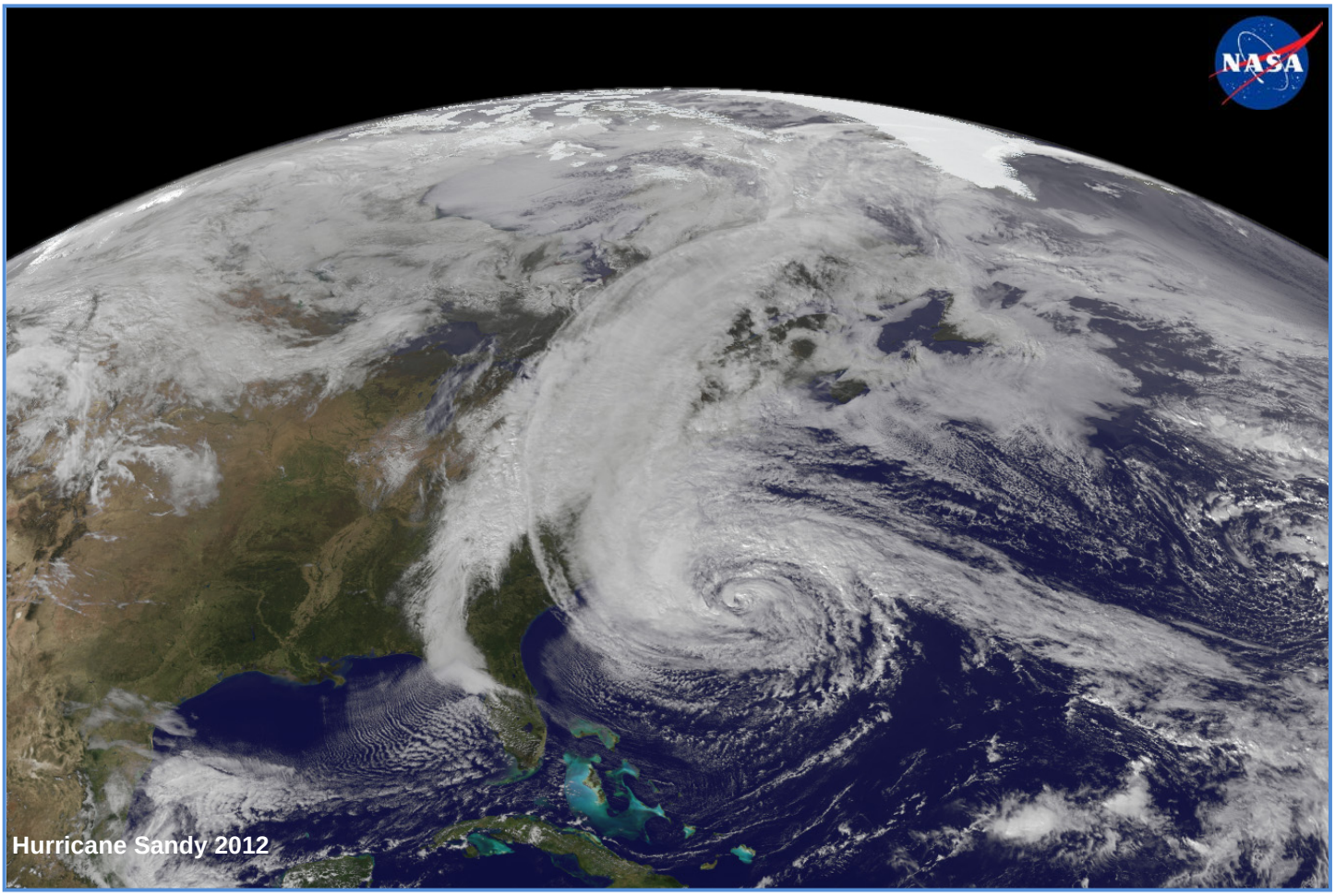
Florida Commission on Hurricane Loss Projection Methodology



Professional Team Report
2011 Standards

AIR Worldwide Corporation

On-Site Review
January 7-9, 2013

On January 7-9, 2013, the Professional Team visited on-site at AIR Worldwide Corporation (AIR) in Boston, Massachusetts. The following individuals participated in the review:

AIR
Brandie Andrews, Senior Risk Consultant
Prashant Annabatturi, Senior Manager
Tanya Bedore, Senior Technical Writer
Kyle Butler, Engineer, Research and Modeling
Alex Dale, Risk Analyst
Tim Doggett, Ph.D., Principal Scientist, Atmospheric Science Research and Modeling
Tomas Girnius, Ph.D., Senior Scientist Research and Modeling
Brian Gridley, Risk Analyst
Jay Guin, Ph.D., Senior Vice President
Anthony Hanson, Principal Analyst
Cheryl Hayes, Senior Research Manager Exposures Group Research and Modeling
Jonathan Holden, Assistant Vice President
Cagdas Kafali, Ph.D., Principal Engineer Research and Modeling
Todd Keller, Analyst, Research and Modeling
Jonathan Kinghorn, Writer/Editor
David Lalonde, FCAS, FCIA, MAAA, Senior Vice President
Greta Ljung, Ph.D., Principal Scientist, Research and Modeling
Matthew Maddalo, Engineer, Research and Modeling
Ram Nagulpally, Director of Quality Assurance
Gayatri Natarajan, Product Manager
Robert Newbold, CCM, Senior Vice President
Praveen Paranjothi, Database Engineer
Sudhir Potharaju, Vice President & Director Software Development
Adam Reichert, Ph.D., Scientist, Research and Modeling
John Rollins, Actuarial Consultant (via phone)
John Rowe, Assistant Vice President, Director of Research Operations
Christy Shang, Risk Analyst
Scott Stransky, Senior Scientist, Research and Modeling
Boyd Zapatka, Analyst
Ivelin Zvezdov, Manager Statistical Analysis/Numerical Models

Professional Team
Jenni Evans, Ph.D., Meteorologist
Paul Fishwick, Ph.D., Computer Scientist
Mark Johnson, Ph.D., Statistician, Team Leader
Marty Simons, ACAS, Actuary
Masoud Zadeh, Ph.D., P.E., Structural Engineer
Donna Sirmons, Staff

The review began with introductions and an overview of the audit process. AIR provided a general overview of the model updates including updating the historical and stochastic storm catalogs, the ZIP Code database, unknown year-built modifiers based on the ZIP Code updates, and the addition of builder's risk modeling and pleasure boats/yachts line of business.

During the review of Form S-5, the note provided on page 311 was discussed. In the process of completing its submission under the 2011 Standards, AIR discovered an issue in the completion of its submission under the 2009 Standards. The issue was not with the model or model results, but with the preparation of several forms. The issue was the discrepancy in the secondary modifiers for completing Form A-3, Form A-5, Form A-9, Form S-2, and Form S-5 and was found in August while preparing the 2011 submission. This revealed some errors in the previous submission. Three issues were identified.

1. Ground up losses were provided in the previous submission instead of zero deductible gross losses.
2. 10% storm surge was included in the Historical Commercial Average Annual Loss in Form S-5 of the previous submission.
3. Exposures contained a mismatch between primary and secondary risk characteristics.

AIR provided a presentation discussing the background, discovery of the mismatch, diagnosis of the root causes, and safeguards put in place to eliminate the risk of a mismatch from occurring in the future. AIR confirmed that the secondary modifiers mismatch only impacted the personal residential loss costs in the previously noted forms and that Form S-5 was the only form that included some storm surge contribution to the historical commercial residential loss costs.

The Professional Team informed AIR that the discrepancies discovered in completing the forms under the 2009 Standards and the corresponding issues should have been reported to the Commission as soon as they were discovered in accordance with the procedures outlined in the *Report of Activities*. After a thorough review of the mismatch, corrective actions, and safeguards put in place, the Professional Team concluded that the errors have been corrected and the problems should not recur. Details of the review of these safeguards are provided in this report under the relevant standards.

The Professional Team reviewed AIR's proposed letter to the Commission reporting the discovery of the errors and their impacts on forms in the previously accepted submission. The Professional Team recommends that a temporary suspension of the model is not warranted.

The Professional Team reviewed the following corrections to be included in the revised submission to be provided to the Commission no later than 10 days prior to the meeting to review the model for acceptability.

1. Pages 23-25, G-1.4, meteorological references updated, actuarial reference corrected
2. Page 43, G-2.A, Prashant Annabattuni added to Table 2.A.5
3. Page 47, G-2.B, Praveen Paranjothi added to list of new employees
4. Page 49, G-2.3.A, dates of meteorology and Friedland and Levitan vulnerability review corrected
5. Page 73, M-4.9, Figure numbers corrected
6. Page 85, V-1.1, Figure 14 flowchart revised
7. Page 96, V-1.11, information on assumptions added
8. Page 104, V-2.A, information on assumptions in Figure 27 added
9. Pages 213-214, Form V-2 corrected
10. Page 224, Form A-2.A, reference to location of Official Storm Set corrected

Report on Deficiencies

The Professional Team reviewed the following deficiencies cited by the Commission at the December 17, 2012 meeting. The deficiencies were corrected, and the corrections have been verified.

1. Model Submission Checklist (page 3)
   Response is incomplete. Item 6d is marked "No," but no explanation was provided under 2. at the bottom of the checklist on page 4.

2. Standard G-1, Disclosure 5.C (pages 31-33)
   Scale for maps is non-responsive to requirement II.A.5.e.3 in the *Report of Activities (page 46): "Maps will use three colors…dark blue and dark red designating the lowest and highest quantities, respectively. The color legend and associated map shall be comprised of an appropriate number of intervals to provide readability."* The minimum and maximum values listed are -5.536 and 0.781% respectively, while the bounds are ±30%.

3. Standard G-2, Disclosure 3.B (page 50)
   Response is incomplete. Documentation that there are no unresolved or outstanding issues from Dr. Friedland's 2012 review was not provided.

4. Standard M-4, Disclosure 10 (pages 75-76)
   Response is incomplete. Hurricane Jeanne (2004) was not provided in the response.

The additional revisions provided by AIR with the deficiencies responses were also reviewed. Discussed how these errors occurred.

