Research & Development Highlights

95-203 Technical Series

Field Tests of Remedial Measures for Houses Affected by Hazardous Lands

Introduction

Urban development has encroached on hazardous lands such as old industrial sites or landfills. Problems on or near these sites has prompted the study of soil gas emission and control measures.

CMHC has conducted several studies on or near hazardous lands, including its own property in Kitchener, Ontario; see *Kitchener Townhouse Study* (1989) (1990). A second project involved a general survey of hazardous lands across Canada - the problems, sources and, where indicated, the solutions. See *Study of Houses Affected by Hazardous Lands (1992).* While the report gave a good overview of the current situation in Canada, it did not include any detail on the testing of remedial measures.

This third project was designed to evaluate the effectiveness of four remedial measures for the control of soil gas (e.g. methane) intrusion into houses. All four measures were house-based as opposed to source-based controls of landfill emissions, for instance.

Research Program

Nine houses from four different communities were identified as having potential methane intrusion problems. In each community a different control measure was studied. The areas and their control measures included:

A former swamp overlaid with organic fill - subslab passive collection system with sub-floor liner.

B buried refuse on site - active venting perimeter collection system.

C adjacent to a former landfill site - passive venting perimeter collection system.

D former farmland consisting of organic soils and peat - liner system only.

In all cases previous monitoring had indicated the presence of methane with potential for intrusion. Monitoring for this study spanned from March 1993 to March 1995 with all areas being monitored under winter or spring conditions.

Continuous monitoring was carried out for indoor methane concentrations, soil gas pressure, temperature, CO_2 concentration, and crawlspace absolute humidity (where applicable). Barometric conditions were obtained from the local airport, and subsurface methane concentrations were measured periodically. Site visits were conducted to calibrate monitors, download data and take methane spot checks.

Findings

Houses in all four communities had low indoor methane levels. Spot testing during site visits usually indicated concentrations consistent with background levels. Recorded indoor concentration fluctuations were attributed to temperature effects on the methane monitoring devices and excessive zero drift. The most erratic fluctuations, in house C, were actually due to the homeowner's habit of leaving the windows open all day as well as a leaky fitting near the furnace.

Barometric declines coincided with increases in soil gases pressures in areas B and C but did not lead to increases in indoor methane concentrations anywhere. In area B, low indoor methane concentrations could be attributed to a lack of significant soil gas pressures and concentrations and relatively tight soils.

Area C had higher soil gas concentrations but the presence of meltwater in the soil pore space inhibited movement of subsurface soil gas.

Area D showed varied methane concentrations in the soil gas around the building perimeters but low indoor concentrations. Dl showed a concentration decrease during periods of high stack possibly due to increased infiltration and crawl space air change rates. The highest indoor concentration increase followed an increase in outdoor temperature after several days of cooler weather and cloud. D2's indoor concentration showed some correlation with high humidity and outdoor temperature but not with stack effect or barometric decline.

Tracer gas testing on area A (subslab passive venting system and liner) indicated that the system is working well. No conclusions could be drawn for area B (active venting system) due to negligible methane levels in the soil gas. Moreover, the exhaust fans in two of the houses were off for the entire monitoring period.

While methane levels were higher in the soils of area C (passive venting system), indoor levels remained below 100 PPM. Low soil permeability in this area likely play a key role in restricting methane migration.

Area D (liner system only) had higher methane soil gas concentrations but negligible soil gas pressures. Under these conditions the liner worked well.

Implications for the Housing Industry

All four control measures for the mitigation of methane from hazardous lands worked well under conditions of relatively low soil gas concentrations and pressures.

Their performance under more severe conditions - higher source strengths or soil gas pressures and permeable lands - is still uncertain. However, the areas tested here are indicative of a large percentage of hazardous lands being redeveloped in Canada, and the measures tested here should be suitable for many houses.

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Research Report: Field Tests of Remedial Measures for Houses Affected by Hazardous Lands (1995)
*Research **Consultant:** CH2M Hill Engineering Ltd.*

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

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