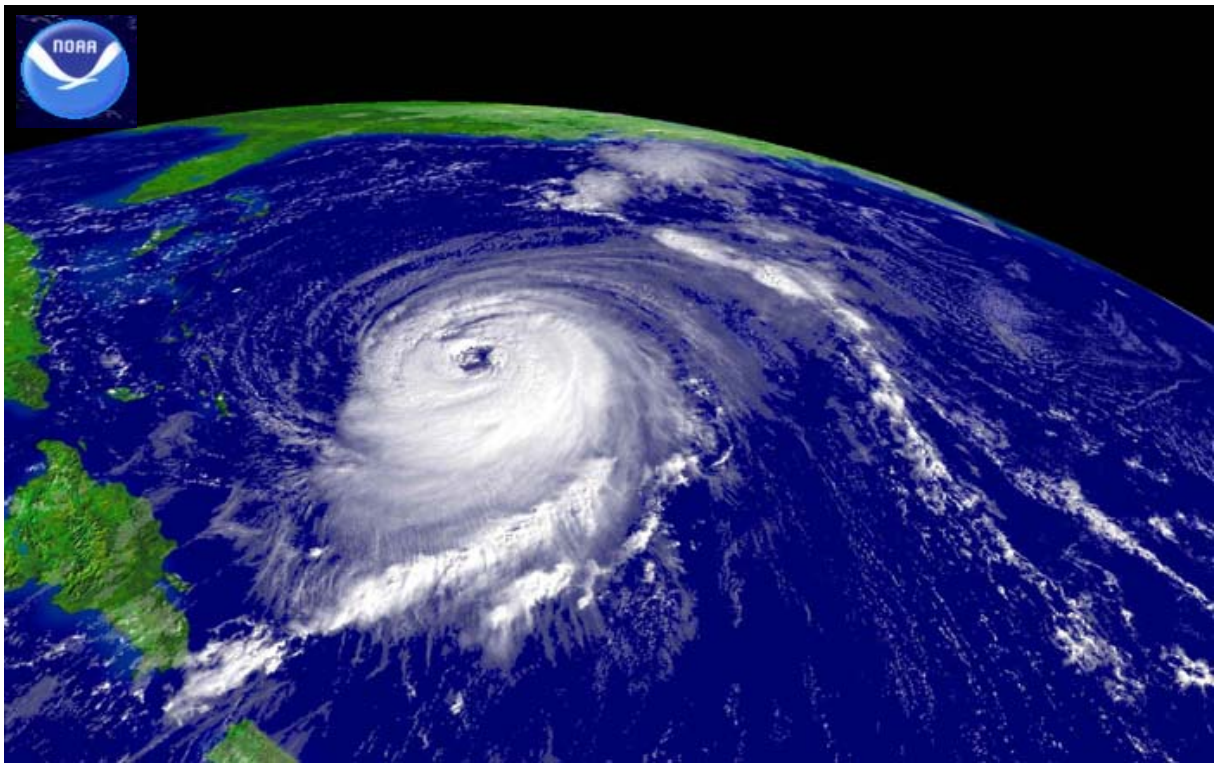
Florida Commission on Hurricane Loss Projection Methodology



Professional Team Report
2003 Standards

EQECAT, Inc.

On-Site Review
April 29 & 30, 2004

On April 29 & 30, 2004, the Professional Team visited on-site at EQECAT, Inc. (EQE) in Oakland, California. The following people participated in the review.

EQECAT

Shawna S. Ackerman, FCAS, MAAA, Principal and Consulting Actuary – Pinnacle Actuarial Resources, Inc. (via telephone)
James R. (Bob) Bailey, Ph.D., P.E., Technical Manager, Wind Engineering Services (via telephone)
Branimir Betov, M.S.
Kent M. David, Senior Principal Engineer (Quality Assurance)
Jun-Rong Huo, Ph.D., Principal Engineer (Structural Engineering)
Petros G. Keshishian, Ph.D., Project Engineer
Mahmoud M. Khater, Ph.D., P.E., Senior Vice President, Chief Science and Technology Officer
Omar Khemici, Ph.D., P.E., Group Manager (Structural Engineering)
Thomas I. Larsen, Senior Vice President (Computer Science)
Sergey Pasternak, Senior Software Engineer
Nilesh Shome, Senior Project Engineer
David F. Smith, Group Manager, Meteorologist

Professional Team

Jenni Evans, Ph.D., Meteorologist
Paul Fishwick, Ph.D., Computer Scientist
Mark Johnson, Ph.D., Statistician, Team Leader
Marty Simons, ACAS, Actuary
Fred Stolaski, P.E., Structural Engineer
Nur Yazdani, Ph.D., P.E., Structural Engineer observer
Donna Sirmons, Staff

The review began with introductions and an overview of the audit process. EQE gave a presentation on the model changes since the February 2003 submission.

- The probabilistic hurricane database was regenerated to be consistent with the Commission's November 1, 2003 storm set.
- The modeled wind field for Hurricane Andrew was modified to be consistent with the latest scientific information available.
- The ZIP Code database has been updated to October 2003.
- The land use/land cover database has been updated.

Discussed and reviewed corrections to be made in the submission that will be provided to the Commission prior to the May 12 & 13, 2004 meetings.

- Page 24, response to G-2.1F revised to include review and communication with Hawaii Department of Insurance
- Pages 25 & 26, response to G-2.2A updated to include additional personnel – Kent David and Petros Keshishian
- Page 35, Form G-1 revised signature for Computer Science
- Page 54, response to V-1.B revised to include additional field surveys
- Page 55, response to V-1.E revised to provide clarification on the incorporation of building code quality or enforcement in the vulnerability functions

- Page 57, response to V-1.3 revised to include further details on the use of site inspections
- Page 101, response to S-2.3 corrected for typographical error
- Pages 186 – 195, Form S-1B, Renters revised for correct values in columns

Deficiencies from March 18, 2004 Meeting

1. M-5.4 (page 47) – Figure 8 is unreadable and non-responsive.

   Verified: YES

2. V-1.3 (page 57) – brief description not provided.

   Verified: YES

3. A-5.2 (page 86) – reference to Table 10 incorrect.

   Verified: YES

EQECAT, Inc. – 2003 Pre-Visit Letter

The main purpose of the on-site review performed by the Professional Team (Pro Team) of the Florida Commission on Hurricane Loss Projection Methodology (FCHLPM) is to verify that the written and electronic submission conforms to the model producing the output ranges included in the submission to the FCHLPM. It is particularly important to review in detail all information relating to the model, including any information that may be considered proprietary. Be prepared to respond to questions and requests for material as outlined in the Audit section under each Standard. It is the responsibility of the modeler to provide all information necessary for a complete review of the model.

