

WORKING DRAFT



ACTUARIAL STANDARDS BOARD

**Proposed
Actuarial Standard
of Practice
No. 38**

Revised Edition

**Catastrophe Modeling
(for All Practice Areas)**

**Developed by the
Catastrophe Modeling Task Force of the
General Committee of the
Actuarial Standards Board**

Doc. No. XXX

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November 2014

TO: Members of Actuarial Organizations Governed by the Standards of Practice of the Actuarial Standards Board and Other Persons Interested in Catastrophe Modeling (for All Practice Areas)

FROM: Actuarial Standards Board (ASB)

SUBJ: Actuarial Standard of Practice (ASOP) No. 38

The document contains the proposed final version of a revision of ASOP No. 38, *Catastrophe Modeling (for All Practice Areas)*.

Background

The ASB first began work on a standard for modeling in the late 1990s. Motivated primarily to address the role catastrophe modeling of earthquakes and hurricanes played in casualty ratemaking, this work was focused on the use of specialized models where the actuary would have to rely on a model that was developed by professionals other than actuaries. As a result of this work, the ASB approved ASOP No. 38, *Using Models Outside the Actuary's Area of Expertise*, in June of 2000 with the scope of the standard limited to the Property/Casualty area of practice. Currently, this is the only ASOP that specifically addresses modeling.

Recently, the number and importance of modeling applications in actuarial science has increased, with the results of actuarial models often entering financial statements directly. Recognizing this trend, the ASB asked the Life Committee in 2010 to begin work on an ASOP focused on modeling. The Life Committee formed a task force to address this issue and, in February of 2012, a discussion draft titled *Modeling in Life Insurance and Annuities* was released. Nineteen comment letters were received.

Based upon this feedback and numerous other discussions on the topic of modeling, in December of 2012 the ASB created two multidisciplinary task forces under the direction of the General Committee: i) a general Modeling Task Force, charged with developing an ASOP to address modeling applications in all practice areas, and ii) a Task Force to consider expanding ASOP No. 38 to all practice areas while focusing exclusively on using catastrophe models.

An exposure draft titled *Modeling* was released in June 2013 with a scope that provides guidance to actuaries when selecting, designing, building, modifying, developing, or using models when performing professional services. The comment deadline was September 30, 2013.

The exposure draft of this revision of ASOP No. 38 was the work of the Catastrophe Modeling Task Force, whose membership has experience in life insurance, health insurance,

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property/casualty insurance, and enterprise risk management. At the direction of the ASB, this standard was developed to apply to all practice areas and all forms of catastrophe models, including natural catastrophes such as hurricanes, earthquakes, and severe convective storms, and other catastrophes such as terrorist acts and pandemics.

Exposure Draft

The exposure draft of this revised ASOP was issued in September 2013 with a comment deadline of December 30, 2013. The task force carefully considered the 18 comment letters received and made clarifying changes to the language in several sections. For a summary of the substantive issues contained in the exposure draft comment letters and the task force's responses, please see appendix 2. There were no major changes from the exposure draft.

The ASB thanks everyone who took the time to comment on the exposure draft.

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The Actuarial Standards Board (ASB) sets standards for appropriate actuarial practice in the United States through the development and promulgation of Actuarial Standards of Practice (ASOPs). These ASOPs describe the procedures an actuary should follow when performing actuarial services and identify what the actuary should disclose when communicating the results of those services.

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ACTUARIAL STANDARD OF PRACTICE NO. 38

**CATASTROPHE MODELING
(FOR ALL PRACTICE AREAS)**

STANDARD OF PRACTICE

Section 1. Purpose, Scope, Cross References, and Effective Date

- 1.1 Purpose—This actuarial standard of practice (ASOP) provides guidance to actuaries selecting, reviewing, evaluating, or using **catastrophe models** when performing actuarial services.
- 1.2 Scope—This ASOP applies to actuaries in all practice areas performing actuarial services when selecting, reviewing, evaluating or using **catastrophe models** to assess risk, including but not limited to models of hurricanes, earthquakes, severe convective storms, terrorist acts, and pandemics. This standard applies to the selection, review, evaluation, or use of **catastrophe models**, whether or not they are proprietary in nature.

This standard does not apply to models of operational risks. This standard also does not apply to models of economic risks that deal with instances of extreme events such as hyper-inflation or a stock market collapse. This standard also does not apply when the actuary is only designing, building, modifying, or developing a catastrophe model (or a portion of a catastrophe model).

