IMPROVING BUILDING VALUE THROUGH FAÇADE WEATHERPROOFING

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A – Façade Connections: Protection from structural damage and mould – Improving energy efficiency and air quality

On our previous chapters we have already discussed the role of the building envelope, and more in particular the role of facades, on building sustainability. Its impact is present on all the different dimensions of sustainability: environmental, economic, social and cultural, with a special call of attention for human health and well-being.

We have pointed out the fact that façade connections are on top of the most common water and air leakage paths. Water and air leakages are top causes for premature deterioration of construction materials and other building pathologies associated with moisture, such as mould, and for deficient thermal and acoustic insulation.

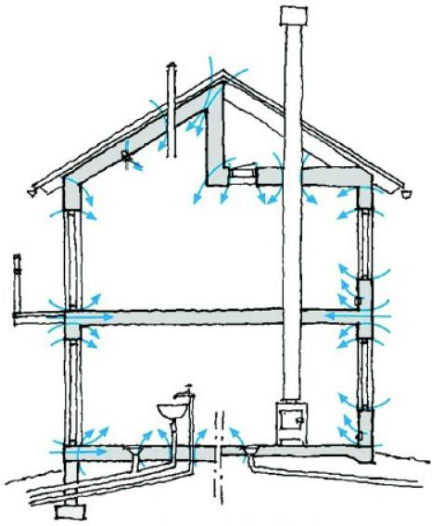

Figure 1 - Common air leakage paths in a building envelope

- **Building Airtightness**

Together with the continuous areas of the building's envelope, façade connections define both water and airtightness, which largely contribute to determine a building's durability. Water and air airtightness protect the building's façade internal layers from corrosion and deterioration caused by water infiltration, maximize building energy efficiency, reduce the risk of condensations and consequentially, the development of mould and fungi, which have a major impact on indoor air quality and human health.

It is important to remember that when considering building airtightness, we can forget the importance of building ventilation. It is now clear that building airtightness has major advantages for energy efficiency, but as our buildings become more airtight, it is crucial that ventilation by natural and mechanical means is assured in order to maintain the necessary ventilation levels for indoor air quality.

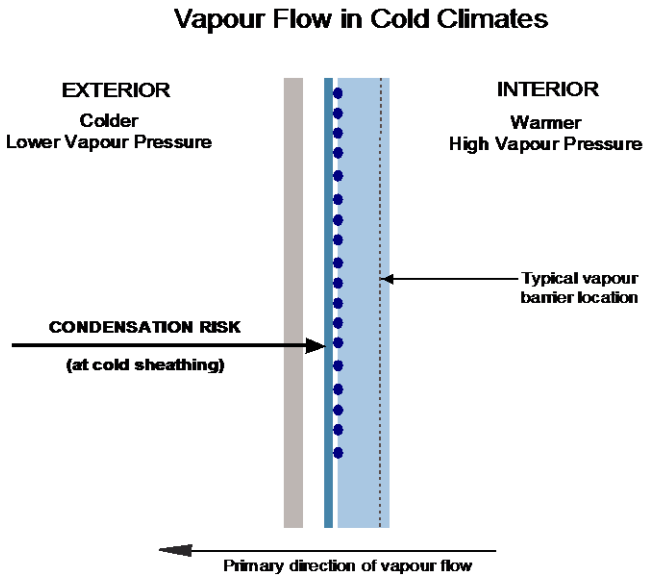

Figure 2 – Vapour flow in cold climates

In a cold climate a proper façade airtight system will assure an airtight layer on the inside, and a water and wind tight layer on the outside.

The same principles that are applied to the continuous façade areas should be applied to façade connections, even more carefully due to all particularities of these points.

- **Water and Windproof layer on the Outside**

The water and windproof layer protects the thermal insulation from rain, snow and wind. Mounted on the outside of the thermal insulation, it prevents cold outside air passing trough the outer insulation layers as well as ventilating the insulation layer. The windproof layer should be wind, rain and water proof but highly permeable to water vapour to allow moisture to dry and evaporate quickly from the insulation and structural components to the outside.

- **Airtight layer on the Inside**

The airtight layer on the inside prevents air flow form the warm interior to the cold exterior, which increases building energy efficiency and eliminates the passage of water vapour from the building interior to the cold exterior, where it can condensate.