For each reference within the submission that cites "material will be shown to the professional team," it is important that the material is presented to the Pro Team during the on-site review. Material that the modeler intends to present to the FCHLPM should also be presented to the Pro Team during the on-site review.

All aspects of the computer software will be reviewed including software either developed off-site or contracted out. Spot checks will occur during the review process, and all relevant personnel for the software being reviewed will need to be present when called upon. If software component authors are not present during the on-site review, the modeler shall have proxies for those components.

In the course of preparing for the on-site review, the Pro Team has identified some specific areas and questions that it intends to cover while on-site. These items are provided below to assist the modeler in preparing for the on-site review. Some of this material may have been shown or available on a previous visit by the Pro Team. The Pro Team will also be considering material in response to the Commission's designation(s) of omissions or responses deemed non-responsive.

The goal of the Pro Team is to provide the FCHLPM with a clear and thorough report of the model, subject to non-disclosure conditions. All modifications, adjustments, assumptions, or other criteria that were included in producing the information requested by the FCHLPM 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 Pro Team. Access to critical articles or materials referenced in the submission or during the on-site review should be available on-site for the Pro Team. The Pro Team should be provided access to a phone line that can provide internet access through one of the Pro Team member computers for reference work that may be required while on-site.

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

General Standards

1. **G1.2** (page 11) – Define SSI intensity. Are there any constraints on the user-defined storms to confine them to be physically realizable?
2. **G1.2** (page 14) – Be prepared to present material on the goodness-of-fit tests for probability distributions and the sensitivity and uncertainty analyses.
3. **G2.1.F** (page 24) – Be prepared to present and discuss all communications between EQECAT and the Hawaii Insurance Division relative to the EQECAT request to be deemed acceptable for property insurance ratemaking in Hawaii.
4. **G2.2.C** (page 27) – Provide names for personnel involved in Figure 4.
5. **G2.3.D** (page 30) – Be prepared to provide a copy of the items mentioned.

Meteorological Standards

6. **M2.1** (page 37) – Be prepared to discuss how central pressure is an intermediary, the profile factor default value of 1, and how air density is incorporated in the model.
7. **M4** (page 41) – Be prepared to provide explicit evidence to address the adjacent states hurricane frequency issue.
8. **M5** (page 44) – Be prepared to discuss how smooth transition is handled with respect to the available data on Hurricane Andrew.
9. **M5.1** (page 46) – Provide clarification on pressure deficit DP(0).
10. **Form M-1** (page 49) – Provide an explanation on how the tabled values were modified.
11. **Form M-2** (page 50) – Be prepared to discuss the method used for choosing Rmax and its impact on the maximum 10-minute sustained winds.
12. **Form M-2** (page 51) – Provide a graphical representation of Rmax vs. Central Pressure using a point plot.
13. **Form M-3** (page 52-53) – Be prepared to confirm that the values are at the ZIP Code level.

Vulnerability Standards

14. **V1.B** (page 54) – Is 1997 the last field survey?
15. **V1.E** (page 55) – Be prepared to describe any analyses performed on the Insurance Services Office's Building Code Effectiveness Grading system to determine that it lacked reliability.
16. **V1.3** (page 57) – Provide copy of referenced document, "Secondary Structural Modifiers: Features and Model Description", July 2003.
17. **Form V-1** (page 61) – Be prepared to discuss use of increased wind speeds and addition of mitigated frame and masonry structure. For future submissions we anticipate a revision to Form V-1 with higher wind speeds and the addition of mitigated frame and masonry structure. Do you have any comments?
18. **Form V-2** (page 65) – Results of the runs at the various wind speeds for individual mitigation measures should be available and selected examples will be reviewed. Be prepared to discuss changes in instructions such as choice of required ZIP Codes, range of wind speed, list of required mitigation measures, use of "Renters' and "Condo Unit Owners" sections, weighted average, change in damage at specific wind speeds rather than a range, adding structures with specific combinations of mitigation measures, etc.

19. **Form V-2** (page 66) – Provide an explanation for the values given in the table.

Actuarial Standards

20. **A1.B** (page 67) – Provide any insurance data obtained since the prior review of your model by the FCHLPM.
21. **A1.2** (page 68) – Be prepared to discuss the two approaches mentioned for unknown residential construction types and when they are used.
22. **A1.6** (page 69) – Provide any analyses performed or assumptions made regarding the lack of necessity to consider under insurance.
23. **A2.1** (page 70) – Be prepared to discuss what adjustments were made to the NOAA model from NWS 23 and 38 and the nature of the word "properly".
24. **A2.1** (page 70) – Be prepared to discuss how local friction and distance to coast is taken into account.
25. **A4.4** (page 83), Figure 11 – Provide level of exposure for loss costs. Provide an explanation for the mini-peak at Martin County.
26. **A5.2** (page 88), Table 3 – Provide basis for the theoretical calculation presented, LHS or standard Monte Carlo.
27. **A7.1** (page 91) – Be prepared to discuss why "a few broken windows" generating "significant damage to contents can result in significant time-element costs."
28. **Form A-1** (page 93-94) – Be prepared to discuss the slight changes in wind speeds and large decreases in losses from previous submission.

Statistical Standards

29. **S1.4** (page 99-100) – Are these the latest validation tests (i.e., 1995)?
30. **S2.3** (page 101) – Provide explanation for "on the of wind speed" stated three times in response.
31. **S5.2** (page 105) – Be prepared to describe and explain outliers found in Figure 16 and explain the implications of the plot.
32. **S6.1** (page 105-106) – Be prepared to provide arguments of statistical reasonableness.
33. **S6.3** (page 107) and **S6.4** (page 108) – Be prepared to provide justification for change from 1.69 billion to 2.12 billion.
34. **S7.1** (page 109) – Be prepared to present details on the impacts of each of the changes listed.
35. **Form S-1A** (page 136-170) – Be prepared to show documentation justifying changes in loss costs for the individual counties greater than 10 percent. The degree to which each individual factor influenced the total change shall be available and documented.
36. **Form S-1B** (page 171-205) – Be prepared to discuss missing ("-") values for weighted averages. For renters, discuss the absence of zero deductible contents output ranges.
37. **Form S-3** (page 122) – Be prepared to explain logical relations to risk aspects, especially as regards to the panhandle area.
38. **Form S-8** (page 130) – Be prepared to discuss the conversion to 1992 dollars. Provide losses in current dollars.

