Institute for Catastrophic Loss Reduction

Building resilient communities

Designed for safer living®

Protect your home from

Hail

Designed for safer living® *is a program endorsed by Canada's insurers to promote disaster-resilient homes.*

About the Institute for Catastrophic Loss Reduction

The Institute for Catastrophic Loss Reduction (ICLR), established in 1997, is a world-class centre for multidisciplinary disaster prevention research and communication. ICLR is an independent, not-for-profit research institute founded by the insurance industry and affiliated with Western University.

The Institute's mission is *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.*

ICLR's mandate is to confront the alarming increase in disaster losses caused by natural disasters and to work to reduce disaster deaths, injuries and property damage. Disaster damage has been doubling every five to seven years since the 1960s, an alarming trend. The greatest tragedy is that many disaster losses are preventable. ICLR is committed to the development and communication of disaster prevention knowledge. For the individual homeowner, this translates into the identification of natural hazards that threaten them and their home. The Institute further informs individual homeowners about steps that can be taken to better protect your family and your home.

The purpose of this handbook is to outline actions that homeowners can take to protect their homes from hail damage. Some of these measures are simple and free; others cost money. All contribute to reducing the risk of hail damage.

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Cover photos: CP Images (top), Dr. Ian Giammanco (bottom left), IBHS (bottom right)

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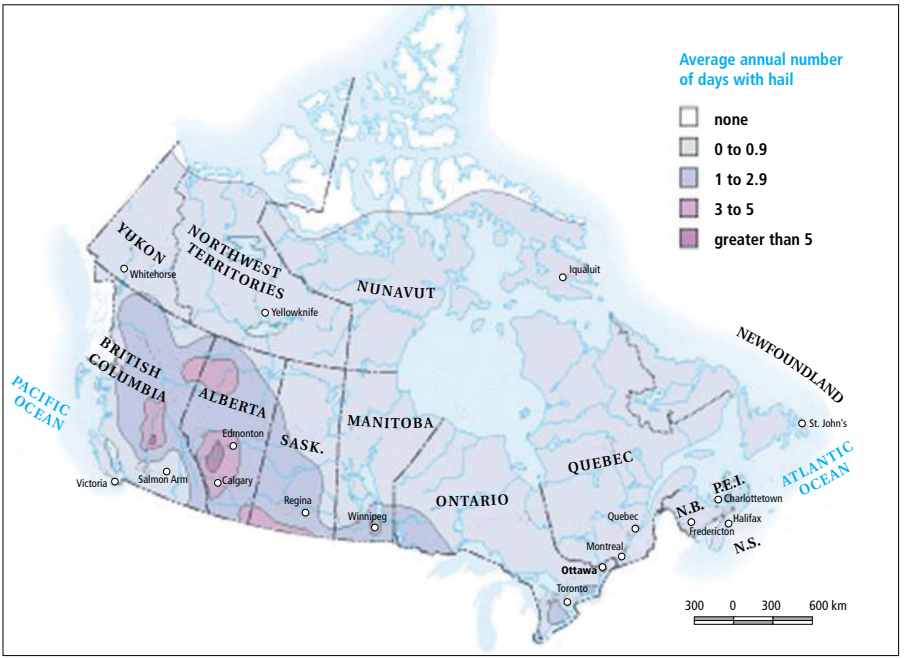
Hail damage

The need to address the problem of mounting hail-related damage in Canada could not be more acute, as property owners and insurers have experienced hundreds of millions of dollars in hail damage in recent years and will likely see more hail damage in Canada going forward. This, not necessarily because of any projected increase in the number of hailstorms, but due to the increased concentration of assets in Canadian cities and suburban housing developments, and the ever-growing costs of replacing damaged and destroyed property.

From an insurance perspective, most of the largest hail damage events recorded in Canada have occurred in the province of Alberta. Indeed, the top three most expensive hailers took place in that province. But this can lead to a false sense of security, as hail can affect every province and territory in Canada and, historically, has to some degree or another. Indeed, as the map indicates, the majority of hail days in Canada occur in British Columbia, Alberta, the Prairies and southern Ontario.



Hailstones generally become destructive when they are about the size of a quarter 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; homes and other structures; and vehicles.

