

# CATtales

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## Building resiliency to natural hazards into new homes

A discussion with Alberta master homebuilder

**Murray Pound**

By Glenn McGillivray, Managing Director, ICLR

On September 19, 2013, after closing our Second Basement Flood Symposium in Toronto (at which he spoke) I sat down with Alberta master homebuilder Murray Pound, president of Gold Seal Homes, to discuss his company's philosophy of 'Building better behind the paint' and about building new homes that are more resilient to natural hazards.

Murray hails from Carstairs Alberta, where, as a homebuilder, he actively seeks out superior build solutions to provide the most durable, safe and valuable homes he can for his clients. He is an avid volunteer in the community. His passions other than his family are fly fishing and being an active

member of the local Emergency Services Group.

**Glenn McGillivray:** Murray, tell us about your business: where you build, how many homes a year, what the typical home looks like, who your typical buyer is?

**Murray Pound:** We are a small home builder, family-based. I'm a second generation builder. We build in our hometown. We tend to build for what I call the 'deurbanizer'. Typically we have a lot of clients that have moved to the Alberta region for work from other parts of the country. They move to a larger centre and realize after they ►

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The view from here

## Local leadership

By Paul Kovacs

Executive Director, ICLR

Local governments are demonstrating leadership in confronting the trend of rising damage from sewer backup. Much more needs to be done but we are finding many creative and innovative initiatives that hold considerable promise. Moreover, most of the local actions are well founded in the science of best practices to reduce the risk of loss and damage.

Infrastructure renewal has emerged as a priority in many communities across Canada. This includes actions to improve the design of new sewer systems, sometimes to take into account climate change and other uncertainty. British Columbia, for example, has committed to replace all sewers in the province that combine sanitary and storm water with a full independent sewer system. Renewal is also addressing maintenance and repair.

It is encouraging that the failings of our aging infrastructure are increasingly being recognized as a critical contributor to the rising loss and damage to buildings from extreme rainfall. Unfortunately this problem was allowed to grow over several decades, and the response remains insufficient. The overall cost of rebuilding our sanitary and storm sewer systems to achieve the performance of the 1970s will cost many billions of dollars, and will take many years.

Local governments are actively looking for opportunities to also engage property owners in addressing the risk of damage from extreme rainfall. This includes financial incentives to pay part of the cost of installing backwater valves, sump pumps and other protective measures. It also includes regulations to reduce the inflow of rainwater

into the sewer system by requiring the disconnection of downspouts and replacement of illegal connections to the sanitary sewer system.

Government officials are also seeking to empower action by homeowners through education and outreach. This includes town hall meetings, mailings to property owners and placement of stories in the media. A primary objective involves informing the public about the risk of loss, and the important role they can play. Actions to engage property owners complement actions to renew the sewer infrastructure, and frequently can be addressed quickly with relatively little cost.

Longer term solutions involve change in building codes and the design of new subdivisions. Thousands of homes now have backwater valves, for example, because local bylaws require them.

Similarly, low impact development options in new subdivisions are effective design criteria to retain extreme rainfall safely in new neighborhoods while minimizing the risk that development will increase the risk of basement flooding. Over time regulations can bring these ideas to communities across the country.

Local governments are working to identify and implement evidence-based actions that will be effective in reducing the risk of damage from extreme rainfall. The insurance industry is emerging as an important partner to help advance this effort. Local governments and insurers can collaborate to identify best practices, like the installation of backwater valves. Partnership can also involve support to share this information with property owners.

Very high damage claims from extreme rainfall in recent years demonstrates that much needs to be done, nevertheless local governments are actively and creatively working to address this issue. [CT](#)



look around for a couple of years that maybe the big city really isn't what they're looking for. And when they start researching the smaller municipalities, luckily for me they trip upon us once in a while. We build custom homes for those people and/or home sale speculations.

**GM:** Your philosophy toward homebuilding is considerably different than that of the typical custom homebuilder in Canada or, should I say, the typical homebuilder in Canada. Tell us about your way of thinking, in particular 'Behind the paint'.

