

Effect of energy renovation on indoor air quality in multifamily residential buildings in Slovakia - DTU Orbit (09/11/2017)

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Buildings are responsible for a substantial portion of the global energy consumption. Most of the multifamily residential buildings built in the 20th century in Central and Eastern Europe do not satisfy the current requirements on energy efficiency. Nationwide measures taken to improve the energy efficiency of these buildings rarely consider their impact on the indoor air quality (IAQ). The objective of the present study was to evaluate the impact of simple energy renovation on IAQ, air exchange rates (AER) and occupant satisfaction in Slovak residential buildings. Three pairs of identical naturally ventilated multifamily residential buildings were examined. One building in each pair was newly renovated, the other was in its original condition. Temperature, relative humidity (RH) and the concentration of carbon dioxide (CO₂) were measured in 94 apartments (57%) during one week in the winter. A questionnaire related to perceived air quality, sick building syndrome symptoms and airing habits was filled by the occupants. In a companion experiment, the IAQ was investigated in 20 apartments (50%) of a single residential building before and after its renovation. In this experiment, concentrations of nitrogen dioxide (NO₂), formaldehyde and total and individual volatile organic compounds (VOC) were also measured. CO₂ concentrations were significantly higher and AERs were lower in the renovated buildings. Formaldehyde concentrations increased after renovation and were positively correlated with CO₂ and RH. Energy renovation was associated with lower occupant satisfaction with IAQ. Energy retrofitting efforts should be complemented with improved ventilation in order to avoid adverse effects on IAQ.

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