1. Standard S-1, Disclosure 6 (page 149)
   Incorrect reference to Figure 43 was corrected.

2. Form A-4
   Highlighting missing from Hardee County Condo Unit $0 Deductible Output Range was added.

3. Form A-8, Part A (Page 290)
   Total Value entered for Average Loss (Millions) column corrected.

4. Form S-3 (Page 298)
   Data Source and Year Range Used columns corrected for Rmax. Date for the Vickery et. Al. reference in the Justification for Function Form column corrected.

Report on Issues

The Professional Team discussed the following issues identified by the Commission at the December 17, 2012 meeting. The modeler will give a detailed presentation to the Commission on these issues during the trade secret session of the meeting to review the model for acceptability.

1. Development of loss costs in the model and changes in the loss costs from the last change in the model, specifically how the model treats coastal versus inland loss costs. Be prepared to fully explain the process for incorporating changes in the model including the analyses of the underlying data. More detail to be provided in the presentation and discussion of Form A-5.

2. Describe if the model makes assumptions for adjustor errors or contract ambiguity.

Professional Team Pre-Visit Letter

The Professional Team's pre-visit letter questions are provided in the report under the corresponding standards.

Pre-Visit Letter

The purpose of the pre-visit letter is to outline specific issues unique to the modeler's submission, and to identify lines of inquiry to be followed during the on-site review to allow adequate preparation by the modeler. Aside from due diligence with respect to the full submission, various questions that the Professional Team is certain to ask the modeler during the on-site review are provided in this letter. This letter does not preclude the Professional Team from asking for additional information during the on-site review that is not given below or discussed during an upcoming conference call that will be held, if requested by the modeler. One goal of the potential conference call is to address modeler questions related to this letter or other matters pertaining to the on-site review. The overall intent is to expedite the on-site review and to avoid last minute preparations that could just as easily have been handled earlier.

Some of this material may have been shown or may have been available on a previous visit by the Professional Team. The Professional Team will also be considering material in response to deficiencies and issues designated by the Florida Commission on Hurricane Loss Projection Methodology (Commission).

The goal of the Professional Team on-site review is to provide the Commission with a clear and thorough report of the model, subject to non-disclosure restrictions on proprietary information. All modifications, adjustments, assumptions, or other criteria that were included in producing the information requested by the Commission in the submission should be disclosed and will be reviewed.

It is important that all material prepared for presentation during the on-site review be presented using a medium that is readable by all members of the Professional Team simultaneously. The Professional Team will review selected computer code in conjunction with the reviews performed for each section. Computer code should be readily available in a format that will allow simultaneous visualization by the entire Professional Team. Access to critical articles or materials referenced in the submission or during the on-site review should be available on-site for the Professional Team. The Professional Team should be provided access to internet connections through the Professional Team members' laptops for reference work that may be required while on-site.

The on-site schedule is tentatively planned to proceed in the following sequence: (1) presentation by the modeler of new or extensively updated material related to the model; (2) section by section review commencing within each section with pre-visit letter responses; (3) responses to new or significantly changed standards in the 2011 Report of Activities, and (4) responses to the audit items for each standard in the Report of Activities.

Be prepared to have available for the Professional Team's consideration, all insurance company claims data received since 2004, including all data related to the 2004 and 2005 hurricane seasons. Be prepared to describe any processes used to amend or validate the model that incorporates this data.

Provide an explanation for each loss cost change of more than 5% from the loss costs produced in the previous submission using the 2007 Florida Hurricane Catastrophe Fund (FHCF) exposure data to the corresponding loss costs produced in the current submission using the 2007 FHCF exposure data.

When the Professional Team arrives on-site, provide five (5) printed copies of all figures with scales for the *X* and *Y* axes labeled that are not so labeled in the submission. Label the figures with the same figure number as given in the submission. Also, provide five (5) printed copies of Form V-3 and the electronic file used to complete Form V-3 on a removable drive medium. This material will be used during the on-site review and will be returned when the on-site review is complete. Additionally, provide five (5) printed copies of Form A-6 (all 8 worksheets) and the electronic file(s) used to complete Form A-6 and Form A-7. The electronic files will be examined only on-site and will be deleted from the Professional Team member's laptop at the conclusion of the review.

Be prepared to provide for the Professional Team's review all engineering data (post event surveys, tests, etc.) received since the review by the Professional Team in 2009. Be prepared to describe any processes used to amend or validate the model that incorporates this data.

If any changes have been made in any part of the model or the modeling process from the descriptions provided in the original 2011 submission, provide the Professional Team with a complete and detailed description of those changes, the reasons for the changes (e.g., an error was discovered), and all revised Forms where any output of the form changed.

As part of the on-site review, the Professional Team is charged with obtaining information regarding the two issues noted in the deficiency letter that will be later considered during the trade secret portion of the Commission meeting.

For your information, the Professional Team will arrive in business casual attire.

The pre-visit comments are grouped by standards sections.

GENERAL STANDARDS – Mark Johnson, Leader

G-1 Scope of the Computer Model and Its Implementation*

*(*Significant Revision)*

A. The computer model shall project loss costs and probable maximum loss levels for residential property insured damage from hurricane events.

B. The modeling organization shall maintain a documented process to assure continual agreement and correct correspondence of databases, data files, and computer source code to slides, technical papers, and/or modeling organization documents.

Audit

1. The main intent of the audit is to determine the capabilities of the model and to assess its implementation for purposes of Florida projected insured loss costs and probable maximum loss levels. Copies of all representative or primary technical papers that describe the underlying model theory shall be made available.

2. The process defined in Standard G-1.B will be: (1) reviewed for its inclusion of all stages of the modeling process, and (2) traced using the Computer Standards for one or more items listed in the response to Disclosure 5.

3. All software (1) located within the model, (2) used to compile data used by the model, (3) used to validate the model, (4) used to project model loss costs and probable maximum loss levels, and (5) used to create forms required by the *Report of Activities*:
    a. Shall fall within the scope of the Computer Standards;
    b. Shall be located in centralized, model-level file areas; and
    c. Shall be reviewable interactively (viewed simultaneously by all Professional Team members in conjunction with the review of each standard).

4. Maps, databases, or data files relevant to the modeling organization's submission will be reviewed.

5. Provide the following information related to changes in the model from the initial submission this year to each subsequent revision.
    A. Model changes:
        1. A summary description of changes that affect, or believe to affect, the personal or commercial residential loss costs or probable maximum loss levels,
        2. A list of all other changes, and
        3. The rationale for each change.
    B. Percentage difference in average annual zero deductible statewide loss costs for:
        1. All changes combined, and
        2. Each individual model component change.
    C. For any modifications to Form A-4 since the initial submission, additional versions of Form A-5:

1. With the initial submission as the baseline for computing the percentage changes, and
2. With any intermediate revisions as the baseline for computing the percentage changes.

D. Color-coded maps by county reflecting the percentage difference in average annual zero deductible statewide loss costs for each model component change:

1. Between the previously accepted submission and the revised submission,
2. Between the initial submission and the revised submission, and
3. Between any intermediate revisions and the revised submission.

Pre-Visit Letter

1. G-1.B, page 15: Illustrate and explain, in detail, the documented process used to comply with Standard G-1.B.

Verified: YES

Professional Team Comments:

Reviewed high-level flowchart of the software development cycle. Reviewed and discussed detailed flowcharts on research and development, model and software development, the update management process, and submission preparation.

Reviewed accessibility of model documentation electronically in AIRPort.

Verified agreement among presented material, written documentation, and computer source code for the Rmax calculation.

Reviewed revisions to various flowcharts prompted by discussions with the Professional Team.

G-2 Qualifications of Modeling Organization Personnel and Consultants

A. Model construction, testing, and evaluation shall be performed by modeling organization personnel or consultants who possess the necessary skills, formal education, and experience to develop the relevant components for hurricane loss projection methodologies.

B. ***The model or any modifications to an accepted model shall be reviewed by either modeling organization personnel or consultants in the following professional disciplines: structural/wind engineering (licensed Professional Engineer), statistics (advanced degree), actuarial science (Associate or Fellow of Casualty Actuarial Society), meteorology (advanced degree), and computer/information science (advanced degree). These individuals shall certify Forms G-1 through G-6 as applicable and shall abide by the standards of their profession.***

Audit

1. The professional vitae of modeling organization personnel and consultants responsible for the current model and information on their predecessors if different than current personnel will be reviewed. Background information on individuals providing testimonial letters in the submission shall be provided.

2. Forms G-1, G-2, G-3, G-4, G-5, G-6, and all independent peer reviews of the model under consideration will be reviewed. Signatories on the individual forms will be required to provide a description of their review process.

3. Discuss any incidents where modeling organization personnel or consultants have been found to have failed to abide by the standards of professional conduct adopted by their profession.

Pre-Visit Letter

2. G-2, Disclosure 2.B, page 47: Resumes for the new employees listed should be available.

3. G-2, Disclosure 3.A, page 49: The Meteorology reviews of 2010 and the 2012 review of Dr. Friedland should be available.

Verified: YES

Professional Team Comments:

Reviewed peer reviews of the meteorological component:

- Peter Black, December 16, 2009 (windfield)
- Robb Contreras, June 11, 2009 (local intensity calculation, observed windspeed validation, extra-tropical transitioning)

- Kerry Emanuel, December 16, 2009 (windfield)

Reviewed peer reviews of the submission standards groups under the 2011 Standards:

- Carol Friedland, October 28, 2012 (vulnerability)
- Narges Pourghasemi, September 14, 2012 (computer)
- John Rollins, October 24, 2012 (actuarial)

Reviewed resumes of new personnel:

- Alexander Dale, B.A. Economics, University of Texas at Austin
- Boyd Zapatka, B.A. Geography and Environmental Science, Clark University, Worcester, MA; M.S. Geographic Information Science, Clark University, Worcester, MA
- Jonathan Kinghorn, B.A. University of Leicester, England; Graduate Diploma in Art Gallery & Museum Studies, University of Manchester, England; Museum Curatorial Certification, UK Museums Association; Webmaster Certification, Clarke University Computer Careers Institute, Cambridge, MA
- Kyle Butler, Ph.D. Civil Engineering, University of Notre Dame, Notre Dame, IN; B.S. Civil Engineering, Georgia Institute of Technology, Atlanta, GA
- Patruni Murty, M.S. Nuclear Physics, Andhra University; B.S. AVN College Visakhapatnam; Diploma in Radiation Physics and Diploma in Management Studies, University of Bombay
- Prashant Annabattuni, Masters Computer Science, University of North West; Bachelors Computer Science, Osmania University
- Brian Gridley, B.S. Finance Economics, Ohio State University, Columbus, OH
- Chun Shang, M.S. Mathematics, University of Connecticut, Storrs, CT; B.A. Economics, Boston University, Boston, MA
- Matthew Maddalo, M.S. Structural Engineering, Northeastern University, Boston, MA; B.S. Civil Engineering, Villanova University, Villanova, PA
- Praveen Paranjothi, M.S. Computer Science, Governors State University, IL; B.T. University of Madras, India

Discussed that there were no departures of personnel attributable to ethical violations.

