Research & Development Highlights

Technical Series
90-231

Crawl Space Ventilation and Moisture Control in British Columbia Houses

Introduction

Crawl spaces are a common feature in new houses in the Lower Mainland area of British Columbia. Current national and provincial building codes require crawl spaces to be vented in an effort to maintain low moisture levels. This wastes a fair amount of energy if the crawl space contains heating ducts and registers.

The Technical Advisory Committee of the B.C. Canadian Home Builders' Association had received many queries on how to deal with crawl space design and inspections. They asked CMHC to investigate the use of ventilation to control crawl space moisture levels.

Research Program

The contractor first surveyed the B.C. building community and existing literature to determine the scope of the problem and solutions already suggested. They selected ten houses of varying styles, all built within the last eight years, and tested the crawl spaces for moisture levels, airtightness, soil conditions, etc.

Because of the difficulty in obtaining houses, the sample is probably not representative of the housing stock. Remedial measures were applied to four of the houses in the survey. In most of these cases, the contractor was able to test conditions before and after the measures were applied.

Findings

- Five of the ten houses had no crawl space vents initially, although four of these had vents retrofitted. Three houses had vents that were closed and stuffed with insulation baus. No house had as much venting as required by code. There was no particular correlation between the number of vents and the crawl space moisture level.
- The crawl space unintentional leakage area to the outside was roughly equivalent to the leakage area provided by the vents. In houses with forced air ducting in the crawl space, the leakage area between the crawl space and house was usually large. This means that a vented crawl space is generally venting the house as well. Those houses with radiant heating (ie. no ducts) had a much smaller leakage area to the crawl space. Design details for radiant-heated houses and forced air heated houses will have to differ.
- Moisture content of the wood members in the crawl spaces was usually less than 28%. Problem areas included the plate for a pony wall, which rested on an inadequately raised footing.
- Foam insulation applied to the walls was frequently bowing, due to inadequate attachment methods. This rendered it useless as insulation, and increased condensation on wall surfaces behind the insulation.
- The moisture-troubled houses had drainage or other groundwater problems. Houses with well drained soils had no crawl space moisture problems, regardless of whether they had vents. Good polyethylene moisture barriers under the slab could prevent much of the wicking of groundwater and consequent high crawl space air moisture levels. It is difficult to retrofit a solution to sloppy site preparation.

The following pages show three crawl space diagrams: a typical design as produced by the architect; the actual crawl space as commonly built; and the design changes recommended by the research contractor.

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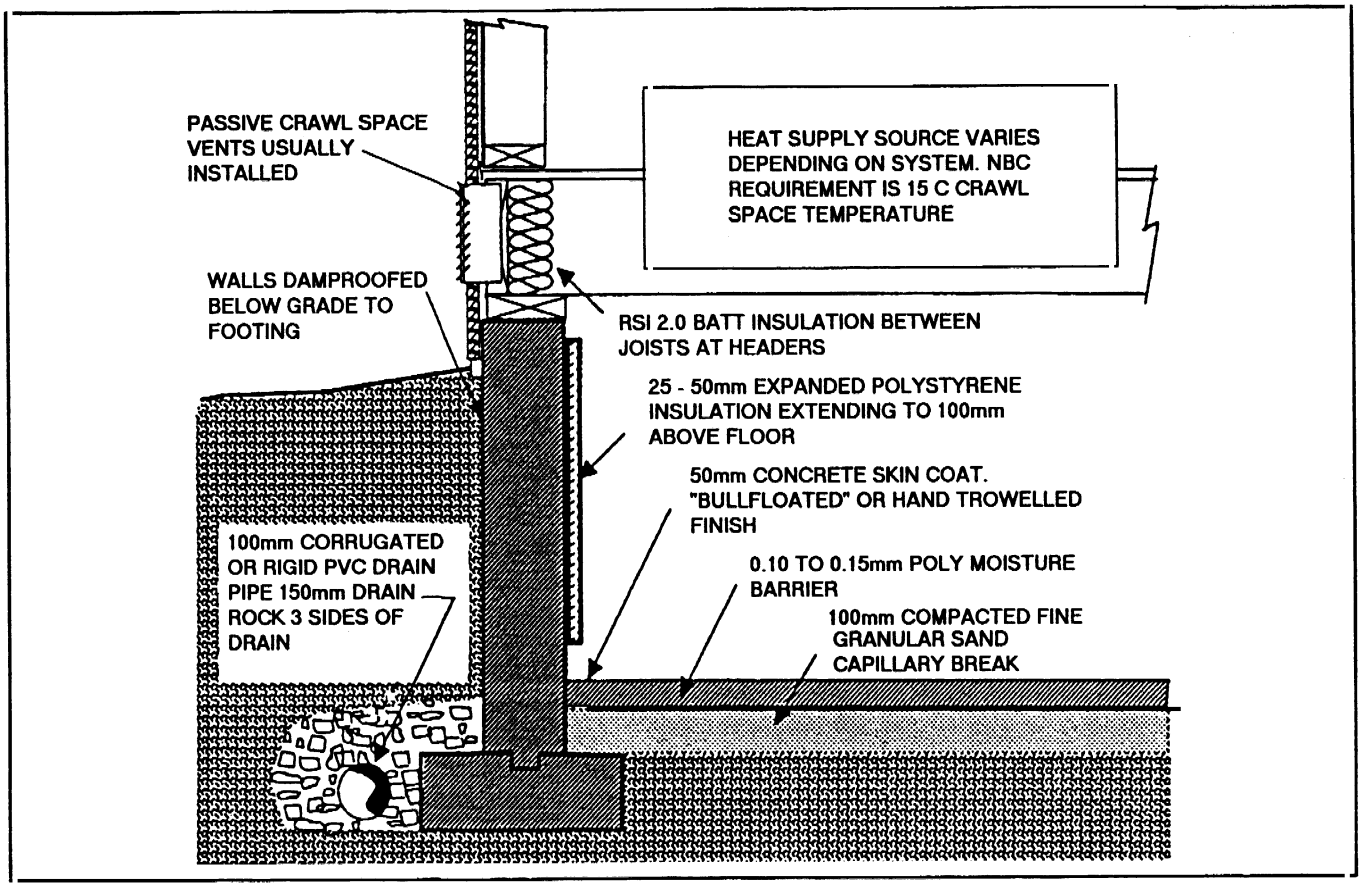

