



Institute for Catastrophic  
Loss Reduction  
Building resilient communities

Institut de prévention  
des sinistres catastrophiques  
Bâtir des communautés résilientes

ICLR's  
**HailSmart**<sup>™</sup>  
PROGRAM

## A benefit-cost analysis of impact-resistant asphalt shingle roofing

### Overview



# ICLR helps people become more resilient to climate and earthquake risks.

The Institute for Catastrophic Loss Reduction creates and disseminates disaster resilience knowledge for Canada. Among the catastrophes ICLR addresses are hailstorms, one of Canada's most serious natural hazards. Hail costs \$400 million annually. A June 2020 hailstorm at the edge of Calgary damaged 77,000 homes and cost \$1.4 billion. Much of that money paid for roof repairs. A direct hit on Calgary could be 5 to 10 times worse. Though the hailstorm is inevitable, the catastrophe is not. This document summarizes a study of one way that homeowners and insurers can prevent costly hail damage: by using impact-resistant asphalt shingle roofs instead of standard shingles.

Impact-resistant roof shingles look like ordinary shingles, but have material that makes them resistant to hail damage. When struck by large hailstones, they resist pits and fractures that would otherwise allow water to pool or penetrate beneath them. And they resist cosmetic damage like the loss of granules: the specks that cover the shingle surface.

**The Institute for Catastrophic Loss Reduction performed a benefit-cost analysis of impact-resistant asphalt roof shingles. The analysis shows that the shingles save more than they cost in Hailstorm Alley and many other places**



Impact-resistant



Non-impact-resistant



**What does an impact-resistant shingle resist?**

A 55-g, 50-mm hailstone falling at terminal velocity from 1 km strikes like a 550-g, 50-mm steel ball falling 6 metres. That is like the worst impact by the biggest hailstone in 99% of storms.

**Hail resilience has costs and benefits**

**For a 170 m<sup>2</sup> (1,800 ft<sup>2</sup>) impact-resistant roof in Calgary:**

**Cost = \$3,400**

**Benefit = \$10,000**

**Benefit-cost ratio = 3:1**

**Benefit-cost ratio reaches 8:1 elsewhere**

Impact-resistant shingles can add 50% to the cost of a roof. For a 170-m<sup>2</sup> (1,800-ft<sup>2</sup>) roof, the added cost is \$3,400. This study used a method called performance-based engineering to estimate how much loss the shingles prevent, compared with standard shingles. One can compare the costs and benefits on an apples-to-apples basis.



1,000 m 6 m

# We studied the costs and benefits of impact-resistant asphalt shingle roofing.

## Impact resistant shingles make financial sense across all of Hailstorm Alley

The shingles are cost effective wherever it hails almost once a year or more, the yellow areas in Figure 1. Climate change will worsen future hailstorms, making impact-resistant shingles more valuable and the yellow area bigger.

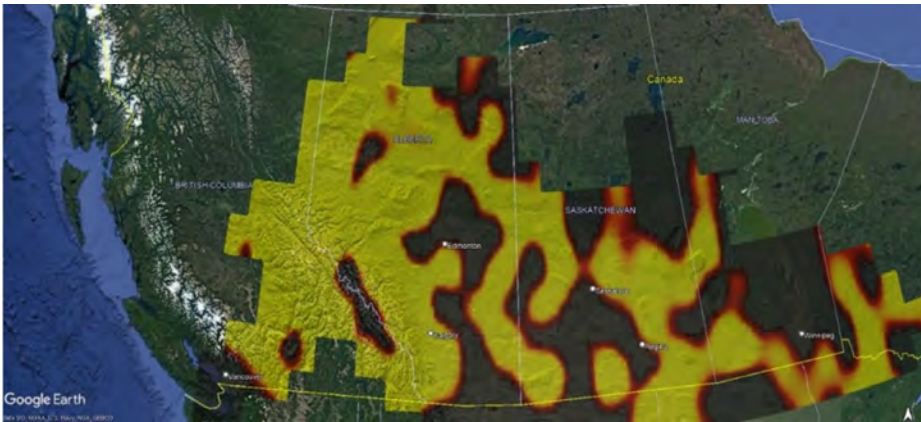


Figure 1. Yellow shows where impact-resistant shingles more than pay for themselves on average