**MP:** 'Behind the paint' has evolved over the last 15 years. We wanted to take our company in a different direction and focus on innovation. We wanted to differentiate ourselves from our competition and, so, what spilled out of that immediately was sustainable construction and then what's followed from that over the years is embedding safety features. And now the big push in our company is durability, building homes that are going to last beyond my children's generation and have low replacement and embedded operational costs. So that's the nexus of the idea of 'Behind the paint'. What you can't see in the home, the quality behind the paint, is actually sometimes a lot more important than the colour of the countertops or the colour of the cabinets, because 15 years from now the cabinets will be torn out and replaced as fashions change, but you certainly don't want to tear down the walls or pull insulation out of the attic. The bones, if you will, everything behind the paint and finish is what I think is important.

**GM:** How did your competition respond to your philosophy?

**MP:** Well, actually, I don't know if my competition has responded to it. I think our need for innovation

was a response to our competition. I love to differentiate ourselves. And, what's interesting is, in 2006/07, we were experiencing a boom in Alberta, there were over 20 builders in my local market, or thereabouts, and then the recession hit. And we had to make a very quick decision: Do we go back to what everyone else is doing and do the bare minimum or do we carry on with our philosophy and go to a 'last man standing' strategy. We decided the latter. We carried on with our build methods, building up our name and quality, embedding even more elements into our homes. During the recession we started putting fire sprinklers in our homes, which was unheard of. Builders were looking for cost effective ways of producing product and we were going the other direction. What's come out of that is we are one of the few builders left in our trading area. Now the market's coming back and we're reaping the rewards; the referrals, the repeat business have come and, so, doing the right thing has paid off. How has my competition responded to that? It's not their model. They are still successful doing what they're doing because unfortunately the marketplace will still reward that type of product. But the discerning clientele, there is always that element of society that has discerning tastes for standards, will reward us with their patronage.

**GM:** Why do you think there is that conservatism in the homebuilding industry, this tendency to do the same old same old, the bare minimum?

**MP:** There does tend to be a resistance to change unless change is imposed. I think that, at the end of the day, like a lot of other companies and a lot of other industries, the sole purpose of producing a product is to coop dividends for investors and create decent ROI at the end of every quarter. For us, because we are a family business, we are more emotionally connected with our product offering and with our clients. I mean, I'm going to meet up with my clients at the post office or the restaurant. Chances are I'm going to see each and everyone one of my clients several times throughout the year. That's one of the main reasons why we adopt change. The industry tends to be a little bit impersonal because a lot of homes are built by production builders, and so there isn't that connection. I contend that if the average CEO of a 300, 400 or 500 home-per-year company had the opportunity to live right next door to his customers, he might have a change of heart and probably do things in their operations. I think there is that impersonality, that distance between client and homebuilder. So there is no need to change, until – the other side of it is – until the market asks for change and creates demand for change. If not, change typically doesn't come about. And, for a home buyer, unless they are presented with a new option, they don't know what's available to them. So, if the marketplace is producing a certain product over and over and over again, the consumer says 'Listen, this is all that's available to us. We need a home. We will find the prettiest one that we can afford, and be happy with it.' ►



**GM:** Hand-in-hand with this - and often it's made fun of in the popular culture - we have the consumer who will put way more time into buying a vehicle that is transient in their lives (they're only going to have that vehicle for a few years whereas they might have their house for decades) or put way more time into buying some consumer product, like a bottle of shampoo, than they will into buying a new home. What's going on here?

**MP:** In North America an automobile is an extension of your personality - it's your human billboard telling the world what you've done in your life to be successful and the type of image you want to convey. So people tend to be really careful about that purchase and what they want to convey about themselves. Whereas a home tends to be a really quick decision - it's an emotional decision. When the buyer has decided 'We're going to buy a new home', what are the research options available to them? They open up a newspaper to the homes section, they see a few ads where builders are building in a community close to where they've already decided they want to live. They go to a showhome parade, there's five builders or six builders in a showhome parade. Each builder says, well, we have three or four home offerings for this area, and that's what they're left with. So, they are left with a handful of floor plans and a handful of builders to choose from and so their decisions come down to emotional response: What the home looks like, is it in their budget, is it close to the school, amenities and work? And, I think, they also don't know how to research it because the tools aren't out there to help them research and compare homes. When you're buying a car, there are buyers guides - consumer

