

Simulations Predict Savings From More Airtight Buildings

U.S. commercial building owners could save substantially on annual heating and cooling energy costs by improving airtightness of their buildings' envelope, according to a recent National Institute of Standards and Technology (NIST) study. The research used simulation software to evaluate the energy impact of improved air barriers in three typical non-residential buildings in five cities, each in a different climate zone. The results predicted potential annual heating and cooling energy cost savings as high as 37 percent.

With baseline energy, climate and building data from each city, the researchers simulated conditions of a typical, two-story office building; a one-story retail building; and a four-story apartment building in Bismarck, N.D.; Minneapolis, Minn.; St. Louis, Mo.; Miami, Fla.; and Phoenix, Ariz. Each building was modeled with wood frame and masonry construction. Methods for increasing air tightness included building wraps or coatings for masonry blocks. The study focused on changes in energy expenditures as a result of increased airtightness, not on the methods themselves, so it does not single out a "best" airtightness method.

For the frame construction, the combined annual gas-electric cost savings of improved airtightness would be 33 percent for the hypothetical office building, 21 percent for the retail building, and 31 percent for the apartment in Bismarck. In Minneapolis, the predicted savings would be 37 percent, 26 percent and 33 percent, respectively. In St. Louis, the numbers would be 37 percent, 24 percent and 31 percent.

Improved air tightness in the warmer climates would produce smaller savings but could still be significant in the long run. In Phoenix, the estimated cost-savings are 10 percent, 16 percent and 3 percent for the office, retail and apartment, respectively; and in Miami, the estimates are 9 percent, 14 percent and 9 percent.

Predicted savings for the masonry buildings were similar to the frame construction. Although not evaluated in this report, improving building envelope airtightness also reduces the potential for problems caused by air leakage such as poor indoor air quality, thermal comfort and degradation of building materials due to moisture damage. (Like most commercial buildings, the buildings in the study used mechanical ventilation systems to maintain good indoor air quality.)

The NIST findings are expected to be useful to the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), which is currently considering updating building air leakage requirements in its non-residential building energy standard 90.1.

Investigation of the Impact of Commercial Building Envelope Airtightness on HVAC Energy Use (NISTIR 7238) is available at <http://fire.nist.gov/bfrlpubs/build05/art007.html>.

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