

# CATtales

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## Insurance industry makes successful submission to new Ontario Building Code

By Glenn McGillivray  
Managing Director, ICLR

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For the first time in decades Canada's insurers proposed and secured change in the building code. Research by the Institute for Catastrophic Loss Reduction team at Western University and a submission by the Institute, with letters of support from Insurance Bureau of Canada and several member insurers, were successful in changing the Ontario Building Code. The change is viewed as a first step in a longer-term industry effort to promote design and construction practices that enhance the resilience of buildings to

damage from severe wind, intense rainfall, wildfire and earthquakes.

In 2010 the industry proposed three changes to the Ontario Building Code, and one was accepted. This year work is underway on several proposals that will be made to the National Building Code of Canada.

The successful submission, which has been added to section 9.23.3.5, was to increase the number of nails in plywood roof sheathing on new homes, from the current 6x12 pattern to a 6x6 pattern. ▶

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Missing roof sheathing in Vaughan, ON, after an F2 tornado, one of a record 19 that touched down in the province on August 20, 2009.

The view from here

## Preparing for the big one

By Paul Kovacs

Executive Director, ICLR

The World Conference on Disaster Reduction will be held in Japan in about 24 months time. Leaders from around the world will meet to update the international strategy to reduce the risk of loss and damage from earthquakes, flood and severe weather. Some of us have been working on this file for some time now. In a number of forums I have been pushing that the next strategy should increasingly focus on preparing for the big one.

The good news is that the risk of fatalities and injury as a result of natural disasters is low and falling. One million people were killed by natural disasters over the past decade, representing less than one percent of the people who die. Further progress is needed to narrow the difference between the very low risk of injury and fatality in affluent countries like Canada, relative to the moderate risk in low income countries; but the risk of death or injury has been falling around the world for many decades. Advance warning about hurricanes, severe storms, tsunami and other perils has reduced this risk significantly. Moreover, change in work and lifestyle has reduced the number of people exposed to hazards, particularly with urbanization of the population.

The bad news is that property damage as a result of natural disasters is increasing at an alarming rate, resulting in more than \$1.2 trillion in direct damage over the past decade. Over the past 30 years the number of people living at risk of flooding worldwide has doubled. Those living in coastal communities increased three-fold. Half of the people living in the world's largest cities are located in regions of high risk. And the world's climate has

changed with sea levels rising and an increase in the number of severe weather events. The increase in damage would have been even greater if it were not mitigated by improvements in the design and construction of buildings and infrastructure.

I believe that almost 25 years of international work on disaster risk reduction has unfortunately focused on too broad a range of disasters. For example, 4,130 disasters were recorded around the world over the past decade – more than one event each day, on average. Rather than seeking ideas to better manage every day disaster risks, I believe that the real challenge for society is preparing for rare, but high consequence events – the big one.

The international discussion about disasters needs to focus on recent catastrophic loss events like the tsunami and earthquake in Japan, the flood in Thailand, the large hurricanes in the United States and the earthquake in Haiti. If society will act upon the lessons learned from these catastrophic events then we will also be better prepared for the daily disasters.

Leaders from the top international disaster risk reduction research institutes, including ICLR, have been meeting for the past two years to discuss how we can best integrate our findings and influence this important discussion. Our third meeting will be later this month.

We believe that application of our emerging knowledge can reduce the risk of natural hazards becoming disasters or catastrophes if we:

- promote better design and construction of buildings
- reduce the number of people

and buildings located in zones of high risk

- invest in resilient infrastructure
- inform the public about disaster safety. **CT**



# Observing the world’s first indoor hailstorm

By Glenn McGillivray  
Managing Director, ICLR

On February 20, the Tampa-based Institute for Business & Home Safety conducted the world’s first indoor hailstorm at IBHS’s Research Center in Richburg, South Carolina. The event was well attended by a number of IBHS member insurers and reinsurers, as well as by members of industry organizations, researchers, media and others; all of whom observed the ‘storm’ in the safety of an enclosed windowed viewing area. After a brief damage survey by Institute researchers and a quick clean-up, attendees donning mandatory hardhats and safety glasses were allowed into the test chamber to inspect the damage first-hand.

After a string of significant hail losses in Alberta in recent years, Canadian property and casualty insurers - through ICLR’s Insurance Advisory Committee - asked the Institute to look into the peril and suggest actions insurers can take to mitigate future hail losses in the country.