G-3 Risk Location

A. ZIP Codes used in the model shall not differ from the United States Postal Service publication date by more than 24 months at the date of submission of the model. ZIP Code information shall originate from the United States Postal Service.

B. ZIP Code centroids, when used in the model, shall be based on population data.

C. ZIP Code information purchased by the modeling organization shall be verified by the modeling organization for accuracy and appropriateness.

Audit

1. Provide geographic displays for all ZIP Codes.

2. Provide geographic comparisons of previous to current locations of ZIP Code centroids.

3. Provide the third party vendor, if applicable, and a complete description of the process used to validate ZIP Code information.

4. The treatment of ZIP Code centroids over water or other uninhabitable terrain will be reviewed.

Pre-Visit Letter

4. G-3, page 52: Maps with before and after centroids superimposed (as we have seen in the past) should be available.

Verified: YES

Professional Team Comments:

Discussed the methodology for updating and validating ZIP Code centroids.

Reviewed geographic displays of ZIP Codes and comparisons of new centroid locations to previous locations for the entire state.

Reviewed in detail the top ten centroid changes.

G-4 Independence of Model Components

The meteorological, vulnerability, and actuarial components of the model shall each be theoretically sound without compensation for potential bias from the other two components.

Audit

1. Demonstrate that the model components adequately portray hurricane phenomena and effects (damage, loss costs, and probable maximum loss levels). Attention will be paid to an assessment of (1) the theoretical soundness of each component and (2) the basis of their integration. For example, a model would not meet this standard if an artificial calibration adjustment had been made to improve the match of historical and model results for a specific hurricane.

2. Describe all changes in the model since the previous submission that might impact the independence of the model components.

Verified: YES

Professional Team Comments:

No evidence of one component compensating for another component's bias. No evidence indicating lack of theoretical soundness.

G-5 Editorial Compliance

The submission and any revisions provided to the Commission throughout the review process shall be reviewed and edited by a person or persons with experience in reviewing technical documents who shall certify on Form G-7 that the submission has been personally reviewed and is editorially correct.

Audit

1. Demonstrate that the person or persons who have reviewed the submission has had experience in reviewing technical documentation and such person or persons is familiar with the submission requirements as set forth in the Commission's *Report of Activities as of December 31, 2011*.

2. Describe all changes to the submission document since the previously accepted submission that might impact the final document submission.

3. Demonstrate that the submission has been reviewed for grammatical correctness, typographical accuracy, completeness, and inclusion of extraneous data or materials.

4. Demonstrate that the submission has been reviewed by the signatories on Forms G-1 through G-6 for accuracy and completeness.

5. The modification history for submission documentation will be reviewed.

6. A flowchart defining the process for form creation will be reviewed.

7. Form G-7 will be reviewed.

Verified: YES

Professional Team Comments:

Editorial items noted by the Professional Team were satisfactorily addressed during the audit. The Professional Team has reviewed the submission per Audit item 3, but cannot guarantee that all editorial difficulties have been identified. The modeler is responsible for eliminating such errors.

Discussed with Jonathan Kinghorn his process for editorial review.

Reviewed submission documentation modification history.

Reviewed flowchart of submission form creation with particular attention to Forms A-2, A-3, A-8, S-2, and S-5.

Meteorological Standards – Jenni Evans, Leader

M-1 Base Hurricane Storm Set*

*(*Significant Revision)*

A. Annual frequencies used in both model calibration and model validation shall be based upon the National Hurricane Center HURDAT starting at 1900 as of August 15, 2011 (or later). Complete additional season increments based on updates to HURDAT approved by the Tropical Prediction Center/National Hurricane Center are acceptable modifications to these storm sets. Peer reviewed atmospheric science literature can be used to justify modifications to the Base Hurricane Storm Set.

B. Any trends, weighting, or partitioning shall be justified and consistent with currently accepted scientific literature and statistical techniques. Calibration and validation shall encompass the complete Base Hurricane Storm Set as well as any partitions.

Audit

1. The modeling organization's Base Hurricane Storm Set will be reviewed.

2. Provide a flowchart illustrating how changes in the HURDAT database are used in the calculation of landfall distribution.

3. Reasoning and justification underlying any modification by the modeling organization to the Base Hurricane Storm Set will be reviewed.

4. Reasoning and justification underlying any short-term and long-term variations in annual hurricane frequencies incorporated in the model will be reviewed.

5. Modeled probabilities will be compared with observed hurricane frequency using methods documented in currently accepted scientific literature. The goodness-of-fit of modeled to historical hurricane frequencies for the four regions of Florida and overall as provided in Form M-1 will be reviewed.

6. Form M-1 will be reviewed for consistency with Form S-1. Changes to the modeling organization's Base Hurricane Storm Set from the previously accepted submission will be reviewed.

7. Comparisons of modeled probabilities and characteristics from the complete historical record will be reviewed. Modeled probabilities from any subset, trend, or fitted function will be reviewed, compared, and justified against the complete historical record. In the case of partitioning, modeled probabilities from the partition and its complement will be reviewed and compared with the complete historical record.

Pre-Visit Letter

5. M-1, Disclosure 1, page 58: Demonstrate the method for incorporating updates to the Base Hurricane Storm Set used.

11. Form M-1, page 196: Justify the distribution of modeled storms, in particular for Regions B and F, and for By-Passing Hurricanes.

12. Form M-1, page 196: Define the process used to verify consistency between Form M-1 and Form S-1 (page 293).

Verified: YES

Professional Team Comments:

Reviewed the procedure for incorporating and validating updates to the Base Hurricane Storm Set. Reviewed flowchart illustrating this procedure. Verified implementation of the updates to the historical storm set used HURDAT as of August 15, 2011 and the reanalysis through 1930. Verified no additional Florida landfalls since previous submission.

Discussed changes to storm characteristics at landfall based on the NHC-6 document.

Reviewed flowchart illustrating how changes in HURDAT are used in the calculation of landfall distribution. Discussed adjustments made based on landfall information. Reviewed Chi-square tests in support of landfall distribution acceptability.

Discussed the procedure for modeling central pressure as a mixture of segment and regional Weibull distributions. Discussed use of this distribution in category-based landfall distributions.

Discussed the comparison of landfall and by-passing frequencies for each region in Form M-1 and the reason for no adjustments to Region F.

Reviewed consistency between Forms M-1 and S-1. Verified the same 50,000 storm catalog was used for completing the forms. Verified the total number of individual Florida landfalling events was equal in both forms.

Verified no partitioning is done to the historical data. Discussed the warm SST catalog developed for sensitivity testing. Verified the warm SST catalog is not used in the submission.

Documentation reviewed:

Dunn, Gordon E., “The Hurricane Season of 1964,” *Monthly Weather Review*, March, 1965.

McDonald, W.F., “Tropical Disturbance of August 18-25, 1935,” *Monthly Weather Review*, August, 1935.

Sumner, H.C., “North Atlantic Hurricanes and Tropical Disturbances of 1948,” *Monthly Weather Review*, December, 1948.

Young, F.A., “Weather on the Atlantic and Pacific Oceans,” *Monthly Weather Review*, August, 1928.

M-2 Hurricane Parameters and Characteristics

Methods for depicting all modeled hurricane parameters and characteristics, including but not limited to windspeed, radial distributions of wind and pressure, minimum central pressure, radius of maximum winds, landfall frequency, tracks, spatial and time variant windfields, and conversion factors, shall be based on information documented in currently accepted scientific literature.

Audit

1. All hurricane parameters used in the model will be reviewed.

2. Prepare graphical depictions of hurricane parameters as used in the model. Describe and justify:
   a. The data set basis for the fitted distributions,
   b. The modeled dependencies among correlated parameters in the windfield component and how they are represented,
   c. The asymmetric nature of hurricanes,
   d. The fitting methods used and any smoothing techniques employed.

3. The treatment of the inherent uncertainty in the conversion factor used to convert the modeled vortex winds to surface winds will be reviewed and compared with currently accepted scientific literature. Treatment of conversion factor uncertainty at a fixed time and location within the windfield for a given hurricane intensity will be reviewed.

4. All cited scientific literature provided in Standard G-1 will be reviewed to determine applicability.

5. All external data sources that affect model generated windfields will be identified and their appropriateness will be reviewed.

6. Describe the value(s) of the far-field pressure used in the model and approximate its sensitivity on the average annual zero deductible statewide loss costs.

Verified: YES

Professional Team Comments:

Discussed hurricane parameters used in the model and verified no changes from the previous submission.

- Intensity, based on central pressure deficit
- Peripheral pressure adjustment (far-field pressure) varies with latitude
- Gradient wind reduction factor (GWRF)
- Peak weighting factor and its relation to GWRF
- Forward speed

- Rmax
- Landfall location

Verified no change in smoothing methods from previous submission.

Reviewed wind validation spreadsheet opened in centralized AIRPort data repository.

Discussed treatment of uncertainty in the conversion factor (Gradient Wind Reduction Factor).

Discussed supporting data analyses and literature relevant to conversion factor developments.

Reviewed external data sources used.

Discussed how far field pressure varies from pure latitudinal distribution based on historical storms. Verified that this is unchanged from the previous submission.

M-3 Hurricane Probabilities

A. Modeled probability distributions of hurricane parameters and characteristics shall be consistent with historical hurricanes in the Atlantic basin.

B. Modeled hurricane landfall frequency distributions shall reflect the Base Hurricane Storm Set used for category 1 to 5 hurricanes and shall be consistent with those observed for each coastal segment of Florida and neighboring states (Alabama, Georgia, and Mississippi).

