CSA Group

Z800-18
National Standard of Canada

Guideline on basement flood protection and risk reduction

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Preface

This is the first edition of CSA Z800, *Guideline on basement flood protection and risk reduction*.

The Guideline was prepared to assist relevant stakeholders in the mitigation of basement flood risk for new and existing *National Building Code of Canada* (*NBCC*) Part 9 residential buildings. Development of the Guideline was motivated both by current basement flood risk and by the potential for increased risk in many regions of Canada under changing climate conditions.

This project was made possible through the generous support of the National Research Council of Canada as part of its Climate-Resilient Buildings and Core Public Infrastructure Initiative.

The seed document for this Guideline was developed by the Institute for Catastrophic Loss Reduction (ICLR). It is expected that the Guideline will continue to evolve to reflect new technologies and information, and changing practice associated with *NBCC* Part 9 building construction, urban drainage, and infrastructure management.

We wish to acknowledge the contributions of Norton Engineering, the Institute for Catastrophic Loss Reduction, and the Intact Centre for Climate Change Adaptation during the development of this Guideline.

This Guideline was prepared by the Technical Committee on Basement Flood Protection under the jurisdiction of the Strategic Steering Committee on Construction and Civil Infrastructure, and has been approved by the Technical Committee.

This Guideline has been developed in compliance with Standards Council of Canada requirements for National Standards of Canada. It has been published as a National Standard of Canada by CSA Group.

Notes:

1) *Use of the singular does not exclude the plural (and vice versa) when the sense allows.*
2) *Although the intended primary application of this Guideline is stated in its Scope, it is important to note that it remains the responsibility of the users of the Guideline to judge its suitability for their particular purpose.*
3) *This Guideline was developed by consensus, which is defined by* CSA Policy governing standardization — Code of good practice for standardization *as "substantial agreement. Consensus implies much more than a simple majority, but not necessarily unanimity". It is consistent with this definition that a member may be included in the Technical Committee list and yet not be in full agreement with all clauses of this Guideline.*
4) *To submit a request for interpretation of this Guideline, please send the following information to* ***inquiries@csagroup.org*** *and include "Request for interpretation" in the subject line:*
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5) *This Guideline is subject to review within five years from the date of publication. Suggestions for its improvement will be referred to the appropriate committee. To submit a proposal for change, please send the following information to* ***inquiries@csagroup.org*** *and include "Proposal for change" in the subject line:*
   a) *Guideline designation (number);*
   b) *relevant clause, table, and/or figure number;*
   c) *wording of the proposed change; and*
   d) *rationale for the change.*

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Guideline on basement flood protection and risk reduction

0 Introduction

0.1 General

Basement flooding is usually associated with intense short- and long-term rainfall. It can also be caused by lot-level factors, system hydraulic factors, poor construction, lack of household preventive maintenance, etc. The consequent urban and rural flooding is the most significant cause of costly disasters in Canada, resulting in annual insured and uninsured losses of tens if not hundreds of millions dollars.

Beyond the immediate financial costs associated with flooding, there can be negative health impacts experienced by homeowners, which underscore the need to mitigate basement flood risk. Examples of possible physical health risks experienced by homeowners after flooding include bacterial and viral infections, exacerbated allergic reactions, asthma episodes, and related respiratory illnesses. The potential mental health impacts of residential basement flooding are also not insignificant and should be considered an additional reason to reduce the risk of basement flooding (for discussion of health risks associated with basement flooding and sewer backup, see Annex C). Vulnerable populations, such as those occupying basement apartments, are particularly prone to financial and mental stress following flooding.

Given the costs and impacts of basement flooding, this Guideline outlines measures that should be taken – primarily by homeowners, but also by anyone with an interest in home flood risk reduction – to limit such impacts at the level of the individual house (i.e., the focus of flood mitigation considered herein is “lot-level”).

Measures that are taken to limit flood risk generally fall into two categories (both of which are considered in this Guideline):

a) behavioural — this includes measures related to changing behaviours or adopting specific behaviours to reduce risk; and
b) physical — this includes physical changes made to buildings and properties to reduce and/or prevent flood damage. Efforts can address “basement flood protection ” (to prevent water from entering the basement and causing damage) and “ basement flood resilience” (to limit the amount of damage if water does enter a basement).

Additionally, homeowner measures can serve to reduce the basement flood risk for entire subdivisions or “drainage areas” by reducing the contribution of excess stormwater and groundwater to sanitary (referred to as private-side inflow/infiltration [I/I] reduction), storm, combined, and/or third pipe systems.

Annex A provides an outline of available private-side basement flood risk reduction measures and the functions of these measures.

