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PROPOSAL FOR RESEARCH PROJECT

“A study of the water resistance performance of the exterior envelope of buildings, particularly relating to the fenestrations, during minimal high wind events (Hurricane Irma).”

This study is proposed by Daniel L. Lavrich, P.E. on behalf of the Boards of Rules and Appeals of Broward and Dade Counties. Mr. Lavrich is a Licensed Professional Engineer in Florida and has practiced in the discipline of structural engineering in South Florida for over 40 years as primarily a structural designer of buildings. He also has acted as a damage consultant relating to damages of buildings and structures. He has inspected and investigated hundreds of buildings and many thousands of fenestrations during the aftermath of hurricanes and storms in South Florida to evaluate the structural and water resistance performance of the fenestrations and the exterior envelope.

Mr. Lavrich is currently a member of the Florida Building Commission Structural Technical Advisory Committee and is currently the Chair of the Broward County Board of Rules and Appeals.

ISSUES

1. On September 10, 2017 Hurricane Irma impacted the Southeast Coast of Florida. Although Hurricane Irma was classified as a Category One Hurricane, wind speeds experienced in South Florida were far less than what can be considered a “Design Event” relating to the wind speed requirements of the Florida Building Code.

2. Notwithstanding the above, an extraordinary amount of water intrusion took place through the exterior envelope and particularly through the fenestrations of buildings during Hurricane Irma.
3. This water intrusion took place even though no structural damage or breaches took place to the exterior envelope or the fenestrations.
4. The quantities of water intrusion were extremely severe with high-rise apartment buildings experiencing in many cases \$500,000 to \$1,000,000 in water intrusion damages.

Observations of Conditions

Inspection of several thousand fenestrations in numerous high-rise buildings ranging in age from 55 years old to 4 years old found the following:

1. Significant water intrusion through the exterior envelope took place in extraordinary amounts in all of the buildings inspected.
2. Although the condition of the fenestrations varied greatly due to age, the water resistant to high wind was similarly deficient in every case.
3. Water intrusion was severe on the windward sides (east and south exposures) of the buildings.
4. Water intrusion on the leeward sides of the buildings was minimal or non-existent.
5. Structural damage to the fenestrations and the envelope was almost non-existent in every case with very few minor exceptions.
6. Some water intrusion took place through the exterior envelope of the building other than through the fenestrations; however, the vast majority of water intrusion took place through or around the perimeter of fenestrations.

Design Issues

1. The Florida Building Code requires that fenestrations be structurally designed according to wind velocities set forth in the Florida Building Code and ASCE-7 and to resist the resulting structural pressures.
2. The Florida Building Code requires that fenestrations be tested to 150% of the structural design pressure for structural performance.
3. The Florida Building Code requires that fenestrations be tested to only 15% of the structural design pressure for water intrusion resistance performance. (Does this highly reduced testing requirement seem reasonable? The extremely poor performance of fenestrations for water resistance during Hurricane Irma would suggest so!)

Initial Conclusions

There are some serious defects in the production and delivery of an effective water-resistant exterior envelope, particularly during high wind events, and particularly relating to the performance of fenestrations.

1. The designers of the exterior envelope must pay better attention to providing water resistance, particularly where fenestrations are incorporated into the envelope.
2. Fenestrations do not perform well to resist water intrusion in a high wind event. This is due in part to the requirements of the Florida Building Code and related Standards that only require a greatly reduced water intrusion performance at high wind pressures.
3. It seems that the Florida Building Code and related Standards relating to design and testing of the exterior envelope and fenestrations should be re-evaluated to provide a better resistance to water intrusion during high wind events.
4. In addition to the design of fenestrations, the installation of fenestrations as well as the installation of the envelope in general is suspect. The installation requirements should be better defined and more effectively monitored.
5. Effective maintenance of fenestrations and the exterior envelope is of great importance and must be highly stressed to the consumer.

Summary

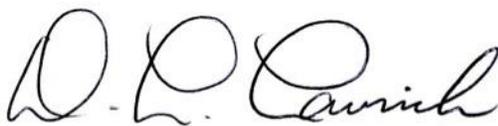
1. Hurricane Irma in South Florida other than the Florida Keys was mostly only a Tropical Storm or a minimal Category One Hurricane. Although fenestrations and the exterior envelope performed very well structurally, the amount of water intrusion that took place through fenestrations and the exterior envelope, both new and old, was staggering.
2. Shouldn't the consumer expect better performance?
3. How as an Industry and Building Code Promulgator and Enforcer can we produce and deliver products and assemblies that perform better during a high wind event?
4. Why is it that an automobile traveling at highway speeds during a driving rainstorm does not experience any water leakage whatsoever, but windows and doors in a building during a minimal high wind event leak profusely? This is particularly interesting since automobiles are not governed by a Building Code, but they perform better relating to water intrusion than buildings that are regulated by Codes.
5. How can we make performance better? Perhaps consider:
 - a. Stronger Building Codes and Standards relating to water resistance performance of fenestrations and the exterior envelope.

- b. Better attention to the design of the exterior envelope as well as fenestrations relating to water intrusion resistance.
- c. Require better installation standards as well as better oversight of the installation.
- d. Provide guidance to the Public for better maintenance of the exterior envelope including maintenance of fenestrations and their perimeters.

SUGGESTED STUDY

1. Broward and Dade Counties have authorized a pursuit of the study of the issues relating to water intrusion of the exterior envelope and fenestrations during a high wind event.
2. A State-Wide Workgroup is suggested to evaluate the issues and propose solutions. Participants should likely include the following:
 - a. Code Officials
 - b. Designers (Architects and Engineers)
 - c. Manufacturers of Fenestrations
 - d. AAMA (American Architectural Manufacturers Association)
 - e. Other Stake Holders
3. It is suggested that this workgroup and study take place under the direction and authority of the Florida Building Commission.
4. It is hoped that the recommendations and findings of this work group will be ultimately implemented by the Florida Building Commission in the way of Code changes and/or distribution of information to the Design Industry, Manufacturers, Code Enforcement Officials, and the Public.

WE CAN DO BETTER! THE PUBLIC DESERVES BETTER!



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