C. Models shall use maximum one-minute sustained 10-meter windspeed when defining hurricane landfall intensity. This applies both to the Base Hurricane Storm Set used to develop landfall frequency distributions as a function of coastal location and to the modeled winds in each hurricane which causes damage. The associated maximum one-minute sustained 10-meter windspeed shall be within the range of windspeeds (in statute miles per hour) categorized by the Saffir-Simpson Scale.

Saffir-Simpson Hurricane Scale:

Category	Winds (mph)	Damage
1	74 – 95	Minimal
2	96 – 110	Moderate
3	111 – 130	Extensive
4	131 – 155	Extreme
5	Over 155	Catastrophic

Audit

1. Demonstrate that the quality of fit extends beyond the Florida border by showing results for appropriate coastal segments in Alabama, Georgia, and Mississippi.

2. Describe and support the method of selecting stochastic storm tracks.

3. Describe and support the method of selecting storm track strike intervals. If strike locations are on a discrete set, show the landfall points for major metropolitan areas in Florida.

4. Provide any modeling organization specific research performed to develop the functions used for simulating model variables or to develop databases.

5. Form S-3 will be reviewed for the probability distributions and data sources.

Verified: YES

Professional Team Comments:

Verified no change in the methodology used to generate stochastic storm tracks.

Verified no change in method for selecting storm track strike locations from a continuous uniform distribution within each 50-mile coastal segment.

Reviewed the smoothing process applied for landfall frequency by Florida segments and adjacent regions.

Reviewed updated Form S-3 for hurricane database sources.

M-4 Hurricane Windfield Structure

A. Windfields generated by the model shall be consistent with observed historical storms affecting Florida.

B. The translation of land use and land cover or other source information into a surface roughness distribution shall be consistent with current state-of-the-science and shall be implemented with appropriate geographic information system data.

C. With respect to multi-story structures, the model windfield shall account for the effects of the vertical variation of winds if not accounted for in the vulnerability functions.

Audit

1. Provide any modeling organization-specific research performed to develop the windfield functions used in the model. Identify the databases used.

2. Provide any modeling organization-specific research performed to derive the roughness distributions for Florida and adjacent states.

3. The spatial distribution of surface roughness used in the model will be reviewed.

4. Identify other variables in the model that affect over-land surface windspeed estimation.

5. Provide detailed comparisons of the model windfield with Hurricane Charley (2004), Hurricane Jeanne (2004), and Hurricane Wilma (2005).

6. For windfield and/or pressure distributions not previously reviewed, present time-based contour animations (capable of being paused) to demonstrate scientifically reasonable windfield characteristics.

7. The effects of vertical variation of winds as used in the model where applicable will be reviewed.

8. Form M-2 will be reviewed.

Pre-Visit Letter

6. M-4.B, page 70: Discuss the currency of the Land Use/Land Cover database used.

7. M-4, Disclosure 7, page 72: Describe the methods used to update the Land Use/Land Cover database used from the 2001 distributions inherent in the Homer et al. (2004, 2007) database.

8. M-4, Disclosure 9, pages 73-75: Explain observational data added, removed, or modified since the previous submission.

9. M-4, Disclosure 10, page 76: Present Figure 12 for Hurricane Charley (2004), but for Florida only.

Verified: YES

Professional Team Comments:

Discussed the 2001 date of the National Land Cover Database used in the model. Discussed the modeler progress in processing the 2012 USGS release.

Reviewed scatter plots of Florida only observed versus modeled windspeed for Hurricane Charley (2004) and Hurricane Jeanne (2004). Discussed no bias of modeled windspeeds at the high end over the low end.

Reviewed modeled versus observations windfield maps for Hurricane Charley (2004) and Hurricane Dennis (2005). Compared maps with previous submission. Verified no change.

Discussed the databases and research included for development of the windfield functions.

Reviewed the spatial distribution of surface roughness used in the model.

Reviewed the model variables that affect over-land surface windspeed estimation.

Reviewed spatial distribution of modeled windspeeds compared to observations for Hurricane Jeanne (2004).

Discussed effect of ZIP Code and county-based aggregation in calculation of roughness factors and modeled windfield. Discussed the possible impact of centroid or grid locations used in forms.

Discussed the maximum windspeeds plotted in Form M-2 maps. Discussed the sources of relativities between maximum and minimum windspeeds for actual and open terrain.

M-5 Landfall and Over-Land Weakening Methodologies

A. The hurricane over-land weakening rate methodology used by the model shall be consistent with historical records and with current state-of-the-science.

B. The transition of winds from over-water to over-land within the model shall be consistent with current state-of-the-science.

Audit

1. Describe the variation in over-land decay rates used in the model.

2. Comparisons of the model's weakening rates to weakening rates for historical Florida hurricanes will be reviewed.

3. Transition of winds from over-water to over-land (i.e., landfall) will be reviewed. Provide color-coded snapshot maps of roughness length and spatial distribution of windspeeds over-land and over-water for Hurricane Jeanne (2004), Hurricane Dennis (2005), and Hurricane Andrew (1992) at the closest time after landfall.

Verified: YES

Professional Team Comments:

Discussed variation of over-land decay rates by geographic area and class of storm intensity. Verified no change in methodology.

Reviewed maps of Hurricane Andrew (1992), Hurricane Dennis (2005), and Hurricane Jeanne (2004) directional friction factors applied at hour after landfall and modeled hourly maximum windspeeds.

M-6 Logical Relationships of Hurricane Characteristics

A. The magnitude of asymmetry shall increase as the translation speed increases, all other factors held constant.

B. The mean windspeed shall decrease with increasing surface roughness (friction), all other factors held constant.

Audit

1. Form M-3 and the modeling organization's sensitivity analyses provide the information used in auditing this standard.

2. Justify the relationship between central pressure and radius of maximum winds.

3. Justify the variation of the asymmetry with the translation speed.

Pre-Visit Letter

10. M-6, Disclosure 3, page 81: Present the analyses of wind radii (modeled versus Extended Best Track) described here.

Verified: YES

Professional Team Comments:

Reviewed the analyses of wind radii. Discussed method of calculation of wind radii given in Form M-3. Reviewed graphical comparison of wind radii upper bounds and lower bounds with extended best track database for historical storms.

Discussed sensitivity of surface windfield distribution to inclusion or exclusion of conversion factor (GWRF) variation.

Verified no change in model treatment of windfield asymmetry.

VULNERABILITY STANDARDS – Masoud Zadeh, Leader

V-1 Derivation of Vulnerability Functions*

*(*Significant Revision)*

A. Development of the vulnerability functions shall be based on any or a combination of the following: (1) historical data, (2) tests, (3) structural calculations, (4) expert opinion, or (5) site inspections. However, any development of the vulnerability functions based on structural calculations or expert opinion shall be supported by tests, site inspections, and historical data.

B. The method of derivation of the vulnerability functions and their associated uncertainties shall be theoretically sound and consistent with fundamental engineering principles.

C. Residential building stock classification shall be representative of Florida construction for personal and commercial residential properties.

D. Building height/number of stories, primary construction material, year of construction, location, and other construction characteristics, as applicable, shall be used in the derivation and application of vulnerability functions.

E. Vulnerability functions shall be separately derived for commercial residential building structures, personal residential structures, mobile homes, appurtenant structures, contents, and time element coverages.

F. The minimum windspeed that generates damage shall be consistent with fundamental engineering principles.

G. Vulnerability functions shall include damage as attributable to windspeed and wind pressure, water infiltration, and missile impact associated with hurricanes. Vulnerability functions shall not include explicit damage to the structure due to flood, storm surge, or wave action.

Audit

1. Historical data shall be available in the original form with explanations for any changes made and descriptions of how missing or incorrect data were handled. For historical data used to develop vulnerability functions, demonstrate the goodness-of-fit of the data. Complete reports detailing loading conditions and damage suffered are required for any test data used. Complete structural calculations shall be presented so that a variety of different structure types and construction characteristics may be selected for review. The basis for expert opinion and original site inspection reports shall be available for review.

2. Copies of any papers, reports, and studies used in the development of the vulnerability functions shall be available for review. Copies of all public record documents used may be requested for review.

3. Multiple samples of vulnerability functions for building structures, mobile homes, appurtenant structures, contents, and time element coverages shall be available. The magnitude of logical changes among these items for a given windspeed shall be explained and validation materials shall be available.

4. Justify the construction types and characteristics used.

5. Provide validation of the mean vulnerability functions and associated uncertainties.

6. Document and justify all modifications to the vulnerability functions due to building codes and their enforcement. If age of building is used as a surrogate for building code and code enforcement, provide complete supporting information for the number of age groups used as well as the year(s) of construction that separates particular group(s).

7. Provide validation material for the disclosed minimum windspeed. Provide the computer code showing the inclusion of the minimum windspeed at which damage occurs.

8. The effects on building vulnerability from local and regional construction characteristics and building codes will be reviewed.

9. Describe whether and/or how the claim practices of insurance companies are accounted for when claims data for those insurance companies are used to develop or to verify vulnerability functions. Examples include the level of damage the insurer considers a loss to be a total loss, claim practices of insurers with respect to concurrent causation, or the impact of public adjusting.

10. Provide the percentage of damage at or above which the model assumes a total loss.

11. Form V-1 will be reviewed.

Pre-Visit Letter

13. V-1.B, page 82: Explain how the uncertainties in vulnerability functions are developed, including the form and basis of the probability distributions around the mean damage ratio for a given windspeed level. Provide examples.

14. V-1.E, page 84: Provide an explanation of how vulnerability functions for appurtenant structures and commercial residential building structures have been developed. Provide examples.

15. V-1, Disclosure 2, page 86: Describe the breakdown of loss data among building, content, and time element. Provide any new insurance data received and analyzed since 2007.

16. V-1, Disclosure 3, page 90: Provide support for Disclosure 3.

17. V-1, Disclosure 5, page 92 and Disclosure 10, page 95: Provide details on the definition, number, and characteristics of "unknown" class of buildings in Florida and how their vulnerability functions and associated uncertainty are developed. Provide the basis for distribution of known building types. Provide examples.

18. V-1, Disclosures 8-14, pages 95-102: Disclosures 8 through 14 are new disclosures for V-1. Prepare to discuss in depth.

19. V-1, Disclosures 8 & 9, page 95: Discuss the basis for developing vulnerability functions for appurtenant structures and consistency with claims data. Provide examples.

