Cat tales

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ICLR retrofits a Toronto home to make it more resilient against wind, winter storm and blackout

On May 6, the Institute for Catastrophic Loss Reduction (ICLR) unveiled its latest home retrofit project to members of the media. As part of the insurance industry's ongoing commitment to educate Canadian homeowners about disaster safety, ICLR once again chose Emergency Preparedness Week (May 3-9, 2009) to highlight a series of simple and largely inexpensive measures that homeowners can take to make their homes more resilient to natural hazards. This year, a home in Toronto served as the showcase.

Paul Kovacs, Executive Director of ICLR, conducted a media tour of the home. Said Kovacs: "Toronto, indeed much of Ontario, represents an active zone for winter storms, high winds and excessive rainfall. What's more, any one of these perils could contribute to a prolonged power outage. Homeowners living in the GTA, and in other places in Canada that are subject to different extremes, can prepare now for hazards that will inevitably strike in the future."

The Toronto home retrofit included:

- Installing a natural gas-powered generator as an alternative power source
- Putting in surge protection on bigger-ticket electronic items
- Anchoring cabinets, office equipment, and bedroom furniture to walls
- Outfitting the washing machine with armoured water supply hoses
- Anchoring the hot water heater to the floor
- Securing pictures and mirrors to the walls
- Upgrading existing glass with 3M safety and security film.
- Installing carbon monoxide and smoke detectors and providing a fire extinguisher
- Installing snow melt cables on roof edges and gutters to prevent the formation of ice dams
- Providing a disaster preparedness kit.

Toronto has been subjected to extreme weather several times in the distant and not-so-distant past.

A major storm in the GTA on August 19, 2005 marked the costliest natural catastrophe in Ontario history, the second most expensive on record for the country. On that day more than 150 millimetres of rain fell on parts of Toronto in a three-hour deluge that impacted a wide swath of real estate from Kitchener-Waterloo to Durham Region. Two tornadoes set down in the Salem/Fergus, Ontario, area, damaging several properties, and a rare tornado warning was issued for Toronto. Insured damage exceeded $500 million.

The now-infamous blizzards of January 1999 dropped 78 centimetres of snow on Toronto

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and area less than two weeks after the region was hit with 40 centimetres. The year's worth of snow in just two weeks shut down parts of the Toronto Transit Commission and the GO Transit system and left thousands stranded.

On October 1954, Hurricane Hazel buffeted the GTA with winds of more than 110 kilometers an hour and dumped over 280 millimetres of rain in just a 48-hour period. Hundreds of people in the Toronto area were left homeless and 81 people lost their lives. It was the highest level of precipitation recorded in a 12-hour period anywhere in Ontario, a record that still holds today.

The blackout of 2003 represented a massive power outage that occurred throughout parts of the Northeastern and Midwestern United States, and in Ontario on Thursday, August 14, 2003. It was the largest blackout in North American history, affecting an estimated 10 million people in the province of Ontario and 40 million people in eight U.S. states. In some parts of the U.S., power was not restored for four days.

According to Kovacs: "We can prevent natural hazards from becoming disasters by taking appropriate preventative measures now. The actions showcased in this home are affordable and easy to implement."

Armoured washing machine hoses can prevent water damage should the common rubber hoses fail. These inexpensive hoses should also be used on dish-washers, sinks and toilets.

Snow/ice-melt cables were installed on the roof to prevent ice damning.

This is the seventh year that ICLR has retrofitted an existing home as part of Emergency Preparedness Week. In 2008 a home in Montreal was retrofitted to protect against winter storm and earthquake, and in 2007 a home in Edmonton was retrofitted to protect against tornado and winter storms. In 2006, a home in Ottawa was made more resilient to earthquakes and winter storms. In 2005, a home in Vancouver was made more resilient to earthquakes, and in 2004, a Halifax home was protected against hurricanes. In 2003, a home in London was made more resilient to tornadoes.

