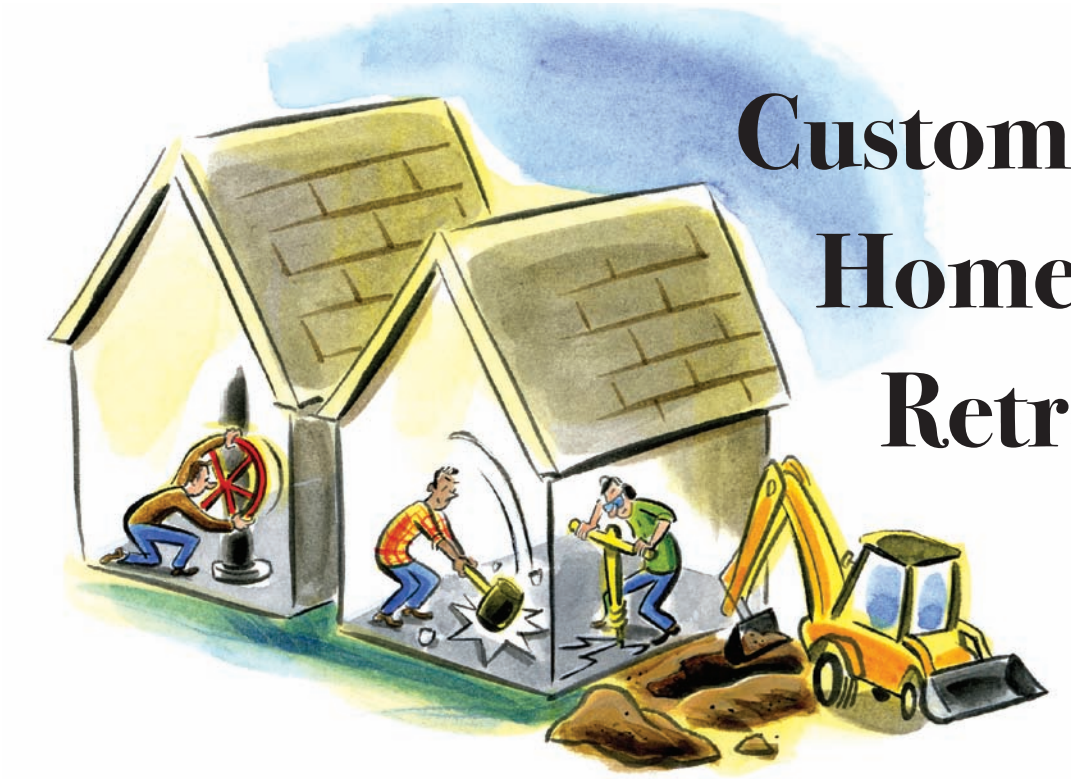

Customizing Home Retrofits

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Flood mitigation efforts need to account for individual differences in each home, neighbourhood and municipality.

Retrofitting homes to mitigate water damage brings to mind an old cliché: easier said than done. Anyone who has undertaken major home improvement projects would likely be all too familiar with this concept, and basement flood retrofits are no different. Indeed, each home to be retrofitted has its own idiosyncrasies that may increase the complexity of the retrofit.

Over the past few years, the Institute for Catastrophic Loss Reduction (ICLR) has retrofitted 10 Canadian homes to exemplify measures that homeowners can take to reduce risk from hazards that affect communities across the country, including severe wind, wildfire, earthquake and basement flooding. These retrofits were undertaken as part of ICLR's Designed for Safer Living *Showcase Homes* series, in which we conduct a home retrofit and invite the media and insurers to view risk reduction measures during National Emergency Preparedness Week.

Dozens of insurance professionals attend the events each year and often comment on the benefits of seeing on-the-ground application of homeowner mitigation options. Because of the localized nature of natural hazard impacts and differences in home design, all of the retrofits were undertaken as collaborative efforts with local municipalities.

The most important lesson learned is that every home, neighbourhood and municipality is different; mitigation measures must be tailored to suit these differences. Complications underscore the need for full understanding of home drainage systems before retrofit measures are installed and the need to communicate with a range of professionals, including municipal staff, plumbers and contractors.

However, any complexities should not detract from the importance of homeowner-level basement flood mitigation. Lot-level mitigation

Illustration by Sandy Nichols/www.threeinabox.com

continues to be an absolutely necessary piece of the basement flood risk reduction puzzle.