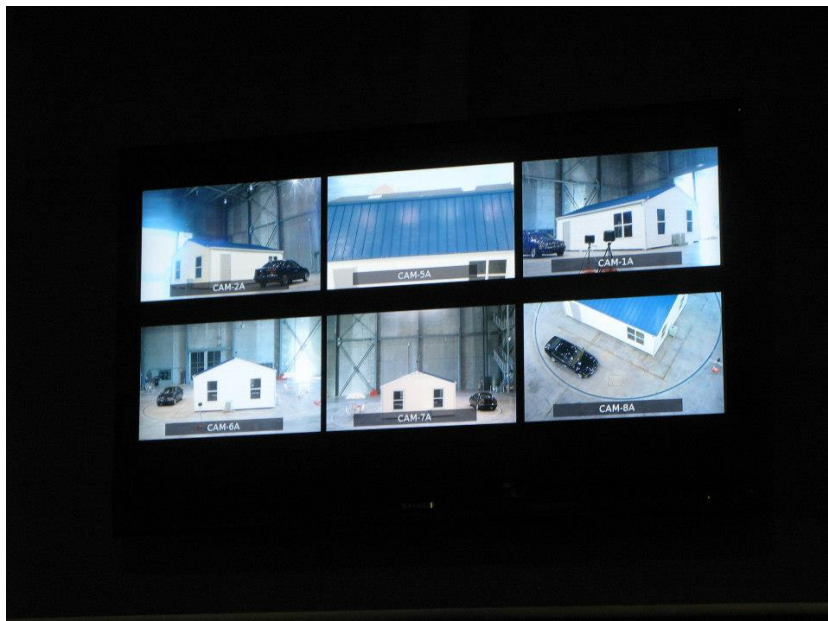
IBHS’s wind research facility in Richburg, South Carolina.

A senior ICLR staffer attended the test, billed as ‘the world’s first indoor hailstorm.’ Many hail tests have been conducted over the years, most often using single shot hail cannons to assess roofing products, siding and the like. However the February 20th test, the culmination of about four

years of research and planning, was the first to subject a full-scale home and a car to a steady four-to five-minute barrage of ice.

During the ‘hailstorm’ multi-barreled hail cannons, painstakingly developed from scratch by IBHS researchers, delivered 8,000 to 10,000 hailstones with diameters of 1”, 1.5” and 2” at up to 76 miles per hour.

Along with the meticulous work that went into developing the hail cannons, at least an equal amount of consideration went into developing stones that replicate real hail as close as possible. Dr. Tanya Brown, IBHS research engineer – and a meteorologist – used a mixture of tap water and seltzer water to attain the appropriate shape, density and hardness that closely mimics hailstones produced by Mother Nature. According to IBHS material, this laboratory work is based on, and supplemented by, field research during which the IBHS team tracked several storms to gather extensive data on which to ►



Six camera views of the test specimen. The hail ‘targets’ were all placed on a turntable to allow them to be equally subjected to hail.

base hand-made hailstones.

Among the challenges faced by IBHS researchers was that – unlike size and density – there is no standard definition or measure for the compressive strength, or hardness, of hailstones. “It makes sense that harder hailstones will cause more damage, but we need to explore that,” said Dr. Brown in an Institute release. “To do that, we had to create a compressive force device, and it had to be portable enough to take into the field, where we could find and measure actual hailstones.”

Adding to the complexity of the test is the fact that hailstones melt quickly and melting rapidly changes their characteristics, so any delay in a test may not provide the intended results.

The multi-shot cannons, mounted on catwalks located on the ceiling of the test facility were aimed at a 20 foot by 20 foot residential-style test specimen featuring different types of roofing, siding and other materials. Also targeted were a car as well as typical outdoor furniture, toys, and accessories. During the test, the cannons were



‘fed’ hailstones by a crew of IBHS researchers and staffers.

With the intent of assessing the impact of hail on several varieties of roofing and building materials all in a single test, and to “demonstrate different levels of performance”, key construction features of the home included:

Roofing: One plane of the roof was covered with standard, non-impact resistant three-tab asphalt shingles;

Attendees watch the test from the safety of a windowed observation area. Guests were later allowed to enter the test chamber to inspect the damage first-hand.

another plane was covered with impact-resistant architectural asphalt shingles (see *Taking action to reduce hail losses* on page 6). The other two planes of the roof were covered with standing seam metal roofing. On one-half of this plane, the metal roofing was installed directly over the roof deck; on the other half, the metal roofing was installed over a layer of asphalt shingles – a common real world occurrence and one which may enable more hail damage.

Exterior walls: Two sides of the test specimen were covered in fibre-cement siding; and the other two were covered with standard vinyl siding.

Windows: Both vinyl and aluminum windows were installed in the test specimen.

Skylights: Of the two skylights on the specimen home, one was rated per Miami-Dade’s requirements for hurricane debris.

Gutters: Both aluminum gutters and downspouts were installed on the home. ►



Damage to the specimen house’s aluminum eavestroughs was most pronounced.

To ensure that all sides of the specimen were subjected to the same level of impact, the house was located on a turntable, which spun it a full 360 degrees over the course of the test. The car and other items were also located on the turntable.

