

# Foundations, Basements and Crawlspace: Thermal and Moisture Performance

## Books and Research Reports

Canada Mortgage and Housing Corporation

*Monitoring the Performance of a Retrofitted Preserved Wood Foundation*

Ottawa: Canada Mortgage and Housing Corporation

2003

“This research describes the monitoring of corrective measures used to retrofit a preserved wood foundation in an Ottawa house, where mold growing inside the foundation caused sensitivities for the occupants. After an internal retrofit involving the continuous venting of the affected wall to the outside, addition of cellulose-fill insulation in the wall cavities and the addition of a new vented plywood baseboard, 80 sensors were placed in the affected area and monitored over a winter/spring season. Results were generally successful, but additional measures could have been taken.”

Available at: CMHC

Canada Mortgage and Housing Corporation

*Performance of Sprayed Polyurethane Foam on Indoor Foundation Walls*

Ottawa: Canada Mortgage and Housing Corporation

2004

“Many homeowners choose to insulate their basement walls with either rigid insulation panels or fiberglass batts, but some choose a more expensive process: sprayed polyurethane foam, applied by specialists. This research examined the medium and long-term performance of this product. Results demonstrate that when applied properly to dry foundation walls, it retains its adhesion and cellular homogeneity properties very well. Previous research concluded that it does offer some advantages over traditional insulation.”

Available at: CMHC

Canada Mortgage and Housing Corporation

*Economic Assessment of Residential Basement System Insulation Options*

Ottawa: Canada Mortgage and Housing Corporation

2007

“This study updates a 1999 economic assessment of residential basement systems in order to better reflect the rising costs of basement construction and space-heating energy. To analyze the various basement insulation options, this study examined capital costs of basement systems and improvements, builder carrying costs and profit margins, and energy prices and forecasts. Computer simulations were also performed to determine the energy performance of three basement classes in five Canadian cities.”

Available at: CMHC

Canada Mortgage and Housing Corporation

*Development and Assessment of Crawl Space Remediation Strategies*

Ottawa: Canada Mortgage and Housing Corporation  
2008

“The crawl space of a building may be compromised by poor management of rainwater, piping leaks and mold growth, among other problems. This Research Highlight documents how well remediation strategies work over the long term. Reviewing large residential crawl spaces remediated in the past, researchers found that well-planned and implemented remediation projects can turn highly deteriorated crawl spaces into functional and durable building components that ensure the long-term stability, performance and sustainability of the building.”

Available at: CMHC

Canada Mortgage and Housing Corporation  
*Long Term Performance of Slab-on-Grade House Foundations in Regina, Saskatchewan*  
Ottawa: Canada Mortgage and Housing Corporation  
2009

“This project documents the performance of slab-on-grade house foundations built on deep clay expansive soil conditions in Regina Saskatchewan between 1955 and 1960. The conditions and observations reflect common conditions found in Regina, even with full basements, and apply only to similar conditions. Slab-on-grade foundation performance in other areas on different soil conditions would be different.”

Available at: CMHC

Homeowner Protection Office  
*At-Grade and Below-Grade Assemblies*  
Vancouver: Homeowner Protection Office  
2011

Most multi-unit residential buildings today include multiple levels below ground level. These below-grade spaces are typically used for automobile and bicycle parking, storage, and mechanical and electrical rooms. Conditioned, occupied spaces below-grade are less common. Water ingress into below-grade spaces is one of the primary building performance issues, can be a nuisance to occupants, and may result in damage to the reinforced concrete structure over the long term.

Swinton, M.C. and Kesik, T.J.  
*Performance Guidelines for Basement Envelope Systems and Materials : Final Research Report*  
Ottawa: Institute for Research in Construction, National Research Council Canada  
2005

“A survey of new home warranty programs across Canada showed that the combined action of water and soils on basements was responsible for most major basement failures in new homes in 1994 and 1995. Frost action on basement walls was cited as a contributing factor in 40% of the failures; swelling clays (resulting from strong fluctuations of wetting and drying in clay soils) were responsible for another 36%; and frost action on the footings, a high water table and the presence of water-borne soluble salts contributed another 9%, for a combined total of 85% of all failure cases surveyed. This survey led the National Research Council (Institute for Research in Construction) to undertake a basement research project, which was guided by a large industry steering committee broadly representative of the issues. After completion of the research, this comprehensive

publication on basement guidelines was developed. The guidelines will facilitate the design and construction of cost-effective basement systems that will achieve satisfactory performance in a cold climate like Canada's. They are intended for technical decision-makers in the home building industry along with material manufacturers, home warranty agencies, building officials, as well as educators. The guidelines are divided into six parts: 1) performance requirements; 2) envelope system selection; 3) materials and equipment; 4) critical design details; 5) quality assurance; 6) cost-benefit analysis”  
Available at: NRC-IRC

## Articles

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