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Certification Expiration Date September 30, 2016

March 2, 2016

Ms. Kate Thompson, MC 105-5D
Texas Department of Insurance
333 Guadalupe Street
Austin, Texas 78701
Kate.Thompson@tdi.texas.gov

Re: TWIA Expert Panel Draft Report – Peer Review
RCG File No: 11009381

Dear Ms. Thompson:

Per our agreement dated February 4, 2016, Rimkus Consulting Group, Inc. was retained to review a draft document prepared by the Texas Department of Insurance (TDI) Expert Panel. This letter comprises our peer review effort, and is based upon our experience in evaluating hurricane damage. Our review is organized in several sections, as follows:

General Overview

"A Proposed Methodology for Estimating Wind Damage to Residential Slab-Only Claims Resulting from a Hurricane Impacting the Texas Coastline" [herein referred to as "Proposed Methodology"] written by the TDI Expert Panel, dated February 3, 2016, is an impressive attempt to provide a scientific and statistical means for determining hurricane wind damage to a specific type of residential structure after the storm surge has swept the superstructure away. The Proposed Methodology incorporates a variety of factors that are common concerns for forensic engineers evaluating such properties, and also attempts to explain its limitations.

From our viewpoint, the Proposed Methodology provides another "tool" in a forensic engineer's "toolbox" that may be helpful in the evaluation of a hurricane-damaged residential property. However, we strongly discourage anyone relying solely on the Proposed Methodology as the basis for determining the extent of wind versus surge damage to a particular property. The defensibility of using the Proposed Methodology as the sole basis of this determination would be seriously undermined by the first statement in Section 6.7 *Identification of Limitations*:

1. The use of average damage ratios that are applicable for a large number of structures are being used to estimate the damage to a single property. *There is large variation in the relative performances of individual structures that cannot be captured by the recommended methodology*. [Emphasis added]

In our opinion, this important statement should be provided at the very beginning of the document rather than halfway through it (page 6-59). *This statement essentially invalidates the very method that is the subject of the document*. We are concerned that one might misunderstand this serious limitation of the Proposed Methodology. Further, we are concerned that the reader may misinterpret the statement "An effort was made to validate the model results using claims data from Hurricanes Ike and Rita in Texas, Hurricane Katrina in Louisiana and Mississippi, and Hurricanes Charley and Ivan in Florida" (page 1-2 in the Executive Summary at the beginning of the document) to suggest that all of the data supports the methodology; when in fact, there are significant variations. The results shown for Rita indicated that the model greatly underestimated the observed damage percentages, in some cases by a factor of 5 (reference Tables 7-12 through 7-20).

Despite our concerns described above, we recognize the potential value that the Proposed Methodology offers in situations when "a reasonably competent engineer cannot determine the extent of water versus wind damage based on what is left of the surviving superstructure" (page 3-1). However, based on our extensive experience evaluating hurricane damage, we would like to point out there is often physical evidence at or near the site that will aid in an engineering assessment, allowing a competent engineer to properly determine the extent of water versus wind damage. This, along with available aerial imagery (pre- and post-storm), weather data, interview information, construction records, soil data, property records, historical photographs, and examination of similar nearby surviving structures often provide sufficient information to assess the extent of likely wind damage to a particular property within a reasonable degree of engineering certainty.

Hazard Module (Wind, Surge and Wave)

Modeling of wind and surge/waves should be based upon substantial data from the specific hurricane event. If there is reasonable doubt as to the timing of peak wind gusts versus peak surge/wave forces, we have found the most defensible approach would be to presume that peak winds occurred prior to peak surge/waves. One should consider that the most violent forces from a hurricane typically involve crashing waves, which are typically coincident with strong wind forces.

Another consideration should be that the accuracy of storm modeling may not be sufficient during the quick time frame that damaged properties must be assessed. A good example of this situation was Hurricane Katrina, where many weather instruments

failed as the storm came ashore – thus limited data was initially available. Early reports from authoritative sources often changed over time after the storm as more data and analyses were considered. For example, the "Preliminary Model Hindcast of Hurricane Katrina Storm Surge" published 11-21-2005 by the Naval Meteorology and Oceanography Command (CNMOC) at the Stennis Space Center (almost 3 months after the storm) posted that peak winds for Waveland, Mississippi arrived approximately 3 to 4 hours before peak water level; within weeks of the hurricane, a third-party meteorological firm determined that peak winds occurred concurrently with peak surge for the same location; and modeling after more than a year of intensive analysis by the U.S. Army Corps of Engineers (USACE) estimated that peak winds arrived 1 hour before peak water level at the same location. Another example is that NOAA issued its highly anticipated report "Hurricane Katrina: A Climatological Perspective" in October 2005 stating that the hurricane made landfall as a Category 4, but then revised the report *10 months later* in August 2006 downgrading it to a Category 3 at landfall.

Finally, in our experience we have found interesting arguments that may arise during legal disputes that follow assessment of storm damage – which are not considered in the Proposed Methodology. In some instances, speculation of tornado damage that immediately precedes the hurricane eyewall have been alleged and argued in Federal Court. Another common argument is that topography or surface structures induced wind channeling effects that exacerbated wind damage at a particular property. Wind-borne versus water-borne debris impact is another factor that often should be considered.