Speaking on the use of materials and the overall reason for the approach taken, IBHS President & CEO Julie Rochman noted in a release: "We are interested in all types of materials that are used on the exterior of buildings. While there are impact-resistant standards for roofing materials, there are absolutely no such standards for siding or fenestration, such as doors and windows. This is incredible, given the many millions of dollars consumers and insurers spend each year on repairing or replacing these materials. One of our goals is to advance development of such standards."

Preliminary test findings include:

- IBHS achieved the conditions present in a typical supercell thunderstorm that produces hail.
- The majority of impacts from the hailstones were on the roofing system, which is typical of what IBHS researchers have seen when conducting post-hailstorm damage investigations in the field.
- The hail delivery system developed by IBHS successfully propelled the hailstones at the correct terminal velocity for each size of hailstone.
- Post-test damage surveys after the hailstones melted away revealed roof damage patterns consistent with what IBHS researchers have documented in the field following recent hailstorms in Colorado and Texas.

Detailed results are forthcoming.

The February 20 test is just the end of the beginning for



IBHS research into hail because, in Rochman's words "[E]ven with all our industry's – and the weather community's – existing expertise with, and expertise about, hail, there is still much to learn."

Future plans on the hail front will see the Institute endeavour to:

- Investigate the impact of aging on the performance of building materials when subjected to hail impacts;
- Document differences between cosmetic and structural damage – and provide insights and guidance about best practices when it comes to evaluating, as well as repairing and replacing building components exposed to hail; and,
- Help people who manage and evaluate different types of risk, including high winds and hail, to understand how various building materials, systems and types are vulnerable to hail damage.

With the IBHS being a long-time research partner of ICLR's – indeed, it is considered to be a 'sister' research institute - and

considering our close working relationships and friendships with researchers and staff there, ICLR will endeavour to work closely with IBHS on the hail front, and report relevant future research findings to ICLR members as they emerge. **CT**

## Taking action to reduce hail losses

By Glenn McGillivray  
Managing Director, ICLR

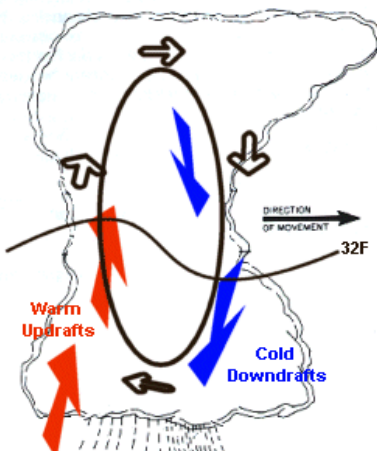
After getting hit with a major Alberta hailstorm in summer 2012 (the second in just three years) as well as by two smaller events, Canadian property and casualty insurers - through ICLR's Insurance Advisory Committee - asked the Institute to look into the peril and suggest actions insurers can take to mitigate future hail losses in the country.

As a first step, a senior ICLR staffer attended 'War on Hail', a symposium sponsored by the Texas Department of Insurance (TDI) to "take a new look at hailstorms as the leading cause of homeowners' insured losses in the state." More than 300 attendees were present to hear discussions of the meteorology of severe storms as well as engineering research to build more storm resilient structures.

Essentially all of the research findings and suggested mitigation measures and insurance business practices discussed at the symposium were not unique to Texas and can be applied here in Canada.

### A brief meteorology of hail

According to Emergency Preparedness Canada: "Hail forms in the core of a thunderstorm. Water vapour in



*warm, rapidly-rising air masses (convection currents) condenses into water at higher, cooler altitudes producing heavy rain showers. If it is cold enough, ice crystals can form around minute particles such as dust whipped up from the ground. These increase in size as more water freezes onto their surfaces. When the ice pellets are too heavy for the ascending air currents to lift, they fall as hail. They may become larger, heavier and more damaging if they collect more water on the way down.*

*Hailstones have a minimum diameter of half a centimetre. Below that they are defined as snow or ice pellets. Hail can grow larger than 10 centimetres - the size of a grapefruit. Hail can hit the ground at 130 kilometres per hour...[it] occurs in the strong updrafts needed to form thunderstorms which tend to occur in warm weather. Therefore, damaging hail storms generally only happen in Canada from May to October."*

Hail can effect every province and territory in Canada and, historically, has to some degree or another. However, as the map indicates, the majority of hail days in Canada occur in Alberta, the southern Prairies and southern Ontario.

From an insurance perspective, essentially all of the large-loss hail events recorded in Canada have occurred in Alberta. Indeed, the top three most expensive hailers took place in that province.

Emergency Preparedness Canada's website lists the September 7, 1991 Calgary event as the most expensive hailstorm in Canadian history with \$237 million in personal property damage spread over 62,000 claims, and a further \$105 million in vehicular damage over 54,000 claims.

However, that event was eclipsed by the July 12, 2010 Calgary storm that pelted the city with hailstones of almost four-centimetres in width. The storm resulted in more than \$400 million in claims.

