

Assessing rainwater harvesting system performance in university buildings: Applications in Brazil and Portugal

Summary

The rainwater harvesting system is presented as an effective solution to ensure alternative water supply, another benefit of the system is the reduction of the volume of water discharged into stormwater networks during heavy rainfall. The combination of the rainwater harvesting system and the green roof is an alternative opportunity to solve the problems of water scarcity and excess water in cities. Thus, the objective of this work was to evaluate the performance of rainwater harvesting systems combined with green roofs as well as the influence of climate change on the system performance, having as case studies university buildings located in Portugal and Brazil.

In this context, five researches were developed, first, a methodology to estimate water consumption and end use in buildings without direct measurement systems was presented. Then, an improved water balance algorithm was developed that includes the use of catchment areas with different runoff coefficients and variable daily water consumption. And finally, the influence of climate change on the performance of conventional rainwater harvesting systems was analyzed using daily rainfall data projected to 2050 and long historical rainfall series.

The methodology developed to estimate the consumption profiles in university buildings proved to be effective and presented indicators that allowed the identification of the main sources of water and energy consumption in the buildings. Regarding the combined rainwater harvesting systems with green roofs, it was observed that their implementation is more recommended in places where the volume of available water is higher than the building consumption most of the time and/or where the main objective of the system installation is rainwater management. Regarding the influence of climate change on rainwater harvesting system performance, in Brazil, there has been a reduction in rainfall, but this reduction did not have the potential to significantly affect the efficiency of the system. In Portugal, statistical analyses indicated changes in rainfall profiles over the years and that these changes had a statistically significant impact on the performance of the rainwater harvesting system.

Keywords

Rainwater harvesting system, university buildings, large buildings, extensive green roofs, climate change.



Biological colonization



Fibre blooming



Corrosion of bolted elements

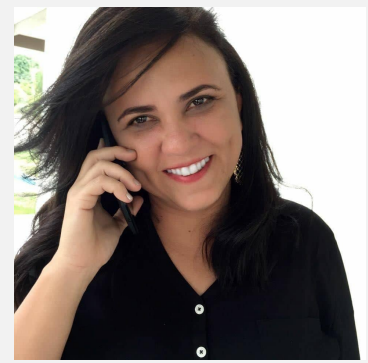


Cracking



Natural ageing (top) and QUV chamber (bottom).

Common anomalies in GFRP elements.



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