Computer Standards

39. **C1** (page 206) – Be prepared to confirm C1.A, B, and C in writing.
40. **C2** (page 206) – Be prepared to list the requirements documentation.
41. **C3** (page 207) – Be prepared to provide information on the architecture.
42. **C4** (page 207) – Be prepared to confirm that the software is traceable starting at the flow diagrams.
43. **C5** (page 208) – Be prepared to discuss the testing software that was used to assist in the testing process.
44. **C7** (page 209) – Be prepared to provide additional details.

GENERAL STANDARDS – Mark Johnson, Leader

G-1 Scope of the Computer Model and Its Implementation

The computer model shall project loss costs for personal lines residential property from hurricane events.

Audit

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

Verified: YES

Professional Team Comments:

Discussed the representative/primary technical papers that describe the underlying model theory which were available for review:

- NWS-23
- NWS-38
- Krayer and Marshall, 1992: Gust factors applied to hurricane winds, Bulletin of the American Meteorological Society, Volume 73, pp. 613-617.
- MacDonald-Mehta Engineers (1993). Vulnerability Functions for Estimating Wind Damage to Buildings, for EQE Engineering and Design, Texas Tech University, Lubbock, Texas.
- Scott, D.W. (1992). Multivariate Density Estimation: Theory, Practice, and Visualization, John Wiley and Sons, New York, NY.
- Simiu, E. and Scanlan, R. H. (1996) Wind Effects on Structures, John Wiley and Sons, New York, NY.

Discussed the user interface for entering user-defined storms through the Storm Editor and the parameters at landfall of one-minute sustained wind speed, peak gust wind speed, Rmax, central pressure, and translational speed.

G-2 Qualifications of Modeler Personnel and Independent Experts

A. Model construction, testing, and evaluation shall be performed by modeler personnel or independent experts who possess the necessary skills, formal education, or experience to develop hurricane loss projection methodologies.

B. The model or any modifications to an accepted model shall be reviewed by modeler personnel or independent experts in the following professional disciplines, if relevant: structural/wind engineering (licensed Professional Engineer (PE)), statistics (advanced degree), actuarial science (Associate or Fellow of Casualty Actuarial Society), meteorology (advanced degree), and computer/information science (advanced degree). These individuals shall abide by the standards of professional conduct if adopted by their profession.

Audit

The Professional Team will review the professional vitae of modeler personnel and independent experts responsible for the current model and information on their predecessors, if different than current personnel. Background information on individuals providing testimonial letters in the submission shall be provided.

The Professional Team will review Form G-1 and all independent peer reviews of the model.

Discuss any incidents where model personnel have failed to abide by the standards of professional conduct adopted by their profession.

Verified: **YES, Contingent upon additional documentation provided to the Commission**

Professional Team Comments:

Reviewed EQE's business workflow diagram outlined in Figure 4 on page 27 and discussed personnel involved at each stage and their responsibilities.

Discussed and reviewed the communications between EQE and the Hawaii Insurance Division relative to EQE's request to be deemed acceptable for property insurance ratemaking in Hawaii.

Reviewed and discussed reviews of EQE's USWIND hurricane model by the following organizations:

- Moody's Investors Service – March 13, 1998 and January 28, 2002
- Fitch Credit Analysis Report, November 29, 2001
- Confidential Offering Circulars – June 26, 2002 and July 21, 2003

Reviewed resumes of modeler personnel:

- Kent M. David, M.S. Structural Analysis and Design, University of California, Berkeley
- Petros Keshishian, Ph.D. Civil Engineering, University of California, Berkeley
- Andreas Mueller, Ph.D. Physics, interdisciplinary (Computer Science, Mathematics, Physics), University of Karlsruhe, Germany
- Qing Xia, Ph.D., Atmospheric Sciences, University of Chicago
- Jun Rong Huo, Ph.D., Civil Engineering, Institute of Engineering Mechanics, Harbin, China
- Nilesh Shome, Ph.D., Structural Engineer, Stanford University
- Branimir Betov, MSEE (in Industrial Automation), Technical University of Sofia, Bulgaria

Discussed with Branimir Betov in detail his independent review and assessment of the EQE model in compliance with the computer standards.

Revised Form G-1 to be provided to the Commission.

Revised response to G-2.1F to include review and communication with Hawaii Department of Insurance.

Revised response to G-2.2A to include additional personnel (Kent David and Petros Keshishian).

G-3 Risk Location

A. ZIP Codes used in the model shall be updated at least every 24 months using information originating from the United States Postal Service. The United States Postal Service issue date of the updated information shall be reasonable.

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

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

Audit

Provide geographic displays for selected ZIP Codes. The Professional Team will review the location of specific centroids.

Verified: YES

Professional Team Comments:

Discussed EQE's process for updating the ZIP Code database including the QA process for verification and testing. Discussed the third party ZIP Code supplier.

Selected five ZIP Codes affected by Hurricane Andrew (33122, 33158, 33170, 33179, 33180) and reviewed the modeled maximum wind speeds, the modeled exposures, and the modeled losses.

Reviewed maps of population weighted ZIP Code centroids for several counties showing the effect of centroid updates on loss costs.

G-4 Units of Measurement

A. All units of measurement for model inputs and outputs shall be clearly identified.

B. All model outputs of length, wind speed, and pressure shall be in units of statute miles, statute miles per hour, and millibars, respectively.

C. Wind inputs to the damage function shall be in units consistent with currently used wind measurement units and/or shall be converted using standard meteorological/engineering conversion factors.

Audit

The Professional Team will review the model to assess the appropriateness and accuracy of the measurements, conversion factors, and techniques.

Verified: YES

Professional Team Comments:

Appropriate units of measurement were verified throughout the review process.

G-5 Independence of Model Components

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

Audit

Demonstrate that the model components adequately portray hurricane phenomena and effects (damage and loss costs). 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 storm.

