Institute for Catastrophic Loss Reduction
Building resilient communities

Institut de Prévention des Sinistres Catastrophiques
Construction de resilient communities

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Keeping roofs on in tornadoes

Institute for Catastrophic Loss Reduction and Western Engineering working to make hurricane ties mandatory in all new homes in Ontario

TORONTO: Woodbridge and Maple, Ontario (August 20, 2009), Midland, Ontario (June 23, 2010), Goderich, Ontario (August 21, 2011), Angus, Ontario (June 17, 2014), Dunrobin and Ottawa, Ontario and Gatineau, Quebec (September 21, 2018). These represent just a few Canadian communities that have been hit by tornadoes in recent years. In all cases roofs were ripped from homes, leading to total losses.

Lab and field research being conducted at Western University by Dr. Gregory Kopp and his team of wind engineers has found that a few low-cost measures can protect homes from extreme wind events, including tornadoes rated as high as EF2. These include use of hurricane ties – inexpensive metal fittings that connect roof trusses to walls.

“One of the problems with new home construction in Canada is that we essentially build homes so the walls keep the roof up. We don’t really consider uplift forces created by severe winds and the tendency of these forces to suck a roof upward,” says Dr. Kopp. “We need to build homes to keep roofs down. This involves doing something other than the typical building code practice of sinking three toenails through each truss into the top plate of the wall.”

In essence, if you lose the roof, you stand a better chance of losing the walls. Roof loss increases the chance that walls will collapse on people, injuring or killing them, allows large debris to enter the wind field causing more damage downstream (as well as deaths and injuries), and opens the home to water damage.

“The good news is that the fix to the roof uplift problem is relatively simple and quite inexpensive,” says Glenn McGillivray, Managing Director, ICLR.

This involves use of hurricane ties to provide a better connection between roof joists and a home’s walls. Hurricane ties cost anywhere from about 60 cents to $2 each, depending on the model chosen. With the average home requiring about 50 to 70 ties and one labourer about two hours to install – the total cost can come in below $150 for a home (including ties, fasteners and labour).

“As simple and inexpensive as they are, it is still very unlikely that homebuilders would opt to install hurricane ties without being told they must. So, the only way to get hurricane ties into new homes is by changing the building code,” says McGillivray.

To that end, ICLR has taken scientific findings gathered by Dr. Kopp and his team and made formal submissions to both the national and Ontario building codes to make hurricane ties mandatory in all new builds.

ICLR and Western Engineering are also investigating other building products and construction methods that could accomplish the same thing as hurricane ties with a view of giving homebuilders several options to address the roof uplift problem.

“If you ask a homeowner who has experienced damage from a windstorm if they would *pay* $150 to have prevented the loss of their roof, what do you think they would say?” asks McGillivray.

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Established in 1998 by Canada's property and casualty insurers, ICLR is an independent, not-for-profit research institute based in Toronto and at Western University in London, Canada. ICLR is a centre of excellence for disaster loss prevention research and education. ICLR's research staff is internationally recognized for pioneering work in a number of fields including wind and seismic engineering, atmospheric sciences, water resources engineering and economics. Multi-disciplined research is a foundation for ICLR's work to build communities more resilient to disasters.

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