That storm, in turn, was overshadowed by the August 12, 2012 hailer that saw parts of Calgary pelted with golf ball-sized stones. According to David Phillips' 'Top ten weathers stories of 2012': "In a matter of 10 minutes, pounding hail dimpled vehicles and riddled house siding with millions of dents. The only saving grace was that the storm's late evening arrival meant fewer vehicles were exposed to the falling hail. At first light, broken glass from shattered windows and sun roofs littered new ►

#### How does hail form?

Inside of a thunderstorm are strong updrafts of warm air and downdrafts of cold air.

If a water droplet is picked up by the updrafts...it can be carried well above the freezing level. With temperatures below 32F...our water droplet freezes.

As the frozen droplet begins to fall...carried by cold downdrafts...it may thaw as it moves into warmer air toward the bottom of the thunderstorm.

But...our little half-frozen droplet may also get picked up again by another updraft...carrying it back into very cold air and re-freezing it. With each trip above and below the freezing level our frozen droplet adds another layer of ice.

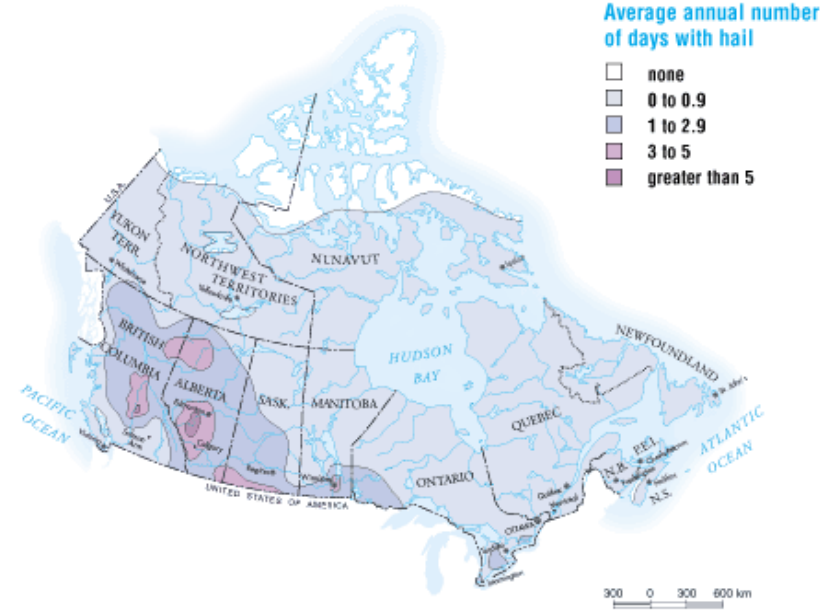
Finally...our frozen water droplet...with many layers of ice - much like the rings in a tree...falls to the ground - as hail!

(Source: NOAA)

car lots across the city. In northeast neighbourhoods, hailstones smashed windows and skylights, flattened flowers and turned backyard vegetable gardens into coleslaw. A parks official said the storm left the worst tree damage he'd ever seen. Hail also penetrated the thick shell of the Calgary Saddledome forcing the building to close to investigate possible leakage."

PCS Canada has pegged insured damage from the storm at more than \$500 million, representing roughly half of all insured damage from severe weather tallied in Canada last year. According to a December 11, 2012 release by Insurance Bureau of Canada, the August 12 storm - along with a July 11/12 event in Edmonton and a July 26 event in southern Alberta - were responsible for more than \$732 million in claims. When added to hail claims wracked up in 2010, Canadian (re)insurers have paid out well over \$1 billion in just three years, not including damage for crops.

Crop hail insurance in Canada is typically written by both private and public insurers, with reinsurance being provided on the private market. According to a Weather Network report



dated November 5, 2012, hailstorms last year caused more insured damage than in 2011: "Insurance companies in Alberta, Saskatchewan and Manitoba paid out around \$280 million in insurance claims, covering 21,600 reported losses. Farmers in Saskatchewan were the worst hit. Insurers paid out \$159 million on 13,500 claims. That's up considerably from last year [2011], when the figures were \$121 million on 11,800 claims. The numbers come from the Canadian Crop Hail Association, which noted the numbers are

significantly up from last year, when insurers paid out \$164 million on 15,000 claims."