A general standard on modeling is under consideration, which is expected to apply to the actuary when designing, building, modifying, or developing catastrophe models as well as when selecting, reviewing, evaluating or using catastrophe models.

If the actuary departs from the guidance set forth in this ASOP in order to comply with applicable law (statutes, regulations, and other legally binding authority), or for any other reason, the actuary should refer to section 4.

- 1.3 Cross References—When this ASOP refers to the provisions of other documents, the reference includes the referenced documents as they may be amended or restated in the future, and any successor to them, by whatever name called. If any amended or restated document differs materially from the originally referenced document, the actuary should consider the guidance in this ASOP to the extent it is applicable and appropriate.

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- 1.4 Effective Date—This ASOP is effective for work performed on or after nine months after adoption by the Actuarial Standards Board.

Section 2. Definitions

The terms below are defined for use in this actuarial standard of practice.

- 2.1 Assumptions—A type of input to a **catastrophe model** that represents expectations or possibilities based on professional judgment, or that may be prescribed by law or by others.
- 2.2 Catastrophe Model—A representation of relationships among events based on statistical, financial, economic, mathematical or scientific concepts and equations. **Catastrophe models** are used to explain a system, to study the effects of different components, and to derive estimates and guide decisions based upon the future occurrences of large-scale, low-frequency, high-severity events.
- 2.3 Data—A type of input to a **catastrophe model** that represents facts or information collected from sources such as records, experience, experiments, surveys or observations.
- 2.4 Expert—One who is qualified by knowledge, skill, experience, training, or education to render an opinion concerning the matter at hand.
- 2.5 Parameters—Mathematical, financial, economic, scientific or statistical input to **catastrophe models**. Examples include expected values and the coefficients of variables in mathematical distributions or regression formulae. As input to a **catastrophe model**, **parameters** are sometimes considered **assumptions** and are sometimes considered **data**, but are named separately in this standard.
- 2.6 Principal—A client or employer of the actuary.
- 2.7 Project's Objective—The specific goal or question the actuary is addressing when selecting, reviewing, evaluating, or using a **catastrophe model** to meet the needs of the **principal**.

Section 3. Analysis of Issues and Recommended Practices

- 3.1 Introduction—In performing actuarial services, an actuary may find it appropriate to select, review, evaluate, or use **catastrophe models**. When selecting, reviewing, evaluating, or using such a model, the actuary should:
- a. determine the appropriate level of reliance on **experts**;

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- b. have a basic understanding of the **catastrophe model**;
- c. evaluate whether the **catastrophe model** is appropriate for the **project's objective**;
- d. determine that appropriate validation has occurred; and
- e. determine the appropriate use of the **catastrophe model** and its results.

The actuary's level of effort in understanding and evaluating a model should be consistent with the **project's objective** and the model output's materiality to the results of the actuarial analysis.

3.2 Appropriate Reliance on Experts—An actuary may rely on **experts** in the fields of knowledge used in the development of the **catastrophe model**. In determining the appropriate level of reliance, the actuary should consider the following:

- a. whether the individual or individuals upon whom the actuary is relying are **experts** in the applicable field;
- b. the extent to which the **catastrophe model** has been reviewed or opined on by **experts** in the applicable field, including any known significant differences of opinion among **experts** concerning aspects of the model that could be material to the actuary's use of the model; and
- c. whether there are industry or regulatory standards that apply to the **catastrophe model** or to the testing or validation of the model, and whether the model has been certified as having met such standards.

3.3 Understanding of the Catastrophe Model—The actuary should be familiar with the basic components of the model and understand both the user input and the model output, as discussed below.

3.3.1 Model Components—The actuary should be familiar with the basic components of the model and have a basic understanding of how such components interrelate within the model. In addition, the actuary should identify which fields of expertise were used in developing or updating the model and should make a reasonable effort to determine if the model is based on generally accepted practices within the applicable fields of expertise. The actuary should also be familiar with how the model was tested or validated and the level of independent **expert** review and testing.

