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Study on Optimization of Air Infiltration at Entrance of a Commercial Complex in Zhejiang Province

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Abstract : In the past decade, with the rapid development of China's economy, the purchasing power and physical demand of residents have been improved, which results in the vast emergence of public buildings like large shopping malls. However, the architects usually focus on the internal functions and streamlines of these buildings, ignoring the impact of the environment on the subjective feelings of building users. Only in Zhejiang province, the infiltration of cold air in winter frequently occurs at the entrance of sizeable commercial complex buildings that have been in operation, which will affect the environmental comfort of the building lobby and internal public spaces. At present, to reduce these adverse effects, it is usually adopted to add active equipment, such as setting air curtains to block air exchange or adding heating air conditioners. From the perspective of energy consumption, the infiltration of cold air into the entrance will increase the heat consumption of indoor heating equipment, which will indirectly cause considerable economic losses during the whole winter heating stage. Therefore, it is of considerable significance to explore the suitable entrance forms for improving the environmental comfort of commercial buildings and saving energy. In this paper, a commercial complex with apparent cold air infiltration problem in Hangzhou is selected as the research object to establish a model. The environmental parameters of the building entrance, including temperature, wind speed, and infiltration air volume, are obtained by Computational Fluid Dynamics (CFD) simulation, from which the heat consumption caused by the natural air infiltration in the winter and its potential economic loss is estimated as the objective metric. This study finally obtains the optimization direction of the building entrance form of the commercial complex by comparing the simulation results of other local commercial complex projects with different entrance forms. The conclusions will guide the entrance design of the same type of commercial complex in this area.

Keywords : air infiltration, commercial complex, heat consumption, CFD simulation
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