

IS YOUR EARTHQUAKE RISK CATASTROPHIC OR B-9?

AIR GUIDANCE ON POLICIES AND PROCEDURES TOWARD COMPLIANCE WITH OSFI GUIDELINE B-9

In Canada, the Office of the Superintendent of Financial Institutions (OSFI) is the primary regulator and supervisor of insurance companies. Because a key risk for insurers is catastrophe exposure, a major component of OSFI's supervisory framework is guidance for, and assessment of, the quality of insurers' catastrophe risk management practices.

OSFI publishes guidelines that set standards for the governance of industry activities and behavior, and insurers are required to follow the best practices outlined in them. Revised in 2013, Guideline B-9, Earthquake Exposure Sound Practices, takes a principles-based approach and requires insurers to proactively develop, document, and demonstrate their own earthquake risk management strategy. Its goal is to ensure that insurers have comprehensive policies and procedures in place, along with the oversight necessary to ensure that they are effectively implemented. In addition, Guideline B-9 sets out factors to be considered when calculating probable maximum loss (PML) which, when compared to the financial resources available to cover it, will enable an insurer to assess its capacity to cope with a major earthquake.

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Catastrophe models play an important role in helping insurers meet these requirements. As stated in the guideline, insurers are encouraged to use “theoretically sound earthquake models as part of their earthquake exposure management.” Catastrophe models, like the Canada earthquake model from AIR Worldwide, overcome the problems associated with assessing the risk from low-frequency, high-severity natural catastrophe events by quantifying the insurer's long-term risk profile. Catastrophe models provide a basis for PML

estimation, earthquake exposure accumulation management, underwriting decision-making, portfolio management, reinsurance purchase, and more.

The principles outlined in Guideline B-9 should form part of the insurer's overall catastrophe risk management strategy and, because they represent good practice, insurers will ideally be meeting the requirements already. The principles are not optional, and insurers' earthquake exposure risk management policies will be assessed against them. Where necessary, OSFI will require remedial action and can use its discretionary authority to adjust the insurer's capital/asset requirements or target solvency ratios. OSFI expects that each insurer will comply with the expectations established in Guideline B-9, including board review of its earthquake exposure risk management policy.

Is your company ready?

WHAT COMPLIANCE MEANS

EVERY REGULATED ENTITY IS DIFFERENT

Insurance companies vary greatly in size, ownership structure, scope and complexity of operations, corporate strategy, and risk profile. Like Solvency II in Europe, Guideline B-9 offers uniform goals for the governance of insurance companies, but the path each insurer takes toward compliance will vary. Neither Solvency II nor Guideline B-9 dictates a prescriptive list of steps an insurer must take to fulfill all of the requirements. Rather, individual companies must decide how to demonstrate compliance. In short, there is no “one-size-fits-all” approach.

GUIDELINE B-9 REQUIREMENTS

The OSFI Guideline B-9 champions sound practices for the use of catastrophe models and requires insurers to adopt a comprehensive policy documenting the key elements of its earthquake exposure risk management. It cautions that model users need to be aware of model

limitations and uncertainty. Insurers are advised to consider using more than one model to counter the uncertainty inherent in models, and are expected to adopt updates to their models within a year of release.

The Guideline requires insurers not only to adopt appropriate policies and procedures but also to demonstrate to OSFI that they have done so. For example, a senior officer of the insurer should make an annual declaration to the board confirming that the insurer's practices and procedures meet, except as otherwise disclosed, the standards set in the guideline. This declaration is to be made available to OSFI on request. Lastly, insurers are required to file an Earthquake Exposure Data form annually with OSFI.

HOW DOES CATASTROPHE MODELING FIT IN?

Guideline B-9 acknowledges that “prudent use of catastrophe models to measure earthquake exposure risk is an important component of sound earthquake exposure risk management” and recommends good practices for their use. Catastrophe models are essential in helping insurers prepare for potential losses in advance of an actual event. They are used to inform actuarially sound ratemaking, guide underwriting principles that meet each company's long-term growth

objectives, formulate claim operation strategies, ensure capital adequacy, and improve portfolio management and reinsurance purchase decisions.

