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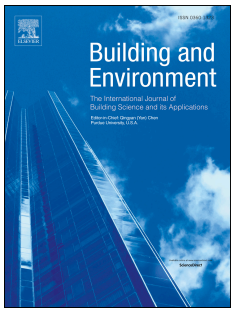

A univariate and multiple linear regression analysis on a national fan (de)Pressurization testing database to predict airtightness in houses

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A Univariate and Multiple Linear Regression Analysis on a National Fan (de)Pressurization Testing Database to Predict Airtightness in Houses

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Abstract

A detailed study of a large national airtightness database was undertaken. Univariate analyses and multiple linear regression based on air change rate and normalised leakage was performed. Univariate analyses revealed important regional and national airtightness trends. Equations predicting pressurised air leakage were developed based on Canadian homes at the pre-retrofit stage. This data set contained homes in 11 of 13 of provinces/territories throughout Canada. Air leakage was examined by building jurisdiction, overall building height, building volume, build date, heating degree days, and enclosure insulation levels. Pearsons correlation coefficient for 3-variable models were moderate in strength explaining 32% to 35% of the variability in both the ACH and NL based air leakage metrics respectively. Improvement in model strength was demonstrated using a 330,000 home dataset in conjunction with an 8-variable model. The 8-variable model raised the explanatory power between 46% to 48% for the ACH and NL metrics respectively. The study established a potential lower bound for future regression based airtightness prediction models across Canadian households.

Keywords: air tightness, air leakage, univariate, blower door, multiple linear regression, ACH, normalised leakage, building envelope, energy efficiency, building physics

1. Introduction

The quantification of building airtightness is paramount in the determination of as-built energy use[1] [2], indoor air quality [3], and moisture related building enclosure durability[4]. Airtightness is also vital in predicting energy

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