The Institute has also retrofitted child care centres across Canada as part of its "Protecting our Kids from Disasters" program.

A natural gas-powered generator was installed as an alterative source of power in the event of a blackout.

New publication

ICLR's Handbook for reducing basement flooding

Valuable information to help reduce the chances of basement flooding

As some industry veterans may well remember, homeowners insurance (in fact, all property insurance) was once known as 'fire' insurance, as that was the major peril that policyholders were insured against. Indeed, many of the earliest insurance companies to be formed in Canada had the word 'fire' in their names; with the Halifax Fire Insurance Association (1809) and the Quebec Fire Insurance Company (1819) being two of the earliest.

But somewhere along the line, as more and more perils came to be covered under the standard policy, came the advent of the all-perils form, where essentially all insured perils were folded into a single policy and riders were largely done away with. (The keyword here is "insured", as the typical homeowners policy in Canada does not cover overland flood, shake from earthquake, or subsidence – i.e. landslide and erosion. Perhaps the term 'all-perils' should be replaced with 'most-perils'.) Today, roughly 80 per cent of all homeowners policies sold in Canada use the all-perils form.

Also somewhere along the line, fire dropped from being the primary cause for concern for property insurance companies. Though fire is still disconcerting (too many people perish in blazes each year and too much damage is caused by fire and smoke), the main concern from a claims perspective is now from water.

However, this piece is not intended to provide a history of homeowners insurance in Canada. Instead, it is meant to act as a segway to announce the Institute for Catastrophic Loss Reduction's latest contribution to helping its p&c insurer members by providing them with tools to assist in the goal of reducing the impact of natural perils on life and property.

Basement flooding: a growing problem

Basement flooding, caused by overland water flows, infiltration and sewer backup, is a major concern for many, if not most, urban municipalities in Canada. Increases in the frequency and intensity of heavy rainfall events exacerbated by rising urbanization, deteriorating infrastructure and climate change will increase basement flood risk in the future. Effective management of flood risks requires improving sewer infrastructure, and also the cooperation of better informed homeowners.

Sewer backup is caused by ground and storm water infiltration and inflow into sanitary and storm systems, which can increase pressure and push sewage into lower levels of buildings through sanitary sewer connections and then enter basements through plumbing fixtures and floor drains. The existence of combined sewer systems, which convey both storm water and sanitary sewage, exacerbates sewage backup risk in older parts of cities.

Damages from this hazard can be extensive. In August 2005, a severe rainfall event in the Greater Toronto Area (GTA) caused extensive overland flood and sewer backup damages, resulting in over 13,000 sewer backup insurance claims at a value of $247 million. In 2004, the City of Edmonton was hit with two severe rainfall events, resulting in 9,500 sewer backup insurance claims valued at $143 million. Similar loss events have also been experienced in many other communities across Canada.

Exacerbating the basement flood problem is the proliferation of finished basements. In the January 2009 issue of CU (*Drenched in Claims* by David Gambrill), Irene Bianchi, vice president of claims and corporate services at RSA, is quoted as saying "[in 2008] we had the majority of…[basement flooding] claims occur in the GTA, where lots of people have very nice, expensive finished basements in their homes. So instead of dealing with regular, unfinished basements that maybe only had laundry machines experiencing the water damage problem, we're dealing with a beautiful basement that the family spends a lot of time in -- basements that are very well-equipped with big-screen TVs, nice laminate flooring and beautiful furniture." As a result, the average cost of sewer backup claims has went from just a few thousand dollars to the five-digit range.

Although sewer backup is generally perceived as strictly an infrastructure problem, effective management of basement flooding requires actions at both the municipal and homeowner levels. Indeed, many homeowners' eavestrough downspouts and foundation drains contribute a significant amount of unwanted and unnecessary water into sewer systems, which exacerbates sewer backup problems. Still others have improper landscaping that conveys water toward the house, rather than direct it away.

