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Assessment of Human Health in Northeast China Apartments with Mould Growth

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Abstract

To assess the situation of mould growth and the influence to human health in northeast China, the CHAMPS software was used to simulate the heat and moisture transfer in residential building wall with Harbin weather files. The simulation values of temperature and humidity in the wall within a year was got from the CHAMPS and then was imported into the WUFI-Bio software. After situation of one year period, result of mould growth and the disadvantage to human health are the following. Under the situation, people who live in northeast China are threatened by the mould growth. There is a variety of factors to the germination of mould. And in different year the weather may different with the weather file, so that the result may biased with the true situation. In the Northeast, the indoor environment may lead to the mould germination, which can do harm to the health of resident. Some measurements should be taken to prevent the growth of mould.

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1. Introduction

In an increasingly urban based society, people spend approximately 85-90 % of their time inside buildings [1]. There is mould grown everywhere in the human living environment, which is generally harmless. However, in some cases inhalation mould spores can trigger asthma, rhinitis or bronchitis symptoms to susceptible. Epidemiology suggests that the mould growth in buildings can have a detrimental effect on the well-being of occupants. The amount of mould exposure to air and SBS (Sick Building Syndrome) have close relationship [2].

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The growth rate of mould have great relative with the organics in building materials [3]. Hud noted that only need a certain oxygen content, an appropriate air temperature, certain RH and a substrate the mould can germination. Adan confirmed that many of the indoor air temperature for germination and growth of mould and mildew contamination has occurred [4]. Gerson noted that in addition to the effects of temperature, when the indoor and outdoor temperature varies greatly different, condensation may occur. This condensation will increase germination and growth of mould on wall surface. In warmer weather, mould will growth in corner because of the blockage [5].

Due to some of designers and builders are not completely master the technology of wall thermal insulation, it leads to some target are not reach the expected standard. Because some of the wall capability cannot reach the insulation standard, so that the wall is easily to condensation. Xianghui Su point out moisture accumulation within the building envelope is an important reason for the growth mould, they study the transfer of moisture in the building wall, and analysis the reasons for the formation of a moisture accumulation phenomenon [6]. Suze Bin pointed out that mould growth not only affect the appearance of wall, but also to people's health .They analyzed and discussed from the condition, location and reason of fungal growth ,then they find some way to figure it[7] .

There is not thorough research for mould growth situation in northeast China so far. This paper analysis the situation of mould in northeast china apartments. Using a combination of CHAMPS and WUFI-Bio software, simulation was conducted to find out the degree of harm to human health in Harbin. This kind of simulation is more accurately than former studies.

2. Methods

Selecting the city Harbin to represent northeast China and using the CHAMPS software, a simulation was carried out on a residential building in Harbin with Harbin weather files. Heat and moisture transfer inside the wall of the different positions were simulated, then outcome the temperature and humidity conditions in the wall. Followed by the different positions of the wall temperature and humidity conditions import to WUFI-Bio software. The walls moldy condition can be drawn as well as their degree of harm to the human body.

2.1. Setting wall material

The simulation object is one of the residential which has mould in the wall in Harbin. There are two place on the wall easily to mould, wall corner and walls cold bridge. What the software need to set is the value of external and internal weather, wall boundary conditions, initial temperature, RH values and wall material. External weather temperature and humidity use the values in the software. The wall thickness is 300mm, except both sides of the yellow parts is air from left to right, from the interior to the exterior were insulation loam of 20mm, C20-25 concrete of 240mm, PSFoam-extruded of 30mm, the outermost layer is 10mm lime plaster. The grid of the wall is divided by CHAMPS as shown in Figure 1.

As shown in Figure 1, the value near the surface need to be more precise, and transfer of heat and moisture in the center of wall is more stable than the surface wall, so the grid at the border of the wall is more tightly than the center. Different colors represent different wall materials. This wall is mainly composed of concrete and insulation materials.

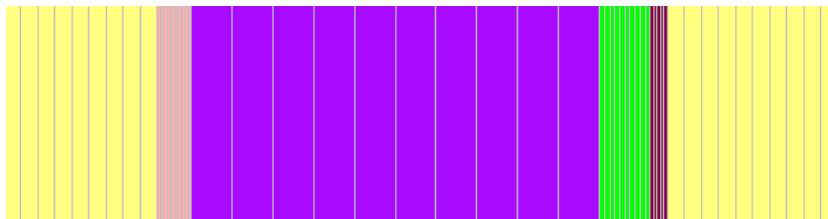


Fig.1. The wall grid by CHAMPS

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