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## Ventilated Cavity Façade System with Pre-painted Aluminium Sheet

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### Summary

For 30 years ventilated cavity façade systems have been widely used for renovation as well as new façade claddings. This system has proved to be optimal in many aspects due to its „natural“ function. While many outside façade cladding materials could be applied, pre-painted aluminium sheet have been preferred by many architects and planners. This material offers corrosion resistance, beauty by its choice of many colours, and functionality at a reasonable price. Especially for residential building renovations the overall system, which is including insulation material, is a special choice with high future market potential.

**Keywords:** Ventilated cavity façade system, rain-screen façade, chimney effect, breathing façade, coil-coating process, marine quality aluminium alloy, permissible load, PVdF paint (polyvinylidenfluorid), cassette-type panels, stiffeners, honeycomb panels, sound-deadened aluminium.

By consequentially separating the weathered surface of a façade from the insulation and the construction material of the wall allowing for an airflow between the weather shield outside and the insulation behind we achieve the so-called „rain-screen façade“ or also called „ventilated cavity façade system“. This system is a so-called „breathing“ façade. It is as natural as can be and therefore represents an optimum in technology which only has to be coupled with the proper materials chosen for the purpose in respect of corrosion resistance, optical appeal, choice of colours, maintenance, etc., also in relation to its price.

The principle is as simple as can be as everybody agrees that insulation saves energy for air conditioning as well as for heating and therefore saves costs in the lifespan of every building. The air cushion between the outside cover sheet (which can be done in a wide range of materials starting from fibre cement to ceramics, to steel panels or aluminium sheet and the insulation material) is the best and cheapest insulation anyway.

In case of rain the ventilated cavity façade system rejects water infiltration which may damage the insulation material. Usually an open joint system leads to counter pressure so that the humidity infiltration is negligible. Any humidity or moisture still prevailing will be taken out in

due time by the constant flow of air (air circulation) which then leads to the so-called „breathing“ façade.

The ventilated cavity system takes into consideration prevailing temperatures, humidity, comfortable room temperatures, etc. By choosing the proper outside cover material longevity of the façade will be determined designed also to withstand all climatic and environmental conditions. When using only weather-resistant, corrosion-resistant and fire-resistant materials this results in a mature system which has proved to be suitable for renovation as well as new building claddings for approx. 30 years in many countries of the world.

Due to the ventilation of the air according to the „chimney effect“, the result of this system is a very comfortable room climate. No matter which climatic conditions - if extremely hot or cold, wet or dry - the breathing façade is physically the best solution as it is a natural principle.

The major arguments for any ventilated cavity system are:

1. The total construction is completely weather-resistant. The façade cladding increases the longevity of the building.
2. The consequential separation of the weather protective outside material (e.g. aluminium sheet) from the insulation material protects the building against weathering.
3. The air circulation avoids heat stagnation and humidity damage.
4. The construction walls and also the insulation material stay dry and fully functional.
5. The total construction is open for humidity diffusion.
6. The construction of heat bridges is avoided.
7. The insulation material secures the greatest possible heat conservation respectively cooling inside the building.
8. A comfortable room climate is the result.
9. Heat losses in winter as well as heating up during summer is avoided.
10. The rain-screen ventilated cavity façade protects the building components against strong temperature stresses.

Furthermore, maintenance is extremely low. The so-called „breathing façade“ also gives an excellent noise reduction - as every thickness and/or density of insulation material - be it rockwool or glasswool - is possible.

Also, this system allows for absorption of building tolerances. By different colours, sizes, designs, etc., individual architectural aspects can be considered.

In case of damage, repairs can be done comparatively easy and cost-effective. The installation is independent of any weather conditions.

While, as an outside skin of this system, many materials can be chosen from we would like to focus on pre-painted aluminium sheet as one major option. For about 30 years pre-painted aluminium sheet have proven to be very suitable for this system. In one practical case, for example, a special corrosion-resistant marine quality aluminium alloy AlMg3 (AA 5754) has been chosen. Due to special rolling technology and annealing, the mechanical value of this material has been optimised to 96 N/mm<sup>2</sup> as permissible load according to DIN 4113. This German standard is even demanding security factors of 2.5 in order to be on the safe side.

The surface of the aluminium rolled product is continuously degreased and chromated in a so-called coil-coating process before a primer coat is applied and cured as well as a topcoat on top. Depending on colours and qualities, 2-coat / 2-bake up to 4-coat / 4-bake systems can be applied. The coil-coating process is designed for an optimal flatness achieved by tension-levelling.