While municipalities should continue to upgrade existing sewer systems and adhere to improved standards when building new systems, upgrading infrastructure is an expensive and long-term ►

proposition. In areas where upgrading of municipal infrastructure may take several years to complete, actions by homeowners can immediately reduce their risk of damage. Homeowners should also be informed of their role in contributing to sewer backup, and should be encouraged to reduce their contributions of unwanted water into sanitary and storm sewer systems.

The handbook

A few years ago, ICLR commissioned a survey to determine how much average homeowners understand about their insurance coverage. Two important findings of the professionally administered survey were that 1) homeowners expect to receive information about how to protect their families and property from the impacts of natural hazards; and, 2) they expect to receive such information from their insurance company.

In this spirit, ICLR's *Handbook for reducing basement flooding* attempts to address the concerns of homeowners, local governments and homeowner insurers of the increasing instances of basement flooding, by providing comprehensive information on how to prevent such a loss from occurring or, at the very least, mitigating the impacts of such an event.

The handbook is meant to represent ICLR's advice on preventing basement flooding. While the handbook is a substantial 56 pages in length, ICLR will, in the near-future, produce a smaller guide highlighting some of the immediate steps homeowners can take to prevent basement flooding form occurring. Additionally, municipal governments and insurance companies can use the handbook to produce their own material for homeowners.

The handbook covers such topics as what basement flooding is and why it happens; simple and inexpensive things that can be done to prevent basements from flooding, and other measures that can be taken that require more effort. In all, the handbook contains 20 measures that homeowners can take to prevent basement flooding from happening.

Additionally, the publication contains several technical photographs and professionally rendered engineering drawings illustrating such things as the dynamics of overland flooding and sewer backup, foundation cracks, cross connections (i.e. when storm water downspouts are connected to sanitary sewer lines), sump-pump and backwater valve installation, and basement flood reduction. What's more, the handbook contains a glossary of common terms related to basement flooding, sanitary sewer and stormwater management.

The threat of fire to property has fallen from top position due to the concerted efforts of the insurance industry, municipal and provincial governments, and homeowners to reduce the risk and impact of fire. The hope is that by providing information on basement flooding, ICLR - in partnership with local governments and insurance company members - can make the same happen with water-related claims.

For more information on ICLR's basement flooding reduction handbook or for a copy, contact handbook author Dan Sandink at dsandink@iclr.org

Handbook author Dan Sandink, Manager, Resilient Communities & Research, ICLR.

Earthquake 1

Defining earthquake risk in Canada

By Daryl Wiebe, P.Eng., Vice President
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From a global perspective, earthquake risk in Canada might not seem that significant. However from a Canadian perspective, research is indicating that the probability of damaging earthquakes is greater than recent historical experience might indicate.

Along Canada's west coast, everyone is bracing for "The Big One." This is the media's term for the next Cascadia subduction event in which the Juan de Fuca plate will take another dive beneath the North American tectonic plate. According to geological evidence, this movement generally occurs approximately every 300 to 800 years, and the last movement occurred in the year 1700.

Subduction events are the most powerful of all earthquake events, typically rating 8 or 9 on the Richter scale. These earthquakes often involve significant movement of land masses (both horizontally and vertically), and due to the fact that it will occur offshore (southwest of Vancouver Island), the formation of tsunamis is almost certain. While the "shake damage" will be widespread, from the perspective of a single site, damage is likely to be less than what would be expected from a smaller earthquake that could occur at closer proximity.

One of the most frequent questions on this subject is whether or not a certain site is located in an earthquake zone. Frankly, there is not really a simple answer. Today, it is generally accepted that earthquakes can occur anywhere on Earth; however, the probability of experiencing an earthquake varies widely. In Canada, it is still true that the hazard is generally constrained to the southwest portion of BC and the Ottawa River and St. Lawrence River corridors in eastern Canada.

Many classification systems have been devised to communicate this variability of earthquake risk in an effort to more clearly understand the hazard.