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

Verified: YES

Professional Team Comments:

The independence of the meteorology, vulnerability, and actuarial components were verified throughout the course of the review.

METEOROLOGICAL STANDARDS – Jenni Evans, Leader

M-1 Official Hurricane Set*

*(*Significant Revision)*

For landfall frequency analyses, the modeler shall use the latest updated Official Storm Set. Updates to HURDAT approved by the Tropical Prediction Center/National Hurricane Center are acceptable modifications to the storm set.

Audit

The modeler will provide the storm set used. Failure to update the storm set, as specified in the Standard, is not acceptable.

Verified: YES

Professional Team Comments:

Verified that the probabilistic hurricane database was updated through the 2002 hurricane season.

M-2 Hurricane Characteristics*

*(*Significant Revision)*

Methods for depicting all modeled hurricane characteristics, including but not limited to wind speed, radial distributions of wind and pressure, minimum central pressure, radius of maximum winds, strike probabilities, tracks, and the time variant wind fields, shall be based on information documented by currently accepted scientific literature or modeler information accepted by the Commission.

Audit

Prepare graphical depictions (e.g., histograms overlaid with fitted density functions) of storm characteristics as used in the model. Describe:

- the data set basis for the fitted distributions,
- the assessments of correlated characteristics (e.g., central pressure and radius of maximum winds),
- the fitting methods used and any smoothing techniques employed, and defend the choices of distributions used,
- the spatial distribution of hurricane force winds associated with both modeled and historical events.

The goodness-of-fit of distributions to historical data will be reviewed.

The modeler will present time-based contour animations (capable of being paused) of wind and pressure fields to demonstrate scientifically reasonable wind field characteristics.

The Professional Team will compare the treatment of uncertainties associated with the conversion of gradient winds to surface winds with currently accepted literature.

Map the location of the peak hurricane intensity compared to the western most point of a random selection of recurving storm tracks for hurricanes effecting Florida.

Verified: YES

Professional Team Comments:

Discussed the methodology for modeling the wind field component including clarifying the dependencies in the gradient wind profile. Reviewed the equation for calculating wind speeds.

Clarified the definition of angle of attack in this context.

Discussed the use of a profile factor for historical storms and reviewed the formula for calculating the profile factor. Discussed the profile factor default value of 1.

Discussed the air density parameter and its relationship to sea-surface temperatures.

Discussed the process for converting gradient winds to surface level, sustained winds, the conversion of 10-minute sustained winds to one-minute sustained winds, and the conversion of one-minute sustained winds to peak gust wind speeds.

Reviewed goodness-of-fit tests of historical data and modeled storms for Rmax.

Discussed how Rmax and central pressure are defined in the model in relation to the storm's initiation and through the storm track's distribution.

Discussed the parameters used in the development of the stochastic storm set.

Reviewed time-based contour animations of a wind field verifying the asymmetric nature of hurricanes as well as other wind field characteristics in the model.

Discussed and reviewed map of recurvature versus location of peak hurricane intensity (maximum sustained winds) for the entire stochastic set for Florida.

Reviewed scatter plot of historical versus modeled wind speed.

Reviewed code for gradient wind distribution.

Reviewed code for determining peak gusts over land.

M-3 Landfall Intensity

Models shall use maximum one-minute sustained 10-meter wind speed when defining hurricane landfall intensity. This applies both to the Official Storm Set used to develop landfall strike probabilities 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 wind speed shall be within the range of wind speeds (in statute miles per hour) categorized by the Saffir-Simpson scale.

Saffir-Simpson Hurricane Scale (for displayed parameters):

Category	Winds (mph)	Central Pressure (mb)	Damage
1	74 - 95	$\geq$ 980	Minimal
2	96 - 110	965 - 979	Moderate
3	111 - 130	945 - 964	Extensive
4	131 - 155	920 - 944	Extreme
5	Over 155	< 920	Catastrophic

Audit

Demonstrate the goodness-of-fit of the frequency distributions of category 3-5 hurricanes.

Demonstrate that the hurricane intensity at landfall is consistent with the Saffir-Simpson wind range for the stochastic storm set.

Verified: YES

Professional Team Comments:

Reviewed landfall frequency confidence intervals for the entire state of Florida, by region, and for surrounding geographic areas.

M-4 Hurricane Probabilities

A. Modeled probability distributions for hurricane intensity, eye diameter, forward speed, radii for maximum winds, and radii for hurricane force winds shall be consistent with historical hurricanes in the Atlantic basin.

B. Modeled hurricane probabilities shall reasonably reflect the historical record through 2002 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).

Audit

Probabilities are compared with observed hurricane frequency using methods documented in currently accepted scientific literature. The Professional Team will review the goodness-of-fit of modeled to historical hurricane frequencies for the four regions of Florida and overall as provided in Form M-1.

Demonstrate that the quality of fit extends beyond the Florida border by showing results for appropriate coastal segments in Alabama, Georgia, and Mississippi.
Describe and support the method of selecting stochastic storm tracks and angles of landfall.

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.

Demonstrate the goodness-of-fit of parametric distributions to historical hurricane characteristics.

Verified: YES

Professional Team Comments:

Reviewed graphical representation of storm frequency in Florida using a Poisson distribution. Reviewed Kolmogorov-Smirnov and Chi-Square goodness-of-fit tests of landfall frequency confidence intervals for adjacent states.

Reviewed goodness-of-fit probability distribution, Chi-Square and Kolmogorov-Smirnov tests of Rmax.

Discussed the values provided in Form M-1.

M-5 Land Friction and Weakening*

A. *The magnitude of land friction coefficients shall be consistent with currently accepted scientific literature, consistent with geographic surface roughness, and implemented with appropriate geographic information system data.
*(*Significant Revision)*

B. The hurricane overland weakening rate methodology used by the model shall be reasonable in comparison to historical records.

Audit

Justify the collection and publication dates of the land use and land cover data used in the model.

Maps depicting land friction effects are required. Describe the representation of land friction effects in the model.

Comparisons of the model's weakening rates to historical Florida storms and to weakening rates will be reviewed.

Transition of winds from over water to over land (i.e. landfall) will be reviewed.