guides - where you can compare and contrast. You can test drive cars, you can't test drive a house, unless you're buying a pre-owned home. So, it's a different buying situation and it's a strange phenomenon. I equate buying homes to the Zen pool of water, there can't be any ripples on that pool. And many builders try to smooth that pool out, they don't want any objections in the selling process. They want to be able to say yes, yes, yes, yes to the client. Yes it's close to school, yes you can afford it, yes it has granite countertops, yes it's 2,200 square feet. They don't want any objections. And I think that's what the clients tend to base their buying decisions on.

**GM:** It seems to me that many builders think they know what homebuyers want and what they are and aren't willing to pay for, and remain steadfast in their beliefs. For many years, builders were really opposed to energy efficient homes. They claimed that homebuyers didn't want them and it took a couple of decades for that to come around, and that to change, and that's finally come to pass. We now know that was wrong. Today, they maintain that homebuyers don't want sprinklers in their homes, that they don't want resiliency features against severe weather and earthquake in their homes. Do you think that this is the case and is this a major barrier to building safer homes in Canada?

**MP:** I contend that I have smart customers and I think most people are pretty smart. I make the joke that my customers find a matching pair of socks each morning, find their way to work and make enough money every year to pay for a house. So for me to assume that they aren't smart enough to make good choices for durability and safety and resiliency, I don't think it's up to me to decide what my clients

should or should not have, but I do believe it's my fiduciary duty to offer them all possible options and to share my experience. Essentially, at the end of the day, they are hiring me as their consultant in their home building process. And if I'm not presenting them with all the different options that can increase the value of their home downstream 10 or 15 years from now, I don't think I'm doing my job very well. If I don't present them with safety features in their homes, fire sprinklers, if I don't present them with the opportunity to put 50 year shingles on their homes or energy efficient features in their homes, I think I'm really doing them a disservice. They can choose those things, they can make those decisions, but I have to make a good case for it. I think it's very easy for a builder or a salesperson to say "Do you want fire sprinklers?" No, the customer is going to say no, but was it explained well to them? Did you give the homebuyer enough good information so they could make an educated choice, yes or no? We have clients, after they have been given the information, choose for and against all sorts of different things, almost like an à la carte menu. At least they had the choice. So 10 years from now, 15 years from now, they can't say 'You know, I really wish we had this, really wish our builder had offered us this feature.' It was offered, you made the choice. **CT**

*Part two of 'Building resiliency to natural catastrophes into new homes: A discussion with master builder Murray Pound' will appear in the next issue of Cat Tales.*

# Studying seismicity induced by hydraulic fracturing in western Canada

By Dr. Gail Atkinson, NSERC/TransAlta/Nanometrics Industrial Research Chair in Hazards from Induced Seismicity and Dr. Kristy F. Tiampo, Professor and Associate Chair  
Department of Earth Sciences  
Western University

Induced seismicity is the occurrence of earthquakes triggered by industrial processes, including resource recovery, mining, and reservoir impoundment. The phenomenon has been recognized for more than a century, dating back to reports of induced seismicity from gold mining in South Africa from the late 1800s onwards. Recently, however, induced seismicity has become a pressing global problem - with major economic and safety implications. Recent advancements in hydraulic fracturing and horizontal drilling by the oil and gas industry aimed at unlocking "tight reservoirs" around the world have ushered in an oil and gas boom. In the process they have reshaped the North American

economy. The director of the International Energy Agency predicts that this new energy boom "will be as transformative to the market over the next five years as was the rise of Chinese demand over the last 15." (Macleans Magazine, June 10, 2013, p.55).

