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SYSTEMS FOR RAINWATER HARVESTING AND GREYWATER REUSE AT THE BUILDING SCALE: A MODELLING APPROACH

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Abstract

In the light of water shortages, frequently affecting many regions worldwide, domestic rainwater harvesting, and greywater reuse systems represent an alternative source of water. This study fits this framework providing a hydraulic/hydrological model developed by means of the EPA's Storm Water Management Model. The model has been applied to a case study, which consists of an apartment building located in the city of Bologna and equipped with a hybrid rainwater-greywater recycling system. Cold, hot and recycled water consumptions were monitored for four flats located in the same building. Data analysis shows that the recycled water consumption accounts for a third of the total one, when considering only the supply for toilet flushing, while in garden flats, where recycled water is used also for watering, non-potable water consumption accounts for about 56% of the total. Continuous simulations were performed with 13 years daily rainfall data, and the long-term performance of different system combinations were evaluated. The case study shows a non-potable water saving efficiency of 75.86%, which accounts by 26.71% of the mains water withdrawal. Simulations performed by changing system type demonstrated that, due to the high number of inhabitants and of the great extension of the areas to be irrigated, the contribution of rainwater harvesting is moderate. In fact, non-potable water saving efficiency curves tend to flatten as the values of the tank volume increase. Furthermore, the system demonstrates a good ability in lowering both stormwater runoff and greywater volumes.

Key words: grey water recycling, rain water harvesting, SWMM, water saving

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