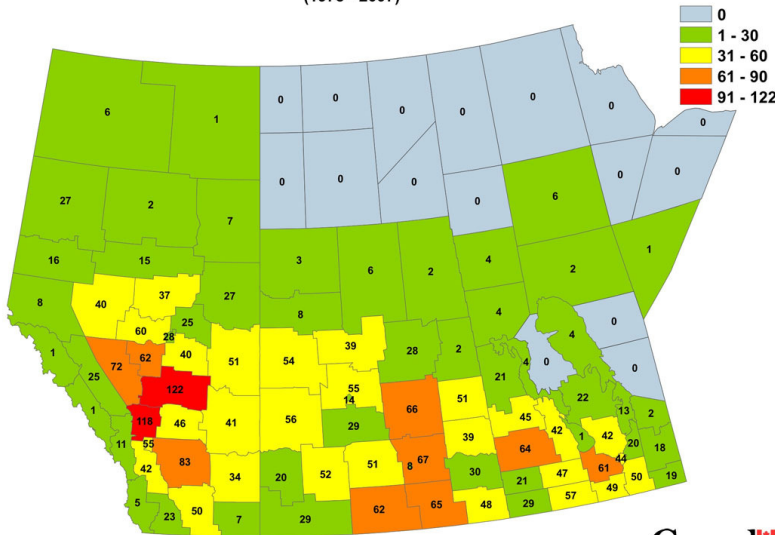
These substantial crop hail losses have had severe negative impacts on both public and private crop insurers, private reinsurers, farmers - and consumers. Crop hail losses fall outside the purview of ICLR.

**Insured assets**

Given that the bulk of insurance claims from hail in this country are from damage to private homes and vehicles, and considering ICLR's area of concentration and expertise, the discussion that follows will deal only with addressing hail damage to those two asset classes.

Hail claims for homes and cars are often to repair damage that is only cosmetic - or aesthetic - in nature. However, large hail events often result in claims for replacement of badly damaged roofs which no longer function properly; shredded and missing siding, broken windows and skylights - all of which can allow water into a home; and replacement of auto glass needed to restore the driveability of a vehicle. ►

Total severe hail events per public forecast region / Événements totaux de la grêle sévère par région de prévision publique (1978 - 2007)



Some of the measures that can be taken to protect homes against hail have become clearer and better understood in recent years, thanks greatly to more and larger damage and insurance claims surveys conducted on-site after major hail events, and to increasingly more laboratory tests (see *Observing the world's first indoor hailstorm* on page 3). Better understanding, however, does not necessarily translate into increased ease of implementation of mitigation measures, thanks to a host of issues, not least of which is openness and acceptance by homeowners and insurance companies.

Though damage to vehicles must also be considered, the answers there are less clear and require further investigation.

**Housing**

As discussed at the Texas Department of Insurance event, hailstones generally become destructive when they are one inch wide or larger. Once they reach that size, they have the capability to cause extensive damage to industrial and commercial assets; public infrastructure; trees, vegetation, crops and livestock; vehicles; and homes.

A quick look at the data available on recent hailstorms in Alberta indicates that while the number of damaged vehicles is substantial when large hail falls, damage to houses is equally as frequent. The data also indicates

that the average hail claim is roughly twice as much for a home than for a vehicle.

**Roofing**

Much of the discussion at the TDI symposium centred around use of impact resistant (IR) roofing products.

As is true in the U.S., the majority of homes in Canada use asphalt shingles for roof covering. According to www.roofery.com "Asphalt shingles can be categorized in terms of design types and constitutive elements. They can also be categorized depending on their weight, mat thickness, and type of filler materials.

It continues: "In terms of design, asphalt shingles come in four types including the single piece shingle, strip shingles, laminated shingles, and interlocking shingles. The single and strip types differ based on size. Laminated asphalt shingles, which are made to resemble the three dimensional visual effect of conventional wood and slate shingles, are a comparatively new entrant into the market. Interlocking asphalt shingles are ideal for storm prone regions that experience gale force winds.

Asphalt shingles may be made of fiberglass or organic elements. The fiberglass variety is preferred for its fire resistant property and for its comparative light weight but not for overall performance. They are preferred in regions with moderate to warm climates.

*Organic composition asphalt shingles, on the other hand, are popular for their durability and value for the money. One rule of thumb when it comes to composite asphalt shingles is that the heavier the shingle, the more durable it is. They are considered more flexible and favored in colder regions.*

*Asphalt shingle ratings have been formulated by the American Society for Testing and Materials (ASTM). ASTM has set standards for both fiberglass and organic varieties of shingles. Fiberglass shingles with an ASTM D 3462 certification and organic shingles with ASTM D 225 certification comply with ASTM standards. To be certified to these standards, the shingle products must have successfully withstood procedures such as nail-withdrawing and tear strength tests.*

*Asphalt shingle ratings cover criteria such as fire and wind impact resistance. Fiberglass shingles are normally Class A rated (the highest fire resistance), and organic shingles are usually Class C (the lowest fire resistance). Impact resistance relates to wind damage and those shingles with a Class 4 rating have extra adhesive strips under the tabs which make them the most wind resistant. They also take six nails as opposed to the usual four to fasten them in order to increase their wind resistance.*

*The Underwriters Laboratory (UL) test specifically tests against wind and hail impact. Only on withstanding 60 miles per hour winds for two hours will shingles win the UL certification. As for hail ratings, the shingles have to remain unscathed under a barrage of steel balls simulating hail stones. Consumers can check for the ASTM and UL labels on shingle packaging and in product brochures." ►*