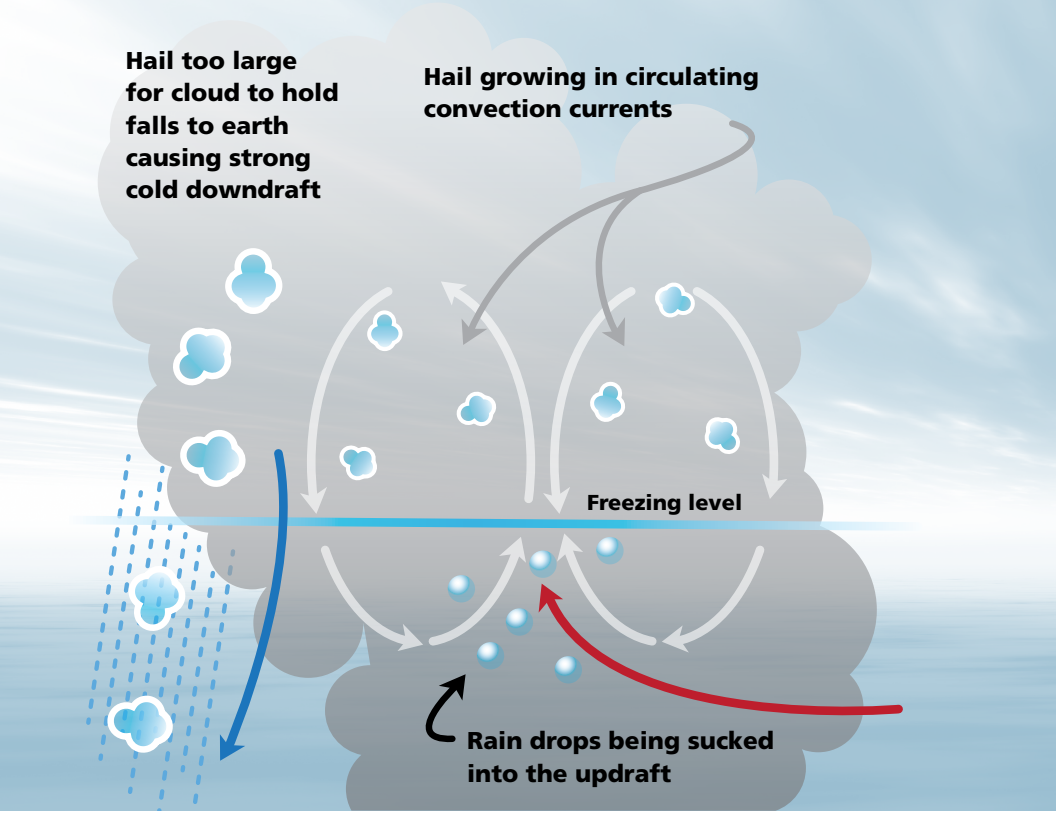
An analysis of the data available on recent hailstorms in Alberta indicates that while the number of damaged vehicles is substantial when large hail falls, damage to houses is equally as frequent. Data also indicate that the average hail claim is roughly twice as much for a home than for a vehicle.

This publication is designed to assist homeowners whose residences are at risk of damage from hail.

It provides an overview of key areas in and around the house that may require attention in order to reduce the risk of hail damage.

How hail forms

Hail is a form of precipitation that is made up of (sometimes odd) formations of ice and snow. Hail forms in cumulonimbus clouds due to the violent convection (rising and falling) currents that are present in the storm cloud (as indicated by the blue and red arrows). Particles of rain or snow are drawn vertically up through the cloud and collide with supercooled water and other particles, such as dust. These collisions lead to the particles sticking together. If the updrafts in a thunder cloud are strong enough, the hail stones can rise and fall several times, getting quite large before they become too heavy to remain aloft. Hail stones can range from pea size to golf ball size, and up.



First steps

Understand your home's vulnerabilities

Depending on the size of the hailstones, wind speed and the duration of a storm, hail can cause a great deal of damage to a home's roof, exterior walls, and doors and windows, among other components. It is important to be aware and educated about your home's vulnerabilities to the threat of severe hail and other hazards.

1 Talk to your insurance provider

It is critical that homeowners talk to their insurance provider to understand what types of damage are covered under their policy. Sometimes specific types of damage can be excluded depending on your policy, or policy deductibles may vary depending on the cause of damage. Insurers can also identify common sources of damage that you should watch for and may be able to direct you to educational resources on hail damage reduction.

2 Have a private building inspector evaluate your home

Because every home is different, private building inspectors can offer important insights into the age of your home and your home's capacity to withstand hail and other hazards.

Taking action on your own

These actions cannot guarantee the safety and security of any home but, if addressed, will help to minimize the risk of hail damage.