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- 3.3.2 User Input—Certain user input may be required to produce model output for the specific application. User input can include **assumptions**, **data**, or **parameters**. If the model requires user input, the actuary should evaluate the reasonableness of the user input and should have a reasonable understanding of the relationship between the model’s input and output. The actuary should take reasonable steps to confirm that the precision and accuracy of the user input are consistent with the **project’s objective**. With respect to the quality and availability of the user input to be used in the model, the actuary should refer to ASOP No. 23, *Data Quality*.
- 3.3.3 Model Output—The actuary should determine that the model output is consistent with the **project’s objective**.
- 3.4 Appropriateness of the Catastrophe Model for the Project’s Objective—The actuary should evaluate whether the model is appropriate for the **project’s objective**. When using the model output, the actuary should also consider limitations of the model, modifications to the model output, and the **assumptions** needed.

Some additional considerations include the following:

- a. Applicability of Historical Data—To the extent historical **data** are used in the development of the model or the establishment of model **parameters**, the actuary should consider the adequacy of the historical **data** in representing the range of reasonably expected outcomes consistent with current knowledge about the phenomena being analyzed.
- b. Developments in Relevant Fields—The actuary should make a reasonable effort to be aware of significant developments in relevant fields of expertise. The actuary should evaluate whether such developments are likely to materially affect the current actuarial analysis.
- 3.5 Appropriate Validation—The actuary should evaluate the reasonableness of the model output, considering the input and the **project’s objective**, taking into account factors such as the following:
- a. how historical observations, if applicable, compare to results produced by the model;
- b. the consistency and reasonableness of relationships among various output results; and
- c. the sensitivity of the model output to variations in the user input.

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- 3.6 Appropriate Use of the Catastrophe Model and Its Results—The actuary should use professional judgment to determine whether it is appropriate to use the model results to develop the actuarial work product. The actuary should also use professional judgment to determine whether any adjustments to the model output are needed to meet the **project’s objective**. The actuary should disclose any such adjustments in accordance with section 4.1.
- 3.7 Reliance on Another Actuary—The actuary may rely on another actuary who has selected, reviewed, evaluated, or used the **catastrophe model**. However, the relying actuary should be satisfied that the other actuary’s selection, review, evaluation, or use of the **catastrophe model** was performed in accordance with this ASOP and is appropriate for the **project’s objective**. The actuary should document the extent of such reliance in accordance with section 4.1.

Section 4. Communications and Disclosures

- 4.1 Actuarial Communications—When issuing actuarial communications incorporating **catastrophe modeling** within the scope of this ASOP, the actuary should disclose the following, as appropriate:
- a. the model used and the **project’s objective**;
 - b. a description of the user input that was incorporated into the model, as discussed in section 3.3.2;
 - c. a description of adjustments made to the model results, as discussed in section 3.6.; and
 - d. the extent of any reliance placed upon the work of another actuary, as discussed in section 3.7.
- 4.2 Documentation—This standard requires documentation whether or not a legal or regulatory requirement exists. The actuary should maintain appropriate documentation of the evaluation of the **catastrophe model** and the use of the model output in the analysis. The documentation should demonstrate how the actuary has met the requirements of sections 3.1–3.7 above.
- 4.3 Proprietary Information—If the **catastrophe model** has proprietary aspects or contains proprietary information, the actuary should document the steps taken to comply with this standard in light of the proprietary aspects or information.
- 4.4 Deviation from Guidance in the Standard—If the actuary departs from the guidance set

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forth in this standard, the actuary should include the following where applicable:

- a. the disclosure in ASOP No. 41, *Actuarial Communications*, section 4.2, if any material assumption or method was prescribed by applicable law (statutes, regulations, and other legally binding authority);
- b. the disclosure in ASOP No. 41, section 4.3, if the actuary states reliance on other sources and thereby disclaims responsibility for any material assumption or method selected by a party other than the actuary; and
- c. the disclosure in ASOP No. 41, section 4.4, if, in the actuary's professional judgment, the actuary has otherwise deviated materially from the guidance of this ASOP.

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Appendix 1

Background and Current Practices

Note: This appendix is provided for informational purposes but is not part of the standard of practice.

Background

Hurricane Andrew in 1992 and the Northridge Earthquake in 1994 led actuaries involved in evaluating hurricane and earthquake exposures to recognize the severe inadequacy of the traditional, empirical actuarial methods used for ratemaking for these exposures. Recognizing the need to replace these methods, many actuaries began using stochastic computer simulation models for their actuarial analysis of hurricane and earthquake exposure. Computer simulation models had been commonly used for some time by actuaries and others for the purpose of evaluating probable maximum loss but had not been widely used for ratemaking.