EXAMPLES OF MITIGATION

ICLR has retrofitted three homes since 2009 to reduce basement flood risk as part of this program. Our experience with basement flood retrofits highlights the complicated nature of home drainage systems and also the need to customize retrofits for each individual home.

Toronto, 2009

The first house ICLR retrofitted to reduce basement flood risk was in the North York area of Toronto. This home was located in an area that had suffered severe and widespread flooding during an extreme rainfall event on Aug. 19, 2005 and was at risk of future flood events.

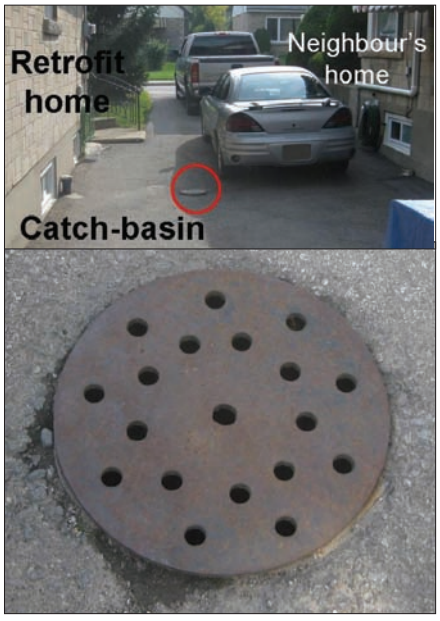
One of the first steps in any flood retrofit project should be a plumbing inspection by a licensed plumber, including a camera inspection of the home's sewer laterals. In this instance, the camera inspection revealed that a backwater valve had been installed without proper disconnection of the foundation drains from the sanitary sewer. This type of arrangement can cause "self flooding" in the home: when the backwater valve closes during an extreme rainfall event, water from the foundation drainage would not be able to exit the home and may backup into the basement through floor drains or bathroom drains and flood the basement. Thus, disconnecting the foundation drain from the sanitary sewer and installing a sump pump system to pump foundation drainage to the surface of the lot were necessary measures that we incorporated into the home. We also rearranged downspout drainage outlets, including installing a French drain system on a downspout that was discharging directly onto the home's driveway.

Hamilton, 2011

The home we retrofitted in Hamilton in 2011 had experienced a severe sewer backup flood on July 26, 2009 and was serviced by a combined sewer system. The homeowner had taken advantage of the City of Hamilton's basement flood retrofit financial assistance program, and had a mainline backwater valve and sump system. Downspouts were also disconnected from the foundation drain before ICLR conducted its work.

The existence of a driveway catch-basin complicated this retrofit, necessi-

Figure 1



tating installation of additional measures to reduce risk. This catch-basin was connected to the home's foundation drainage; surprisingly, it served to drain the neighbour's driveway, which was sandwiched between the two homes (See Figure 1 above). The catch-basin essentially transformed the neighbour's driveway into a huge funnel that directed massive quantities of rainwater into the foundation drainage and risked overloading of the sump pit and pump during heavy rainfall events.

This arrangement was a relic from a time when property developers did not fully appreciate and understand property drainage issues.

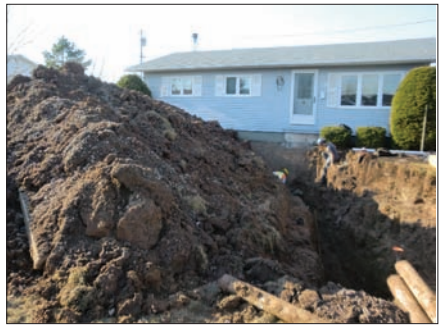
ICLR installed a second, large-capacity sump-pit and pump, as well as re-graded a part of the front yard to direct as much water away from the driveway catch-basin as possible. An automatic natural gas generator that could power the pumps in the event of a power outage was also installed. Had the catch-basin not been there, a simple backwater valve/sump pump arrangement would likely have been sufficient for the home, along with other relatively simple measures, including window well covers and disconnecting downspouts.

Moncton, 2012

ICLR's Moncton retrofit was conducted on a home that had experienced a severe sewer backup event when tropical storm Danny dumped heavy rain on the city in late August 2009. In this case, the home was serviced by a separated sewer system and sewage had backed up into the basement from the storm sewer. This home's plumbing arrangement necessitated the installation of backwater valves on the storm and sanitary sewer laterals, as well as a sump-pump system with a battery backup. A small part of the back yard was also re-graded to direct water away from the foundation, and window wells and window well covers installed on two basement windows.

