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Abstract: Natural ventilation is a commonly used principle when buildings are being ventilated. It can be controlled by openings in the building envelope, which open or close depending on the need of air inside the building. It can also be the simple action of just opening a door or a window to let the fresh air in. In both cases it is often necessary to have an idea of the amount of air coming through the window.

In cross-ventilation, the expressions are rather well defined and here the difficulty lies within the definition of the discharge coefficient that describes the characteristics of the opening, since it seems to fluctuate depending on the incidence angle of the wind. In single-sided ventilation where openings only exist in one side of the building, the flow through the opening is harder to predict. The main driving forces are still wind pressure and temperature differences as with cross-ventilation, but here the turbulence in the wind and the pulsating flow near the opening also affect the flow through the opening.

From earlier work, some design expressions already exist, but none of these include the incidence angle of the wind, which is an important parameter in this type of ventilation. Several wind tunnel experiments are made and from the results of these, a new design expression is made which includes the wind pressure, temperature difference, incidence angle of the wind and the fluctuations in pressure at the opening. A discussion is made regarding the correctness of using wind tunnel measurements for a design expression to be used outdoors, but here it is concluded from analysis of the different types of wind that this can be done with some knowledge of the differences.

Finally, the new expression is compared to results found from outdoor fullscale measurements with good agreement.

Supervisor: Professor Per Heiselberg

Opponents: Professor Marco Perino and Professor Mats Sandberg

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