双幕墙风压缩尺效应及其产生机理的数值分析

Numerical ANALYSES FOR SCALE EFFECT ON WIND PRESSURE OF DOUBLE-SKIN FACADES AND ITS MECHANISM

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中文摘要

将Realizable k-ε湍流模型与非平衡壁面函数搭配使用，对带L型和一字型双层幕墙的矩形建筑的原型、1:10及1:100的缩尺模型进行计算流体动力学(CFD)建模分析，研究缩尺刚性模型风洞试验中由于双层幕墙廊道间距缩尺导致模型与原型的压力系数差异。通过对双层幕墙通风廊道内的气流流动和沿程阻力的分析，阐述了产生缩尺效应的内在原因。对L型双层幕墙，当处于幕墙廊道内气流流动较强的风向角时，廊道内沿程阻力对廊道内平均内压的影响较大，缩尺效应通过沿程阻力的影响而对内压产生影响，而且随着模型缩尺比的减小而增大；当处于廊道内气流流动较弱的风向角时，沿程阻力对内压影响不大，相应的缩尺效应也不明显。对一字型双层幕墙，在所有风向角下，其廊道内气流流动均较弱，因此缩尺效应对一字型双层幕墙平均内压的影响很小。

英文摘要

With Realizable k-ε Model and Non-equilibrium Wall Functions, the rectangular buildings with L-section and straight-section DSF(Double-Skin Facades) were modeled by computational fluid dynamics (CFD) at full scale、1:10 scale and 1:100 scale respectively. The differences of wind pressure coefficient due to the scale of the gap between double-skin facades in rigid scale model wind tunnel test are studied. The cause of scale effect was explained through the analysis of air flow and flow resistance in the gap of DSF. For L-section DSF the gap flow resistance has a great impact on the mean internal pressure when it lies under the wind direction where the airflow in the gap of DSF is strong. Scale effect influences the mean internal pressure by gap flow resistance, and the effect increases with decrease of the model scale. The gap flow resistance has little effect on the mean internal pressure when the airflow in the gap of L-section DSF is not strong, and the influence of the scale effect on internal pressure is slight. The airflow in the gap of straight DSF is feebleness under all wind directions, so the scale effect can be neglected.

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