The rise in production of unconventional hydrocarbon resources has been coupled with an equally important but much-less-heralded increase in local and regional seismicity rates. In the central United States, the heartland of the unconventional oil and gas boom, there has been a rapid rise in seismicity rates that is believed to be related to energy activities. Some induced events have been surprisingly large, including several of  $M > 5$ ,

causing damage and significant concern. In June, 2012, the Senior Science Advisor of the U.S. Geological Survey (USGS) for Earthquake and Geologic Hazards told the U.S. Congress that: "The USGS has documented that  $M3$  and larger earthquakes have significantly increased in the U.S. mid-continent since 2000, from a long-term average of 21 such earthquakes per year between 1970 and 2000, to 151 per year since 2008. Most of this increase in seismicity has occurred in areas of enhanced hydrocarbon production and, hence, increased disposal of production-related fluids." (Dr. William Leith, Testimony before U.S. Congress, June 2012). ►

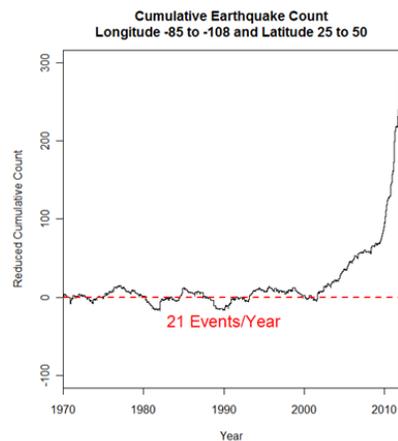
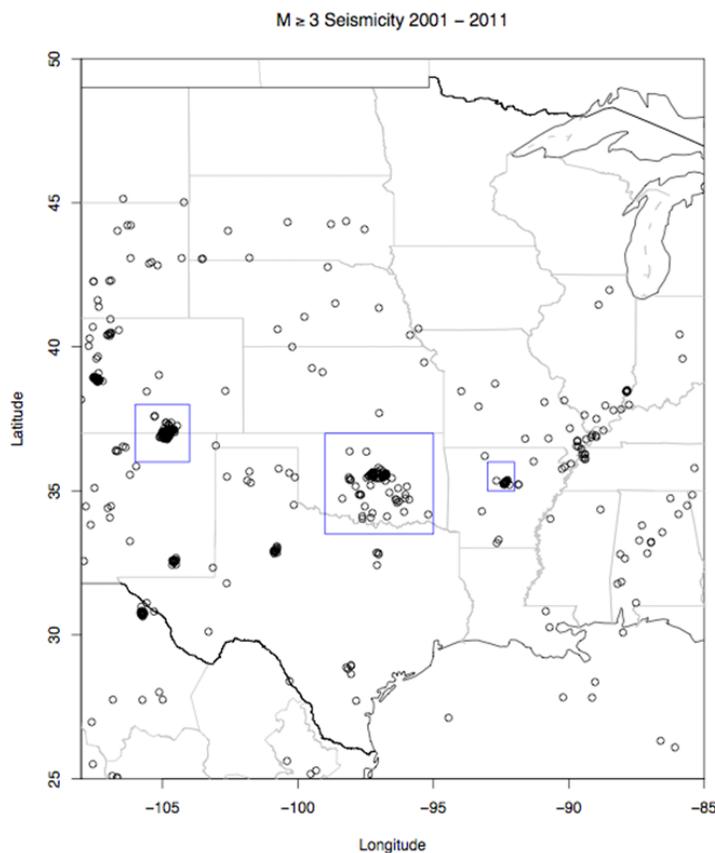


Figure 1: (Left) Earthquakes of  $M > 3$  in the U.S. mid-continent. Blue boxes show areas where seismicity has increased in the last decade. The plot above shows the rate of  $M > 3$  events versus time. The red line corresponds to the long-term rate of 21 earthquakes per year. Figure courtesy of Justin Rubinstein, U.S. Geological Survey, Nov. 2013.

The issue has been highlighted by scientists at the U.S. Geological Survey, as shown in Figure 1 and discussed in a July, 2013 article in *Science* by Bill Ellsworth.