**Table 1: Design Wind Speed / Shingle Testing Standards/Impact Resistant Classification**

Wind Speed	Shingle Wind Testing Standard/ Classification	Impact Resistant Classification
110 mph or less	ASTM D3161 (Class F) or ASTM D7158 Class G or H	UL 2218 Class 4
Greater than 110 mph up to 120 mph	ASTM D7158 Class G or H	UL 2218 Class 4
Greater than 120 mph	ASTM D7158 Class H	UL 2218 Class 4



According to CASMA – the Canadian Asphalt Shingle Manufacturers’ Association – hail can have two main effects on asphalt roofing: aesthetic and functional: “By far the most common type of damage caused by hail [is aesthetic]; small localized areas with minor loss of granules. This type of damage generally has little impact on the expected life of the roof. Functional damage is where there is sufficient damage to the shingles to either cause a short term leak or to reduce the life of the roof. This type of damage is recognized by significant granule loss (easily visible from the ground, large areas of asphalt becoming exposed) or shingle fracture/penetration which can be seen by fractures through the back of the shingle. Generally shingle replacement is only required in severe cases of damage. Remember that asphalt shingle applications provide at least two layers of shingle material over the entire roof.”

ASTM standards noted in the roofing.com information above are not typically used by Canadian shingle manufacturers whose products are not exported to the U.S. and, thus, are usually only used for shingles that are manufactured in the United States for use there, or that are imported into Canada.

As noted above, for an impact resistant (IR) roofing standard that is used by both U.S. and Canadian shingle manufacturers one must look to Underwriters Laboratories Standard *UL 2218 Impact resistance of roofing systems*, which is the recognized norm for asphalt roofing regularly used in both countries.

According to Tampa-based Insurance Institute for Business & Home Safety (IIBHS) “UL 2218 is a test that is administered by Underwriters Laboratories and involves dropping steel balls of varying sizes from heights designed to

simulate the energy of falling hailstones. Class 4 indicates that the product was still functional after being struck twice in the same spot by 2" steel balls. Note that this standard is appropriate for flexible roofing products like asphalt shingles, and metal panels or shingles. Asphalt shingles should meet the impact resistant classification shown in Table 1.”

It was noted at the TDI symposium that asphalt shingles designated as Class 4 under the UL standard hold up very well against 95 per cent of all hailstorms experienced.

The main recommendation iterated several times at the symposium was that insurers replacing a hail-damaged roof, particularly in areas that regularly experience significant hail events, should make it their policy to only provide reimbursement for Class 4 IR roofing that meets UL 2218. The moderately higher cost over installation of a Class 1 shingle would be small given the potential claims savings, and could be reduced by an insurer’s buying power.

Not noted at the symposium, but worthy of consideration, is the idea that new home builders use a Class 4 shingle whenever a home is being built in a high-risk hail zone, such as in southern Alberta and southern Saskatchewan.

Other considerations include use of roof systems other than asphalt, such as metal and plastic. It was recognized at the symposium, however, that the vast majority of homes in the U.S. (and Canada) utilize asphalt shingles.

***Siding, vents, soffits, fascia, fenestration etc.***

In moderate hailstorms, it is often just the roof of a home that is damaged. However in larger, very destructive storms, the

experience in Texas is that while roughly half the damage is related to the roof, the other half is related to siding, vents, soffits, fascia, skylights and fenestration (i.e. windows and doors).

To-date, while a significant amount of research has been conducted on roofing systems, very little has been done on these other items, which can prove to be significant sources of damage.

Discussions in Texas noted that there is a huge void in the science and testing, and virtually no IR standards exist for siding, vents, soffits, fascia and fenestration.

One consideration is to encourage use of cement board over aluminum or vinyl siding, particularly in high-risk hail zones. An additional benefit to cement board is it’s higher resilience to fire, which makes it suitable for use in the wildland urban interface (WUI) where risk of damage/loss to wildfire is greatest.

Clearly, much more work needs to be done in the testing of siding, vents, soffits, fascia, fenestration etc., and in the development of IR standards for same. Again, see *Observing the world’s first indoor hailstorm* on page 3 for the latest developments in this area.

**Vehicles**

While the radar technology most commonly in use by weather services in the U.S. and Canada today may allow for warnings of up to a half-hour or longer prior to strike, the very nature of hail and hailstorms oftentimes provides for very little – and often no - forewarning of an impending storm. As such, it is virtually impossible to be able to guarantee that people can be warned far enough in advance to allow them to get their vehicles under cover before a ►

damaging hailstorm begins.

Though the TDI event concentrated mostly on hail mitigation for homes, there was some discussion around protection of vehicles, with two possibilities raised.

