Hurricane Harvey Wind Damage Assessment

Report Summary

JULY 2018

When Hurricane Harvey made landfall near Rockport, Texas, on August 26, 2017, with maximum sustained winds of 130 mph it was the first major (Category 3 or higher) hurricane to make landfall in the U.S. since Hurricane Wilma in 2005. Harvey was also the second most costly hurricane in U.S. history after Hurricane Katrina, causing an estimated $125 billion in damage.

Three days later (August 29), IBHS deployed a damage assessment team to Texas specifically to study the wind damage caused by this storm. The team consisted of four IBHS engineers, two staff from SwissRe and two staff from State Farm's Technology Research and Innovation Lab.

The team performed wind damage assessments on 213 structures spanning five wind speed zones, collecting quantitative data using IBHS' custom damage assessment software. The data examined:

- The effect of shingle type, roof slope and roof shape on the frequency of roof damage
- Damage frequency for various terrain exposures
- Damage frequency for doors by type
- Damage frequency for shingle roofs by wind speed

Vulnerability curves by wind speed zone were developed from the data for:

- Asphalt shingle damage frequency and severity
- Underlayment and roof deck damage severity on shingle roofs
- Garage door damage frequency

Buildings surrounded by relatively open terrain (open water, open land) had high damage frequencies while wind damage in inland locations was reduced by tree coverage and other features that moderated the wind speeds (Figure 1).

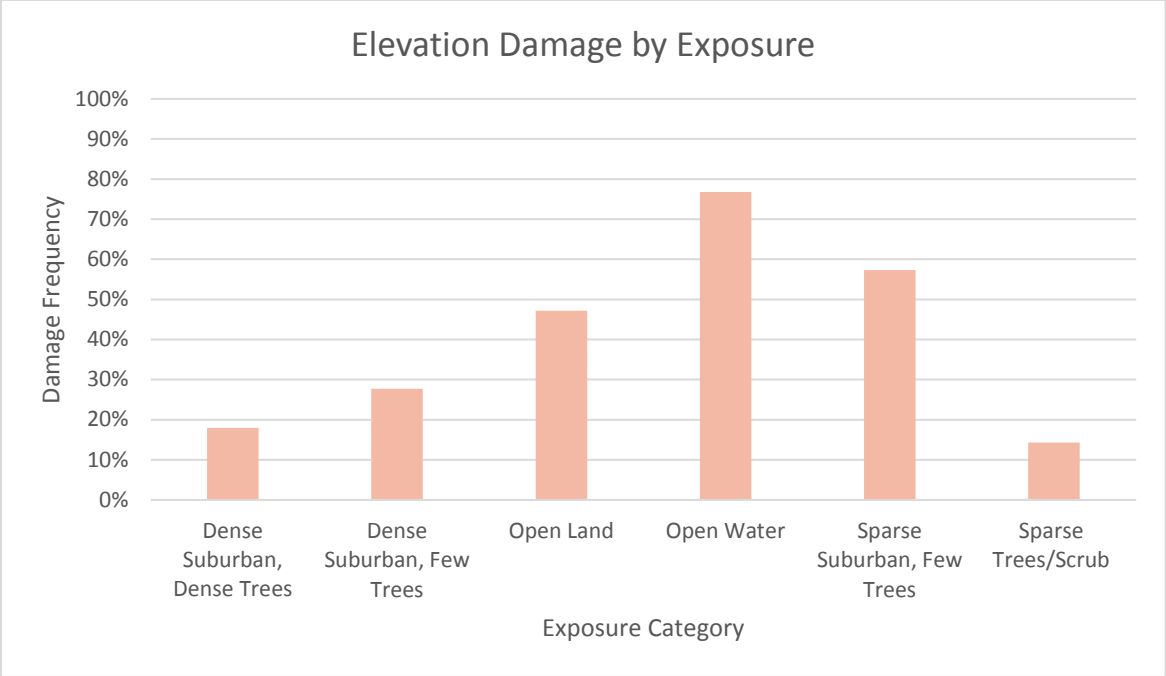

Figure 1. Damage frequency of individual elevations by exposure

Asphalt shingle damage continues to be a challenging problem, with more than half of the shingle roofs investigated displaying some level of roof cover damage. 3-tab shingle damage occurred on every home investigated in Rockport Southeast, Port Aransas South and Rockport Northwest (Figure 2). However, roofs with architectural shingles had an average damage severity of less than 20%.