Verified: YES

Professional Team Comments:

Discussed in detail the update of the land use/land cover data to the latest available from the five Florida water management districts:

- South Florida (collected 2000, published 2002)
- Southwest Florida (collected 1999, published 2002)
- St. Johns River (collected 1995, published 1997)
- Suwannee River (collected 1995, published 1999)
- Northwest Florida (collected 1995, published 1997)

Reviewed maps illustrating the differences by county from the old to the new land use/land cover data.

Reviewed plots of the modeled decay rates compared to the Kaplan-DeMaria decay rate.

Discussed treatment of land friction for barrier islands.

Discussed in detail the transition of winds from over water to over land, the central pressure deficit, and distance from coast.

Discussed evidence for Hurricane Andrew revision from Category 4 to 5.

Discussed the modification of EQE's modeled wind field for Hurricane Andrew to characterization of intensity consistent with the central pressure.

Discussed treatment of friction effect on surface winds for exiting storms.

M-6 Logical Relationships of Hurricane Characteristics

A. The radius of maximum winds shall reflect historical hurricane characteristics.

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

C. The wind speed shall decrease with increasing surface roughness (friction), all other factors held constant.

Audit

Forms M-2, M-3, and the modeler's sensitivity analyses provide the information used in auditing this Standard.

Verified: YES

Professional Team Comments:

Reviewed scatter plot of Rmax versus Central Pressure data in Form M-2.

Discussed the methodology used for choosing Rmax and its impact on the maximum 10-minute sustained winds.

Reviewed storm characteristics relevant to Hurricane Andrew simulation.

VULNERABILITY STANDARDS – Fred Stolaski, Leader

V-1 Derivation of Vulnerability Functions*

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

B. The method of derivation of the vulnerability functions shall be theoretically sound.

C. Any modification factors/functions to the vulnerability functions or structural characteristics and their corresponding effects shall be clearly defined and be theoretically sound.

D. Construction type and construction characteristics shall be used in the derivation and application of vulnerability functions.

E. In the derivation and application of vulnerability functions, assumptions concerning building code revisions and building code enforcement shall be reasonable and be theoretically sound.
*(*Significant Revision)*

F. Vulnerability functions shall be separately derived for building structures, mobile homes, appurtenant structures, contents, and additional living expense.

G. The minimum wind speed that generates damage shall be reasonable.

Audit

Historical data should be available in the original form with explanations for any changes made and descriptions of how missing or incorrect data were handled. To the extent that historical data are used to develop vulnerability functions, demonstrate the goodness-of-fit of the data to fitted models. 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 building types and construction characteristics may be selected for review. The basis for expert opinion and original site inspection reports should be available for review.

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

Multiple samples of vulnerability functions for building structures, mobile homes, appurtenant structures, contents, and additional living expense should be available. The magnitude of logical changes among these items for a given wind speed shall be explained and validation materials should be available.

Justify the construction types and characteristics used, and provide validation of the range and direction of the variations in damage.

Document and justify all modifications to the vulnerability functions due to building codes and their enforcement.

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

Describe how the duration of wind speeds at a particular location over the life of a hurricane is considered.

Form V-1 will be reviewed.

Verified: YES

Professional Team Comments:

Reviewed insurance company claims data and communications used in the derivation of the vulnerability functions.

Discussed the minimum wind speed where damage occurs, reviewed the computer code showing the inclusion of the minimum wind speed, and reviewed the validation data.

Reviewed and discussed in detail the vulnerability function curves by construction type, contents, and additional living expense. Reviewed spreadsheets with insurance data used to validate the vulnerability curves. Traced development of vulnerability curves back to origination and reviewed subsequent validation reports.

Verified there are no modifications made to the vulnerability functions due to building codes and their enforcement.

Discussed additional field surveys conducted by EQE and their role in validation of the vulnerability functions:

- 1998 Hurricane Georges
- 1999 Hurricane Irene
- 2003 Hurricane Isabelle
- 1999 Oklahoma City Tornado
- 2000 Ft. Worth Tornado
- 2003 Mid-West outbreak of tornados

Reviewed site inspection reports documentation:

- Secondary Structural Modifiers: Features and Model Description, July 28, 2003
- Typhoon Paka, December 1997
- Alternative Risk Transfer/Catastrophe Bonds
- Western Washington Earthquake of July 2, 1999
- Izmit, Turkey Earthquake of August 17, 1999
- EQE Summary Report, The Adana-Ceyhan (Turkey) Earthquake of 26 June 1998
- Seattle (Nisqually), Washington Earthquake of February 28, 2001
- Chichi, Taiwan Earthquake of September 21, 1999
- Puerto Rico Damage Investigation of Hurricane Georges
- The May 3, 1999 Oklahoma City Tornado
- The May 2003 Tornado Outbreak

Reviewed reference documentation:

- Wind Effects on Structures, E. Simiu and R.H. Scanlan, 1996. John Wiley and Sons, New York, NY
- Vulnerability Functions for Estimating Wind Damage to Buildings for EQE Engineering and Design, Texas Tech University, Lubbock, Texas, McDonald-Mehta Engineers, 1993.
- Development of a Series of Vulnerability Functions for Industrial and Commercial Buildings, August 27, 2003

Reviewed results of Kolmogorov-Smirnov goodness-of-fit tests for building damage comparing wind speed versus mean damage ratio for wood frame.

Reviewed Form V-1 and discussed refinements to format.

Responses to V-1.B, V-1.E, and V-1.3 to be revised and provided to the Commission.

V-2 Mitigation Measures*

*(*Significant Revision due to Form V-2)*

A. Modeling of mitigation measures to improve a building's wind resistance and the corresponding effects on vulnerability shall be theoretically sound. These measures shall include fixtures or construction techniques that enhance:

- ***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 shall be reasonable both individually and in combination.

Audit

Form V-2 provides the information used in auditing this Standard.

Total effect on damage due to use of multiple mitigation measures will be reviewed and shown to be reasonable. Any variation in the change over the range of wind speeds for individual and multiple mitigation measures will be reviewed and shown to be reasonable.

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.

Verified: YES

Professional Team Comments:

All required mitigation measures reported in Form V-2 were completed with the maximum and minimum calculated values of percent change in damage and found to be reasonable.

Reviewed spreadsheet with mean damage of the vulnerability curves used for completing Form V-2, including mapping of mitigation measures to model categories and description of base structure used. Also reviewed computer runs giving the required change in damage due to an individual mitigation measure.