20. V-1, Disclosures 13 & 14, pages 96-102: Explain the apparent larger uncertainty in actual data versus simulated data and how this relates to modeling uncertainty in vulnerability functions.

24. Form V-1, pages 209-211: Describe the process and provide the documentation for all steps to complete Form V-1. Discuss the reasons for closeness of losses in Part B for wood frame, masonry, and mobile home. Provide comparisons of the corresponding vulnerability functions.

Verified: YES

Professional Team Comments:

Discussed vulnerability functions developed through published research, engineering analysis, damage surveys, and detailed claims and loss data analysis.

Reviewed and discussed the original and revised flowcharts for development of hurricane vulnerability functions.

Discussed the use of claims analysis to develop the uncertainty distributions for the vulnerability functions. These are handled in the model using truncated probability distributions.

Reviewed comparison of uncertainty in vulnerability with Bhinderwala (1995).

Reviewed comparison of the observed and modeled damage distribution around 3% and 10% modeled mean damage ratios.

Discussed appurtenant structure vulnerability is based upon the same vulnerability as used for primary structure types, varies by construction and occupancy, and is validated against actual claims.

Discussed model ability to use different and separate vulnerability functions for appurtenant structures.

Discussed that building and appurtenant structure vulnerability are developed and validated concurrently.

Reviewed loss data broken down among building, content, and time element.

Discussed the development of vulnerability functions for unknown construction class using weights from the industry exposure database for building inventory distribution in Florida.

Discussed in detail the responses provided to Disclosures 8-14.

Discussed the assumptions for commercial residential construction including potential for more engineering used in design and construction of commercial residential buildings.

Reviewed scatter plots comparing actual and modeled damage ratios versus wind speed for structures and appurtenant structures. Discussed the model loss data points being mean damage ratio thus showing less variability.

Discussed the underlying data for Figure 44.

Reviewed data and validation assumptions in development of vulnerability functions for appurtenant structures.

Discussed the simulated points representing the mean damage ratio produced by the model and the actual data points from the claims data showing the complete spread of damage ratio values used in the underlying uncertainty validation.

Reviewed procedure used for preparation of Form V-1. Discussed the reasons for closeness of loss in Part B.

Reviewed several plots of modeled mean damage ratios versus actual damage ratios for various construction types.

Reviewed specific data points on the charts and data behind them.

Discussed that the model has no assumptions on total loss threshold and the basis for damage ratio.

Reviewed plots of coefficient of variation (COV) on modeled damage ratio as a function of mean damage ratio and COV as a function of windspeed for wood frame, masonry, and mobile home constructions.

Discussed assumptions for development of vulnerability functions for commercial residential. Reviewed the revised response to V-1, Disclosure 11.

V-2 Derivation of Contents and Time Element Vulnerability Functions*

*(*Significant Revision)*

A. The relationship between the modeled structure and contents vulnerability functions and historical structure and contents losses shall be reasonable.

B. Time element vulnerability function derivations shall consider the estimated time required to repair or replace the property.

C. The relationship between the modeled structure and time element vulnerability functions and historical structure and time element losses shall be reasonable.

D. Time element vulnerability functions used by the model shall include time element coverage claims associated with wind, flood, and storm surge damage to the infrastructure caused by a hurricane.

Audit

1. To the extent that historical data are used to develop mathematical depictions of contents functions, demonstrate the goodness-of-fit of the data to fitted models.

2. Justify changes from the previously accepted submission in the relativities between loss costs for structures and the corresponding loss costs for contents.

3. Documentation and justification of the following will be reviewed:
    a. The method of derivation and data on which the time element vulnerability functions are based;
    b. Validation data specifically applicable to time element coverages;
    c. Assumptions regarding the coding of time element losses by insurers;
    d. The effects of demand surge on time element for the 2004 and 2005 hurricane seasons;
    e. Assumptions regarding the variability of time element losses by size of property;
    f. Statewide application of time element coverage assumptions;
    g. Assumptions regarding time element coverage for mobile homes, tenants, and condo unit owners exposure;
    h. The methods used to incorporate the estimated time required to repair or replace the property;
    i. The methodology and available validation for determining the extent of infrastructure damage and its effect on time element costs.

4. Justify changes from the previously accepted submission in the relativities between loss costs for structures and the corresponding loss costs for time element.

5. To the extent that historical data are used to develop mathematical depictions of time element functions, demonstrate the goodness-of-fit of the data to fitted models.

Pre-Visit Letter

21. V-2, pages 104-105: Discuss in depth and provide supporting documentation.

22. V-2.B, page 104: Provide the basis and documentation on repair and replacement time.

23. V-2.C, page 105: Explain the apparent inconsistency between Figure 28 and Figure 29.

Verified: YES

Professional Team Comments:

Discussed the relationship among modeled structure and contents loss costs, and among modeled structure and time element loss costs.

Discussed the assumptions for estimated time required to repair or replace damaged property in time element vulnerability functions.

Discussed the data source and methodology used in developing relation between building repair time and damage ratio.

Discussed the underlying data used in Figures 28 and 29 and the differences.

Verified no changes in the methodology for calculating contents and time element loss costs.

Reviewed the mis-match of Florida Hurricane Catastrophe Fund (FHCF) data and its mapping to AIR codes in previous submission versus the correct mapping of the FHCF to AIR codes in the current submission.

Verified there were no changes between the relation of time element and building vulnerability functions from previous submission.

V-3 Mitigation Measures

A. Modeling of mitigation measures to improve a structure's wind resistance and the corresponding effects on vulnerability shall be theoretically sound and consistent with fundamental engineering principles. These measures shall include fixtures or construction techniques that enhance the performance of the structure and its contents and shall consider:

- ***Roof strength***
- ***Roof covering performance***
- ***Roof-to-wall strength***
- ***Wall-to-floor-to-foundation strength***
- ***Opening protection***
- ***Window, door, and skylight strength.***

B. Application of mitigation measures that enhance the performance of the structure and its contents shall be justified as to the impact on reducing damage whether done individually or in combination.

Audit

1. Form V-2 and Form V-3 (Trade Secret item) provide the information used in auditing this standard.

2. Individual mitigation measures as well as their effect on damage due to use of multiple mitigation measures will be reviewed. Any variation in the change over the range of windspeeds for individual and multiple mitigation measures will be reviewed.

3. Mitigation measures used by the model that are not listed as required in this standard will be disclosed and shown to be theoretically sound and reasonable.

Pre-Visit Letter

25. Form V-2, pages 212-218: Provide the process and steps taken to complete Form V-2 along with documentation. Compare this form with the previous submission Form V-2. Explain the differences.

Verified: YES

Professional Team Comments:

Reviewed the process for completing Form V-2. Discussed differences from previous accepted submission due to new calculation methodology to better reflect the actual mitigation impacts represented by the model.

Review of Form V-3 revealed discrepancy with the submitted Form V-2. A corrected Form V-2 will be provided in the revised submission documentation.

Verified no new mitigation measures were added and no changes to the existing factors.

ACTUARIAL STANDARDS – Marty Simons, Leader

A-1 Modeling Input Data

A. When used in the modeling process or for verification purposes, adjustments, edits, inclusions, or deletions to insurance company input data used by the modeling organization shall be based upon accepted actuarial, underwriting, and statistical procedures.

B. All modifications, adjustments, assumptions, inputs and/or input file identification, and defaults necessary to use the model shall be actuarially sound and shall be included with the model output report. Treatment of missing values for user inputs required to run the model shall be actuarially sound and described with the model output report.

Audit

1. Quality assurance procedures shall include methods to assure accuracy of insurance data. Compliance with this standard will be readily demonstrated through documented rules and procedures.

2. All model inputs and assumptions will be reviewed to determine that the model output report appropriately discloses all modifications, adjustments, assumptions, and defaults used to produce the loss costs.

Verified: YES

Professional Team Comments:

Discussed the quality assurance procedures to assure accuracy of insurance data.

Reviewed a model sample analysis log provided in Appendix 6 which discloses all selections used by the modeler for the model output.

A-2 Event Definition*

*(*Significant Revision)*

A. Modeled loss costs and probable maximum loss levels shall reflect all insured wind related damages from storms that reach hurricane strength and produce minimum damaging windspeeds or greater on land in Florida.

B. Time element loss costs shall reflect losses due to infrastructure damage caused by a hurricane.

Audit

1. The model will be reviewed to determine that the definition of an event in the model is consistent with this standard.

2. The model will be reviewed to determine that by-passing storms and their effects are considered in a manner that is consistent with this standard.

3. The model will be reviewed to determine whether (if so, how) the model takes into account flood or hurricane storm surge.

Verified: YES

Professional Team Comments:

Verified no change in the definition of an event or the handling of by-passing storms in the model.

Reviewed a sample analysis log indicating flood and storm surge losses were not included in the model output.

A-3 Modeled Loss Cost and Probable Maximum Loss Considerations

A. Loss cost projections and probable maximum loss levels shall not include expenses, risk load, investment income, premium reserves, taxes, assessments, or profit margin.

B. Loss cost projections and probable maximum loss levels shall not make a prospective provision for economic inflation.

C. Loss cost projections and probable maximum loss levels shall not include any provision for direct hurricane storm surge losses.

D. Loss cost projections and probable maximum loss levels shall be capable of being calculated from exposures at a geocode (latitude-longitude) level of resolution.

E. Demand surge shall be included in the model's calculation of loss costs and probable maximum loss levels using relevant data.

F. The methods, data, and assumptions used in the estimation of demand surge shall be actuarially sound.

Audit

1. Describe how the model handles expenses, risk load, investment income, premium reserves, taxes, assessments, profit margin, economic inflation, and any criteria other than direct property insurance claim payments.

2. The method of inclusion of secondary uncertainty in the probable maximum loss levels will be examined.

3. Provide the data and methods used to incorporate individual aspects of demand surge on personal and commercial residential coverages, inclusive of the effects from building material costs, labor costs, contents costs, repair time, etc.

4. All referenced literature will be reviewed to determine applicability.

Verified: YES

Professional Team Comments:

Verified modeled loss costs do not include expenses, risk load, investment income, premium reserves, taxes, assessments, or profit margin, and the model does not make a prospective provision for economic inflation.