Defining earthquake risk allows us to :

- Reduce uncertainty in loss estimates
- Identify business interruption loss potential
- Develop response plans:
  - Emergency response
  - Business continuity
- Select sites for new construction
- Identify or cost-justify mitigation opportunities
- Evaluate cost-effectiveness of risk financing.

Understanding risk

To understand your risk, you must understand the probability of occurrence of a damaging earthquake as well as your level of exposure in that identified region.

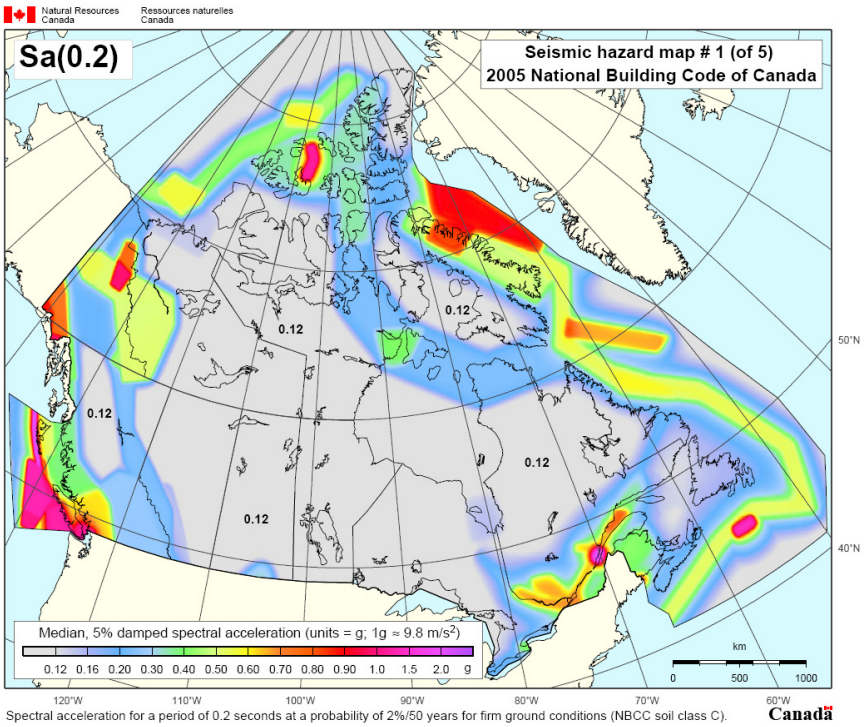
Risk is generally defined as the product of hazard and exposure. From an insurer's perspective, exposure is usually measured by insured values, while the hazard is determined by some measure of probability of loss.

Earthquake risk is the product of:

- proximity to a probable earthquake event
- the soil's response to expected seismic ground accelerations
- specific location details (occupancy, construction, height, etc)
- values exposed.

Earthquake hazard

In this country, the Geological Survey of Canada (GSC) defines the earthquake hazard. In the past (pre-2005), this hazard was defined primarily by zones based on peak ground acceleration (pga with a 10% probability of exceedance in 50 years). Recently, however, it has been established that structures of different heights (different►



Spectral acceleration for a period of 0.2 seconds at a probability of 2%/50 years for firm ground conditions (NBCC soil class C).

natural periods of vibration) are vulnerable to earthquake motion frequencies that resonate with the structure's natural frequencies. This has led to the publishing of many different hazard maps for various frequencies, which has left many people confused (the rule of thumb is number of stories divided by 10 equals the resonant period of vibration in seconds).

In general, for structures of two stories or less, or for non-structural building elements (in buildings of any height), the earthquake hazard can be inferred by reference to the 0.2 second period spectral acceleration map shown above. As noted in the footnote to the above map, this hazard quantification is based on the assumption of "firm ground conditions." Soft soil conditions could significantly amplify the earthquake hazard, while solid rock conditions could lessen the site-specific earthquake hazard.

