Refurbishment of buildings with back ventilated rainscreen cladding

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Gert MOEGENBURG
Industrial Mgr
FVHF e.V.
Wiesbaden, Germany

Gert Moegenburg, born in 1946, industrial manager, worked for ten years for a construction company, then in the cladding manufacturing industry. He has been in charge of FVHF e.V. since 1997.

Summary

In many European countries—particularly in Eastern Europe—large-scale housing developments form the mainstay of the housing economy. On the one hand, these large-scale developments guarantee affordable housing; on the other hand, however, they also represent a factor of social uncertainty for their residents. The objective must therefore be to attractively design this living space and its surroundings so that the residents can identify themselves with it. An important feature of a housing complex with which people identify is the facade. Its design, together with the structural comfort that it offers its residents, can be decisive for an individual's positive identification with the building.

1. Introduction

The majority of these large-scale housing developments were built using industrially prefabricated materials. In many cases, the quality of these materials and the construction work were unsatisfactory. Damage caused by moisture and corrosion is only one of the consequences. Thus, improvement of the outside appearance is only one aspect of the refurbishment of such facades. The system of back ventilated rainscreen cladding ensures that the structure dries out within the shortest time possible. Advancing carbonisation is halted, and the required airtightness is created. The use of chemicals for protection against corrosion can be avoided. Mineral insulation, which can be applied in any desired thickness, reduces heating costs and ensures the well being of a building's residents. Uneven surfaces on the outer wall are bridged over, thus creating a vertical line. Non-back ventilated cladding systems cannot fulfil these structural requirements. Back ventilated rainscreen cladding ensures the expected remaining life of the refurbished building to its full extent.

2. Function of Back Ventilated Rainscreen Cladding

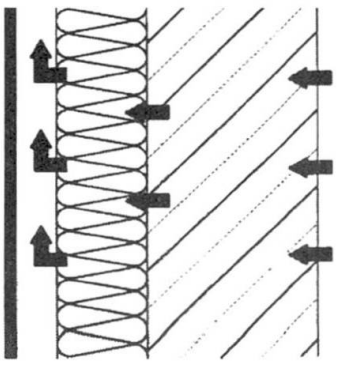

Fig. 1 Schematic representation of back ventilated rainscreen cladding

The back ventilated rainscreen cladding system essentially consists of four components: The supporting framework, the thermal insulation, the back ventilation, and the protection against weather (cladding). The functions "protection against loss of heat" and "protection against weather" are constructionally separate components. Moisture inside the building is drawn through the absolutely vapour permeable thermal insulation into the adequately dimensioned back ventilation area. The non-constrained supporting framework, usually made of aluminium, surrounds the building and ensures the required wall clearance. The actual protection against weather is provided by the cladding, which is available in a large variety of materials and designs.

3. System Components

Back ventilated rainscreen cladding consists of a series of integrated system components which—regarding their application in Germany—either conform to industrial standards or construction codes.

Anchoring devices are a combination of plugs and screws, which anchor the wall support of the supporting framework into the anchoring foundation. Cadmium plated screws are admissible if they have been proven to be adequately protected against corrosion. It is also possible to use stainless steel or grout anchors, independent of the anchoring foundation. Anchoring devices must conform to general construction codes; furthermore, they must be selected according to their suitability for use with a particular anchoring foundation and the calculated load they are expected to bear.

Connecting devices are generally screws or rivets, which connect the individual components of the supporting framework. Connecting devices must possess proof that their dimensioning meets the requirements set on them. These requirements must also be met when using supporting frameworks made of wood.

Fastening devices are the mostly visible parts that permanently fix the cladding to the supporting framework, whereby a principle difference is made between visible and hidden fasteners.
Visible fasteners are e.g. screws or rivets, which are arranged on the surface of the cladding panel. For so-called small-format cladding panels, nails, screws, clevis hooks and driven-in hooks can also be used.
Hidden fasteners, e.g. undercut anchors and welded bolts, are attached to the back of the cladding panels.
It needs to be mentioned here that the choice of fastening device can have considerable influence on the appearance of the facade after it has been installed. Visible fasteners are generally less expensive than hidden fasteners. In addition, fastening devices are often not only system-dependent, but also dependent on the supporting framework and the choice of cladding.

Supporting frameworks are the constructional connecting member between the anchoring foundation and the cladding.
The supporting framework is stably attached to the building, absorbs all loads occurring as a result of wind suction and wind pressure and transfers these to the structure. At the same time, the supporting framework absorbs any strain caused by fluctuations in temperature. The choice of supporting framework components is determined by the cladding, the desired type of joint, the expected weights, and the anchoring foundation.
The supporting framework's construction consists of wall angles and vertical supporting profiles. Depending on the cladding, horizontally arranged profiles are also sometimes possible. The structurally formed "fixed point" is meant to transfer loads arising from wind suction and wind pressure as well as the calculated construction load onto the building. "Movable points" merely absorb wind suction and wind pressure forces and accordingly, they are more weakly dimensioned.