Wind Performance of Asphalt Shingles

Research Topic: Through post-event assessment, identify the relative frequency of different causes of asphalt shingle failure during 2021 hurricane season and provide recommended research topics to mitigate future shingle loss if warranted by the findings.

Rationale: Recommendation #FL-14b from FEMA's MAT report following Hurricane Michael (pasted below) calls for industry groups to assess the observed widespread asphalt shingle roof covering loss, specifically noting that the research should strive to determine the root cause of the failure, particularly in areas that experience wind speeds below design level.

> **Recommendation #FL-14b. Industry groups should assess the causes for the widespread asphalt shingle roof covering loss that was observed by the MAT.** Installation issues of asphalt shingles were observed at many sites. More research should be considered by industry groups (e.g., manufacturers, insurers, builders) and academia to explain why post-FBC asphalt shingle damage was observed to be widespread. In particular, this research should focus on areas where wind speeds were below design level. The research should attempt to determine whether these failures were the result of design, installation, testing, inspection, manufacturing, or other issues.

Scope: It is anticipated that the project would require a deeper investigation of the damage to roof cover than is typically performed during a FEMA MAT investigation or an NSF StEER investigation. The execution of the project would be dependent on the path of storms in the 2021 season and may be well suited to be part of an ongoing damage investigation contract.

Wind Performance of Ridge Vents

Research Topic: Identify causes of roof ridge vent failures during high wind events and provide recommendations for mitigating future failures.

Rationale: Recommendation #FL-16 from FEMA's MAT report following Hurricane Michael (pasted below) calls for an investigation of the wind failure of common ridge vents.

> **Conclusion FL-16**
> **The failure of ridge vents contributed to significant water infiltration at many sites.**
> The loss of ridge vents can expose large openings in the roof deck to water infiltration. Water infiltration can cause extensive interior damage, contribute to the growth of mold and mildew, and result in degraded building function or downtime until repairs are made.
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> **Recommendation #FL-16. Industry groups and academia should perform research on commonly used ridge vent products to better determine the causes of ridge vent failure and develop solutions.**

Scope: Perform laboratory experiments to evaluate the wind and water intrusion performance of typical ridge vents used in Florida. This research should include an evaluation of the efficacy of TAS 100(A) in determining the expected performance of ridge vents in high wind events. A portion of this work could also be paired with the topic of post-event asphalt shingle failure mode investigation.

Wind-Driven Rain Intrusion

Research Topic #1 for WDR: Identify relative frequency of different causes of water intrusion through fenestrations during 2021 hurricane season and provide recommended research topics if warranted by the findings.

Rationale: Mr. Dan Lavrich provided a research proposal to the Florida Building Commission based on observed water intrusion damage during Hurricane Irma. The proposal indicated that several buildings ranging in age from 55 years old to 4 years old were investigated and that significant water intrusion damages were widespread, however, the supporting data was not available for further study to determine whether the damage resulted from poor installation or inadequate testing requirements. A project was undertaken by the University of Florida that brought different stakeholders together and was ultimately unable to determine whether changes to the Florida Building Code were warranted. This is like the question posed by the FEMA MAT team about the asphalt shingle damages observed in Hurricane Michael. Damage has been observed, but there has not been enough investigation of the root cause to determine if the problem lies in the installation, the product performance, or a combination of both causes.

Scope: It is anticipated that the project would require a deeper investigation of damage than is typically performed during a FEMA MAT investigation or an NSF StEER investigation. The execution of the project would be dependent on the path of storms in the 2021 season.

Research Topic #2 for WDR: Investigate the climatology of wind-driven rain to illustrate how expected mean recurrence intervals for rain rates and wind speeds interact and where these recurrence intervals line up with respect to current test standards for water intrusion performance under normal conditions below design pressures and during hurricanes.

Rationale: The current performance requirements for the water intrusion testing of fenestrations per the AAMA 101 standard use a wind pressure equal to 15% of the structural design pressure. Another standard, ISO 15821- Doorsets and Windows- Water-tightness Test under Dynamic Pressure- Cyclonic Aspects, specifies cyclic pressure testing, which is applicable to areas subject to severe weather and wind-driven rains including hurricanes. It is unclear what level of risk tolerance is achieved by either of these standards because the climatology of the wind-driven rain is not well understood. The wind maps in ASCE 7 are based on mean recurrence intervals for the wind, and do not provide information about the expected recurrence of rain rates to go along with different wind speeds. This type of climatological information is needed in order to determine the performance-based design level for buildings in Florida and what changes to the test standards and the Florida Building Code would be needed to achieve the performance goal.

Scope: This project would include modeling of both historical data and expected trends as a result of climate change to determine mean recurrence intervals for rain rates and wind speeds, as well as how these recurrence intervals interact or intersect with each other (rain alone, wind alone, and the intersection of wind and coincident rain) and the relation of the findings to the current test standard pressures and rain rates.