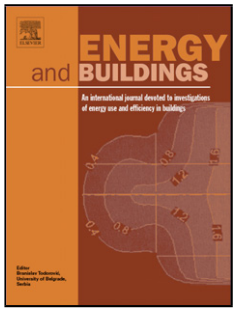

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Influence of Vegetation, Substrate, and Thermal Insulation of an Extensive Vegetated Roof on the Thermal Performance of Retail Stores in Semiarid and Marine Climates

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ABSTRACT

Buildings play an important role in energy use and greenhouse emissions. Vegetated roofs, so-called green roofs, offers many benefits beyond energy savings. Among different building types, retail stores with flat and large roof/walls ratio, offers a match for this technology. Despite this potential in retail stores the literature review shows a lack of studies on the influence of vegetated roofs' design parameters on the thermal and energy performance of retail stores. This study performs a parametric analysis to evaluate the influence of the main green roof design parameters on the thermal performance of a big-box retail stores. The selected climates are semiarid climates of Albuquerque (USA) and Santiago (Chile) and the marine climate of Melbourne (Australia) to inform engineers and architects design of vegetated roofs that fully use their thermal benefits. Based on the analyzed roofs, this study finds that: (1) vegetation can be more effective than insulation on reducing cooling loads due to the evapotranspiration of the vegetation-substrate system and canopy's shading effects and (2) thermal insulation shows significantly larger influence on the stand-alone retail's heating loads than the thermal properties of the substrates and LAI of vegetation.