Catastrophe models are a crucial tool for estimating probable maximum loss (PML), and for determining the relevant risk factors that underlie the PML, including the types of events that cause this size loss to the portfolio, the regions that carry the greatest loss potential, and the risks that are the largest contributor to the loss. However, the PML—or any model output—does not represent “the answer” and, ultimately, it is the responsibility of each company to own their risk. Putting the PML into the context of the insurer's exposure data quality, inherent model uncertainty, and nonmodeled sources of loss requires a comprehensive understanding of the model.

UNDERSTANDING CATASTROPHE MODELS

Key to having sound earthquake model practice is having a good understanding of the scientific data, assumptions, and methodologies used in the model, its limitations and sources of uncertainty, and the exposure data used as input. Even using the same data sets, model vendors can reach different conclusions on the frequency and severity of future events and the damageability of structures they impact.

GUIDELINE B-9 EXPECTS INSURERS TO:

- Demonstrate a strong commitment to obtaining consistent, accurate, and complete data and to verifying that their databases are accurately capturing all the data. Senior management need to understand the possible impact of data limitations on the results projected by models and make appropriate adjustments to the model estimates.
- Use theoretically sound earthquake models as part of their earthquake exposure management. Insurers need to demonstrate a sound knowledge of the model's underlying assumptions and methodologies and to appropriately consider their limitations and uncertainties. Sound earthquake model practices should be adopted, and model results should be validated.
- Develop PML estimates that reflect the total expected ultimate cost to the insurer, including considerations for data quality, nonmodeled exposures, model uncertainty, and exposures to multiple regions.
- Ensure that they have the financial resources and contingency plans necessary to enable them to respond appropriately to a major earthquake.

Users of catastrophe models should understand the data sources and methodologies used in model development, as well as modeled and nonmodeled sources of potential loss. Earthquake losses, for example, can arise from ground shaking, tsunami, landslide, liquefaction, and fire following. Users should be aware that not all models cover all of these perils and can therefore understate potential insured losses; adjustments to model output should be made accordingly.

Guideline B-9 notes that there is “significant uncertainty associated with catastrophe modeling” and urges all users of catastrophe model output to be conscious of this uncertainty. Because models are mathematical representations of extremely complex real-world phenomena, uncertainty is inherent in all model components. Model output should include quantification of both primary uncertainty (uncertainty surrounding the frequency and intensity of simulated events) and secondary uncertainty (uncertainty in the damage estimation, given that an event has occurred).

SOUND MODEL USE STARTS WITH HIGH QUALITY DATA

Beyond the scientific and mathematical understanding of the models, prudent exposure data management practices are critical for sound model use. Data characterizing the exposed portfolio have as their source the underwriting process, where information about the risks and their characteristics is collected and entered into the insurer’s underwriting systems. The practices surrounding the collection and quality assurance of these raw exposure data are important, as are the processes that translate the raw data into catastrophe model inputs. Ensuring that this process is systematically applied within an organization is critical to catastrophe modeling quality, and the organization should implement accountability standards.

High quality input data help ensure that the results generated by the catastrophe model appropriately reflect the potential loss. Catastrophe models require accurate input data for the property’s location, risk characteristics (such as construction, age, and height), replacement value, and policy conditions. The most accurate results are obtained using location-specific exposure characteristics, instead of relying on the model’s

assumptions when characteristics are coded as unknown.

Prior to catastrophe loss analysis, model users should assess the quality of the exposure data and enhance it where possible. Users should also perform reasonability checks on exposure data summaries, including minimum replacement value, maximum replacement value, and the average value per risk. This enhances the understanding of the exposure data structure and provides insight into any significant departures from industry averages or any underlying deficiencies in the exposure data, such as having many unknown characteristics or locations with potentially erroneous characteristics, which can be flagged for further inspection.

