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Effect of insulation ground on anti-condensation in rural residence

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Abstract

Condensation on ground often occurring in rural residence in hot and humidity area is a threat against its indoor thermal comfort. This paper studies the moisture-proof measures on ground in rural residence in Chongqing area. A typical two-story rural residence was modelled by using DesignBuilder software. The data of annual ground temperature and humidity which were used to calculate the duration and strength of condensation in cases of using ordinary residential cement ground and thermal insulation ground was simulated. The results show that: for Chongqing rural residence, the temperature of the first floor is generally lower 1-2 degrees than that of the second floor; The ground condensation of rural residence in Chongqing area are mainly concentrated from the end of March to early July; the effect of thermal insulation ground to avoid condensation is good to solve the problems occurred in rural residence, when the insulation layer thickness is 50mm and the thermal resistance value is 0.49m^2 • K / W, it can basically eliminate the ground condensation.

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Keywords: Rural residence; Ground condensation;Insulation ground; Thermal resistance

1. Introduction

Chongqing is in Southwest China, due to the perennial high wet climate condition, indoor ground condensation problem is very serious, and concentrate on March to July[1]. It is particularly important to solve the problem of indoor ground condensation. At present, residents take some measures such as thermal insulation ground to solve the problem, but these measures are not clear and have no specific construction parameters. At the same time, Chongqing rural residence ground has good storage performance of heat and cool during the summer and winter which can effectively regulate the indoor air temperature. The anti-condensation measures will affect the

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advantages. This paper search for such a critical thermal insulation layered thickness, which can give full play to the advantages of rural residences ground that warming in winter and cooling in summer, and prevent ground condensation effectively.

2. Research methods and model establishment

2.1. Research methods

A rural two-story residential building in Chongqing was selected as research object, residential building model was established by DesignBuilder software. By using the typical meteorological year data of Chongqing from the Standard Chinese Meteorological Database[2], annual indoor temperature, humidity and surface temperature of the typical rural residence were simulated. On the basis of the calculation methods presented in the literatures[3], the total number of dew hours could be calculated. According to the data, the ground dewing time and strength, and the improvement to dewing by using moisture-proof measures were analyzed.

2.2. Model establishment and settings

Figure 1 was a simplified model of rural residence established by using DesignBuilder software, figure 2 was the plan of the first floor. Building envelope thermal parameters were set depending on the actual construction of the building envelope, as shown in table 1.

Building ground was set to 2 kinds of circumstances, respectively for ordinary cement ground, thermal insulation ground. The cement ground was used commonly in Chongqing rural residences, the structure was that concrete and cement mortar layers covered on rammed earth layer. For thermal insulation ground, the insulation layer material was full lightweight aggregate concrete. Thickness variation range was from 10mm to 100mm. The specific parameters of the 2 kinds of ground were set in table 2.

Five months were selected from March to July to simulate, and two types of ground surface condensations were analyzed. The construction models calculated based on the monthly mean temperature of Chongqing underground 0.5 meter. In the internal heat source settings, the internal heat and mechanical heat source were setting at 4.3 W/m^2 depending on the 50824-2013 GBT 《Rural residential building energy efficiency design standards》[4]. From March to July, indoor window opening and natural ventilation all the days were set.

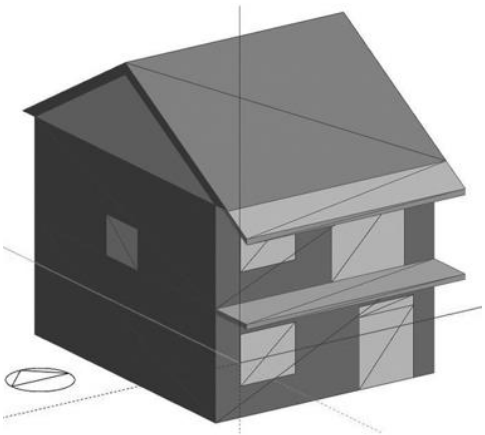

Fig.1. The two-story residential building model