



CONSERVE

Energy through Greater Efficiency

BUILDINGS | CARBON CAPTURE AND STORAGE | FUEL CELLS | NUCLEAR | POLICY | PLANNING
RENEWABLES | SMART GRID | STORAGE | SUSTAINABLE MOBILITY | SUSTAINABILITY ANALYSES



FOUNDATIONAL RESEARCH INTO ENERGY-EFFICIENT BUILDINGS

Pooneh Maghoul

Canadians burn a lot of fuel to keep our buildings warm in winter. WISE researcher Pooneh Maghoul believes a key way to cut heating bills and reduce our carbon emissions lies beneath our feet.

The geotechnical engineer set out to better understand the heating, cooling, freezing and thawing that occurs in the soil surrounding building foundations. These are processes that depend not only on air temperature and heat loss from the building but also on the level of moisture in the soil.

Maghoul created a numerical model of coupled heat and mass transfer and validated it by comparing her results with experimental data published by other researchers. She then applied her model to a case study of soil around an insulated basement, creating a detailed picture of how soil temperature and ice distribution vary during the year.

This research provides valuable information for improving the energy efficiency of Canadian basements: the next logical target now that most buildings are well-insulated above-ground. In today's homes, as much as 30 to 50 per cent of heat loss occurs below ground.

Maghoul's findings can also be applied to the design of geothermal pile foundations. This zero-carbon technology incorporates geothermal pipework into the foundation piles that support buildings. In the winter, the pipework transfers heat from the surrounding soil to the building via a heat exchanger, providing warmth. In the summer, the system can run in reverse, keeping the building cool.

For all these reasons, this is research that should be warmly embraced by Canada's building sector.

Researcher(s): Pooneh Maghoul

Partners: IREQ

Source: Maghoul, P. (2017). Numerical Simulation for Foundations Energy Efficiency in Cold Region. *Poromechanics VI*.

[READ FULL ARTICLE](#)