

# Accepted Manuscript

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PII: S0360-1323(17)30448-1

DOI: [10.1016/j.buildenv.2017.09.034](https://doi.org/10.1016/j.buildenv.2017.09.034)

Reference: BAE 5113

To appear in: *Building and Environment*

Received Date: 14 July 2017

Revised Date: 29 August 2017

Accepted Date: 29 September 2017

Please cite this article as: Ismailos C, Touchie MF, Achieving a low carbon housing stock: An analysis of low-rise residential carbon reduction measures for new construction in Ontario, *Building and Environment* (2017), doi: 10.1016/j.buildenv.2017.09.034.

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# Achieving a Low Carbon Housing Stock: An Analysis of Low-rise Residential Carbon Reduction Measures for New Construction in Ontario

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## Abstract

Residential buildings contributed 14% of Canada's greenhouse gas emissions in 2014, making this sector pivotal to climate change mitigation. In 2016, the provincial government of Ontario, Canada mandated a net-zero carbon standard for new "small buildings" by 2030, meaning the low-rise residential sector must undergo major changes to meet this target. Through an energy modelling analysis of a typical single-family home in Ontario, this study demonstrates the potential carbon emissions savings of different reduction strategies, including changes to the building envelope and mechanical system. The most effective strategies include increasing building airtightness, installing additional exterior insulation, and switching to an air source heat pump for heating and cooling. These strategies were then analysed based on the incremental cost above a house built to the building code baseline. In terms of cost per kilogram of carbon mitigated, the most efficient strategies are further insulating the basement, adding additional exterior insulation, and increasing the efficiency of the heat recovery ventilator. Finally, a policy discussion demonstrates that carbon reductions implemented at the design stage must be verified and monitored post-occupancy using policy tools such as energy reporting and small-scale performance studies.

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