- **Sealing façade connections – Water, wind and airtight layers**

When selecting a solution to seal façade connections one should be sure that this solution will prevent water and wind infiltration from the outside, while allowing moisture to escape and dry, being 100% airtight on the inside – when considering a building located on an area with cold winters.

B - Construction materials : From manufacture to disposal – Impact on a building's sustainability

When analysing a construction material and how it can impact a building's sustainability there are many properties and dimensions that should be considered. Below we will list most of these dimensions and discuss some more in detail.

- **Manufacture**

With regards to manufacturing there are several aspects that have to be analyzed in order to determine the sustainability of a construction material, such as:

  - Waste produced during production
  - Recycled content
  - Use of natural materials
  - Energy used for production
  - Material packaging

A product featuring recycled content has been partially or entirely produced from post-industrial or post-consumer waste. The incorporation of waste materials from industrial processes or households into usable building products reduces the waste stream and the demand for raw natural resources.

For example a manufacturing process that saves energy will reduce the embodied energy of the material.

Selecting materials that are manufactured by environmentally responsible companies promotes not only building sustainability, but global sustainability, encouraging these companies efforts at pollution prevention.

- **Installation and Use**

    - Reduction in Construction Waste
    - Energy Efficiency
    - Use of Non-Toxic or Less Toxic Materials
    - Durability
    - Maintenance

Minimal **construction waste** during installation reduces the need for landfill space and also provides cost and resource savings.

For example, using customized solutions, pre-cut for perfect fitting will significantly reduce waste on site.

Energy efficiency is an important feature in making a building material environmentally sustainable. The long-term energy costs of operating a building are heavily dependent on the materials and solutions used in its construction.

As we have seen before efficiently designed and applied solutions for sealing façade connections largely contribute for a building's energy efficiency.

Non- or less toxic materials are less hazardous to construction workers and buildings' occupants. Many materials adversely affect indoor air quality and expose occupants to health hazards. Some building materials, such as adhesives, emit dangerous fumes for a short time during and after installation; others can contribute to air quality problems throughout a building's life.

The use of façade connections sealing solutions that do not use accessories, such as adhesives and primers, largely reduce the amount of toxic materials on site. When strictly necessary there are options for such accessories with reduced or inexistent content of VOC's.

Durability: Materials with a longer durability need to be replaced less often. This reduces the natural resources required for manufacturing and waste, and the amount of money spent on installation and associated labor. The durability of materials is an important factor when analyzing a building's life-cycle costs. Materials that last longer will, over a building's useful life, be more cost-effective than materials that need to be replaced more often.

Maintenance consumes a significant portion of a building's operating budget: over the building's lifetime, maintenance can easily exceed the original construction costs. This includes the cost of labor, cleaning/polishing materials, equipment, and the replacement of items.

This means that selecting construction solutions with minimal maintenance requirements will clearly contribute to a building's sustainability.

- **Disposal**

  - Reusability
  - Recyclability
  - Biodegradability
  - Waste disposal

Reusability: Very durable materials may have many useful years of service left when the service life of the building in which they are installed ends, and may be easily extracted and reinstalled in a new site.

Selecting solutions for sealing façade connections that have superior durability and that are not fully adhered, but clipped or mechanically fixed, can allow the re-use of such solutions once a building's life-cycle has been completed. These solutions can be easily removed and separated from the building's façade package without damages.

Recyclability measures a material's capacity to be used as a resource for the creation of new products. Many building materials that cannot be reused in their entirety, still can be broken down into recyclable components. Plastics alone are easy to recycle but are often integrated into other components, which makes separation difficult or impossible.

As previously mentioned for the item reusability solutions that are not fully adhered. but clipped or mechanically fixed, can easily be separated from the building façade package allowing an easy separation for recycling.

The **biodegradability** of a material refers to its potential to naturally decompose when discarded. Organic materials can return to the earth rapidly, while others, take a long time. An important consideration is whether the material in question will produce hazardous materials as it decomposes, either alone or in combination with other substances.

Waste disposal is, depending on the material, a complex process. For example, bitumen based waterproofing membranes are commonly considered hazardous and have to the disposed according to special procedures, which have high costs.