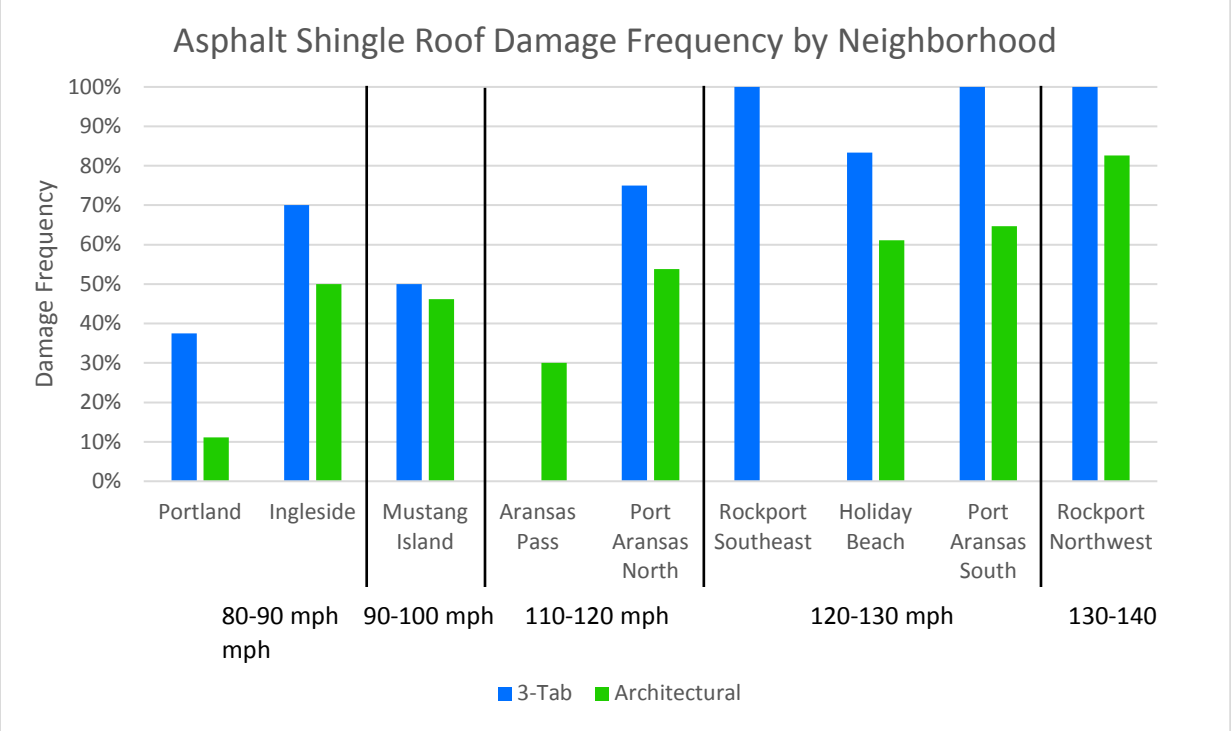

Figure 2. Distribution of roof damage frequency of asphalt shingle roofs by wind speed zone.

Steep-slope roofs had lower damage frequencies of underlayment and decking damage compared to moderate- and low-slope roofs. Roof shape (Figure 3) was also a factor. Gable roofs had higher damage frequencies of underlayment and decking damage compared to hip roofs and gable/hip combination roofs.