Hail and your home

Hail-related insurance claims involving homes are often to repair visible damage only. However, large hail events result in claims for replacement of damaged roofs, shredded and missing siding, and broken windows and skylights – all of which can allow water into a home, leading to even more damage.

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 larger and more in-depth forensic damage studies and insurance claims surveys conducted immediately after major hail events, and through more advanced laboratory testing, conducted by such groups as the Tampa-based Institute for Business and Home Safety (IBHS).

Photo: Dr. Ian Giammanco

A researcher from the Tampa-based Institute for Business and Home Safety (IBHS) conducts an analysis of a freshly fallen hailstone before it begins to melt and its properties change.

Roofing

The vast majority of homes in Canada (more than 90 per cent by some estimates) have asphalt shingle roofs.

Two main resiliency standards have been developed by standards setting agencies for shingle manufacturers.

The American Society for Testing and Materials (ASTM) has developed testing protocols and standards for both fibreglass and organic asphalt shingles. Fibreglass shingles with an ASTM D 3462 certification and organic shingles with an ASTM D 225 certification comply with ASTM

Quick facts about the Class 4 UL 2218 impact test

The UL test drops a steel ball from 20 ft. to see if the material will crack.

On a standard shingle, cracks and ruptures will appear after the ball is dropped.

On a Class 4 rated shingle, no evidence of cracking or tearing will be seen after the test.

Impact resistance testing

Drop height (ft)	12	14	17	20	
Golfball (1.680″ D)	(1¼″ D)	(1½″ D)	(1¾″ D)	(2″ D)	Baseball (3″ D)
Class	1	2	3	4	

standards. To meet these standards, shingles must pass nail-withdrawing and tear strength tests.

Underwriters Laboratory (UL) has developed testing protocols and standards for both wind and impact. Only on withstanding 60 mile-per-hour (~97 km/h) winds for two hours will shingles win the UL wind certification. As for hail, the shingles have to remain unscathed under a barrage of steel balls simulating the energy hailstones could have.

Consumers can check product brochures and shingle packaging for the ASTM and UL labels. However, ASTM standards are not typically used by Canadian shingle manufacturers whose products are not exported to the U.S. Generally, they are only used for shingles that are manufactured in the U.S. or manufactured in Canada and imported to the U.S.

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 the U.S. and Canada.

According to the Institute for Business & Home Safety (IBHS) "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." IBHS notes that this standard is appropriate for flexible roofing products like asphalt shingles, and metal roofing products.

Homeowners, builders, insurers and others should not confuse shingle warranties with resiliency standards. Warranties are simply marketing devices created by the shingle manufacturer for business purposes. A longer warranty (such as with a '25-year shingle') does not directly equate to strength or resilience of the product or its ability to withstand extreme wind or hail.

Researchers have noted that a Class 4 rated new shingle manufactured under the UL standard will hold up very well against approximately 95 per cent of all hailstorms experienced.

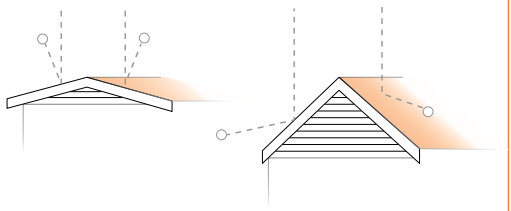
ICLR advocates for the installation of Class 4 impact resistant roofing that meets UL 2218 for all homes located in regions of moderate or high risk of hail. The moderately higher cost over installation of a Class 1 shingle is small given the potential savings.

Homeowners re-roofing their homes and builders conducting major renovations or constructing new homes should use Class 4 shingles whenever a home is being built in a moderate to high-risk hail zone, such as in southern Alberta and southern Saskatchewan. Other considerations include use of roof systems other than asphalt, such as rubber, metal or plastic.

It is important to note that while several types of roofing materials have passed the UL 2218 test and, therefore, are considered impact resistant; many of these materials (such as ceramic tile, slate, concrete and metal) are still subject to cosmetic damage from hail resulting in potential insurance claims and higher insurance premiums for homeowners. These materials tend to be considerably costlier to replace than asphalt shingles.