The first possibility centred around the idea of lobbying auto makers for the manufacture of hail resilient vehicles. Such vehicles, it was proposed, would use materials that would be more resistant to hail strike, such as Polymers for panels that would perform better than traditional metal. However, at least two shortcomings can be seen from such an attempt. First, would be the time, resources and energy needed for such an advocacy effort. Such a change would not occur overnight, so what would motorists and insurers do in the meantime? The second is that while use of Polymers or other materials might address the body panel issue, what of damage to auto glass? Attendees at the TDI event appeared to quickly move on from this suggestion, sensing a long and expensive process that would not likely lead to success.

The second possibility reconsidered the tried-and-true method of providing cover for vehicles located in high-risk hail zones. Such cover can be permanent – such as with car ports and garages; or temporary, as with fabric shade systems used to shelter open lot vehicle inventories like those found at car rental lots and auto dealerships.

Permanent car port-type structures can take various shapes and forms, and range from being very basic to quite complex in design. One may see various styles and types of permanent car ports while driving through the Dallas-Fort Worth area.

Keeping cars under permanent cover provides ideal protection. However when use of permanent structures is not possible, temporary tent-like

fabric covered structures, as well as custom car covers or blankets such as the type used by owners of vintage cars, may be considered as alternatives.

Though there are several manufactures and sellers of car covers/blankets purported to be 'hail resistant', to-date, it is unclear if any have been subjected to rigorous hail testing, and currently no standards bodies have published standards for such products.

Several companies in the United States manufacture and market fabric structures to protect vehicles against hailstones, as well as against the sun's harmful UV rays. Such structures can be seen at rental car lots (for instance, at the Dallas-Fort Worth Airport), auto manufacturing plants and car dealerships.

A speaker at the TDI event offered an example of a dealership that was incentivized through it's insurance company to use such covers. Incentivizing the use of vehicle covers – whether permanent or temporary – is easily done for insureds who hold large inventories of vehicles. However, it may not be possible, realistic or desirable to incentivize property owners to provide such cover if the vehicles that they protect are not their own, as with public parking lots or employee parking lots, for example. This represents a big gap that would be difficult to address.

Perhaps more consideration may need to be put into rigorously testing and issuing a standard for custom car covers/blankets.

### **Conclusion**

The need to address the problem of mounting hail-related claims in Canada could not be more acute, as the industry will likely see more hail damage in Canada going forward. This, not necessarily because of any

projected increase in frequency of hail, but due to increased concentration of values and growing costs of replacing damaged property in such places as Calgary.

Large gaps currently exist in the testing of siding, vents, soffits, fascia, fenestration etc. as well as with the implementation of IR standards for same.

There are also clear gaps that need to be filled regarding research to better protect vehicles from large and damaging hail.

This being said, it is likely best for the Canadian insurance industry to concentrate first on those measures that make the most sense, where we have the most knowledge, and where insurers will get the best return – on roofing.

Currently, we know enough to be able to say that IR roofing products perform markedly better than non-IR products. As a result, insurers writing business in high-risk hail zones need to consider leveraging their buying power, and incentivizing their use.

The next discussion, perhaps, needs to centre around a push for IR requirements in building codes for homes being constructed in high-risk hail zones.

There are gaps in the research to be sure, however we know enough at this stage to be able to move forward with a plan to better utilize IR roofing products, and we know enough about where research and testing is lacking to begin to work towards filling these gaps.

If not, Canadian insurers writing personal lines business in hail hazard areas should get used to writing big cheques more often. **CT**

## Urban flooding in Canada: Lot-side risk reduction through voluntary retrofit programs, code interpretation and by-laws

On February 15, the Institute for Catastrophic Loss Reduction released a study on urban flooding in Canada which looks at, among other topics, interpretation of building and plumbing code wordings that relate to installation of backwater valves to protect homes from sewer backup. While a significant amount of research by ICLR and others has concluded that resolution of building code *enforcement* issues may result in reduced vulnerability to extreme natural hazards, issues surrounding code *interpretation* have not previously been studied.

Urban flood damages are a recurrent and growing issue for municipalities, insurers and homeowners across Canada. Damages from urban flood events often total in the \$10s- and \$100s of millions of dollars. In May, 2012, a storm system that affected Thunder Bay and moved through to Montréal resulted in \$260 million in insured damages. In July, 2012, a storm moved through southern Ontario affecting several neighbourhoods in Hamilton and Ottawa, resulting in \$90 million in insured damages. An extreme rainfall event that affected a large region of southern Ontario from Hamilton to Durham Region in August, 2005 resulted in over \$500 million in insured damages, \$247 million of which was associated with sewer backup. Also in 2005, heavy rainfall and associated flooding resulted in \$300 million in insured damages in southern Alberta. A severe storm in Edmonton, Alberta in 2004 resulted in approximately \$166 million in insured damages, \$143 million of which were associated with sewer backup.