Verified no change in the previously accepted methodology for producing probable maximum loss estimates.

Verified no change in the previously accepted methodology for demand surge calculations.

Model is capable of producing loss costs and probable maximum loss costs at a geocode (latitude/longitude) level.

Discussed secondary uncertainty in the probable maximum loss levels is included in the model.

A-4 Policy Conditions

A. The methods used in the development of mathematical distributions to reflect the effects of deductibles and policy limits shall be actuarially sound.

B. The relationship among the modeled deductible loss costs shall be reasonable.

C. Deductible loss costs shall be calculated in accordance with s. 627.701(5)(a), F.S.

Audit

1. Describe the process used to determine the accuracy of the insurance-to-value criteria in data used to develop or validate the model results.

2. To the extent that historical data are used to develop mathematical depictions of deductibles and policy limits, demonstrate the goodness-of-fit of the data to fitted models.

3. To the extent that historical data are used to validate the model results, the treatment of the effects of deductibles, policy limits, and coinsurance in the data will be reviewed.

4. Justify changes from the previously accepted submission in the relativities among corresponding deductible amounts for the same coverage.

Verified: YES

Professional Team Comments:

Verified no change in the process for calculating and applying deductibles and policy limits from previously accepted submission.

Reviewed modeler's definitions and calculations relating to gross losses and ground up losses.

Discussed structured processing procedures for insurer data.

A-5 Coverages

A. The methods used in the development of contents loss costs shall be actuarially sound.

B. The methods used in the development of time element coverage loss costs shall be actuarially sound.

Audit

The methods used to produce contents and time element loss costs will be reviewed.

Verified: YES

Professional Team Comments:

Verified no change in the accepted process and calculations used to develop contents and time element loss costs from the previous submission.

Reviewed exhibits showing relationship of building, contents, and time element coverages.

A-6 Loss Output*

*(*Significant Revision)*

A. The methods, data, and assumptions used in the estimation of probable maximum loss levels shall be actuarially sound.

B. Loss costs shall not exhibit an illogical relation to risk, nor shall loss costs exhibit a significant change when the underlying risk does not change significantly.

C. Loss costs produced by the model shall be positive and non-zero for all valid Florida ZIP Codes.

D. Loss costs cannot increase as the quality of construction type, materials and workmanship increases, all other factors held constant.

E. Loss costs cannot increase as the presence of fixtures or construction techniques designed for hazard mitigation increases, all other factors held constant.

F. Loss costs cannot increase as the quality of building codes and enforcement increases, all other factors held constant.

G. Loss costs shall decrease as deductibles increase, all other factors held constant.

H. The relationship of loss costs for individual coverages, (e.g., structures and appurtenant structures, contents, and time element) shall be consistent with the coverages provided.

I. Output ranges shall be logical for the type of risk being modeled and deviations supported.

J. All other factors held constant, output ranges produced by the model shall in general reflect lower loss costs for:

1. masonry construction versus frame construction,

2. personal residential risk exposure versus mobile home risk exposure,

3. inland counties versus coastal counties, and

4. northern counties versus southern counties.

A-6 Loss Output (Continued)

K. For loss cost and probable maximum loss level estimates derived from or validated with historical insured hurricane losses, the assumptions in the derivations concerning (1) construction characteristics, (2) policy provisions, (3) coinsurance, (4) contractual provisions, and (5) relevant underwriting practices underlying those losses, as well as any actuarial modifications, shall be appropriate based on the type of risk being modeled.

Audit

1. Provide the data and methods used for probable maximum loss levels for Form A-8.
2. All referenced literature will be reviewed to determine applicability.
3. Graphical representations of loss costs by ZIP Code and county will be reviewed.
4. Color-coded maps depicting the effects of land friction on loss costs by ZIP Code will be reviewed.
5. The procedures used by the modeling organization to verify the individual loss cost relationships will be reviewed. Forms A-1, A-2, A-3, A-6, and A-7 will be used to assess coverage relationships.
6. The total personal and commercial residential insured losses provided in Forms A-2 and A-3 will be reviewed individually for total personal residential and total commercial residential insured losses.
7. Forms A-4 and A-5 will be reviewed, including geographical representations of the data when applicable.
8. Justify all changes in loss costs from the previously accepted submission.
9. Form A-4 will be reviewed to ensure appropriate differentials among deductibles, coverage, and construction types.
10. Anomalies in the output range data will be reviewed and shall be justified.

Pre-Visit Letter

26. Provide detailed results for Monroe County at the ZIP Code level for all Actuarial forms.
27. Form A-1, page 221: Explain the dark red area amongst other areas of lighter red around Glades County in Figure 62.

28. Form A-4: Explain the relative values of Frame Renters versus Frame Owners, especially for the Low category.

29. Form A-4, page 245: Explain the shaded loss cost (0.629) for the Low Frame Owners loss cost in Bay County.

30. Form A-4, pages 248 & 257: Explain the following: Hardee County Frame Condo Unit and Masonry Condo Unit are unshaded for 0% deductible; these are shaded for specified deductibles.

31. Form A-4, pages 252 & 263: Explain the following: Union County Frame Condo Unit results should be non-zero.

32. Form A-5, pages 267-274: Explain the results for Walton County in Figures 71-78.

33. Form A-5, page 272: Explain the result for Okeechobee County in Figure 76.

34. Form A-6, page 275: Describe the process and provide the documentation for all steps to complete Form A-6. Describe the steps taken to ensure sensibility of the results.

35. Form A-7, pages 276-287: Describe the process and provide the documentation for all steps to complete Form A-7. Describe the steps taken to ensure sensibility of the results.

Verified: YES

Professional Team Comments:

Reviewed Forms A-1, A-2, A-3, A-4, A-5, A-7, and A-8 as submitted and A-6 on site.

Reviewed Forms A-1, A-2, A-3, A-4, A-5, A-6, A-7, and A-8 completed for Monroe County only at the ZIP Code level.

Reviewed the Monroe County loss costs by ZIP Code with and without secondary risk characteristics applied for Frame Owners versus Masonry Owners. Discussed difference in Form A-1 and Form A-4 results relate to the application of secondary risk characteristics in Form A-4 but not in Form A-1.

Reviewed the results provided in the output ranges, Form A-4. Reviewed Form A-4 completed with previously accepted model in new format.

Discussed with John Rollins his review and the revisions in the submission made as a result of his review.

Discussed difference in locations for maximum loss in Form A-1 between frame owners and masonry owners to mobile homes.

Discussed the dark red apparent anomaly around Glades County attributed to the ZIP Code centroid shape and location.

Discussed the counterintuitive results for frame owners low category in Bay County being due to the difference in the underlying risks.

Verified that the values in Form A-4 for Condo Unit are correct. The highlighting format missing from Hardee County was added.

Discussed no frame condo unit exposures in the original data for Union County.

Discussed results for Walton and Okeechobee Counties were driven by the catalog changes and updates in the ZIP Codes.

Discussed the process used to complete Form A-6 and Form A-7 and to ensure the sensibility of the results. AIR stated the process used to complete the forms was generally the same as used for any consulting project at AIR.

Reviewed the SQL scripts for calculating the percent changes in Form A-7.

Discussed reasonability of Form A-4 loss costs for Frame Owners versus Frame Renters and reviewed pertinent additional exhibits. Reviewed validating damage survey photos for Hurricane Ivan (2004) and Hurricane Katrina (2005).

Reviewed maps of loss costs by county and the effect of land friction on the loss costs by county.

Discussed changes in loss costs due to remapping of mobile home exposure based on new mobile home code definition provided in the Industry Technical Guide with the exposure data.

STATISTICAL STANDARDS – Mark Johnson, Leader

S-1 Modeled Results and Goodness-of-Fit

A. The use of historical data in developing the model shall be supported by rigorous methods published in currently accepted scientific literature.

B. Modeled and historical results shall reflect statistical agreement using currently accepted scientific and statistical methods for the academic disciplines appropriate for the various model components or characteristics.

Audit

1. Forms S-1, S-2, and S-3 will be reviewed. Provide justification for the distributions selected including, for example, citations to published literature or analyses of specific historical data.

2. The modeling organization's characterization of uncertainty for windspeed, damage estimates, annual loss, and loss costs will be reviewed.

Pre-Visit Letter

36. S-1, page 140: Provide supporting material for the newly fitted distributions (parameter estimates, goodness of fit tests, graphical plots, and so forth relevant to the chosen distributions).

39. Form S-2, page 295: Explain how a majority of the years have no landfalling hurricanes in Florida yet the median losses are non-zero.

40. Form S-3, page 298: Describe how the data in HURDAT are used to fit the Rmax distribution. Describe how the method used is different from the method in the cited paper (Vickery et al., 2001).

Verified: YES

Professional Team Comments:

Discussed the basis of landfall probabilities using the August 15, 2011 version of the HURDAT database. Reviewed the storms changed in the stochastic catalog and the segments impacted.

Reviewed the probability distribution and landfall updates implementation. Discussed the adjustments made by segment and intensity.

Reviewed graphical comparisons of historical and modeled landfall frequencies by 50-mile coastal segments after these adjustments were made.

Reviewed historical and modeled landfall frequencies by 50-mile coastal segments comparison of model version 14.0.1 to previous model version 12.0.1.

Discussed Form S-1 limited to hurricanes making a direct landfall in Florida and Form S-2 including by-passing storms as well.

Reviewed scatter plot of Rmax versus Central Pressure.

Reviewed goodness-of-fit tests for historical and simulated Florida storms based on the updated model with the new stochastic storm catalog.

Reviewed documentation on Catalog Generation.

Reviewed regression model used to simulate Rmax. Reviewed code and verified consistency with documentation.

Reviewed the input data file and the Java code for selecting segment values.

Reviewed Forms S-2 and S-3.

Reviewed consistency across all related forms.

S-2 Sensitivity Analysis for Model Output

The modeling organization shall have assessed the sensitivity of temporal and spatial outputs with respect to the simultaneous variation of input variables using currently accepted scientific and statistical methods in the appropriate disciplines and have taken appropriate action.

Audit

1. The modeling organization's sensitivity analysis will be reviewed in detail. Statistical techniques used to perform sensitivity analysis shall be explicitly stated. The results of the sensitivity analysis displayed in graphical format (e.g., contour plots with temporal animation) will be reviewed.