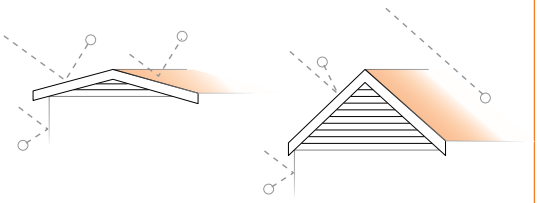
Roof slope is an important factor when considering damage from hail. A steeply-sloped roof can reduce overall hail damage in two ways. First, if the hail falls in a relatively straight path, a steep roof can limit damage as it is usually direct – and not glancing – impacts from hailstones that cause roof damage in hail storms (steep roofs limit direct hits and increase glancing or ricocheted of hailstones). Second, if the hail falls on an angle, while the part of the roof facing the wind will likely experience damage, the wind-shaded side may get less or no damage, depending on the angle of impact and steepness of the roof.

Figure 1a



The home on the left would sustain greater roof damage because of the more direct impact from hailstones. The home on the right would experience less roof damage because of the less direct glancing blows.

Figure 1b



Wind conditions can distort damage to a home. The home on the left has more glancing blows to the roof from the wind, while the windward wall comes under attack from direct hail impact. The right wall is protected and undamaged from the hail. The home on the right will more likely sustain roof damage on the windward side because of the more direct impact.

Source: C. Roberts Consulting Engineers, Inc.

The Institute suggests that full roof underlayment be installed over the entire roof deck prior to installation of the final roof cover. Such underlayment can provide a good secondary line of defence against water penetration and ice buildup, particularly if the primary cover is damaged by wind or hail. In addition to basic underlayment, the seams in the roof decking can also be sealed using several different products.

While there are several underlayment products available on the market, from asphalt-saturated felts to synthetic underlayments, ICLR suggests that homeowners consider the comprehensive protection offered by self-adhering waterproofing underlayment (commonly referred to as ice-and-water shield). The use of these components can significantly protect against immediate water entry in the event the roof cover is damaged by extreme hail.

Other components of a home

In moderate hailstorms, it is often just the roof of a home that is damaged. However in larger, very destructive storms, the experience 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, little has been done on these other items, which can prove to be significant sources of damage.

But while there is a void in the science and testing, and virtually no impact resistance standards exist for siding, vents, soffits, fascia and fenestration, some early work has been done that may potentially point to promising solutions to prevent such damage to private homes.

Cement fibre siding, such as Hardie board, stands up much better to hail impact than does aluminum or vinyl siding and also adds more resistance to fire, making it well suited to areas that are exposed to hail, wildfire and high winds.

Siding

One important consideration to minimize major hail damage to houses is to encourage use of cement board (a.k.a. fibre or Hardie Board) where aluminum or vinyl siding would otherwise be used, particularly in high-risk hail zones. While cement board is more resilient to hail than vinyl and aluminum, an additional benefit is its higher resistance to fire, which makes it suitable for use in the wildland urban interface (WUI) where risk of damage/loss from wildfire is greatest.

An early objection to cement board from homeowners was that the product did not come in designer colours and, therefore, had to be painted every few years. In recent years, however, manufacturers have begun to offer cement board in several designer colours.

Skylights, windows and doors

While there are no impact resistance requirements for skylights, windows and doors in the country, some Canadian manufacturers produce these items for sale in the domestic market and for export to U.S. hurricane-prone states. Miami-Dade County in Florida does have an impact resistance requirement for such items, but it is not immediately clear if these products are readily available in the Canadian market.

Homeowners, renovators and builders are encouraged to make inquiries to domestic manufacturers (many of which are small, local companies) and sellers of skylights, windows and doors to determine if impact resistant products are readily available in the Canadian market.

Photo: IBHS

In mild to moderate hail storms, damage to homes is usually limited to roofs. However, in larger hail storms, extensive damage can be done to siding, skylights, windows and doors.

It is important to mention that window safety films are readily available at most home renovation stores in Canada. Such films usually do not make window glass unbreakable, but do make it harder to break (providing added security against break-and-enter and theft). Further, these films ensure that glass does not shatter into tiny fragments and enter a home with enough force to injure occupants. These films often have the added bonus of providing energy efficiency-improving UV protection. Moreover, safety films can also reduce the risk of water entering the home through broken windows, a major source of damage.

Vehicles

Vehicle-related hail damage often costs Canadians (and their insurers) a significant amount of money. Further, most homeowners in the country own at least one vehicle.

When it comes to protection of vehicles against hailstorms, the simplest, most common and most effective form of mitigation is to get vehicles under cover prior to a storm. Such cover can be permanent – as with carports and garages; or temporary, as with commercial fabric shade systems used to shelter open lot vehicle inventories like those found at car rental lots and auto dealerships in the southern U.S.