Figure 1: Typical design for a heated crawl space

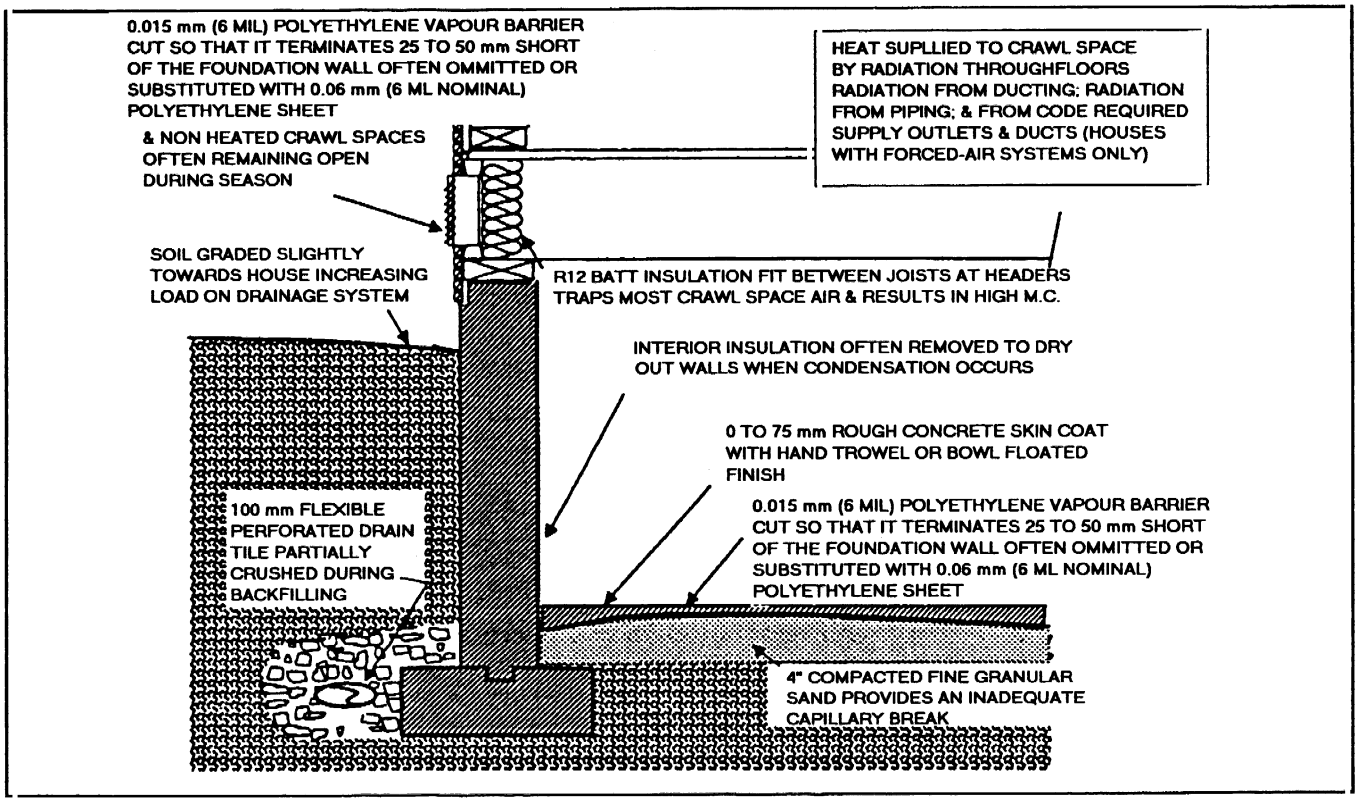

Figure 2: Typical crawl space as actually constructed, showing problems identified in the study

