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Thermal Performance of the Extensive Wetland Green Roofs in Winter in Humid Subtropical Climate

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Abstract : Regarding the pressing issue of reducing energy consumption and carbon footprint of buildings, past research has focused more on analyzing the thermal performance of the extensive terrestrial green roofs with sedum plants in summer. However, the disadvantages of this type of green roof are relatively limited thermal performance, low extreme weather adaptability, relatively higher demands in maintenance, and lower added value in healing landscape. In view of this, this research aims to develop the extensive wetland green roofs with higher thermal performance, high extreme weather adaptability, low demands in maintenance, and high added value in healing landscape, and to measure its thermal performance for buildings in winter. The following factors are considered including the type and mixing formula of growth medium (light weight soil, akadama, creek gravel, pure water) and the type of aquatic plants. The research adopts a four-stage field experiment conducting on the rooftop of a building in a humid subtropical climate. The results found that emergent (Roundleaf rotala), submerged (Ribbon weed), floating-leaved (Water lily) wetland green roofs had similar thermal performance, and superior over wetland green roof without plant, traditional terrestrial green roof (without plant), and pure water green roof (without plant, nighttime only) in terms of overall passive cooling (8.00C) and thermal insulation (4.50C) effects as well as a reduction in heat amplitude (77-85%) in winter in a humid subtropical climate. The thermal performance of the free-floating (Water hyacinth) wetland green roof is inferior to that of the other three types of wetland green roofs, whether in daytime or nighttime.

Keywords : thermal performance, extensive wetland green roof, Aquatic plant, Winter , Humid subtropical climate
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