For a typical structure and occupancy, we would generally recommend that earthquake-specific design provisions be considered when the pertinent spectral acceleration values (with a 2% probability of exceedance in 50 years) exceed 50%g. For more critical facilities, a more conservative position may be appropriate.

Earthquake risk modeling

There are a variety of earthquake risk models available in the insurance industry today. When used appropriately these models are probably the best tools available for making risk management decisions regarding earthquake exposures.

The primary characteristics upon which most earthquake models are based are:

1) Location (precise positioning using latitude and longitude coordinates is desirable)
2) Occupancy (infers the level of non-structural damage)
3) Building height (defines resonant frequencies)
4) Construction
5) Age

The results of these models are all presented using some variation of the Exceedance Probability curve (EP). These results can be calculated on a per-occurrence, or an annual-aggregate basis, and provide the annual probability of experiencing a loss *exceeding* the specified loss level.

While these models are probably the best tools we have, they also share some less desirable features:

- Cost
- Statistical nature (*works well with large portfolios where the law of large numbers takes care of any site specific anomalies. Care must be taken when using the results of these models for specific properties*)
- Models are not seamless but regional (no global model)
- Garbage in...garbage out
- When used inappropriately they promote the "Delusion of Rigorous Research"
- Statistical data might not shape the future (*i.e. human development in prone regions, etc.*).

Most modeling agencies update their models at least annually. In general, the advances being made as models are being updated are::

- New regions available for modeling
- Continual refinements in spectral acceleration parameters
- Better resolution of soils response
- Improved knowledge of building response to seismic acceleration (much is learned after every significant earthquake event).

Conclusion

Earthquake risk does exist in Canada (and around the globe). Identifying and/or quantifying this risk for a particular property or portfolio is a necessary step if these risks are to be minimized or mitigated. Due to changes within a portfolio or advances in earthquake sciences, the earthquake risk to a portfolio should be reviewed on a regular basis. Whether risk is qualified using some form of a hazard map, or quantified using a detailed analytical model, be aware that all methodologies are subject to certain limitations.

There is no perfect tool that can accurately predict future events.

Earthquake 2

The ups and downs of earthquake models

By Mike Wallace, Vice President Risk, Reinsurance & Underwriting
RSA Canada

As destructive earthquakes battered areas of China, Indonesia and numerous other countries in recent years, the insurance industry has watched closely and made great strides in supporting efforts to predict and mitigate these devastating catastrophes.

In the last 15 years, the industry has embraced earthquake models which have become an invaluable tool for understanding our exposure, assisting in our understanding of pricing and ultimately helping us to better create a product that we can sell to our customers. The models, using various calculation methods, are able to provide the annual probability of experiencing a loss that exceeds a specified loss level.

Yet as far as these tools have come, there is still a long way to go.

Despite the rising popularity, when it comes to earthquake models, confusion often reigns. For starters, sometimes the same data can produce significantly different results when used by various models. What tends to be lacking in those cases, is an understanding of the differences between the models which can account for the discrepancy in the results.

Another challenge for the insurance industry is staying on top of updates made to these models which take place on a sometimes annual basis. It is crucial that we as an industry don't get left behind when it comes to keeping up with the changes and understanding what they mean.

There is also likely more that can be done in terms of training, accreditation and sharing of best practices, as well as a greater focus on lessons learned. For example, there is still a lot that can be taken away from hurricane Katrina which devastated the Gulf coast in 2005. A good portion of the loss was not actually from the wind itself but rather, the catastrophic failure of the levee system.

In Canada, earthquake models also lack any verification or approval process by the government – something that is required within the United States, particularly in Florida. A focus on data and building code enforcement in Canada could potentially be of great benefit.

And perhaps one of the more concerning shortcomings of earthquake models is our overall reliance on the models themselves. The risk is that we place so much emphasis on the models as the only successful tool we have and we fail to seek out other options to help the industry understand its overall exposure.

