

Analysis and Modeling of the Building's Facades in Terms of Different Convection Coefficients

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Abstract : Building Simulation tools need to better evaluate convective heat exchanges between external air and wall surfaces. Previous analysis demonstrated the significant effects of convective heat transfer coefficient values on the room energy balance. Some authors have pointed out that large discrepancies observed between widely used building thermal models can be attributed to the different correlations used to calculate or impose the value of the convective heat transfer coefficients. Moreover, numerous researchers have made sensitivity calculations and proved that the choice of Convective Heat Transfer Coefficient values can lead to differences from 20% to 40% of energy demands. The thermal losses to the ambient from a building surface or a roof mounted solar collector represent an important portion of the overall energy balance and depend heavily on the wind induced convection. In an effort to help designers make better use of the available correlations in the literature for the external convection coefficients due to the wind, a critical discussion and a suitable tabulation is presented, on the basis of algebraic form of the coefficients and their dependence upon characteristic length and wind direction, in addition to wind speed. Many research works have been conducted since early eighties focused on the convection heat transfer problems inside buildings. In this context, a Computational Fluid Dynamics (CFD) program has been used to predict external convective heat transfer coefficients at external building surfaces. For the building facades model, effects of wind speed and temperature differences between the surfaces and the external air have been analyzed, showing different heat transfer conditions and coefficients. In order to provide further information on external convective heat transfer coefficients, a numerical work is presented in this paper, using a Computational Fluid Dynamics (CFD) commercial package (CFX) to predict convective heat transfer coefficients at external building surface.

Keywords : CFD in buildings, external convective heat transfer coefficients, building facades, thermal modelling

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