It is best practice to provide summary information on exposure along with the associated analysis results to aid in an informed interpretation of the results. When primary risk characteristic information is not available, users should make reasonable assumptions based on an understanding of their portfolio and be able to share and explain those assumptions to other stakeholders.

Adjusting PML Estimates

Any adjustments made to the modeled PML estimate—to account for exposure data or model limitations, to incorporate a company’s loss experience, or to reflect alternate views of risk—should be at the discretion of the insurer. The insurer should maintain sufficiently detailed documentation on the quality of the data, enhancements to data quality, and justification and methodologies for adjustments made to the model results.

VALIDATION

When selecting an earthquake model for risk management, insurers should examine whether the model vendor has undertaken a comprehensive calibration and validation process as well as peer review. Due diligence, however, also requires companies to perform their own validation to ensure that models

produce a reliable and unbiased view of seismic risk for their business.

A basic reasonability test is how well modeled output compares to actual loss experience. There are a variety of ways to do this, including: examining whether modeled industry and company losses and associated exceedance probabilities make sense for large historical events; comparing modeled and reported average annual losses; and assessing how the model performs in real time as an event unfolds. While the level of scrutiny in the validation process closely depends on the amount and quality of available data (such as ground motion data, historical damage reports, claims data, and damage surveys), model users can go even deeper to examine detailed model components, including frequency/severity assumptions, ground motion prediction equations, damage functions, and damage footprints.

HOW AIR CAN HELP

A *direct* relationship with a modeler provides access to an unparalleled level of insight into the inner workings of the model, a better grasp of the strengths and weaknesses of the model, the ability to perform advanced sensitivity testing, and the resources needed to implement a robust model change management process.

AIR is committed to helping companies satisfy all regulatory requirements—whether in the form of developing comprehensive responses to model-related questions or providing guidance on the implications of upcoming regulatory legislation. AIR’s consulting solutions, for example, can help companies comply with the earthquake exposure risk management, earthquake exposure data, and PML estimation principles outlined in Guideline B-9, as well as the section that covers the use of earthquake models.

In recent years, AIR has played a key role in helping clients meet new and upcoming regulatory challenges around the world. In Europe, for example, AIR co-authored a document to help insurance and reinsurance professionals understand the implications of Solvency II for the catastrophe modeling component of their business and to suggest best practices for a smooth and efficient implementation of

Solvency II (Boss, Chris, et al., 2011, [Industry Good Practice for Catastrophe Modelling](#)). AIR is working with clients on fulfilling requirements under Solvency II and identifying strategic opportunities for controlling risk. And we provide thousands of pages of detailed model and software documentation to help companies answer questions posed by regulators in Europe.

OUR OFFERINGS

AIR’s advanced catastrophe models, software that helps clients truly own their risk, and a comprehensive array of client-focused consulting services enable us to help insurers with all aspects of Guideline B-9 compliance. AIR’s products and services include:

- Software and services to assist insurers in developing policies and procedures to document their earthquake exposure risk management
- Tools, information, and education to help companies develop and implement catastrophe risk management strategies
- A comprehensive set of solutions to help insurers understand, enhance, and communicate the quality of their exposure data
- Consultants working hand-in-hand with organizations to foster a better understanding of AIR models, the science and assumptions behind them, and their inherent uncertainties
- Help for companies in answering regulators’ reporting questions and fulfilling their requirements

THE AIR EARTHQUAKE MODEL FOR CANADA

AIR is well known for producing the most scientifically rigorous catastrophe models in the industry and has extensive experience with modeling Canada earthquake risk. In 2014, a comprehensive update to the AIR Earthquake Model for Canada—the fifth since the model’s launch in 1997—will be released. It incorporates the latest research—including the latest hazard information from the Geological Survey of Canada, newly developed damage functions that have been reviewed by leading local experts, and an updated industry exposure database—to provide the most up-to-date and comprehensive view of Canada’s seismic risk. This view also now includes risk from the secondary seismic perils of tsunami, landslide, liquefaction, and fire following.