Damage Estimation Module

We agree that "if nearby surviving structures are very similar to the structure under consideration by the model, then observed damage can be more heavily weighted in consideration of damage estimation." This observed damage comparison should take precedence over any analytical modeling approach, in our opinion.

We are concerned of the reliance on the model to limit an estimated wind speed at the theoretical point in time that the model estimates that the storm surge caused structural collapse. Considering the statistical variation in numerous aspects of the analyses, any reliance of modeled wind versus surge timing data may be grossly inaccurate – particularly in instances where the calculated percentages of collapse due to wind versus collapse due to surge are similar. Unless there is relatively strong physical evidence to indicate that a particular structure collapsed prior to the maximum wind speed occurring at its location, we recommend that the maximum wind speed that occurred at that location be considered regardless of the modeled timing estimates. If the modeled timing estimates are to be considered, we recommend that every statistical margin of error be applied toward maximizing the estimated wind speed.

We have some concerns about the wall stud framing assumptions. Section 6.3.2 *Wall Stud Bending Performance Function* presumes that the bending strength of an assumed 2 x 4 wall stud may be increased to account for full composite behavior with contribution from an assumed 3/8" thick layer of wall sheathing. However, wall sheathing is typically installed in panels that create a discontinuous break midway along the stud height; and thus would not provide for complete composite reinforcement for a stud in bending. Please note that ANSI/AF&PA *Special Design Provisions for Wind and Seismic with Commentary* provides an alternative to using the 1.15 C_r repetitive use factor provided in the *National Design Specification*. The alternative method is based on tested wall assemblies with certain construction features including drywall and sheathing with specified fasteners on *each side* of the stud, along with solidly blocked panel edges. Unless these construction features can be confirmed, the alternative method should not be used. We are also concerned that the model does not appear to address uplift/overturning forces that may cause wood studs to vertically withdraw from the bottom plate. For example, Section 6.3.3 *Wall Stud to Plate Connection Performance Function* explains that end nail connections between the studs and bottom plates are assumed, but this analysis is with regard to the lateral load capacity of these connections – not vertical uplift forces (for which end-nailed connections have no reliable resistance). Following hurricane Katrina, we inspected many slab cases where the only wood framing that remained was the wood bottom plate anchored to the concrete slab. Nails from the end connections into the missing wall studs typically remained projecting from the bottom plate. If the nails were pointed upward, this typically indicated that the structure overturned (uplift failure at the windward wall). If the nails were bent horizontally, this typically meant that the structure failed in shear – as might be expected from strong surge forces in the lower portion of a structure.

The latter portion of this module attempts to apply statistics to opinions elicited from 24 unnamed "construction and engineering experts" chosen for this effort. As stated in Section 6.5 *Modifications to Resistance Values*, the Proposed Methodology states "The experts were asked to estimate expected resistance reduction due to variables in construction practices that could impact overall resistance to extreme loads caused by high winds and flooding. The experts were also asked to estimate expected resistance reduction due to variability in eight different components, including the impact of age and deterioration over 25 years on four of those eight components." In our opinion, the narrow focus and lack of robustness in data leads one to question the validity of this approach.

Section 6.7 *Identification of Limitations* appears to provide a fair warning to anyone employing the use of this document. We recommend that this be placed at the beginning, perhaps with a disclaimer. In our opinion, this specific section will be used to discredit the use of the approach by those that will challenge it.

Economic Loss Module

Based on the statement “As with building damage, it is the current opinion of the Panel that TWIA likely has better knowledge of contents values for specific properties, and therefore should not rely on the model to estimate contents valuations and associated losses”, we find no technical information to review regarding this module.

Report Generation Module

We recommend that the “Identification of Limitations” information be included with the generated report, perhaps with a disclaimer with adequate warning for its reliance.

Recommendations

The Expert Panel’s recommendations for the Proposed Methodology are generally focused on efforts to obtain reliable and adequate physical data that would be used to strengthen and improve the model. We generally agree with these recommendations, however we strongly caution the determination of the timing of wind verses surge damage to a structure with the proposed “probabilistic based approach.” We agree with the Expert Panel’s data collection recommendations described in 11.2 *Pre-storm Actions* and in 11.3 *Post-storm Actions*. We also agree with 11.4 *Ongoing Model Validation* as a due-diligence effort to establish the reliability of this approach. With additional time, further thought, and more data, the Proposed Methodology will likely improve – becoming an increasingly important tool in a forensic engineer’s toolbox.

This peer review was prepared for the exclusive use of the Texas Department of Insurance and was not intended for any other purpose. Our work was based on the information available to us at this time. Should additional information become available, we reserve the right to determine the impact, if any, the new information may have on our opinions and conclusions and to revise our opinions and conclusions if necessary and warranted.

Thank you for allowing us to provide this service. If you have any questions or need additional assistance, please call.

Sincerely,

RIMKUS CONSULTING GROUP, INC.

James W. Jordan
Vice President, National Property Division Manager

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Attachments: CVs