Over time, the output from catastrophe models became commonly used by property/casualty actuaries in developing rates for catastrophic perils as well as many other risk management purposes.

Current Practices

Catastrophe models are now widely used by actuaries in all practice areas for risk management analyses and calculating expected losses due to hurricanes, earthquakes, and terrorist acts. More recently, catastrophe models have also been developed to simulate wild fires, severe convective storms, tsunamis, and pandemics.

In addition, due to changes in regulations and financial reporting requirements, the number and importance of modeling applications in actuarial science has increased, with the results of actuarial models often entering financial statements directly.

Lastly, due to the evolution of enterprise risk management (ERM) practices and regulations, there has been increased use of catastrophe modeling as part of insurer stress testing and risk management across all practice areas. This trend is likely to continue to evolve.

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Appendix 2

Comments on the Exposure Draft and Responses

The exposure draft of this revision of ASOP No. 38, *Catastrophe Modeling (for All Practice Areas)*, was issued in September 2013 with a comment deadline of December 30, 2013. Eighteen comment letters were received, some of which were submitted on behalf of multiple commentators, such as by firms or committees. For purposes of this appendix, the term “commentator” may refer to more than one person associated with a particular comment letter. The Catastrophe Modeling Task Force and the General Committee of the Actuarial Standards Board carefully considered all comments received, and the General Committee and ASB reviewed (and modified, where appropriate) the changes proposed by the task force.

Summarized below are the significant issues and questions contained in the comment letters and the responses.

The term “reviewers” in appendix 2 includes the task force, General Committee, and the ASB. Also, unless otherwise noted, the section numbers and titles used in appendix 2 refer to those in the exposure draft.

GENERAL COMMENTS	
Comment	One commentator suggested that adopting this ASOP would lend undue credibility to the idea that these models are reliable. By definition catastrophes are low frequency events, making it unlikely that any model can accurately predict when or where these events will occur (for example, hurricane forecasts for the past few years have not been very good). Predicting the financial effect involves making many more assumptions that would be mostly guesses.
Response	The reviewers disagree and note that models of the type contemplated in the ASOP have been in use for years. The uncertainty surrounding the events and the modeling of the events is a strong reason to have guidance for actuaries.
Comment	One commentator asked whether there is a general standard or “rule of thumb” to distinguish a catastrophe from an event that is merely big, either in lives lost or financial losses. Several other commentators indicated that catastrophe is not clearly defined.
Response	The reviewers believe that the definition of catastrophe model in section 2.2, which refers to a catastrophe as a large-scale, low frequency, high severity event, is sufficiently clear and made no change.

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Comment	One commentator stated that the ASOP should recognize that models of man-made catastrophes should differ from the models of natural catastrophes because the former are modeling complex human behavior rather than the more predictable natural phenomena based on the science of physics.
Response	The reviewers note that the current ASOP No. 38 has been used for over 10 years as guidance for man-made catastrophes. The reviewers agree with the commentator that modeling human behavior is complex and there exists significant uncertainty in any single answer or range of answers. The ASOP gives guidance to the actuary in documenting and disclosing reliance and limitations. The ASOP does not require the actuary to identify and consider every possible opinion available; rather it guides the actuary to consider whether the use of a particular catastrophe model is appropriate. Accordingly, no change was made.
Comment	One commentator expressed concern that the ASOP does not recognize that models designed to satisfy other users should differ from the models designed to satisfy regulators, because the two alternative sets of users seek different information from the actuary, as different as a plausible range is different from a best estimate.
Response	The reviewers note that the ASOP does not specify the structure of the model, the output of the model, or the use of the model. All of these should be consistent with the project’s objective. The definition of project’s objective is a key part of the ASOP and provides guidance that the work product must meet the needs of the principal. The ASOP is applicable over the full distribution of outcomes.
Comment	One commentator believes the ASOP is not flexible enough, and that it narrows the choice of models to models not developed by actuaries and will therefore discourage actuaries from developing new approaches for new situations.
Response	The reviewers disagree and note that the definition of expert easily accommodates an actuary. Further, nothing in the ASOP prevents an actuary from building his or her own catastrophe model. The definition of catastrophe model could include “classical actuarial models.” Thus, no change was made.
Comment	A commentator asked whether a catastrophe must be a single event or can it be multiple events that, in a short period of time, satisfy an objective definition of catastrophe. For example, 2005 had not only Katrina but also Rita and other hurricanes that together produced catastrophic losses.
Response	The reviewers believe that catastrophe model output may be on an occurrence or aggregate basis. The actuary, in addressing the project’s objective, should determine what output is appropriate. Therefore, no change was made.
Comment	One commentator questioned the need for two standards of practice on modeling, and also suggested that the guidance in the exposure draft would be good practice with respect to other types of models as well, not just models of catastrophic events. The commentator did not see why additional requirements should be imposed on models of certain types of events.
Response	The reviewers disagree and believe that ASOP No. 38 has served the actuarial profession well, as a specialized application of models.
Comment	One commentator indicated that it would be nice to have less detailed required knowledge when the catastrophe model use is de minimis for the task at hand, using the damage to autos from hurricanes in Iowa as an example.
Response	The reviewers note that section 3.1 provides that the actuary’s level of effort should consider the materiality of the model’s output on the project and made no change.