Traced back figures of percent change chosen, at random by the Professional Team, from Form V-2.

ACTUARIAL STANDARDS – Marty Simons, Leader

A-1 Underwriting Assumptions

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

B. For loss cost estimates derived from or validated with historical insured hurricane losses, the assumptions in the derivations concerning (1) construction characteristics, (2) policy provisions, (3) claim payment practices, and (4) relevant underwriting practices underlying those losses, as well as any actuarial modifications, shall be reasonable and appropriate.

Audit

Quality assurance procedures should include methods to assure accuracy of input insurance data prior to code execution. Compliance with this Standard will be readily demonstrated through rules and documented procedures.

Demonstrate how the claim practices of insurance companies are accounted for when claims data for those insurance companies are used to develop or to verify model calculations. For example, the level of damage the insurer considers a loss to be a "total loss." Provide the methods used to delineate among the insurer claim practices in the use of historical claims data to verify model outputs.

Verified: YES

Professional Team Comments:

Discussed the quality assurance procedures utilized to ensure accuracy of the insurance data used.

Discussed the insurance-to-value statistic and the underinsurance valuation process undertaken at the time an insured applied for coverage.

Discussed handling of unknown residential structures.

Reviewed insurer claim file and correspondence from insurer.

A-2 Loss Cost Projections

A. Loss cost projections produced by hurricane loss projection models shall not include expenses, risk load, investment income, premium reserves, taxes, assessments, or profit margin.

B. Loss cost projections shall not make a prospective provision for economic inflation.

C. Loss cost projections shall not explicitly include demand surge.

Audit

Demonstrate how the presence of demand surge has been considered in any analysis where Hurricane Andrew losses are used for development or verification of the model or its output. Demonstrate how demand surge is incorporated in any other data used in the development or verification of the model.

Describe how the model handles expenses, risk load, investment income, premium reserves, taxes, assessments, profit margin, and economic inflation.

Verified: YES

Professional Team Comments:

Discussed the actuarial review of the model and verified there has not been any model changes since the last actuarial review.

Verified demand surge was not included in producing the loss costs. Discussed Hurricane Andrew claims data and adjustments made for demand surge when using Andrew and other major event data for validation.

A-3 User Inputs

All modifications, adjustments, assumptions, defaults, and treatments of missing values used in the model shall be actuarially sound and included with the model output.

Audit

All insurer inputs and assumptions will be reviewed.

Verified: YES

Professional Team Comments:

Reviewed output from a sample portfolio and discussed the insurer inputs involved.

A-4 Logical Relationship to Risk

A. 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.

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

C. Loss costs cannot increase as friction or roughness increase, all other factors held constant.

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 (A, B, C, D) shall be consistent with the coverages provided.

Audit

Graphic representations of loss costs by ZIP Code and county will be reviewed.

Color-coded maps depicting the effects of land friction on loss costs by ZIP Code will be reviewed.

Individual loss cost relationships will be reviewed. Forms A-1 and A-2 will be used to assess coverage relationships.

Verified: YES

Professional Team Comments:

Reviewed color-coded maps of the effects of land friction on ground-up loss costs for frame, masonry, and mobile home by ZIP Code.

Reviewed Figure 11 showing loss costs for coastal counties and discussed the relationship between distance to coast and the loss costs.

A-5 Deductibles and Policy Limits

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. Differences in these relationships from those previously found acceptable shall be reasonable.

Audit

The modeler actuary may be asked to attest to the actuarial soundness of the procedure for handling deductibles and policy limits. To the extent that historical data are used to develop mathematical depictions of deductibles and policy limit functions, demonstrate the goodness-of-fit of the data to fitted models. Justify changes from the prior submission in the relativities among corresponding deductible amounts for the same coverage.

Verified: YES

Professional Team Comments:

Verified no changes were made in the methodology for handling deductibles and policy limits.

A-6 Contents

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

B. The relationship between the modeled building and contents loss costs shall be reasonable, based on the relationship between historical building and contents losses. Differences in the relationship of building and contents loss costs from those previously found acceptable shall be reasonable.

Audit

The modeler actuary may be asked to attest to the actuarial soundness of the procedure for calculating loss costs for contents coverage. 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. Justify changes from the prior submission in the relativities between loss costs for buildings and the corresponding loss costs for contents.

Verified: YES

Professional Team Comments:

Verified no changes were made in the methodology for handling contents losses.

A-7 Additional Living Expenses (ALE)

A. The methods used in the development of Additional Living Expense (ALE) loss costs shall be actuarially sound.

B. ALE loss cost derivations shall consider the estimated time required to repair or replace the property.

C. The relationship between the modeled building and ALE loss costs shall be reasonable, based on the relationship between historical building and ALE losses. Differences in the relationship of building and ALE loss costs from those previously found acceptable shall be reasonable.

Audit

The modeler actuary may be asked to attest to the actuarial soundness of the procedure for calculating loss costs for ALE coverage. Documentation and justification of the following will be reviewed:

A. The method of derivation and data on which the ALE vulnerability function is based;
B. Validation data specifically applicable to ALE;
C. Assumptions regarding the coding of ALE losses by insurers;
D. The effects of demand surge on ALE for Hurricane Andrew;
E. Assumptions regarding the variability of ALE by size of property;
F. Statewide application of ALE assumptions;
G. Assumptions regarding ALE 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 ALE costs.

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

Verified: YES

Professional Team Comments:

Verified no changes were made to the methodology for handling Additional Living Expense. Discussed the process for using claims data to develop and validate the ALE vulnerability functions.

STATISTICAL STANDARDS – Mark Johnson, Leader

S-1 Use of Historical Data

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 agreement using currently accepted scientific and statistical methods.

Audit

Graphical comparisons of modeled and historical data and goodness-of-fit tests will be reviewed. Examples include hurricane frequencies, tracks, intensities, and physical damage. Forms S-10 and S-11 will be reviewed.

The modeler's characterization of uncertainty for wind speed, damage estimates, annual loss, and loss costs will be reviewed.

Verified: YES

Professional Team Comments:

Verified that the validation and verification of the model is based on actual claims data from Hurricanes Alicia (1983), Elena (1985), Gloria (1985), Juan (1985), Kate (1985), Hugh (1989), Bob (1991), Andrew (1992), Iniki (1992), and Opal (1995).

