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Predicting night-time natural ventilation in Stanford's Y2E2 building using an integral model in combination with a CFD model GIACOMO LAMBERTI, CATHERINE GORLE', Stanford University — Natural ventilation can significantly reduce energy consumption in buildings, but the presence of uncertainty makes robust design a challenging task. We will discuss the prediction of the natural ventilation performance during a 4 hour night-flush in Stanfords Y2E2 building using a combination of two models with different levels of fidelity: an integral model that solves for the average air and thermal mass temperature and a CFD model, used to calculate discharge and heat transfer coefficients to update the integral model. Uncertainties are propagated using polynomial chaos expansion to compute the mean and 95% confidence intervals of the quantities of interest. Comparison with building measurements shows that, despite a slightly to fast cooling rate, the measured air temperature is inside the 95% confidence interval predicted by the integral model. The use of information from the CFD model in the integral model reduces the maximum standard deviation of the volume-averaged air temperature by 20% when compared to using literature-based estimates for these quantities. The heat transfer coefficient resulting from the CFD model was found to be within the literature-based interval initially assumed for the integral model, but the discharge coefficients were found to be different.

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