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SECTION 1. PURPOSE, SCOPE, CROSS REFERENCES, AND EFFECTIVE DATE	
Section 1.1, Purpose	
Comment	One commentator suggested that section 1.1 be revised to include evaluating catastrophe models, and that section 1.2 similarly refer to evaluating models in addition to selecting and using models.
Response	The reviewers agree and revised sections 1.1 and 1.2 to include evaluation of models.
Comment	One commentator asked whether the standard should give any guidance on when the actuary should consider using a catastrophe model.
Response	The reviewers note that the appendix gives examples of when an actuary might use a catastrophe model and made no change.
Section 1.2, Scope	
Comment	One commentator indicated that for the life practice area, where catastrophe risk is not usually a consideration in the actuary’s work, the scope of the ASOP and the definition of catastrophe model is not sufficiently clear. The commentator indicated that, since ASOP No. 38 is intended to apply only to catastrophes associated with insurance risk (for the life practice area, insurance risk would mean mortality and morbidity risk), and not any type of extreme events related to operational or economic risk, it would be clearer if the ASOP indicated this limitation directly. Catastrophic increases in mortality and/or morbidity risk would be unlikely to be reflected in life pricing, but catastrophic risk in mortality and/or morbidity risk might be considered at the Enterprise Risk Management (ERM) level when determining a company’s capital needs. Such increases in mortality/morbidity due to situations such as a terrorist act or a pandemic might require the use of special models.
Response	The reviewers agree and modified the scope accordingly.
Comment	One commentator indicated that the distinction between “using” versus “modifying or developing” a model is not sufficiently clear and is likely inappropriate.
Response	The reviewers believe the distinction is clear and appropriate, and made no change. The reviewers note that a standard on modeling is being considered that would apply to the development and modification of all models, including catastrophe models.
Comment	One commentator indicated that the ASOP scope is too broad and that the ASOP does not provide sufficiently detailed guidance.
Response	The reviewers believe that the ASOP establishes a reasonable scope and provides an appropriate level of guidance.
Comment	One commentator indicated that the inclusion of a reference to “ASOP No. XX, Modeling” is inappropriate as it does not define the scope of this ASOP and that it is premature to include in proposed language any reference to a standard that does not yet exist, as it presumes a decision has already been made on such a standard.
Response	The reviewers removed the reference to “ASOP No. XX,” and added wording to indicate that a standard on modeling is being considered.

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Comment	Two commentators questioned why macroeconomic events are categorized separately and excluded from the standard, indicating that these are catastrophes and are similar in nature to catastrophes covered by the ASOP, and should therefore be subject to the same guidance as is given for the non-financial events.
Response	The reviewers believe that operational and economic risk models are more appropriately addressed in the standard on modeling that is being considered.
SECTION 2. DEFINITIONS	
Section 2.1, Assumptions	
Comment	One commentator suggested that the reference to “...based on professional judgment” is a low standard for selecting inputs and suggested something like “based on professional judgment supported by and documented with readily available (publicly available) data.” The commentator indicated that judgment alone leaves too much to individual preference, which can be influenced by a desired outcome, and that specific supporting information should be a part of assumption selection. The commentator also indicated that a selected assumption should be supported by narrative comment on why the selection is appropriate and why alternative selections are inappropriate.
Response	The reviewers disagree based on the definition of “professional judgment” in ASOP No. 1, <i>Introductory Actuary Standard of Practice</i> . The reviewers also note that selection and documentation of assumptions are addressed in other ASOPs.
Section 2.2, Catastrophe Model	
Comment	One commentator suggested that the ASOP specify that the listed catastrophic events are not the only catastrophic events that can be modeled. Another commentator suggested including in the examples more of the events identified in the first paragraph of the “Current Practices” section.
Response	The reviewers agree that it could be made clearer that catastrophic events include, but are not limited to, the examples that had been listed in section 2.2. Therefore, the reviewers moved the examples to section 1.2, Scope, and made clear in section 1.2 that catastrophic events include, but are not limited to, those examples.
Comment	Two commentators suggested that the definition of “catastrophe model” be revised to include the term “scientific.”
Response	The reviewers agree and revised the language to also refer to scientific concepts.
Comment	One commentator suggested that the term “tornadoes” be replaced with “severe convective storms,” because in catastrophic models that peril includes wind, hail, and tornado.
Response	The reviewers agree and made the changes in section 1.2 (where the examples were moved) and elsewhere where the term “tornado” had appeared.