Because of our expertise, AIR was engaged by the Insurance Bureau of Canada to conduct a [study](#) of the impact and the insurance and economic costs of major earthquakes affecting British Columbia and the Ontario/Quebec region to serve as a tool for planning, and mitigating, the risk from future earthquakes in Canada.

Learn more about AIR's Canada earthquake model [here](#).

Exposure Data Consulting Services

AIR offers exposure data consulting services to help companies ensure that their exposure data are of high quality. We conduct on-site, hands-on review of company processes for collecting exposure data used in catastrophe risk assessment.

AIR will work with underwriting staff and managers responsible for front-line operations to determine the effectiveness of the data collection process and to identify any potential shortcomings. AIR will report findings and recommendations for process improvement and an attestation of AIR's conclusions.

EDUCATIONAL OPPORTUNITIES AND ADDITIONAL RESOURCES

AIR is dedicated to helping model users meet the complex challenges of catastrophe risk assessment and management, including in-depth training, client and technical support, and a wealth of easily accessible information and education resources on [AIR's website](#), including comprehensive model documentation, presentations, white papers, and articles.

AIR hosts seminars, webinars, and an annual client conference to better meet the risk management information needs of its expanding global client base. These events cover the latest science and engineering that underlie AIR models, best practices for using AIR's software to improve business, and timely industry topics. Model users can also earn the designation of Certified

Catastrophe Modeler™ through an intensive and interactive training program offered at the AIR Institute.

Links to a selection of publications, created or contributed to by AIR, are provided below to help insurers as they establish or refine their Earthquake Exposure Sound Practices in compliance with Guideline B-9. Additional resources are accessible to clients of AIR through AIR's client portal.

[Anatomy of a Damage Function: Dispelling the Myths](#)

[Beyond "The Answer": Embracing Uncertainty in the Management of Catastrophe Risk](#)

[Blending Severe Thunderstorm Model Results with Loss Experience Data—A Balanced Approach to Ratemaking](#)

[Construction Distributions: An Essential Element of Robust Industry Loss Estimates](#)

[Effects of Different Sources of Uncertainty and Correlation on Earthquake-Generated Losses](#)

[Getting Comfortable With Catastrophe Models: Questions Executives Should Ask](#)

[How Would Your Claim Operation Fare in a Mega-Disaster? – Part I and Part II](#)

[Industry Good Practice for Catastrophe Modelling](#)

[Model Change: Albatross or Opportunity?](#)

[Modeling Fundamentals: What Is AAL?](#)

[Modeling Fundamentals: FAQs about Average Annual Loss](#)

[Modeling Fundamentals: Combining Loss Metrics](#)

[Sensitivity Analyses: Capturing the Most Complete View of Risk](#)

[Solvency II and Catastrophe Models](#)

[So You Want to Issue a Cat Bond](#)

[The AIR Industry Exposure Databases](#)

[Uncertainty in Earthquake Ground Motion: Which NGA Equation Is Right?](#)

[Uncertainty in Estimating Commercial Losses—and Best Practices for Reducing It](#)

[Understanding Uncertainty](#)

ABOUT AIR WORLDWIDE

AIR Worldwide (AIR) is the scientific leader and most respected provider of risk modeling software and consulting services. AIR founded the catastrophe modeling industry in 1987 and today models the risk from natural catastrophes and terrorism in more than 90 countries. More than 400 insurance, reinsurance, financial, corporate, and government clients rely on AIR software and services for catastrophe risk management, insurance-linked securities, detailed site-specific wind and seismic engineering analyses, and agricultural risk management. AIR is a member of the Verisk Insurance Solutions group at Verisk Analytics (NASDAQ:VRSK) and is headquartered in Boston with additional offices in North America, Europe, and Asia. For more information, visit www.air-worldwide.com.