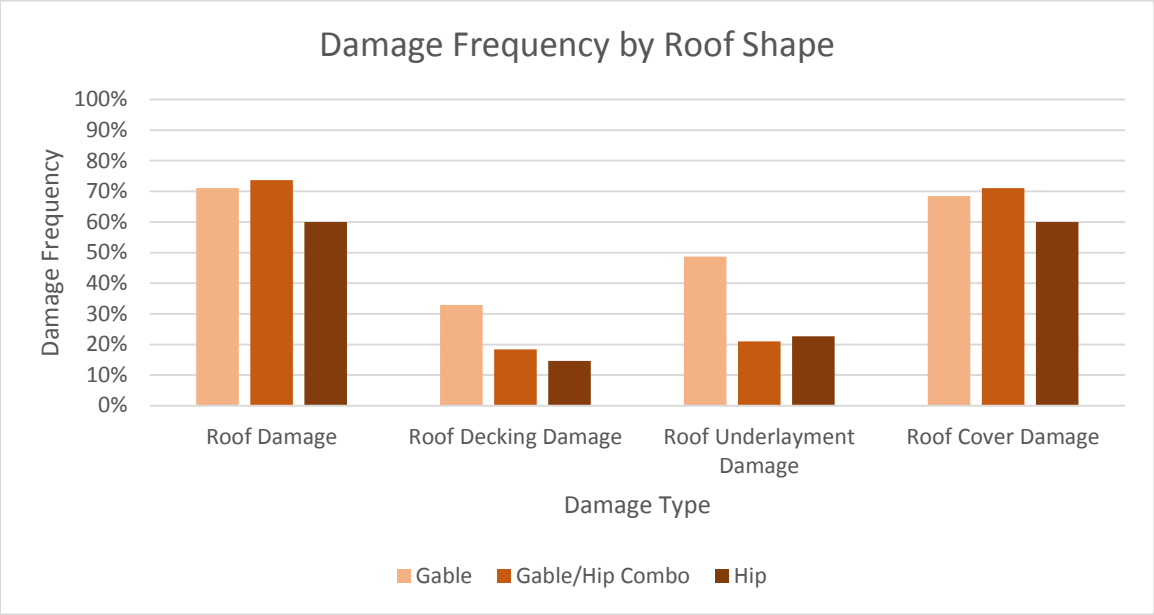

Figure 3. Roof Damage frequency by roof shape

Unprotected doors were damaged up to six times more frequently than protected doors. Damage frequencies were highest for slider doors.

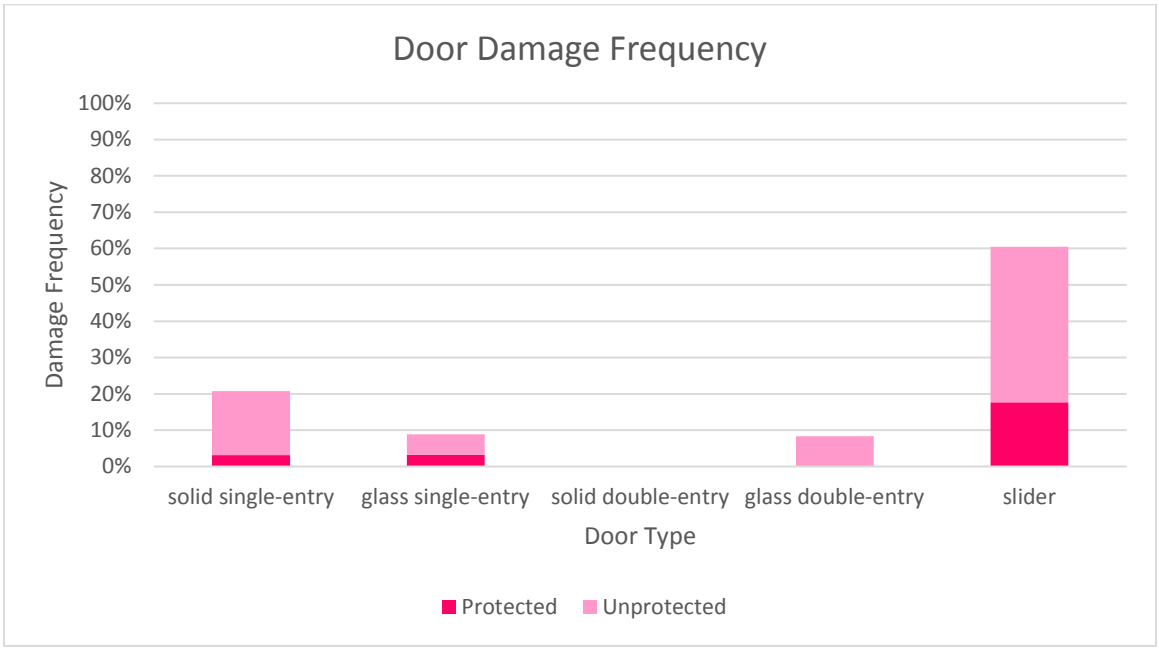

Figure 4. Damage frequency for protected and unprotected doors by type

The team also found that single-car garage doors failed at a higher rate than double-car doors, which is a disparity that has been seen in other post-disaster events.

Finally, the highest wind speeds did not always correlate with the highest damage frequencies. The influence of building age, construction type, and exposure also contributed to damage frequencies, and sometimes outweighed the wind speed effects.

Additional research is needed to study the causes of higher damage frequencies for single-car garage doors, sliding doors, and the vulnerability of non-shingle roof materials, soffits, siding and windows.

The complete *Hurricane Harvey Wind Damage Investigation* report is available on the IBHS website.

IBHS is grateful for the assistance of the Texas Tech University Hurricane Research Team and Florida Coastal Monitoring Program for providing access to wind speed information to help determine assessment locations. Thanks are also extended to our partners at RMS for providing access to HWind data, which were invaluable for the site selections and analyses in various wind speed zones.