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Section 2.4, Experts	
Comment	A commentator objected to anyone being called an “expert” in light of the many uncertainties inherent in the models and indicated that the definition of “expert” and the criteria for determining whether a person has the requisite skill, experience, etc. are vague. The commentator also indicated that if an actuary is to select such a “model,” then given the stringent requirements in section 3 (particularly if the model being considered is proprietary and does not easily lend itself to review by the actuary), it would seem that the actuary needs to be an expert in order to properly select the model and user input.
Response	The reviewers disagree and note that “expert” is defined this way in ASOP No. 17, <i>Expert Testimony by Actuaries</i> . Section 3 provides guidance and guidelines to the actuary, defining a reasonable process to select and use catastrophe models.
Section 2.7, Project’s Objectives	
Comment	A commentator asked whether the principal can be the actuary or another individual who is working on a research project and indicated that the section suggests that the principal cannot be the actuary performing the model work. The commentator also asked whether the objective can be to improve the accuracy, documentation, and usability of the model in a research context.
Response	The reviewers believe that a research project could be governed by this ASOP where the actuary is effectively his or her own client. However, if “working on” or “improving the accuracy, documentation, and usability of the model” means any of the actions not covered, as discussed in section 1.2, then the ASOP would not apply.
SECTION 3. ANALYSIS OF ISSUES AND RECOMMENDED PRACTICES	
Comment	A commentator suggested that the ASOP should include a specific obligation to be responsive to the regulatory body that receives rate or product filings and to a regulatory official who needs more information in evaluating a filing or financial statement. The commentator indicated that it is not sufficient to have that requirement only in another ASOP or in the <i>Code of Professional Conduct</i> (Code).
Response	The reviewers disagree. The Code, which applies to all actuarial services, places a strong obligation on the actuary to act with professionalism and courtesy. Additionally, ASOP No. 41, <i>Actuarial Communications</i> , provides guidance to actuaries responding to regulatory requests.
Section 3.1, Introduction	
Comment	One commentator indicated that the language presumes that the user of a catastrophe model is always in charge of which catastrophe model to use, or whether to use a catastrophe model. The commentator suggested that this ASOP needs to allow for the use of a catastrophe model at the direction of the principal. For example, a large property insurer may have many different people involved in pricing and ratemaking, but the insurer can't afford to allow each one to choose which catastrophe model to run and use for the pricing/ratemaking. The commentator asked what the responsibility should be for the actuary using the catastrophe model in such a situation where he or she has no choice in what is used, but instead relies on others within the company.
Response	The reviewers note that when the model selection is made by another actuary, section 3.7 allows reliance on that actuary under the circumstances specified. When the selection is made by someone other than an actuary, ASOP No. 41 provides guidance on reliance on others for selection and any disclosure requirements. The ASOP guidance in regard to use would still apply.