When use of permanent or temporary structures is not possible, custom car covers or blankets, such as the type used by owners of vintage cars, may be considered as alternatives. Though there are several manufacturers and sellers of car covers/blankets purported to be 'hail resistant', it is not immediately clear if any have been subjected to rigorous scientific hail testing, and currently no standards bodies have published standards for such products. Therefore, consumers are warned that they use such products at their own risk.

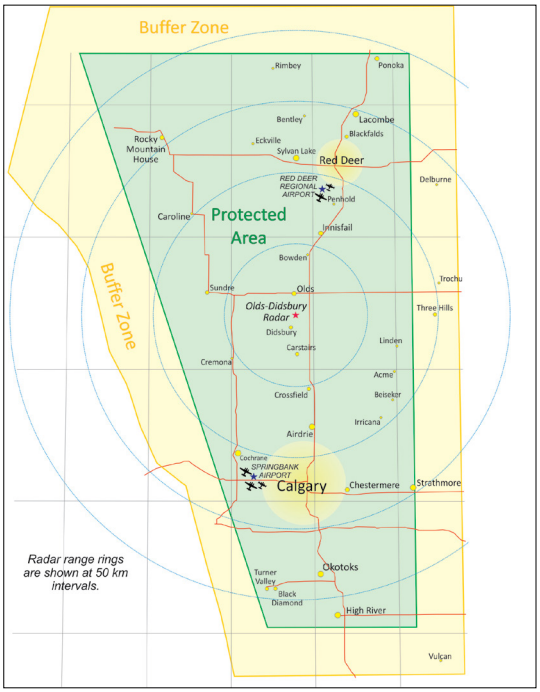
These products require the owner to deploy them ahead of a thunderstorm. While forecasting and warnings for severe weather continue to improve, a person should never jeopardize their own life-safety when attempting to use such a product.

Another way insurers are working to prevent hail damage

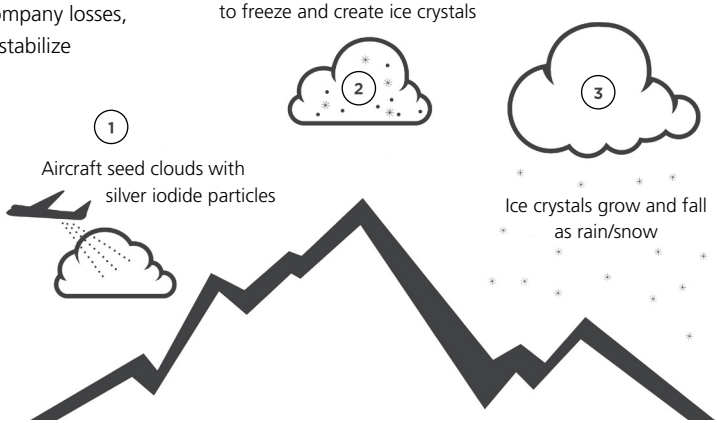
The Alberta Severe Weather Management Society (ASWMS) is a private, non-profit organization that was established by the property and casualty insurance companies of Alberta to reduce the risk of hail damage.

Cloud seeding is a form of intentional weather modification that involves the process of dispersing a substance such as silver iodide into developing clouds. The intention is to alter the cloud's micro-physical properties which results in a change of the type of precipitation that will fall. Cloud seeding does not eliminate hail, but it does seek to reduce the size of hailstones which would result in less damage.