Reviewed binder containing results on goodness-of-fit tests for hurricane characteristics, comparisons of observed and modeled wind speeds, landfall frequency distributions, vulnerability curve fits, and modeled versus observed claims fits.

S-2 Sensitivity Analysis for Model Output

The modeler 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 and have taken appropriate action.

Audit

The modeler'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.

Form S-12 will be reviewed for new modeling companies which have not previously provided the Commission with this analysis.

Verified: YES

Professional Team Comments:

Discussed sensitivity analyses performed, the methodology utilized, and the results achieved on model parameters of occurrence rate, central pressure, and filling rate.

S-3 Uncertainty Analysis for Model Output

The modeler shall have performed an uncertainty analysis on the temporal and spatial outputs of the model using currently accepted scientific and statistical methods 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

The modeler'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.

Form S-12 will be reviewed for new modeling companies which have not previously provided the Commission with this analysis.

Verified: YES

Professional Team Comments:

Discussed and reviewed results of uncertainty analysis performed on the model parameters of occurrence rate, central pressure, and filling rate, and on the estimation of loss and the vulnerability functions.

Reviewed plots showing results of uncertainty analyses on storm frequency and loss estimation.

S-4 County Level Aggregation

At the county level of aggregation, the contribution to the error in loss costs estimates induced by the sampling process shall be negligible based upon currently accepted scientific and statistical methods.

Audit

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.

Verified: YES

Professional Team Comments:

Discussed EQE's use of importance sampling in generating output ranges.

Reviewed the impacts of using the reduced set of stochastic storms.

S-5 Replication of Known Hurricane Losses

The model shall reasonably replicate incurred losses on a sufficient body of past hurricane events, including the most current data available to the modeler. This Standard applies separately to personal residential and, to the extent data are available, to mobile homes. Personal residential experience may be used to replicate building-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.

Audit

The following information for each insurer and hurricane will be reviewed:

1. 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,
2. The version of the model used to calculate modeled losses for each storm provided,
3. A general description of the data and its source,
4. A disclosure of any material mismatch of exposure and loss data problems, or other material consideration,
5. The date of the exposures used for modeling and the date of the hurricane,
6. An explanation of differences in the actual and modeled storm parameters,
7. A listing of the departures, if any, in the wind field applied to a particular hurricane for the purpose of validation and the wind field used in the model under consideration,
8. The type of property used in each storm to address:
   a. Personal versus commercial
   b. Residential structures
   c. Mobile homes
   d. Condominiums
   e. Buildings only
   f. Contents only,
9. The inclusion of demand surge, storm surge, loss adjustment expenses, or law and ordinance coverage in the actual losses, or the modeled losses.

The following documentation will be reviewed:

1. Publicly available documentation referenced in the submission,
2. The data sources excluded from validation and the reasons for excluding the data from review by the Commission (if any),
3. An analysis that identifies and explains anomalies observed in the validation data,

4. User input sheets for each insurer and hurricane detailing specific assumptions made with regard to exposed property.

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

Form S-6 will be reviewed.

Verified: YES

Professional Team Comments:

Reviewed scatter plots of validation of loss estimates data in Form S-6.

Reviewed standardized residual plot of the modeled and historical loss and discussed the reasons for the outliers found in Figure 16.

S-6 Comparison of Estimated Hurricane Loss Costs

The difference, due to uncertainty, between historical and modeled annual average statewide loss costs shall be statistically reasonable.

Audit

Forms S-4, S-5, S-7, S-8, and S-9 will be reviewed.

Justify the following:

1. Meteorological parameters,
2. The effect of by-passing storms,
3. The effect of actual storms that have two landfalls impacting Florida,
4. The departures, if any, from the wind field, vulnerability functions, or insurance functions applied to the actual hurricanes for the purposes of this test and those used in the model under consideration, and
5. Exposure assumptions.

Verified: YES

Professional Team Comments:

Reviewed color-coded maps of ground-up loss costs for frame, masonry, and mobile home at the ZIP Code level.

Discussed the effect of by-passing storms and multiple landfalls on the AAL.

Discussed results of convergence tests used to ensure stability of the results produced by USWIND.

S-7 Output Ranges

For a model previously found acceptable by the Commission, the differences in the updated output ranges shall be reasonable.

Audit

Forms S-1A, S-1B, S-2, and S-3 will be reviewed.

Justify the following:

1. Changes from the prior submission of greater than five percent in weighted average loss costs for any county.
2. Changes from the prior submission of five percent or less in weighted average loss costs for any county.

Verified: YES

Professional Team Comments:

Reviewed the impact on the statewide loss costs of the model updates to the ZIP Code database, the storm set database, and the land use/land cover database.

Reviewed percentage changes in the Output Ranges by county and the underlying reason for these changes. Explanations found to be reasonable.

Discussed the occurrences of 0.000 for the weighted average loss costs and verified the occurrences are due to the exposure weight file provided containing no exposure data for that policy form and construction within those counties.

Revised Form S-1B, Renters to be provided to the Commission.

COMPUTER STANDARDS – Paul Fishwick, Leader

C-1 Documentation

A. The modeler shall maintain a complete set of documents specifying the model structure, detailed software description, and functionality. Development of each section shall be indicative of accepted software engineering practices.

B. All computer software (i.e., user interface, scientific, engineering, actuarial) relevant to the modeler's submission shall be consistently documented.

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

Audit

The primary document binder, in either electronic or physical form, and its maintenance process will be reviewed. The binder shall contain fully documented sections for each Computer Standard.

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

Modeler personnel, or their designated proxies, responsible for each aspect of the software (i.e. user interface, quality assurance, engineering, actuarial) shall be present when the Computer Standards are being audited. The Professional Team will interview internal users of the software.

Verified: YES

Professional Team Comments:

Reviewed the primary document binder and the master list of reference documents.

Reviewed the following user documentation:

- WORLDCATenterprise User Manual, Rev. 10, October 8, 2003
- EQECAT Reference Guide
- EQECAT File Layout & Import Manual
- EQECAT Data Dictionary

C-2 Requirements

The modeler shall maintain a complete set of requirements for the model, its computer implementation, and all appropriate model documentation.

Audit

The documentation of the requirements specifications will be reviewed.