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Section 3.2, Appropriate Reliance on Experts	
Comment	One commentator indicated that the bar set for validating and certifying models in section 3.2(c) is too high and unachievable.
Response	The reviewers disagree and note that section 3.2(c) directs the actuary to consider whether there are industry or regulatory standards that apply to the validation or testing of the model and, if so, whether the model has been certified to meet those standards.
Section 3.3.1, Model Components	
Comment	One commentator indicated that the ASOP requires the actuary to identify the fields of expertise used in developing or updating the model, and suggested that this be softened somewhat to the “general” fields of expertise, as there may be some special areas of expertise within seismology or geology or meteorology that may be relevant to this question but are beyond the needs of an actuary using a generic well-accepted third-party vendor model (such as AIR, RMS, or Egecat). The commentator also suggested that the requirement for familiarity with “the level of independent expert review and testing” also seems excessive for someone using a well-accepted third-party vendor model for a rate filing.
Response	The reviewers disagree and believe that “fields of expertise” or “knowledge” is a general description. It is reasonable to expect the actuary to be familiar with the validation and degree of independent review of any model that the actuary uses.
Section 3.3.2, User Input	
Comment	One commentator indicated that the actuary should be familiar with all possible model inputs that could influence model outputs and be prepared to discuss the difference between model outputs that could have been produced using all possible model inputs with the model output produced given the model inputs actually used.
Response	The reviewers disagree and believe that the actuary should be allowed to determine the appropriate level of testing consistent with the project’s objective.
Comment	One commentator asked whether, where the ASOP says that “the actuary should evaluate the reasonableness of the user input,” the actuary can rely upon an in-house expert, since that may be a specialized function within a larger company. The commentator noted that the same issue applies to section 3.4(a) with regard to “Applicability of Historical Data.”
Response	The reviewers believe the standard covers this appropriately and made no change. ASOP No. 41 also provides guidance regarding reliance on others.
Section 3.5, Appropriate Validation	
Comment	One commentator indicated that it isn’t clear that validation must be adequately documented, and suggested that (i) if model results differ “materially” from historical results, documentation should be supplied explaining the differences and (ii) it should be possible for a third party or regulator to reproduce results with specific inputs.
Response	The reviewers disagree and note that section 4.2, Documentation, specifically notes the section referring to validation and historical results. It is expected that reproducibility will be addressed in the proposed Modeling ASOP.

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Section 3.7, Reliance on Another Actuary	
Comment	One commentator observed that the ASOP indicates that the actuary may rely on another actuary who has selected or used the catastrophe model, and asked whether there should be specific guidance for scenarios where it wasn't an actuary who selected or used the catastrophe model. Another commentator indicated that reliance on others is not sufficiently covered in the ASOP, noting that certain components of the actuarial work product are subject to specialization done by central areas within a larger company.
Response	The reviewers note that ASOP No. 41 provides guidance regarding reliance on others, and section 3.7 of this ASOP provides additional guidance with respect to reliance on an actuary. Thus, no change was made.
Comment	One commentator suggested that this section needs to be near the beginning of section 3 and should be clearer as to how it affects the other requirements of section 3.
Response	The reviewers disagree and believe that the section is clear and properly placed, and made no change.
SECTION 4. COMMUNICATION AND DISCLOSURES	
Section 4.1, Actuarial Communications	
Comment	One commentator indicated a concern that a principal may use an actuarial result in a way that was not intended and suggested that when such misuse can reasonably be anticipated, the actuary should communicate key limitations.
Response	The reviewers disagree that a specific section is needed for this ASOP. Disclosure of limitations and control of the work product are addressed in the Code, applicable to all actuarial services.
Section 4.2, Documentation	
Comment	One commentator suggested including “The documentation should specifically demonstrate in a separate section or chapter how the actuary has met the requirements of each and every aspect of sections 3.1– 3.7.”
Response	The reviewers disagree and believe that this section need not specify the form of the documentation, and made no change.
Comment	One commentator noted that this paragraph says “The documentation should demonstrate how the actuary has met the requirements of sections 3.1–3.7 above,” and questioned why it is necessary to document compliance with this ASOP as part of the work product, while with other ASOPs it may only be necessary to be able prove compliance (via an audit trail or in some other fashion).
Response	The reviewers disagree and believe that this section does not specify the form of the documentation, and made no change.
Section 4.3, Proprietary Information	
Comment	One commentator agreed that proprietary information should be addressed in this ASOP, but indicated that this section provides a loophole for an actuary to assert proprietary aspects without requiring any justification that the model is appropriate. The commentator indicated that when addressing a regulator, an actuary should be required to describe why the model should be allowed to be used.
Response	The reviewers disagree and believe that sections 1.2 and 4.3 make clear the actuary’s obligation even when a model has proprietary aspects.

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APPENDIX 1	
Comment	One commentator suggested that a reference to IAA Monograph “Stochastic Modeling – Theory and Reality from an Actuarial Perspective” would be helpful.
Response	The reviewers disagree and note that the referenced monograph is not free. Readers may independently choose to purchase the document.