2. Form S-6 will be reviewed, if applicable.

Verified: YES

Professional Team Comments:

Reviewed examples of sensitivity analyses. Verified no changes from the previous submission and no new sensitivity tests.

Reviewed the impact of removing the stochastic variation in the peak weighting factor and the gradient wind reduction factor on the estimated average annual modeled losses.

S-3 Uncertainty Analysis for Model Output

The modeling organization shall have performed an uncertainty analysis on the temporal and spatial outputs of the model using currently accepted scientific and statistical methods in the appropriate disciplines and have taken appropriate action. The analysis shall identify and quantify the extent that input variables impact the uncertainty in model output as the input variables are simultaneously varied.

Audit

1. The modeling organization's uncertainty analysis will be reviewed in detail. Statistical techniques used to perform uncertainty analysis shall be explicitly stated. The results of the uncertainty analysis displayed in graphical format (e.g., contour plots with temporal animation) will be reviewed.

2. Form S-6 will be reviewed, if applicable.

Verified: YES

Professional Team Comments:

Reviewed examples of uncertainty analyses. Verified no changes from the previous submission and no new uncertainty tests.

Reviewed the impact of removing the stochastic variation in the peak weighting factor and the gradient wind reduction factor on the variance of the estimated modeled losses.

S-4 County Level Aggregation

At the county level of aggregation, the contribution to the error in loss cost estimates attributable to the sampling process shall be negligible.

Audit

1. Provide a graph assessing the accuracy associated with a low impact area such as Nassau County. We would expect that if the contribution error in an area such as Nassau County is small, the error in the other areas would be small as well. Assess where appropriate, the contribution of simulation uncertainty via confidence intervals.

Pre-Visit Letter

37. S-4, page 157: Provide supporting material regarding the negligible sampling process error (estimates of the error).

Verified: YES

Professional Team Comments:

Reviewed several graphs illustrating the convergence by county at 50,000 years of simulation.

Reviewed comparison of 50,000 year to 100,000 year results for Nassau, Lee, Levy, Putnam, Franklin, Hillsborough, and Okaloosa counties. Discussed use of Thompson et.al. (1992) methodology for convergence testing.

S-5 Replication of Known Hurricane Losses*

*(*Significant Revision)*

The model shall estimate incurred losses in an unbiased manner on a sufficient body of past hurricane events from more than one company, including the most current data available to the modeling organization. This standard applies separately to personal residential and, to the extent data are available, to commercial residential. Personal residential experience may be used to replicate structure-only and contents-only losses. The replications shall be produced on an objective body of loss data by county or an appropriate level of geographic detail and shall include loss data from both 2004 and 2005.

Audit

1. The following information for each insurer and hurricane will be reviewed:
    a. The validity of the model assessed by comparing expected losses produced by the model to actual observed losses incurred by insurers at both the state and county level,
    b. The version of the model used to calculate modeled losses for each hurricane provided,
    c. A general description of the data and its source,
    d. A disclosure of any material mismatch of exposure and loss data problems, or other material consideration,
    e. The date of the exposures used for modeling and the date of the hurricane,
    f. An explanation of differences in the actual and modeled hurricane parameters,
    g. A listing of the departures, if any, in the windfield applied to a particular hurricane for the purpose of validation and the windfield used in the model under consideration,
    h. The type of property used in each hurricane to address:
        (1) Personal versus commercial
        (2) Residential structures
        (3) Mobile homes
        (4) Commercial residential
        (5) Condominiums
        (6) Structures only
        (7) Contents only,
    i. The inclusion of demand surge, storm surge, loss adjustment expenses, or law and ordinance coverage in the actual losses or the modeled losses.

2. The following documentation will be reviewed:
    a. Publicly available documentation referenced in the submission,
    b. The data sources excluded from validation and the reasons for excluding the data from review by the Commission (if any),
    c. An analysis that identifies and explains anomalies observed in the validation data,
    d. User input sheets for each insurer and hurricane detailing specific assumptions made with regard to exposed property.

3. The confidence intervals used to gauge the comparison between historical and modeled losses will be reviewed.

4. Form S-4 will be reviewed.

5. The results of one hurricane event for more than one insurance company and the results from one insurance company for more than one hurricane event will be reviewed to the extent data are available.

Pre-Visit Letter

38. S-5, Disclosure 1, page 159: Explain the nature of the overestimation of actual losses for Hurricane Bonnie (three to five times larger depending on the company).

Verified: YES

Professional Team Comments:

Discussed exhibit for Hurricane Bonnie (1998).

Discussed that Hurricane Bonnie (1998) is only one storm of many used for model validation.

Reviewed comparisons in Form S-4 and their changes from the previous submission.

S-6 Comparison of Projected Hurricane Loss Costs

The difference, due to uncertainty, between historical and modeled annual average statewide loss costs shall be reasonable, given the body of data, by established statistical expectations and norms.

Audit

1. Form S-5 will be reviewed for consistency with Standard G-1, Disclosure 5.

2. Justify the following:
   a. Meteorological parameters,
   b. The effect of by-passing hurricanes,
   c. The effect of actual hurricanes that had two landfalls impacting Florida,
   d. The departures, if any, from the windfield, vulnerability functions, or insurance functions applied to the actual hurricanes for the purposes of this test and those used in the model under consideration,
   e. Exposure assumptions.

Verified: YES

Professional Team Comments:

Reviewed map of the average annual loss by county due to by-passing hurricanes.

Reviewed map of the average annual loss by county for hurricanes with two landfalls impacting Florida.

Verified no change to the exposure assumptions.

Reviewed Form S-5 which led to the realization that the submission for the previously accepted model contained errors in selected forms, as noted in the introduction to the Professional Team report.

COMPUTER STANDARDS – Paul Fishwick, Leader

C-1 Documentation*

*(*Significant Revision)*

A. Model functionality and technical descriptions shall be documented formally in an archival format separate from the use of letters, slides, and unformatted text files.

B. The modeling organization shall maintain a primary document binder, containing or referencing a complete set of documentation specifying the model structure, detailed software description, and functionality. Development of the documentation shall be indicative of accepted software engineering practices.

C. All computer software (i.e., user interface, scientific, engineering, actuarial, data preparation, and validation) relevant to the submission shall be consistently documented and dated.

D. The modeling organization shall maintain (1) a table of all changes in the model from the previously accepted submission to the initial submission this year and (2) a table of all substantive changes since this year's initial submission.

E. Documentation shall be created separately from the source code.

Audit

1. The primary document binder, in either electronic or physical form, and its maintenance process will be reviewed. The binder shall contain or reference full documentation of the software.

2. All documentation shall be easily accessible from a central location.

3. Complete user documentation, including all recent updates, will be reviewed.

4. Modeling organization personnel, or their designated proxies, responsible for each aspect of the software (i.e., user interface, quality assurance, engineering, actuarial, verification) shall be present when the Computer Standards are being audited. Internal users of the software will be interviewed.

5. Provide verification that documentation is created separately from and is maintained consistently with the source code.

6. The tables specified in C-1.C that contain the items listed in Standard G-1, Disclosure 5 will be reviewed. The tables shall contain the item number in the first column. The remaining five

columns shall contain specific document or file references for affected components or data relating to the following Computer Standards: C-2, C-3, C-4, C-5, and C-6.

7. Trace the model changes specified in Standard G-1, Disclosure 5 through all Computer Standards.

Pre-Visit Letter

41. C-1.B, page 167: Relate the primary binder table of contents with the response to Standard G-1, Disclosure 5 (pages 29-30) by demonstrating individual table item compliance with Computer Standards C-1 through C-7.

Verified: YES

Professional Team Comments:

Reviewed documentation mapping through the Computer Standards for the significant changes affecting personal or commercial loss costs or probable maximum loss levels in Florida.

1. Modeling pleasure boats line of business
2. Catalog and event set updates
3. Modeling builders risk line of business
4. ZIP Code data updates
5. Average physical property factors

Reviewed the updated table of model changes from the previous submission in table form, as required by Standard C-1.D.

Reviewed the use of AIRPort as a central repository for all documentation and for a subset of databases and data files.

Reviewed flowcharts and revisions related to Standard G-1.B:

Process Overview
Research Model Development Process
Model Development Process
Software Development Process
Update Management Process
FCHLPM Submission Process

Reviewed additional flowchart for preparation of Actuarial and Statistical forms.

Reviewed the modified flowchart for updating the HURSIM software.

Reviewed the use of procedurally documented modeler-internal team communications used to ensure consistency among all forms for documentation as required by Standard G-1.B.

Discussed with the modeler the problems identified for the previously accepted model. The following problems were identified in the submission:

1. The modeler's use of ground-up losses, instead of zero deductible gross loss, in calculating the values in Table 49 on Page 310 of the submission.
2. The modeler's default inclusion of storm surge in a subset of the affected forms.
3. The modeler's Form S-5 mismatch between primary and secondary risk characteristics.

Reviewed changes in the flowchart documentation provided on site. These changes included:

1. A feedback loop on Research Model Development Process flowchart in the case where verification fails.
2. A feedback loop on the FCHLPM Submission Process flowchart in case where validation fails.
3. A new flowchart detailing the FCHLPM Submission Process for forms creation, including an explicit ordering of scripts to be executed when processing SQL queries for Actuarial forms.