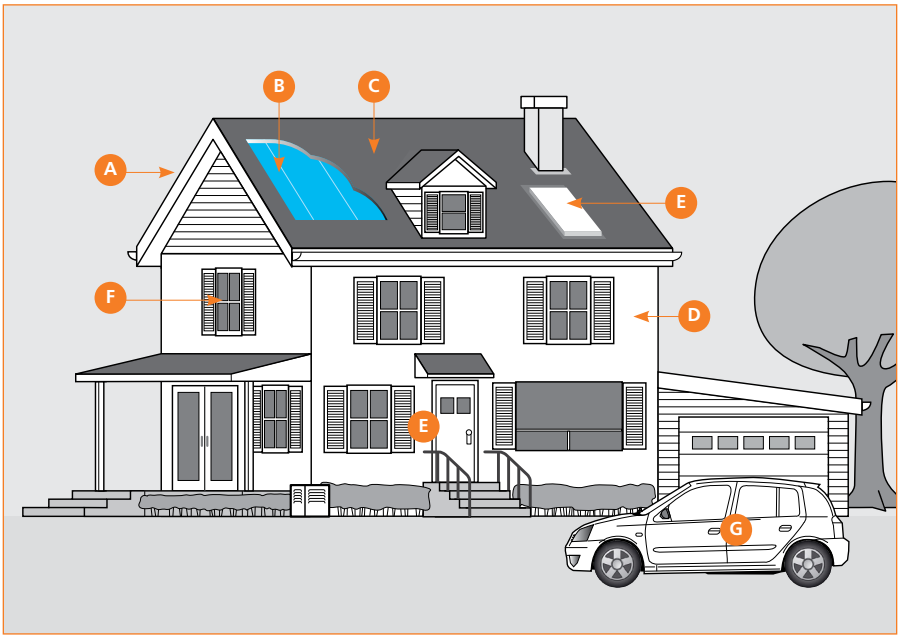
Cloud seeding seeks to reduce the size/frequency of hailstones, which in turn reduces damage to people's gardens, crops, homes, cars and businesses. Cloud seeding also helps to control insurance company losses, which in turn helps to stabilize insurance rates.



Silver iodide particles cause cloud moisture to freeze and create ice crystals



Protecting your home and vehicles from severe hail



A Purchase a home with a steeper sloped roof as flatter roofs are more vulnerable to hail damage.

B When re-roofing, install full roof underlayment, preferably self-adhering waterproofing underlayment (a.k.a. ice-and-water shield).

C Use roofing products with the Underwriters Laboratories UL 2218 Class 4 impact resistance rating.

D Use brick cladding or cement board (a.k.a. fibre or Hardie Board) siding in place of aluminum or vinyl.

E For skylights, windows and doors, use products made to withstand high debris impact such as those with a 'Miami-Dade' impact resistance rating.

F An alternative are window safety films which are readily available at most home renovation stores.

G Whenever possible, keep your vehicle parked under permanent cover (garage or carport).

Measuring your risk of severe hail damage

Assign yourself the indicated number of points for each question. The fewer the points you score, the more protected your family and property are against severe hail damage. If a question does not apply to your home, assign a score of 0.

General			
Do you live in or near a high-risk hail zone? (see map on page 1)	No Yes	5 20	
Has your home been damaged by hail before?	No Yes	5 20	
If you own a car, do you always park it in a covered space (eg. carport or garage)?	Always Sometimes Rarely	0 10 20	
Roof			
Is your roof covered with an Impact Resistant (IR) product (class 4 asphalt, rubber, metal, cement, other)?	Yes No	0 20	
Is your roof steep, moderately steep or flat/almost flat?	Steep Moderately steep Flat/almost flat	0 10 20	
Do you have underlayment (i.e. ice and water shield) under your roof covering?	Yes No	0 10	
Do you have skylights?	Yes, but not impact resistant Yes, and impact resistant No	20 5 0	

Siding			
Is your home cladded with masonry, cement fibre board or aluminum/vinyl siding?	Masonry (brick, stone, stucco, cement fibre board, etc.) Other Aluminum or vinyl	 0 5 20	
Doors and windows			
Are your doors and windows rated for impact resistance (IR)?	Yes Between 20 and 80% are impact resistant No/Don't know	0 5 10	
		My total risk score is ►	

Low 21 or less, **Moderate** 21-29
High 30-35, **Extreme** 35 or more

Notes

Repair or upgrade to-do-list

Description

Location | Start date | Completed

☐ Repair ☐ Upgrade ☐ Replace | $ Budgeted | Actual cost

Description

Location | Start date | Completed

☐ Repair ☐ Upgrade ☐ Replace | $ Budgeted | Actual cost

Description

Location | Start date | Completed

☐ Repair ☐ Upgrade ☐ Replace | $ Budgeted | Actual cost

Description

Location | Start date | Completed

☐ Repair ☐ Upgrade ☐ Replace | $ Budgeted | Actual cost

Important questions

Important contact information

Insurance company

Address | Postal code

Telephone | Alternative telephone

E-mail | Website

Contact person | Contact person

Insurance broker or agent

Address | Postal code

Telephone | Alternative telephone

E-mail | Website

Contact person | Contact person

Municipal government

Address | Postal code

Telephone | Alternative telephone

E-mail | Website

Contact person | Contact person

Contractor

Address | Postal code

Telephone | Alternative telephone

E-mail | Website

Contact person | Contact person

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