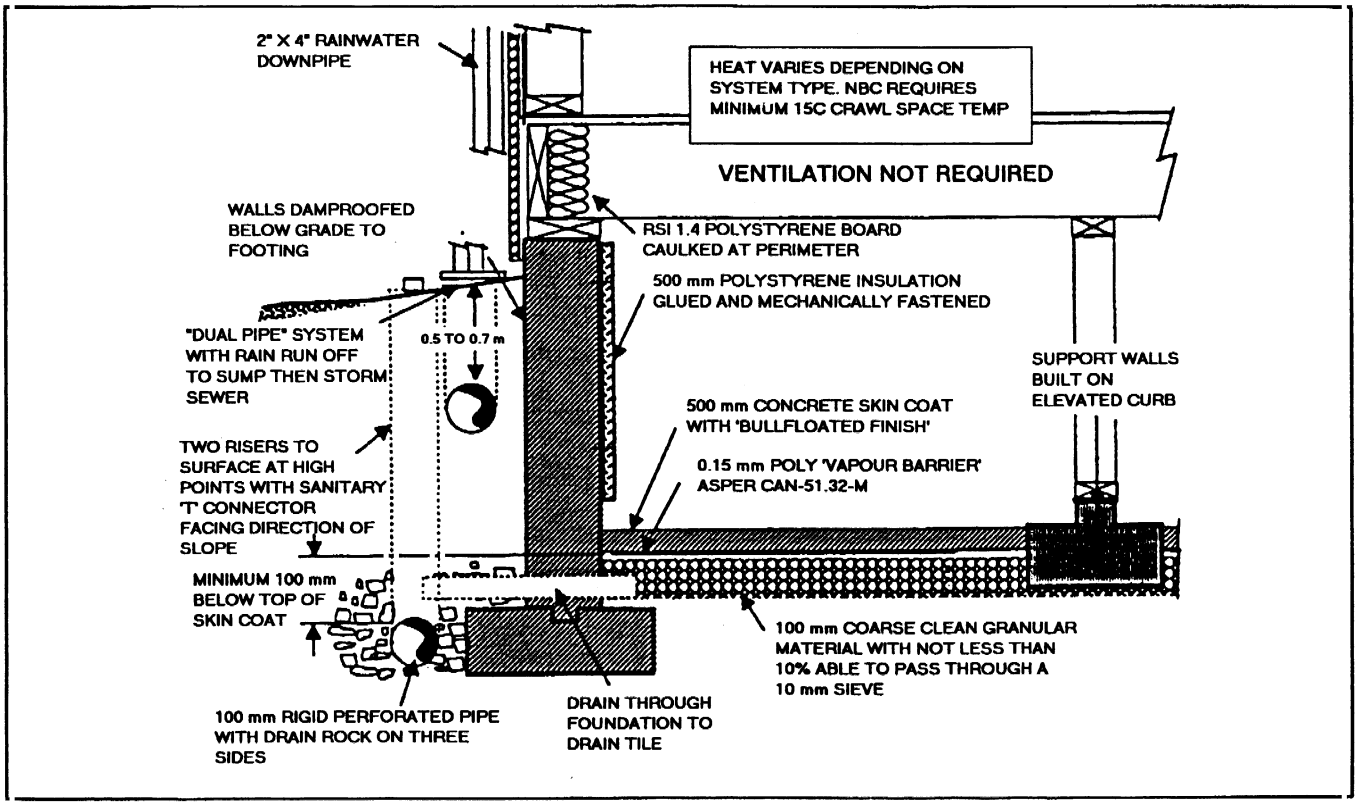

Figure 3: Suggested design for an effective crawl space moisture control system

Implications for the Housing Industry

- Current codes are not being interpreted uniformly and were not followed in any of the ten houses visited. The codes should be changed to make them more clear and enforceable.
- Venting is not necessary for a well-drained, forced-air heated crawl space. In other words, if the crawl space is built like a small basement, it does not require additional venting to the outside.
- The 1990 NBC requirement for polyethylene under the slab should greatly reduce the moisture generation rates in crawl spaces.
- Builders cannot count on crawl space venting to take care of moisture problems. The vents do not necessarily provide adequate or appropriate ventilation, and householders often close louvers or block openings. Improved control of groundwater is preferable and more reliable. Some details were suggested by the contractor, and these may not entail significant costs beyond current practice.
- There are a number of areas where additional research is required: crawl space ventilation in houses without forced-air heating systems; ways to moisture-proof the tops of foundation walls; and the time required to air out moisture after construction.

Project Manager: Don Fugler

Research Report: Investigation of Crawl Space Ventilation and Moisture Control Strategies for B.C. Houses (1991)

Research Consultant: Sheltair Scientific Ltd

A full report on this research project is available from the Canadian Housing Information Centre at the address below.

Housing Research at CMHC

Under Part IX of the National Housing Act, the Government of Canada provides funds to CMHC to conduct research into the social, economic and technical aspects of housing and related fields, and to undertake the publishing and distribution of the results of this research.

This factsheet is one of a series intended to inform you of the nature and scope of CMHC's technical research program.

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