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Experimental and numerical research on the performance of an energy-saving elevated kang in rural buildings of northeast China

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Abstract

Traditional Chinese Kang is frequently used for space heating in rural areas of northern China, since it is easy to construct and offers various benefits for a rural building, including cooking, heating, providing a place for sleeping and so on. However, various problems, such as smoke leakage, non-uniformity of the kang surface temperature and so on, exist in a rural building heated by Chinese kang. Here, a novel kang system called energy-saving elevated kang (ESEK) is proposed based on the ordinary elevated kang (OEK) model. Experimental results showed that the comprehensive efficiency can be improved by 6.06 %. Under the same operation condition, the indoor temperature of ESEK is 2.2°C-5.3°C higher than that of OEK, creating a more comfortable indoor thermal environment. In addition, the temperature field of the upper surface and the velocity field of flue gas of ESEK under different boundary conditions were studied in detail using the Fluent software. Simulation results indicated that the temperature of ESEK has better uniformity. Furthermore, the optimal inlet velocity of flue gas should be between 0.5m/s and 0.7m/s. The ESEK proposed in this paper is suitable for application in rural buildings to improve the indoor thermal environment.

Keywords: energy-saving elevated Chinese kang; ordinary elevated kang; heating system; experiment analysis; numerical simulation

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