Airtightness, Breathability & Vapour Control

Airtightness, vapour control and breathability play a critical role in the operational performance of buildings. Understanding how they work together enables us to control air leakage, maximise energy efficiency, optimise indoor air quality and ensures durability of the building fabric.

Three Pillars of Building Performance:

While these terms are often confused, they are not mutually exclusive. Designing for all three is key to maximising energy efficiency and indoor air quality.

1. Airtightness (Stopping Draughts)

Airtightness aims to minimise uncontrolled air leakage through gaps, cracks, and poorly fitted components.

- **Precision Control:** By minimizing leaks, airflow can be monitored and managed, allowing for higher energy efficiency.
- **Method:** This can be achieved through draught-proofing, specialist membranes and tapes, or natural materials like lime and clay plasters.
- **Vital Note:** An airtight building must have a proper ventilation strategy to maintain air quality and moisture balance.

2. Vapour Control (Managing Moisture Ingress)

Vapour control limits how much water vapour can enter the building fabric, preventing it from condensing and causing damage in cooler areas of the structure.

- **Traditional Layers**: A standard Vapour Control Layer (VCL) is a moisture-impermeable sheet that blocks humid air.
- **Variable Membranes:** “Smart” membranes can block humid air but also allow moisture already in the fabric to diffuse back out into the room.
- **Gradient:** You can achieve control without membranes by ensuring each layer of the wall becomes progressively more “breathable” from the inside to the outside.

3. Breathability (Safe Moisture Passage)

A breathable structure allows moisture to pass through safely without accumulating as harmful water (liquid water or persistently high humidity).

- **Dynamic Balance**: Breathable materials like sheeps wool adjust their moisture content to balance with the surrounding humidity acting as a moisture buffer.
- **Vapour Open:** These materials are “vapour open,” meaning they allow water vapour to move through them as a gas rather than trapping it.

How They Work Together

Breathable buildings still require airtightness to prevent draughts and vapour control to prevent the system from being “overloaded” by excessive moisture. The safest designs ensure layers are built up so that any moisture that enters the structure can always escape.