So although these models have been extremely important tools, it is dangerous to rely solely on them without considering other options, particularly in the areas of education and preparedness. It is anticipated that one day the "Big One" will hit British Columbia. But with no major earthquakes having taken place in Canada in decades, it is easy to understand why there may be complacency on the part of consumers.

When it comes to engaging Canadians, the government has a larger role to play. Although the various levels of government have made efforts to educate Canadians in terms of overall preparedness through literature and response plans, a much more active plan, particularly with the Office of Superintendent of Financial Institutions, is needed. If you look at California, when you buy a 30 year mortgage, it comes with the probability that there will be an earthquake within that 30 years. There is a huge amount of awareness in other parts of the world.

The government could also be doing more to reduce risks with respect to infrastructure and ensuring that it is appropriate for particular regions. Despite the looming risk in British Columbia, Vancouver is a city that has numerous bridges, levees, transformers on poles and dams in residential areas.

If you look back over the last 15 years, the insurance industry has come a long way when it comes to how it addresses the risk of earthquakes. In the future, it is likely changes will be made to property policies, both on the personal and commercial side, to better meet the risk.

Education and awareness will continue to be a major focus, particularly for brokers, and the earthquake modeling tools will further develop and improve to allow for a greater and more detailed understanding.

Mike Wallace, Vice President Risk, Reinsurance & Underwriting, RSA Canada, and member of ICLR's Insurance Advisory Committee.

ICLR joins UN Insurance Working Group For Sustainability

On May 19, Butch Bacani, Programme Officer, Insurance & Investment, for the United Nations Environment Programme Finance Initiative (UNEP FI) informed the Institute for Catastrophic Loss Reduction (ICLR) that it has been accepted in the UNEP FI academic working group as an advisory institution.

UNEP FI is a global partnership between the United Nations Environment Programme (UNEP) and the financial sector. UNEP FI works closely with over 170 financial institutions who are signatories to the UNEP FI statements, and a range of partner organizations to develop and promote linkages between the environment, sustainability and financial performance. Through regional activities, a comprehensive work programme, training programmes and research, UNEP FI carries out its mission to identify, promote, and realize the adoption of best environmental and sustainability practice at all levels of financial institution operations.

UNEP FI provides its signatories with practical research, capacity building, action oriented publications, as well as hosting international conferences and events that bring together professionals from around the globe. UNEP FI also provides quality support for member organizations. In addition to a dedicated team, UNEP FI opens up a vast network of sustainable development contacts, information and networking services that are dedicated to helping member organizations make a difference.

The UNEP FI Insurance Working Group (IWG) is an alliance of leading insurers and reinsurers committed to integrating ESG factors into their core business strategies and operations to enhance long-term company value. In 2006, the IWG was established to address current and emerging sustainability issues concerning the insurance industry.

Funding approved for world's first tornado simulator

The University of Western Ontario has received funding to build the first wind tunnel that will simulate a tornado.

The Canadian Foundation for Innovation (CFI) has confirmed $9.5 million to build the WindEEE (Wind Engineering, Energy and Environment) Dome.

The Dome will be the world's first six-sided wind tunnel able to simulate an F3 tornado, according to the ICLR.

WindEEE will use a series of giant fans to simulate an F3 tornado roughly six metres in size. The facility will be able to test the vulnerabilities of structures, power lines, agricultural crops, forests and wind turbines against the swirling winds associated with tornadoes, and the powerful winds resulting from downdrafts. The dome could also be used to track the spread of pollutants over wide areas.

Construction of the facility is anticipated to begin in a year and will be in operation a year or two later.

ICLR fully supports the WindEEE Dome project, which it believes will fill a void in the area of wind engineering research. The ICLR is affiliated with UWO and has been working with the wind engineering team there for a number of years.

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Mission
To reduce the loss of life and property caused by severe weather and earthquakes through the identification and support of sustained actions that improve society's capacity to adapt to, anticipate, mitigate, withstand and recover from natural disasters.

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