Induced seismicity is a pressing and timely problem in western Canada, given the rapid deployment of new resource extraction technologies and the growing realization of the potential to trigger unplanned seismic events. There is a history of moderate triggered seismicity in Alberta from conventional resource activities, in particular with regards to the Strachan field (near Rocky Mountain House, Alberta), including triggered events of  $M > 4$ . A series of earthquakes, the largest being  $M 3$  to  $4$ , were triggered by

hydraulic fracturing in the Horn River Basin of B.C. Historical seismicity along the deformation front in Alberta is shown in Figure 2. The maximum magnitude of the events that could be triggered in various regions due to the range of activities is not yet known, but the most extreme example is a series of three  $M \sim 7$  events that occurred near the Gazli gas field (USSR) in the 1970s and 80s, in an area that had previously been aseismic. As a result, there is a significant (though very small) possibility that triggered events could be large.

The basic mechanism of induced seismicity is widely agreed-upon: it is caused by a change in pore fluid pressure and/or a change in the state of

stress, which may cause re-activation of existing faults or fractures. However, currently we cannot predict the likelihood or magnitude of such events from specific planned operations because we do not have enough data on the complex natural rock systems, nor do we have validated predictive models. Without a quantitative model with which to evaluate the likelihood of induced seismicity, it is difficult to assess its significance and plan appropriate mitigation strategies to counter the risk.

A new research program based at Western University and led by Dr. Gail Atkinson, NSERC (Natural Science and Engineering Research Council) *Industrial Research Chair in Hazards from Induced Seismicity*, is focused on understanding the mechanisms and associated hazards associated with industry-related induced seismicity. Funded by NSERC and two industrial partners, Transalta and Nanometrics Corporations, University and government partners include the University of Calgary, the Alberta Geological Survey (AGS) and the Pacific Geoscience Centre (PGC) of the Geological Survey of Canada (GSC). The proposed research program includes the expansion of the seismic network in Alberta, in conjunction with specific research projects in the following areas: understanding the nature of induced seismicity; assessment of the likelihood of events/ground motions from induced seismicity; the relationship between energy production parameters (e.g. fluid injection and extraction rates) and induced seismicity in different geologic settings; hazards to critical infrastructure due to induced seismicity; and protocols to mitigate the consequences of induced seismicity (i.e. real-time response and traffic light systems). Taken together, they will provide an ►

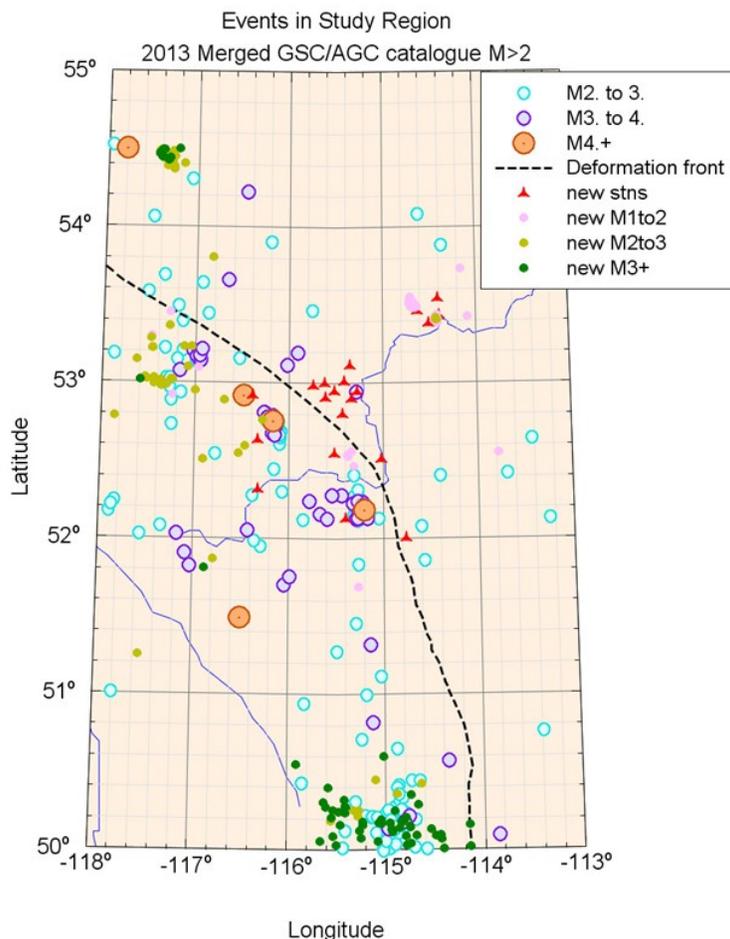


Figure 2: Historical seismicity in western Alberta to Sept. 2013, along with new events (small dots) detected by the stations added (red flags), from Sept. 2013-March 2014.