Verified: YES

Professional Team Comments:

Reviewed the following documentation on requirements specifications for the software:

- USWIND Requirement Specification, Revision 1, August 25, 1994
- Design Specification EQECAT Additional Reports, February 1, 1999
- Design Specification EQECAT Additional Reports, Revision 2, June 30, 1999
- WORLDCATenterprise System Requirements, Rev. 3, February 3, 2003

Lotus Notes Database with the following documents:

- Treaty Underwriter Module Hardware/Software Requirements, Revision 2, November 7, 2000
- Treaty Underwriter Module Software Requirements Specifications (SRS) Volume 1 of 3, Preliminary Draft, September 7, 2000
- Treaty Underwriter Module Software Requirements Specifications (SRS) Volume 2 of 3, Preliminary Draft, September 7, 2000
- Treaty Underwriter Module Software Requirements Specifications (SRS) Volume 3 of 3, Preliminary Draft, September 12, 2000
- Treaty Underwriter Module Product Requirements Document, Revision 1.0.8, March 6, 2000
- WORLDCAT Enterprise Version 2.0 Product Requirements Document, Revision 1.0.0, September 20, 2000

C-3 Model Architecture and Component Design

The modeler shall maintain information defining the model architecture and design of model components and sub-components.

Audit

The following will be reviewed:

1. Detailed control and data flow diagrams,
2. Interface specifications for all components in the model,
3. Documentation for schemas for all data files, along with field type definitions,
4. Each network diagram including components, sub-component diagrams, arcs, and labels.

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

Verified: YES

Professional Team Comments:

Reviewed the model custodian responsibility cross-listing for code, documentation, and data. Reviewed the following documentation on design levels of the software, including software components and interfaces, data files, and database elements.

- EQECAT Catastrophe Management Output Reports Definitions, Revision 2, November 30, 1994
- EQECAT Catastrophe Management System, Version 3, GUI Design Specification, Revision 5, February 21, 1996
- EQECAT Natural Hazard Applications, Version 5, System Analysis and Data Flow Diagrams, Revision 2, December 1, 1998
- EQECAT Natural Hazard Applications, Version 5, System Design and Implementation, Revision 4, April 16, 2000
- EQECAT Natural Hazard Applications, Version 5, Interface Control Document, Revision 9, September 22, 2000
- EQECAT Data Directory Help File on CD-ROM
- Design Specification EQECAT Additional Reports, February 1, 1999
- Design Specification EQECAT Additional Reports, Revision 2, June 30, 1999
- EQECAT User Manual
- EQECAT Reference Guide
- EQECAT File Layout & Import Manual
- QA Test Procedure
- (Lotus Notes) Application Programmers Interface (API) for the EQE TUM Analysis Engine Broker, Revision 0, August 11, 2000
- (Lotus Notes) Treaty Underwriter Module Data Dictionary Modifications, Revision 0, September 27, 2000

C-4 Implementation

The software shall be traceable from the flow diagrams down to the code level.

Audit

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

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

The interfaces and the coupling assumptions will be reviewed.

Verified: YES

Professional Team Comments:

1. Reviewed the underlying model algorithm implementation and technical assumptions.

2. Performed code spot checks:
   2a. Verified site wind speed calculation component
   2b. Verified portfolio analysis component

3. Documentation reviewed:
   - USWIND Requirement Specification, Revision 1, August 25, 1994
   - EQECAT Natural Hazard Applications, Version 5, System Design and Implementation, Revision 4, April 16, 2000
   - EQECAT Catastrophe Management System, Version 3, GUI Design Specification, Revision 5, February 21, 1996
   - EQECAT Natural Hazard Applications, Version 5, Interface Control Document, Revision 9, September 22, 2000
   - (Lotus Notes) WORLDCAT Enterprise Installation Guide, Revision 2, May 17, 2001

C-5 Verification

A. General

The modeler shall maintain procedures for verification, such as code inspections, reviews, calculation crosschecks, and walkthroughs, sufficient to demonstrate code correctness.

B. Testing

Tests shall be performed for each software component, independent of all other components, to ensure that each component provides the correct response to inputs. The modeler shall use testing software to assist in documenting and analyzing all component test procedures and cases.

Audit

The code 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.

The testing of each component will be reviewed.

Verified: YES

Professional Team Comments:

Reviewed the model's testing procedures and software to verify that the software results are consistent with the intended simulation approach and the algorithms employed.

Reviewed modeler generated Test Suite software.

Reviewed the following documentation:

- Technical Reference, USWIND Version 4.0 to 5.x, December 1997 – April 2001
- Technical Reference, Damage to Loss Calculation, USWIND and USQUAKE Version 4.0 to 5.x, December 1997 – April 2001
- QA Test Procedure
- Test Runs, Test Plan and Summary of Results
- Test Runs, QA Verification of Scenario Wind Speed
- Test Runs, QA Verification for Wind Speed and Damage Calculations
- Test Runs, QA Verification for Scenario Damage Calculation
- Test Runs, QA Verification for Scenario Gross Loss Calculation
- Test Runs, QA Verification for Scenario Net Loss Calculation
- Test Runs, QA Verification for Gross to Net Calculation

- Test Runs, QA Verification for Probabilistic Gross Loss Calculation
- Test Runs, QA Verification for Probabilistic Net Calculation
- (Lotus Notes) Tum Technical Test PIan R.4
- EQECAT Automated Build Process
    - Test Documentation for Test Cases, WP-POL-00, Primary Underwriter Module Policy Test Case, Florida Wind
    - Test Documentation for Test Cases, WP-SS-00, Primary Underwriter Module Single Site Test Case, Florida Hurricane

C-6 Model Maintenance and Revision

A. The modeler shall have developed and implemented a clearly written policy for model revision with respect to methodologies and data.

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 modeler shall use tracking software to identify all errors, as well as modifications to code, data, and documentation.

Audit

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

Verified: YES

Professional Team Comments:

Reviewed the following methods and documentation for software maintenance and revision:

- SourceSafe for managing software access and management
- EQECAT Build Machine/Process

C-7 Security*

*(*New Standard)*

The modeler shall have implemented security procedures for access to code, data, and documentation in accordance with standard industry practices.

Audit

Provide a written policy for all procedures and methods used to ensure the security of code, data, and documentation. Specify all security procedures.

Verified: YES

Professional Team Comments:

Reviewed EQE code, data, and security policy documentation.