Documentation reviewed:

Version-Specific Update Documentation
CLASIC/2 and Model 21 Updates
Enhancements and Florida Commission Documentation Mapping
Version Change History
Data Sources and Third Party Applications

Model 21 Development Documentation
ZIPAll Centroid and ZIPAll
AIR Tropical Cyclone Model for the U.S. Gulf and East Coasts
HURSIM
Catalog Generation
Physical Properties
Individual Risk Module
Loss Data
Demand Surge
Random Number Generators
Model 21 Catastrophe Model
Data Control Worksheet
Model 21 Data Files for 2012
Model 21 Equations/Formulas, Variable Mapping, and Crosschecking
Data File Converter

CLASIC/2 Development Documentation
CLASIC/2 Software
CLASIC/2 Loss Analysis Engine
CLASIC/2 AirAreaCode Database Reference Manual
CLASIC/2 AirCL2Exp Database Reference Manual
CLASIC/2 AirCL2Loss Database Reference Manual
CLASIC/2 AirCommon Database Reference Manual
CLASIC/2 AirExpWork Database Reference Manual
Updating the AirCL2Ind and AIRIndustry Databases
Updating the ZIP Code Information in the AirAreaCode and AIRGeography Databases
Setting up a CLASIC/2 Development Environment
Building CLASIC/2
Implementing New Features, Perils, and Models in CLASIC/2
CLASIC/2 Hazard Model Framework

Procedural Documentation
Development, Implementation and Validation Processes
Software and Model Revision Change Control Process and Versioning
Generating Output Range Reports for the Florida Commission Submission
Generating Probable Maximum Loss for the Florida Commission
Software and Model Testing Procedures
Coding Guidelines for FORTRAN, C++/COM, C#/.NET, Java and SQL
AIR Documentation Control Process
AIR Security Policies
Florida Commission Report of Activities Computer Standards E-Forms

CLASIC/2 User Documentation
CLASIC/2 Release Notes
CLASIC/2 Installation, Update, and System Configuration Instructions
CLASIC/2 System Requirements
Getting Started Guide: CLASIC/2 Version 14.0 Installation
CLASIC/2 Reference Guide
CLASIC/2 User's Guide
AIR ImportExpress User's Guide for CLASIC/2
CLASIC/2 Database Reference Manual
UNICEDE/px Data Exchange Format Preparer's Guide
UNICEDE/fx Data Exchange Format Preparer's Guide
Using Storm Surge and Precipitation Flood in the AIR Models

C-2 Requirements

The modeling organization shall maintain a complete set of requirements for each software component as well as for each database or data file accessed by a component. Requirements shall be updated whenever changes are made to the model.

Audit

1. Provide confirmation that a complete set of requirements for each software component, as well as for each database or data file accessed by a component, has been maintained and documented.

Pre-Visit Letter

42. C-2, page 169: Provide requirements documentation that specifically relates to each model change identified in Standard G-1, Disclosure 5 (pages 29-30).

Verified: YES

Professional Team Comments:

Reviewed requirements associated with Standard G-1, Disclosure 5: (1) Use of August 2011 version of HURDAT resulting in an updated event generation module, and (2) Need for annually updating of the ZIP code database.

Reviewed the reasonability of time-stamping the files in AIRPort, including the requirements reflecting the changes to the model identified in Standard G-1, Disclosure 5.

Reviewed process for updating and revising requirements during model updates.

C-3 Model Architecture and Component Design

The modeling organization shall maintain and document (1) detailed control and data flow diagrams and interface specifications for each software component, and (2) schema definitions for each database and data file. Documentation shall be to the level of components that make significant contributions to the model output.

Audit

1. The following will be reviewed:
    a. Detailed control and data flow diagrams, completely and sufficiently labeled for each component,
    b. Interface specifications for all components in the model,
    c. Documentation for schemas for all data files, along with field type definitions,
    d. Each network diagram including components, sub-component diagrams, arcs, and labels.

2. A model component custodian, or designated proxy, shall be available for the review of each component.

Verified: YES

Professional Team Comments:

Reviewed the original and revised flowcharts for defining the process of developing the vulnerability functions.

Reviewed the process defined in the flowchart produced in response to Standard M-1, Audit item 2.

C-4 Implementation

A. The modeling organization shall maintain a complete procedure of coding guidelines consistent with accepted software engineering practices.

B. The modeling organization shall maintain a complete procedure used in creating, deriving, or procuring and verifying databases or data files accessed by components.

C. All components shall be traceable, through explicit component identification in the flow diagrams, down to the code level.

D. The modeling organization shall maintain a table of all software components affecting loss costs, with the following table columns: (1) Component name, (2) Number of lines of code, minus blank and comment lines; and (3) Number of explanatory comment lines.

E. Each component shall be sufficiently and consistently commented so that a software engineer unfamiliar with the code shall be able to comprehend the component logic at a reasonable level of abstraction.

F. The modeling organization shall maintain the following documentation for all components or data modified by items identified in Standard G-1, Disclosure 5:

1. A list of all equations and formulas used in documentation of the model with definitions of all terms and variables.

2. A cross-referenced list of implementation source code terms and variable names corresponding to items within F.1.

Audit

1. The interfaces and the coupling assumptions will be reviewed.

2. Provide the documented coding guidelines and confirm that these guidelines are uniformly implemented.

3. The procedure used in creating, deriving, or procuring and verifying databases or data files accessed by components will be reviewed.

4. The traceability among components at all levels of representation will be reviewed.

5. The following information shall be available and will be reviewed for each component, either in a header comment block, source control database, or the documentation:
    a. Component name,

b. Date created,
c. Dates modified and by whom,
d. Purpose or function of the component,
e. Input and output parameter definitions.

6. The table of all software components as specified in C-4.D will be reviewed.

7. Model components and the method of mapping to elements in the computer program will be reviewed.

8. Comments within components will be examined for sufficiency, consistency, and explanatory quality.

Verified: YES

Professional Team Comments:

Verified there were no new equations or calculations in the submitted model compared with the previous submission.

Reviewed the implemented scripting method of creating the new actuarial tables, such as Form A-7, by starting with a database and translating the elements of the database into forms.

Reviewed regression test methodology and results related to the ZIP Code update.

Reviewed the two safeguards put in place to resolve the problems associated with the following forms from the previous submission: Forms A-2, A-3, A-8, S-2, and S-5. The two safeguards are implemented through a revision of a set of automated database scripts.

Verified modeler modifications to database scripts that contained errors resulting in the issues with the prior submission described by the modeler in the current submission.

Reviewed an equivalency correspondence between the documented equation and the coded equation for fitting the Rmax distribution related to Standard S-1.

Reviewed the storm resampling adjustment logic and implementation.

C-5 Verification*

*(*Significant Revision)*

A. General

For each component, the modeling organization shall maintain procedures for verification, such as code inspections, reviews, calculation crosschecks, and walkthroughs, sufficient to demonstrate code correctness. Verification procedures shall include tests performed by modeling organization personnel other than the original component developers.

B. Component Testing

1. The modeling organization shall use testing software to assist in documenting and analyzing all components.

2. Unit tests shall be performed and documented for each component.

3. Regression tests shall be performed and documented on incremental builds.

4. Aggregation tests shall be performed and documented to ensure the correctness of all model components. Sufficient testing shall be performed to ensure that all components have been executed at least once.

C. Data Testing

1. The modeling organization shall use testing software to assist in documenting and analyzing all databases and data files accessed by components.

2. The modeling organization shall perform and document integrity, consistency, and correctness checks on all databases and data files accessed by the components.

Audit

1. The components will be reviewed for containment of sufficient logical assertions, exception-handling mechanisms, and flag-triggered output statements to test the correct values for key variables that might be subject to modification.

2. The testing software used by the modeling organization will be reviewed.

3. The component (unit, regression, aggregation) and data test processes and documentation will be reviewed including compliance with independence of the verification procedures.

4. Crosschecking procedures and results for verifying equations will be reviewed. Examples include mathematical calculations versus source code implementation, or the use of multiple implementations using different languages.

5. Flowcharts defining the processes used for manual and automatic verification will be reviewed.

6. The response to Disclosure 1 will be reviewed.

Pre-Visit Letter

43. C-5, page 178: Provide complete and thorough verification procedures and output from the model changes identified in Standard G-1, Disclosure 5 (pages 29-30).

45. Appendix 8, page 353: Provide an example of procedures, tests, or inquiries by Narges Pourghasemi used to verify compliance with Standard G-1.B (page 15).

46. Appendix 8, page 362: Provide an example of the test cited by Narges Pourghasemi in the first full paragraph.

Verified: YES

Professional Team Comments:

Reviewed SQL code implemented to conduct a verification of the secondary features in the source data (hlpm2007c.exe) translated into AIR codes to eliminate the risk of a mismatch in the UPX tables.

Reviewed the Audit Schedule followed by Narges Pourghasemi when conducting her peer review of the submission under the Computer Standards.

Reviewed the methods and process defined to illustrate the approaches used by the modeler to ensure correspondence among different types of media (e.g., design documents vs. source code). Reference: Standard G-1.B.

Discussed examples of tests reviewed by the external peer reviewer, Narges Pourghasemi.

Reviewed the interactive, map-based, approach used to verify that changes to the ZIP Code database reasonably reflect changes to calculated changes in loss cost from prior model releases.

Reviewed an equivalency correspondence between the documented equation and the coded equation for fitting the Rmax distribution related to Standard S-1.

C-6 Model Maintenance and Revision

A. The modeling organization shall maintain a clearly written policy for model revision, including verification and validation of revised components, databases, and data files.

B. A revision to any portion of the model that results in a change in any Florida residential hurricane loss cost shall result in a new model version number.

C. The modeling organization shall use tracking software to identify all errors, as well as modifications to code, data, and documentation.

D. The modeling organization shall maintain a list of all model versions since the initial submission for this year. Each model description shall have a unique version identification, and a list of additions, deletions, and changes that define that version.

Audit

1. All policies and procedures used to maintain the code, data, and documentation will be reviewed. For each component in the system decomposition, provide the installation date under configuration control, the current version number, and the date of the most recent change(s).

2. The policy for model revision will be reviewed.

3. The tracking software will be reviewed.

4. The list of all model revisions as specified in C-6.D will be reviewed.

Pre-Visit Letter

44. C-6.D, page 183: Provide the model version history over the past 5 years, leading up to the version identified in the submission.

Verified: YES

Professional Team Comments:

Reviewed the model versioning methodology.

Reviewed the model version history over the past five years, leading up to the version identified in this year's model submission.

C-7 Security

The modeling organization shall have implemented and fully documented security procedures for: (1) secure access to individual computers where the software components or data can be created or modified, (2) secure operation of the model by clients, if relevant, to ensure that the correct software operation cannot be compromised, (3) anti-virus software installation for all machines where all components and data are being accessed, and (4) secure access to documentation, software, and data in the event of a catastrophe.

Audit

1. The written policy for all procedures and methods used to ensure the security of code, data, and documentation will be reviewed. Specify all security procedures.

2. Documented security procedures for access, client model use, anti-virus software installation, and off-site procedures in the event of a catastrophe will be reviewed.

Verified: YES

Professional Team Comments:

Verified the new modeler training module for information security.

Verified that there were no security issues or breaches since the previously audited and accepted model submission.