

## Accepted Manuscript

Title: 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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PII: S0378-7788(17)31317-8  
DOI: <http://dx.doi.org/doi:10.1016/j.enbuild.2017.04.037>  
Reference: ENB 7533

To appear in: *ENB*

Received date: 30-12-2016  
Revised date: 7-3-2017  
Accepted date: 12-4-2017

Please cite this article as: S. Vera, C. Pinto, P.C. Tabares-Velasco, W. Bustamante, F. Victorero, J. Gironás, C.A. Bonilla, Influence of Vegetation, Substrate, and Thermal Insulation of an Extensive Vegetated Roof on the Thermal Performance of Retail Stores in Semiarid and Marine Climates, *Energy and Buildings* (2017), <http://dx.doi.org/10.1016/j.enbuild.2017.04.037>

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

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19 **Keywords:** Vegetation, Substrate, Thermal Insulation, Extensive Vegetated Roof, Retail  
20 Stores, Semiarid climate, Marine Climate, EnergyPlus

21  
22 **ABSTRACT**

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