Previous research conducted by ICLR revealed that a mainline, full port, normally open backwater valve, when

properly installed and maintained, in tandem with the severance of foundation drains (i.e. weeping tile) from the sanitary sewer, is one of the best measures a homeowner can take to reduce the risk of stormwater and/or sewage backing up into a basement. But building code/plumbing code and/or local by-law requirements to install such valves in new homes is spotty across the country, largely owing to code interpretation.

The study revealed that backwater valve building/plumbing code wordings are interpreted differently across the country, though there is greater interpretation consistency in some regions than in others. Specifically, the survey revealed that 19% of British Columbia respondents, 81% of Alberta respondents, 86% of Saskatchewan respondents, 72% of Manitoba respondents, 26% of Ontario respondents and 58% of respondents from New Brunswick and Nova Scotia interpreted code wordings in a manner that required backwater valves to be installed in all or most new homes. The study further revealed that interpreting code wordings in this manner was strongly correlated with a higher frequency of installation of backwater valves in new homes, indicating the importance of code interpretation for backwater valve installation.

According to Dan Sandink, study author, "Despite the fact that the National Building Code of Canada and virtually all provinces use near identical code wordings in the backwater valve sections of their respective building and/or plumbing codes, this study found that there are differing interpretations of code wordings, resulting in differing frequencies of installation of backwater valves. So, while

building and plumbing officials in many jurisdictions in Canada interpret the code as meaning that all new homes should have backwater valves, some officials in some jurisdictions interpret the code as meaning that backwater valves shall be used only in certain circumstances."

The primary recommendation of this report is that sentences in the National Plumbing Code and provincial building and/or plumbing codes that relate to installation of backwater valves to protect against sewer backflow be reworded or clarified to ensure they are clearly and consistently interpreted and applied.

According to the study, there are many advantages of installing backwater valves in new homes. Due to the unpredictable nature of extreme rainfall events and the unpredictability of infiltration and inflow (I/I) in relatively new, separated sewer systems, it is often impossible to identify which regions of an urban municipality are exposed to sewer backup risk until widespread or regional sewer backup events have occurred. It is also more economical to install backwater valves in new homes when compared to retrofitting valves into existing homes. For example, several Canadian municipalities provide partial retrofit subsidies of several thousand dollars for the retrofit of backwater valves, while installation of valves in new homes costs approximately \$250. Requiring installation of valves in new homes would also help offset relatively low uptake frequencies for municipal subsidy programs aimed at encouraging homeowners to adopt urban flood risk reduction measures.

The paper can be downloaded at [www.iclr.org](http://www.iclr.org) **CT**

A 6x12 pattern requires that nails along the outer edge of a roof sheathing panel, where the panel shares the upper cord of the joist with the adjoining sheet, be spaced every 6 inches apart while those nails in the interior of the panel can be 12 inches apart.

A 6x6 pattern requires that nails be spaced 6 inches apart, regardless of whether they are on the outer edge or in the interior of the sheet.

Much of the work surrounding loss of roof sheathing from extreme winds came as a result of findings made in the field after the August 20, 2009 record outbreak of 19 tornadoes in Ontario and ensuing tests performed at the Insurance Research Lab for Better Homes (IRLBH) at Western University in London, Ontario. While on-site in Woodbridge and Maple after two F2s touched down, ICLR/Western researchers found instances of 4x8 plywood sheathing missing from otherwise relatively undamaged roofs. Missing plywood roof sheathing after extreme wind events indicates a weak nailing pattern and, oftentimes, nails that have missed joists.

Work at the IRLBH showed that nails located along the edge of plywood roof sheathing play little role in the hold-down strength while those in the interior of the sheet are essential to keeping the panel anchored during extreme wind events. Just 12 extra nails afforded in the change from 6x12 to 6x6 substantially increases the ability of the roof panel to withstand uplift, while adding almost no cost to construction.



Missing roof sheathing, Gulf Coast of Florida after Hurricane Deniis, 2005.

Prior to the August 2009 outbreak, ICLR/Western researchers found the same type of damage in Bornholm, Ontario after a weak F0 tornado in May 2007, and in Florida and the Gulf Coast after hurricanes in 2004 and 2005.

When a roof becomes pressurized in extreme wind, a poorly anchored roof panel may lift from the joists and become debris in the airstream, damaging other structures and/or vehicles and potentially injuring people or worse. Missing roof sheathing also opens the home up to damage from water ingress, including growth of mould if the house is not properly dried out or repaired following a storm.

ICLR has a long standing program to look at what needs to be done to existing homes to make them more resilient to extreme weather and earthquakes. Recently, the Institute has begun to focus on

new homes. Implementing ICLR's new home program will take time as the Institute reaches out to homebuilders, building code officials and other stakeholders across the country. ICLR is, however, encouraged that its first effort to influence a provincial building code was successful, and will seek to build on this success going forward.

The Institute hopes the end result will mean more resilience in Canada's building stock. **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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