

Is ventilation of timber façades essential?

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KEYWORDS: *timber façade, ventilation, vented, non-ventilated, constant air change per hour*

SUMMARY:

This paper discusses the question whether the ventilation of timber façades is necessary. Following the Swiss research initiative “fire protection in timber structures”, exterior timber wall claddings incorporating specific fire protection measures are permitted in Switzerland up to a height limit of 22 m. This includes exterior wall claddings with a ventilation space that is interrupted and closed off from above at each storey level, so called vented claddings. It was investigated if a simple model of constant air change per hour in the ventilation space is sufficient. By means of hygrothermal simulations of previous measurements from Mayer and Künzle from 1980 using the software WUFI® it is shown that satisfactory results are obtained if the long-term behaviour of a construction is considered. It is further shown that the amount of air change rate (air change per hour – ach) of different kinds of ventilation (ventilated: ach 50 h⁻¹ / vented: ach 20 h⁻¹ / non-ventilated with air space and a large number of joints: ach 20 h⁻¹) can be deduced from these previous measurements combined with hygrothermal calculations. A parametric study was carried out after the model validation, analyzing different kinds of ventilation, climate, coatings as well as two types of walls (timber frame and brick). The results show that the large number of joints (e.g. tongue and groove) in a non-ventilation cladding is effective to dry the wooden cladding. Consequently, the authors suggest that in many cases ventilation of timber façades is not essential.

1. Introduction

In structures, based on the ventilation, four kinds of façades can be distinguished (Fig. 1). The air change between the outside and the ventilation space can occur through three ways: the upper openings, the lower openings and if existing through the joints in the façade cladding (e.g. tongue and groove, clapboard, weather boarding). This air change is induced by solar radiation, the thermal lift and the influence of the wind.

In the last 60 years, the ventilation of claddings has been investigated among others by Mayer and Künzle (1980 and 1984), Gertis (1972), Salonvarra et.al. (2007), Finsch and Straube (2007). A good overview of the international state of research is found in Salonvarra et.al. (2007). Consistently the authors question the need of ventilation. Mayer and Künzle already postulated in 1980 the possibility to renounce openings when a lot of joints like in small fibre cement boards or wooden tongue and groove claddings exist. This was confirmed by a recent research project from Holzforschung Austria (proHolz 2007).

In the current national standards (e.g. in Switzerland SIA 233: 2000) upper and lower openings and adequate ventilation in the cross section are mandatory. Additionally, it is compulsory that water which comes behind the cladding – caused by wind driven rain (WDR) – does not induce a high load of humidity in the layers behind the cladding and must be dissipated. However in other regulations (e.g. in Germany DIN 68800-2: 1996, BDZ 2006) non-ventilated wooden façades with an adequate air