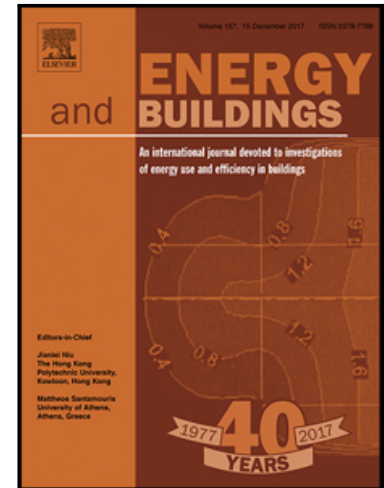


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Investigation on Performance of Building-Integrated Earth-Air Heat Exchanger

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Abstract

Conventional applications of earth-air heat exchanger (EAHE) inevitably have high initial cost to have better performance, or issues about insufficient installation space. To improve the feasibility of EAHE in high-density housing, this paper presents an integrated system consisting of air pipes immersed in the water-filled raft foundation, taking advantage of immense amount of water and relatively stable temperature in raft foundation of building. The aim of the study is to perform a field monitoring and performance analysis of EAHE integrated with water-filled raft foundation of residential building. The foundation-integrated EAHE was applied to a residential building located in Yilan, Taiwan, and its thermal performance was measured in the field experiment. The results indicated that the cooling potential of integrated system was close to the potential of soil-based EAHE at 2 m depth or deeper. An analytical model based on thermal resistance method was validated by measurement results, and was used to carry out the dimensioning of foundation-integrated EAHE. In addition, the return-on-investment with regard to thermal performance and economics of the application was evaluated. Because the installation for air pipes is scheduled in the building foundation construction, the utilization of integrated system spends less construction cost compare to the conventional EAHEs.

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