

# Technology offer

## Development of a load-bearing double-skin façade prefabricated timber wall element

### Field of use

Timber building, renovation and retrofit, structural resistance, timber-glass wall elements, façade elements.

### Current state of technology

Stage of Development:  
Available for demonstration

### Patent status

Patent pending

### Developed by

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### Background

In modern multi-storey prefabricated wooden construction, there is an increasing tendency to use an increased proportion of glazing, which is located primarily on the south side of the building. As a result, due to the stated asymmetry in the stiffness of the wall elements, such floors are distorted, which escalates as a problem especially with the increased number of wooden structures located in highly active seismic and windy areas.

The main purpose of the invention is to develop a load-bearing transparent façade timber-glass prefabricated wall element, which simultaneously provides a certain degree of horizontal load bearing capacity and stiffness in the structural aspect, as well as sound and heat insulation in the building -physic aspect.

### Description of the invention

The subject of the invention is the development of a load-bearing double-skin façade (DSF) prefabricated wooden wall element, which could be used in new multi-storey prefabricated timber buildings, as well as in structural and energy retrofit. The DSF wall element is basically a special type of vertical building envelope consisting of two, in most cases transparent layers, insulating glazing or a single glass pane, separated by air cavity. In general there are several subsystems of DSF elements in the known literature, which differ from each other according to the type or the position of the glazing, the width of the air cavity, the use of blinds, the method of ventilation and air exchange between the cavity and the interior of the building, but none of these has so far been considered as load – bearing. The installation of ventilation which would also be optimal for the building, is not suitable for load -bearing DSF systems. Ventilation requires holes in the load -bearing elements of the DSF system, which significantly affects the horizontal load -bearing capacity of such DSF wall element. The effects of openings on horizontal load -bearing capacity and rigidity are generally known from some reference studies of such effects on classical frame -panel wall elements without the use of glazing, from which it is evident that the influence of openings on frame – panel timber wall elements is much greater than in the case of cross -laminated (CLT) load -bearing wall elements. Additionally, in case of ventilation, a subsequent maintenance is required which is rather problematic.

However, with this invention the researchers want to develop an exclusive load -bearing wall element. The subject of the present invention is only a variant when DSF wall element is unventilated, i.e. without any openings. On the inside of the timber frame, an insulating panel with three glass panes is used and attached to the timber frame with a polyurethane adhesive. On the outside, a single laminated glass pane is used and attached to the timber frame with a weather resistant structural silicone adhesive.

The selected thickness of all glazing can also be variable, however only DSF wall elements with the specified thicknesses were tested experimentally and the other values were parametrically calculated by the previously mentioned mathematical models.

### **Main advantages**

Developed DSF wall elements can also act as load-bearing elements that can significantly contribute to the horizontal stability of the building, which cannot be achieved with a classic glass façade. An additional positive effect in the context of the DSF timber-glass load-bearing wall element, achieved with the outer glass layer is an increase in the sound insulation of the external wall envelope.



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