in Jupiter).

Negative pressures resulting from the high winds caused the total failure of this mechanically attached roof system.

Upon review, it was determined that the failure started at a corner and simply peeled back the system. A close look at the edge detail revealed the edge metal was not secured with a continuous cleat (although the building code at the time of installation required it).

We estimate that a continuous cleat would have added approximately $3,000 to the initial construction cost. Its omission resulted in an approximate $400,000 loss.

During the 2004-2005 hurricane season, we investigated several similar failures with the common observation being inadequate edge securement.

Preventative Maintenance Considerations for Hurricane Season

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Although hurricane season officially runs from June to November, the peak activity on the east coast occurs between mid-August and September. Due to the unpredictable nature of hurricanes, it is imperative that roofing systems be adequately secured to resist the negative pressures associated with high wind events.

Following are two examples of wind related failures with recommendations for preparing for future events.

Example 2

This roof in western North Carolina was blown off due to high winds not associated with a storm. Bricks, wood blocking, sheet metal and membrane were blown over 100 feet across an adjacent courtyard.

Not surprisingly, our investigation revealed inadequate perimeter construction with wood blocking fastened directly to the top course of brick. This configuration prevented adequate resistance to wind forces resulting in the failure observed.

During the replacement process, a bond beam was formed with high strength grout to allow for the installation of anchor bolts to provide adequate securement to the structure.

The result is a system designed to far exceed the requirements of the building code and perform in extreme wind conditions for years to come.

Recomendations

It is a good practice to review the condition of your roofing systems prior to all extreme weather patterns. At a minimum, the review should consist of the following:

- Ensure all rooftop mechanical equipment is adequately secured to the structure
- Remove all unnecessary materials and equipment from the surface of the roof
- Review roof drains to ensure screens are clear and allow proper flow
- Review construction details (especially edge conditions) for suitability and adequate securement.

These services should be performed by a licensed design professional (Engineer or Architect) specializing in building envelope science or a Registered Roof Consultant as certified by RCI, Inc.

There is never a bad time to perform these condition assessments on your roofing systems, however if you wait until a catastrophic failure has occurred, you've missed an opportunity to prevent a loss and a potential hazard to the public.

REI ENGINEERS

Provides expert design and remediation consulting for building envelope (BE) systems including roofs, waterproofing, windows and exterior walls. Our clients are building owners, facility managers, design professionals and contractors throughout the Eastern United States.

Our highly trained team consists of Professional Engineers and RCI, Inc. Registered Professionals including Registered Building Envelope Consultants (RBEC), Registered Waterproofing Consultants (RWC), Registered Roof Consultants (RRC), Registered Roof Observers (RRO), and Registered Exterior Wall Consultants (REWC). Since our inception we have grown to more than 50 full time professionals with 5 offices throughout the southeastern United States.

Because REI is licensed as an Engineering firm, we are able to provide design services, including necessary calculations and engineering analyses, that may not be provided in house by unlicensed consultants. Our process places high priority on client involvement and feedback to ensure consistent, reliable building envelope performance.

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