0.2 Users

This Guideline is aimed at, but its use is not restricted to, the following stakeholders:

a) home and property owners — residential homeowners are increasingly being impacted by basement flooding. This Guideline provides direction on actions that can be taken to limit the potential for basement flooding. In many cases homeowners are able to apply these actions themselves (e.g., placing plastic covers over window wells), while in other cases the input of specialists/contractors is required (e.g., backwater valve installation);

b) governments (federal, provincial, municipal) — governments at all levels should better understand the growing threat that basement flooding presents to their constituents. This Guideline provides a foundation for informed dialogue on flood preparedness between politicians and their constituents;

c) developers and builders — developers and builders should factor flood resiliency into house design and construction. This Guideline provides direction to builders and developers regarding means to build more flood-resilient houses;

d) property and casualty insurers — insurers that cover property and casualty insurance can use this Guideline to reach out to their clients by providing direction on actions they can take to limit their chance of basement flooding and the consequent increases in insurance premiums;

e) banks, credit unions, and mortgage lenders — it is in the best interests of providers of home mortgages to limit the probability of basement flooding, as a flooded basement can cause a mortgagee to default on the mortgage. This Guideline will help to limit mortgage arrears;

f) credit rating agencies — credit rating agencies are increasingly factoring severe weather into the credit ratings of municipalities that might default on bonds following extreme weather events. This Guideline outlines the factors that can improve flood-readiness in communities, which, in turn, can be factored into credit rating assignments;

g) lawyers — cases pertaining to how home construction and design can impact flood potential are increasing. This Guideline provides direction to legal professionals regarding the fundamentals of home flood-protection preparedness;

h) tradespeople (e.g., drainage contractors, plumbers) — tradespeople asked to provide input to homeowners on basement flood risk mitigation can use this Guideline to better serve their clientele;

i) real estate brokers and agents — increasingly, as basement flooding becomes more prominent, real estate brokers and agents are being asked by clients about basement flood potential. This Guideline enables brokers and agents to provide informed responses to these inquiries;

j) home inspectors — increasingly, home inspectors are being asked to provide more detailed assessments pertaining to the vulnerability of basements to flooding. This Guideline enables home inspectors to provide better insight into basement flood potential and vulnerabilities;

k) securities commissions — the thirteen Canadian securities commissions require full disclosure of environmental risks that could influence a reasonable investor's decision to invest in the stock or bonds of a publicly traded company. This Guideline shows how flood preparedness should factor into residential community design and construction, and why flood risk should be disclosed by publicly traded companies;

l) institutional investors — institutional investments in residential real estate could be impacted by large-scale flooding. This Guideline will help to inform institutional investors about the flood risks related to residential holdings; and

m) educational institutes — universities (particularly engineering faculties) and colleges (e.g., those offering training in home inspection and building construction) will find this Guideline of direct relevance when educating students on the means and merits of home flood protection.

1 Scope

1.1 General

This Guideline covers measures to reduce the risks of basement flooding, and to mitigate the adverse effects on property, public safety, and public health in case of a flood event. It covers existing, new, rebuilt, and renovated houses in rural and urban settings.

1.2 Buildings covered

This Guideline covers all types of ground-related houses, with or without basements, that are considered Part 9 buildings according to the *National Building Code* (*NBC*) including

a) detached houses;
b) semi-detached houses; and
c) row houses.

Recommendations made in this Guideline are generally appropriate for houses serviced by gravity-based storm, sanitary, combined, or third pipe systems.

1.3 Types of flood hazards

The types of flood hazards addressed by the measures described in this Guideline are

a) overland flooding associated with precipitation events and resulting in the accumulation/ponding of rainwater and/or snow melt in and around ground-related houses;
b) storm and sanitary sewer backwater (surcharge);
c) infiltration flooding (groundwater seepage);
d) plumbing and drainage failures, including failure of sump systems and sewer lateral failure; and
e) flooding associated with improper installation of basement flood risk-reduction technologies (see Annex A).

Note: *Users of this Guideline are reminded that any of the provisions outlined herein are subject to existing codes and standards that are applicable in the jurisdiction under which the Guideline user is operating. It is strongly recommended that appropriate licensed professionals conduct any work outlined in this Guideline. All appropriate local, provincial, and national codes and standards must be adhered to in the application of the provisions outlined herein. All appropriate permits and inspections from authorities having jurisdiction must be obtained when undertaking any of the work outlined here.*

2 Reference publications

This Guideline refers to the following publications, and where such reference is made, it is to the edition listed below, including all amendments published thereto.

Note: *See also Annex E.*

CSA Group

CAN/CSA-C22.2 No. 108-14
Liquid pumps

CAN/CSA-E60335-2-41-13
Household and similar electrical appliances — Safety — Part 2-41: Particular requirements for pumps

Alberta Safety Codes Council

STANDATA Building Code Bulletin 06-BCB-009R1
Disaster Recovery Program Flood Mitigation Measures, Government of Alberta

