

## Effective Thermal Retrofitting Methods to Improve Energy Efficiency of Existing Dwellings in Sydney

**Authors :** Claire Far, Sara Wilkinson, Deborah Ascher Barnstone

**Abstract :** Energy issues have been a growing concern in current decades. Limited energy resources and increasing energy consumption from one side and environmental pollution and waste of resources from the other side have substantially affected the future of human life. Around 40 percent of total energy consumption of Australian buildings goes to heating and cooling due to the low thermal performance of the buildings. Thermal performance of buildings determines the amount of energy used for heating and cooling of the buildings which profoundly influences energy efficiency. Therefore, employing sustainable design principles and effective use of construction materials for building envelope can play crucial role in the improvement of energy efficiency of existing dwellings and enhancement of thermal comfort of the occupants. The energy consumption for heating and cooling normally is determined by the quality of the building envelope. Building envelope is the part of building which separates the habitable areas from exterior environment. Building envelope consists of external walls, external doors, windows, roof, ground and the internal walls that separate conditioned spaces from non-condition spaces. The energy loss from the building envelope is the key factor. Heat loss through conduction, convection and radiation from building envelope. Thermal performance of the building envelope can be improved by using different methods of retrofitting depending on the climate conditions and construction materials. Based on the available studies, the importance of employing sustainable design principles has been highlighted among the Australian building professionals. However, the residential building sector still suffers from a lack of having the best practice examples and experience for effective use of construction materials for building envelope. As a result, this study investigates the effectiveness of different energy retrofitting techniques and examines the impact of employing those methods on energy consumption of existing dwellings in Sydney, the most populated city in Australia. Based on the research findings, the best thermal retrofitting methods for increasing thermal comfort and energy efficiency of existing residential dwellings as well as reducing their environmental impact and footprint have been identified and proposed.

**Keywords :** thermal comfort, energy consumption, residential dwellings, sustainable design principles, thermal retrofit

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