in-depth understanding of the likelihood of induced seismicity and associated risk potential that currently does not exist. Most importantly, the results will provide a knowledge-based foundation for the development of practical models to evaluate and mitigate the risk to critical infrastructure posed by energy extraction technologies.

It is the aim of this collaborative research program to provide the scientific foundation that will allow us to adequately assess the seismic hazard issues arising from induced seismicity. However, one fundamental difficulty in assessing the likelihood of induced seismicity is the lack of regional information concerning the relationship between energy technologies and seismicity in Alberta. Studies are hampered by the sparseness of regional seismic monitoring in Alberta. The spatial separation between seismographic stations is hundreds of kilometres. As a result, events are poorly located and the location accuracy of the national network in Alberta is ~10 kilometres. Recorded events cannot be confidently correlated with the structures on which they are occurring. Furthermore, the magnitude threshold for detection is high in many areas ( $M > 3$ ), leading to sparse statistics with inadequate resolution. Thus enhanced monitoring is a critical pre-requisite to evaluating and managing the risk from induced seismicity. Steps to improve regional monitoring in Alberta began in the summer of 2013, and will provide valuable new data to aid in the research program.

Because monitoring capability in much of Alberta is relatively poor due to sparse

station spacing, the overall minimum detection/location threshold in the current national catalogue is about  $M > 3$  at the regional level. Thus there are many more undetected events in comparison to the detected events. However, a number of regional stations have been operated since ~2006 by the University of Calgary and the University of Alberta, with the cooperation and assistance of the AGS. While a few of these stations are telemetered to the national data centre at the PGC, most of the stations are operated in a campaign mode, with data being retrieved every six months for unrelated studies. There has also been a temporary array collecting additional signals in the active Strachan cluster, Alberta. As a result, many additional seismic events have been archived that do not appear in the national catalogue and are not generally accessible at present. A major study led by the AGS is in progress to analyze these data and compile an updated recent seismicity catalogue for Alberta. We will build on this improved catalog going forward, in collaboration with the AGS, using data from an enlarged real-time network that will be providing continuous data analysis and cataloguing functions.

The research program will take advantage of data from 28 new real-time stations being installed in Alberta and operated by Nanometrics Inc. Furthermore, the AGS will augment the network by upgrading several of the current campaign-mode stations to real-time operation, which will further enhance regional coverage. With the new network in place, we will have a detection/location

threshold of approximately  $M > 1$  or  $M > 2$  across a broad region that will vary with network density. This network will likely locate hundreds of events/year in the area and with a location accuracy of 500 metres to one kilometre. We will mine the data as it is collected in order to facilitate studies of the underlying mechanisms and improve our understanding of the seismic hazard due to induced seismicity.

This exciting new research program, the first of its kind in Canada, will develop an understanding of induced seismicity processes that is required to assess and mitigate induced seismicity risks. This understanding will help our collaborators in the AGS and the PGC to fulfill their agency mandates in the areas of safe resource development in Canada, and in Alberta in particular. By developing protocols to appropriately assess and monitor risks, and modifying resource activities where warranted, it will be possible to allow the safe exploitation of natural resources while protecting the integrity of critical infrastructure. Moreover, this research program will result in the training of personnel for the energy and engineering sectors in an area of growing global importance, as similar issues of facilitating resource development while minimizing impact are faced in other regions, both in Canada and worldwide. The insights and advances made here will be very important in terms of ensuring public safety, while supporting the continued successful and safe production of hydrocarbon resources in western Canada. **CT**

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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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