



Research & Development Highlights

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Study of Houses Affected by Hazardous Lands

Introduction

Soil gas infiltration into houses is a contributing factor to the degradation of indoor air quality. Housing located on or near contaminated lands may be more apt to suffer from soil gas problems. This project was initiated to give a qualitative breakdown of the incidence of soil gas infiltration problems in housing in Canada today.

Research Program

A Canada-wide survey was undertaken to identify:

- incidents of soil gas contamination into housing;
- the types of soil gas contaminants found;
- the effect of these soil gases on indoor air quality, occupant safety and health; and
- the remedial measures taken and the relative success of these measures.

The main sources of information regarding soil gas infiltration come from governmental organizations, media reports, and engineering contractors who specialize in soil gas remediation.

As a large body of research into radon gas already exists, this study expressly focussed on other types of soil gas contaminants.

Findings

Three major types of soil gases were identified as causing the majority of incidents in Canada. These were petroleum hydrocarbons, methane, and miscellaneous volatile organic compounds (VOCs).

Petroleum hydrocarbons were identified as the most common soil gas problem, as a result of the number of leaking underground storage tanks and the spillage of home heating fuel and gasoline. These incidents were readily identifiable due to the characteristic odours. Typically, remedial measures were implemented quickly and long-term high dose exposures were extremely rare.

Methane gas infiltration was the next most frequent occurrence. Sources for methane included natural sites,

such as swamps and peat bogs, as well as industrial sources and landfill sites. Methane gas, even at low concentrations, is recognized as a safety hazard and as such many well documented studies exist.

VOC contamination was the least frequently documented problem. Sources for VOCs included the offgassing of contaminated groundwater, local spills, illegal activities, and the migration of trace gases from landfill sites.

During the course of this survey a number of obstacles were encountered which prohibited the complete assessment of every reported incident.

Most significantly, there were inconsistencies in jurisdictional authority across the country. In many instances, jurisdictional authority extended to natural problem lands such as methane-emitting peat bogs, but not to human-made contaminated sites. Other authorities had jurisdiction over outside soil gas problems but not over indoor air quality. Thus, depending on the type of problem, location of the problem, and area of the country, any number of authorities could be called in, including the local fire department, municipal officials, Ministry of the Environment, Ministry of Health, Ministry of Labour, and Ministry of Natural Resources.

Another key problem was the issue of confidentiality. Many authorities would or could not impart information due to fear of public outcry.

Another inconsistency discovered in this study concerned the investigation protocol in the event of a soil gas incident. The study found that approaches used for various soil gas incidents did not follow any set protocol. Monitoring techniques, equipment, action levels (e.g., evacuation), and remediation techniques varied from case to case, with some being more appropriate than others (see following table).

Remediation techniques were defined as either house-based or source-based. House-based remediation included sub-slab venting, pressurized air curtains, liners, sealing and caulking, and plumbing corrections. Source-based control included soil vacuum extraction, passive venting, liners, pressurized air curtain, and soil excavation.

Implications for the Housing Industry

The survey and its appendices give a comprehensive overview of the situation in Canada. The information contained in the report, and in appended case studies, provide many examples of situations where soil gas incidents have occurred. It may be instructive for municipal officials, builders, developers, or engineers to look over the listed examples, particularly when considering development of land near potential soil gas problems. Follow-up studies are in progress at CMHC.

This report highlights a number of inconsistencies with respect to jurisdiction, monitoring and remediation protocol of soil gas problems in housing.

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Research Report: Study of Houses Affected by Hazardous Lands (1992)*

Research Consultant: CH2M Hifi Engineering Ltd.

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

Summary of the Three Most Commonly Found Soil Gases

Types of Pollutants	Sources	Range of Action Levels
Petroleum Hydrocarbons	Leaking underground storage tank, fuel oil/gasoline spill, leaking gas pipe	Occupational guidelines or Occupational guidelines divided by 1000 or Dissipation of fumes
Methane	Underground mines, landfill, organic fill, decomposing woodchips, peat bogs, swamps, marsh lands, sewage	Indoor levels of 1000 parts per million (ppm) methane for two weeks or Indoor levels of 5000 ppm or Soil gas levels of 50,000 ppm by house
Miscellaneous VOC's	Illegal dumping, contaminated soil, hazardous waste landfill, former industrial sites	Indoor levels must meet outdoor regulations or Comparison with neighbouring houses or Comparison with existing studies

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.

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