RESEARCH HIGHLIGHT

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Cold Climate Radon Mitigation

INTRODUCTION

Radon is a radioactive gas. Exposure to high levels of radon has been associated with an increased risk of lung cancer, depending on the time length or exposure. In 2007, as a result of new scientific findings, Health Canada (HC) lowered the federal indoor radon guideline for dwellings to 200 Bq/m³ after consultation with provincial and territorial officials. As a result of this change, housing stakeholders have been exploring options for radon preventative measures for new houses to be included in building codes and the development radon testing and remediation measures for existing houses. As these initiatives advanced, it became clear that experience with, and knowledge of, effective and efficient radon mitigation measures were limited in Canada.

In contrast, since the mid-1980s radon mitigation has been a relatively common activity in the United States (US) that has been supported by research and programs from the government's Environmental Protection Agency (EPA) and others. As a result, radon mitigation in the US is undertaken following the methods, systems and designs prescribed in guidelines such as the American Society for Testing and Materials (ASTM) E2121-09 "Standard Practice for Installing Radon Mitigation Systems in Existing Low-Rise Residential Buildings". While most American installations use a fan and exhaust venting located outside the house envelope, there is a concern that the system could be susceptible to ice build up particularly in colder regions.

The objective of this research project, conducted by a recipient of funding under Canada Mortgage and Housing Corporation's External Research Program, was to investigate how radon mitigators who work in cold climates similar to that of Canada were successfully conducting radon mitigation work. The research focused on whether or not the mitigators follow the ASTM standard with respect to the location of the fan, the location, and orientation, of the discharge pipe termination or whether alternative approaches were taken – particularly to deal with ice build up. The intent of the recipient was to document and share the experiences of radon mitigators with those involved in the development of radon mitigation measures for Canada.

Figure 1 Frost covered radon vent in Winnipeg
Photo credit: Harry Johnson

Canada

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HOME TO CANADIANS

METHODOLOGY

The recipient, a radon remediator, contacted fifty or more radon mitigation contractors in the colder states (which resemble Canadian climates) and several European countries, to see whether they were using the ASTM standard or whether they had modified the advice to better suit colder climates. The recipient restricted the American interviews to mitigators certified for radon work by NEHA (National Environmental Health Association) and NRSB (National Radon Safety Board). A "guided conversation" approach was taken that allowed the researcher to fill in answers to the survey questions as the conversation progressed.

RESULTS

The recipient reported that all mitigation contractors contacted located the fan outside the house envelope and had the radon vent discharge at or above the roof level. No one volunteered that they were using side-wall venting or fans located inside the house. There were reports of icing in the venting systems and suggestions were received of various ways to reduce the possibility of icing. These included the following:

1. Locating the fan and ducting as much as possible within an attached, preferably heated garage. Note that heated garages are common in Alaska but rare in most of Canada.
2. Locating the ducting inside the house and the fan inside the attic, which usually is marginally warmer than outside in winter.
3. Having condensate drains installed to avoid moisture accumulation in the ducts.
4. Locating the fan as close to the end of the ducting as possible to minimize condensation problems with the fan itself.
5. Avoiding rain caps and animal screens, which restrict the free flow of the soil gases to outside and lead to increased icing.
6. Insulating the ducting that is outside of the heated portion of the house.

Most of these recommendations will increase the cost of an active subslab depressurization system compared to the rudimentary outside duct system.

CONCLUSIONS

The results indicate that the radon remediation contractors contacted report that an outside fan and vertical ducting to the roof work adequately in the more temperate parts of the US and are not experiencing major icing problems.

IMPLICATIONS FOR THE HOUSING INDUSTRY

This External Research Program-funded project looked to American (and European) experience with radon mitigation in cold climates to see if radon vent icing is a substantive issue. The results reported by the recipient indicate that an outside fan with vertical ducting to the roof works adequately in the more temperate parts of the US. However, for the colder parts of the continent additional protective measures may be required to avoid icing, such as vent insulation or locating the vent in a heated location.

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