## Impact resistant shingles can save 8 times what they cost

In Calgary, impact-resistant shingles reduce the chance of damage by 15 times. If the roof is damaged, average repair cost drops by half. Considering how frequently hailstorms happen, that saves \$3 for every \$1 in added cost, or \$10,000 over a life of a roof. The shingles pay for themselves in 5 years, on average. (That assumes one repairs the roof every time it gets damaged.) Figure 2 shows where the shingles are most cost effective: red means savings 8 times the cost.

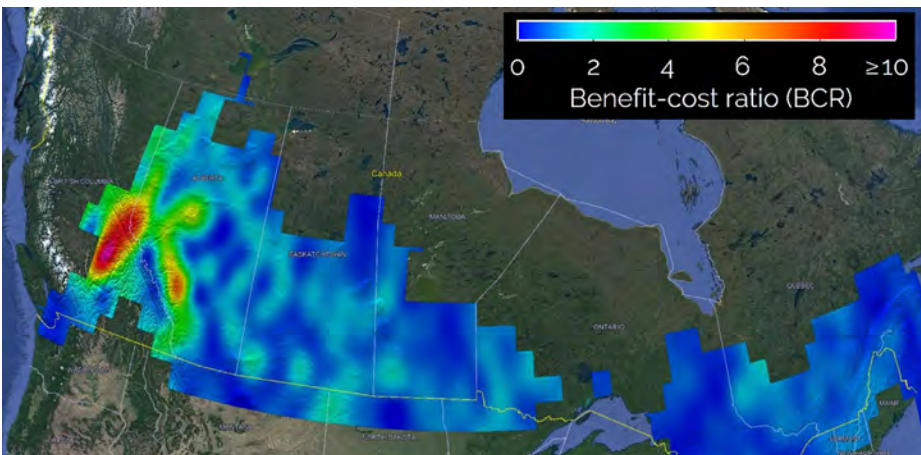





Figure 2. Benefit-cost ratio (BCR) for class-4 (the highest on a 1-to-4 rating scale) impact-resistant asphalt shingles. The shingles more than pay for themselves anywhere coloured light blue or warmer, wherever the benefit is more than 1 times the cost.


The costs and benefits scale up or down with roof size. Equations in the technical report show a mathematically-inclined reader how to scale the costs and benefits for different sized roof and different locations. Like all studies, this one has its assumptions, limitations, technical details, and suggestions for future research. See the technical report to learn more.


## Top findings of ICLR's benefit-cost analysis of impact-resistant asphalt shingles


 With performance-based engineering, we can do apples-to-apples comparison of costs and benefits of hail mitigation


 Impact-resistant asphalt shingles make financial sense for insurers and homeowners


 On an average-sized roof (170 m<sup>2</sup>, 1,800 ft<sup>2</sup>), they add about \$3,400 in cost, more for a bigger roof, less for smaller


 Their rubber-like qualities reduce the chance of damage by 15 times

 If damage does occur, impact-resistant asphalt shingles reduce the repair cost of damage by half: from \$2,400 on average to \$1,200 for the average-sized roof

 They pay for themselves wherever it hails almost once a year or more

 **BCR = 3:1** In Calgary, they pay for themselves within about 5 years on average, and eventually 3 times over. The benefit-cost ratio is 3 to 1.

 **BCR up to 8:1** In some places, they save 8 times their cost or more, assuming you repair the damage every time it occurs

 Climate change will make them more valuable



*A benefit-cost analysis of impact-resistant asphalt shingle roofing can be downloaded at [www.iclr.org](http://www.iclr.org)*



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