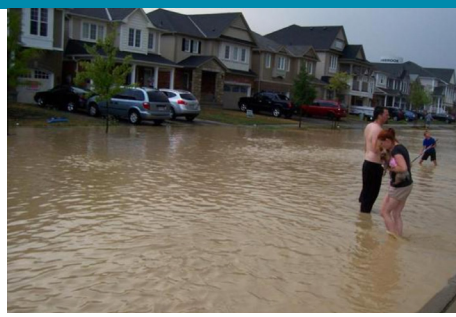
Basement flood protection: New construction



Basement flooding can occur even where well-defined major drainage systems are present, due to excess water entering sanitary sewers. Regional basement flooding occurred during this storm in Binbrook, where ~250 mm of rain fell in 3 hrs. (Photo: Weather Network)

This document provides **basic**, **enhanced**, and **resilience** level measures appropriate for any Part 9 building in Ontario to reduce risk of basement flooding.

Extreme, short-duration rainfall events overwhelm stormwater system capacity, resulting in flooding of basements from a combination of stormwater/overland flow, sewer backup, and seepage. Every year, thousands of households in Canada are affected by basement flood events, resulting in $100s of millions in damages, most of which are uninsured.

Unlike river flood events in Ontario, urban/basement flooding can affect almost any home when rainfall intensities exceed stormwater management system design standards.

As this document is meant to support pilot implementation of flood resilience, it focuses on basic flood protection options. Guidance concerning basic, enhanced, and resilience level measures are provided in the table below. Detailed guidance on basic measures are provided in the appendix to this document. Enhanced and Resilience level measures are outlined in CSA Z800:18 – *Basement flood protection and risk reduction*.

Protection level	Recommendations
Basic	• **Provide sanitary sewer backflow protection.** • **Provide backup power system(s) for sump pumps (where pumps are present).** • **Provide backwater valve and backup power maintenance guidance to the owner.** • **Where provided, backwater valves and sump pumps systems should be accessible for ease of maintenance.** • **Ensure lot grading and drainage directs water away from the building (applies only where local lot-grading and drainage bylaws are not present)** *See appendix for additional detail on basic basement flood protection options.*
Enhanced	Basic measures plus: • Provide enhanced grade on mainline backwater valve (between 3% and 8%). • Provide a well-graded, impermeable cap on backfill area, which extends beyond the line of excavation and backfill. • Provide enhanced surface flood protection for exterior stairwells (where present). • Eavestrough downspout and sump pump discharge points should be located beyond the backfill area, directed to appropriate receiving drainage systems. • Address foundation cracks and entry points for infiltration flooding. • Identify and seal all potential surface flood entry points (e.g., penetrations through foundations).
Resilience	Enhanced measures plus full application of remainder of CSA Z800:18, including: • Avoid installation of window wells. Where they are present, provide enhanced surface drainage protection. • Foundation drainage systems drain by gravity to receiving systems and are protected against backwater. Where this is not possible, drain to the surface via sump pump (avoid 3rd pipe systems). • Foundation drainage systems constructed in a manner that reduces risk of accumulation of debris over the life of the home. Access for foundation drain system maintenance is provided. • Enhanced provisions are made for possible sump pit overflow/sump pump failure. • Installation of sanitary sewer pipe complies with highest level of manufacturer guidance, with attention paid to grade, bedding, haunching, and backfill.

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Appendix: Detailed recommendations for achieving basic basement flood protection

Sewer backflow protection:

- Install backwater protection in sanitary sewer service lateral. Preferred product is a normally open, mainline valve. Valve/installation should comply with OBC 7.4.6.4. and manufacturer's instructions, including minimum grading requirements.
- Provide backwater valve maintenance information to homeowner.

Battery backup for sump pumps (where sump pumps are present):

- Provide a battery backup system for sump pump(s), installed based on manufacturer's instructions.
- Provide a sump pump failure alarm (may be integrated into battery backup system).
- Provide backup power operations, maintenance information to homeowner.

Ease of access:

- Backwater valve inspection chambers and sump pits should be located in areas that are easily accessible by the homeowner for inspection and maintenance.

Maintenance information:

- Provide manufacturers' recommended maintenance instructions for backwater valves and sump pump systems.
- Where these are not available, refer to www.backwatervalveinstallation.com for maintenance recommendations.

Lot grading and drainage (note that these options apply only where municipal lot grading and drainage requirements are not in place):

- Slope of backfill, up to and including 1.5 m away from the building, should direct surface drainage away from the house. The initial grade should be exaggerated to ensure that the final/post-settlement grade is at least 5%.
- Slope of the remainder of the lot (outside of the 1.5 m perimeter) should be at least 1.5% directed away from the building.
- Provide well defined swales between buildings.
- Lot grading should direct surface drainage away from window wells, exterior stairwells, and decks.
- Patios located next to foundation walls should have a positive grade away from the building (minimum 1%).
- Ensure that downspouts and sump pump discharge pipes (where present) discharge beyond the backfill zone to appropriate drainage features (e.g., swales).
- Do not install reverse sloping driveways, or any driveway or surface that may result in water accumulating near or against the building.

Image: Sewer backwater protection and backup power for sump pump