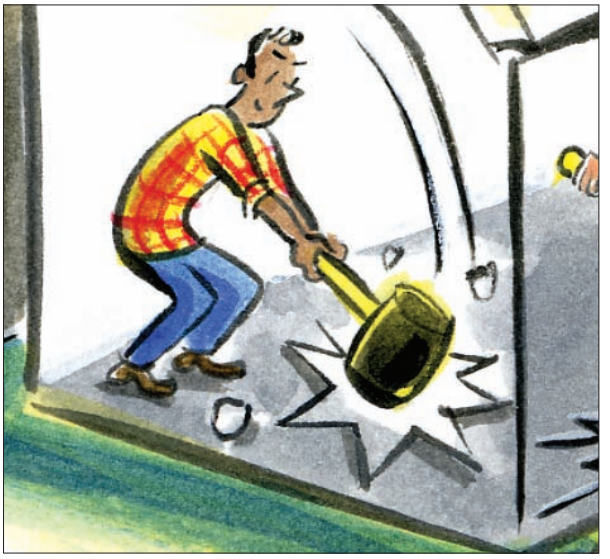
Two surprises were waiting for us in this home. First, when the plumbers conducted the camera inspection of the laterals on the day that the backwater valves were to be installed, they found that both laterals were full of standing water and sewage. Normally, sewer laterals are graded in a manner that directs

Figure 2



water away from the home quickly; they should never have any standing water. Based on the camera inspection, and before the backwater valves were installed, the laterals had to be torn up and replaced, requiring the excavation of the front yard (See Figure 2).

Second, when installing the window



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wells, the landscapers found that the foundation drains were plugged with silt and were not properly draining groundwater away from the home's foundation. Before the window wells could be installed, we had to clear out the foundation drainage using a large vacuum truck.

LESSONS LEARNED

Failure to disconnect the foundation drainage in the Toronto home meant the backwater valve would have provided little flood protection: the home could have still flooded from its own foundation drainage had the valve closed during a heavy rainfall event.

Further, in the Moncton home, backwater valves would have been ineffective — and may have even increased flood risk — if they were installed in the laterals when the laterals were full of standing water. In this case, replacement of the laterals was absolutely necessary to ensure the backwater valves would work properly.

Both of these examples illustrate the complex nature of basement flood risk reduction. A seemingly simple, straightforward installation of a backwater valve on the sanitary sewer lateral is not always an effective or meaningful risk-reduction option.

The Hamilton case study shows the need to balance the cost and benefits of mitigation measures, since it is sometimes difficult to implement perfect or ideal mitigation options in homes. For that home, ICLR explored the possibility of re-grading the neighbour's driv way and installing a permeable pavement system. This would have allowed us to eliminate the need for the catch-basin.

However, to implement this approach, huge quantities of fill would have had to be brought in to re-grade the driveway, causing significant disruption for the homeowner and neighbours. It would have also resulted in a cost in the tens of thousands of dollars.

We decided a second sump, a powerful pump and generator system, was a reasonable compromise.

Generally, plumbers and contractors with whom we worked to retrofit the homes were knowledgeable and did the work within a reasonable period of time. However, it was more difficult to find contractors and plumbers who were knowledgeable and willing to complete this type of work than expected. In some instances, it was necessary to convince contractors that certain flood reduction measures were necessary.

For example, we experienced push-back when we requested that the contractor locate the foundation drainage connection in the Toronto home. The contractor cited difficulties in locating the connection and the possible need to tear up several spots in the basement floor as reasons not to complete this measure. In the end, we insisted that the work be performed.

However, the contractor could have persuaded homeowners who were not confident in their knowledge of basement flood risk reduction that this measure was not worth the aggravation.

The retrofit process can be intimidating to homeowners who are not armed with clear, consistent information from authorities and who are not confident in their knowledge of what needs to be done to address basement flood risk. Some municipalities publish lists of plumbers who are knowledgeable about basement flood risk-reduction measures; others provide assistance in the form of home inspections to identify necessary flood-reduction options.

These are useful tools for homeowners who are interested in starting the retrofit process, but don't know where to begin.