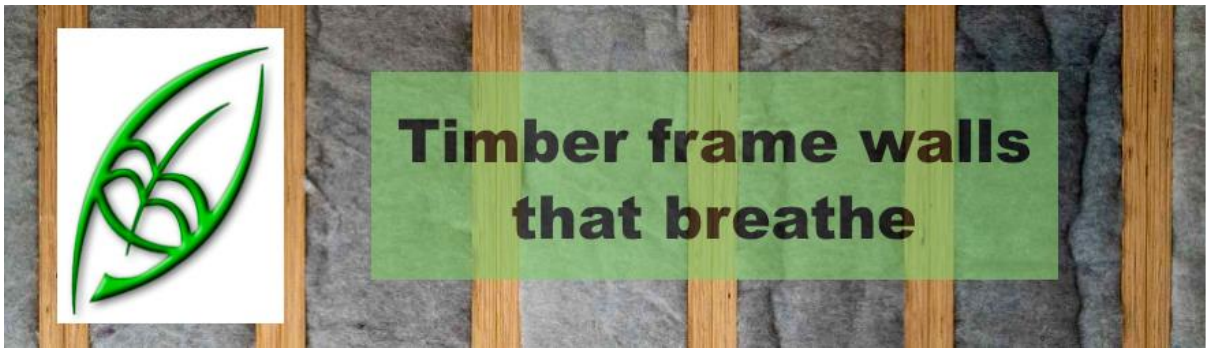


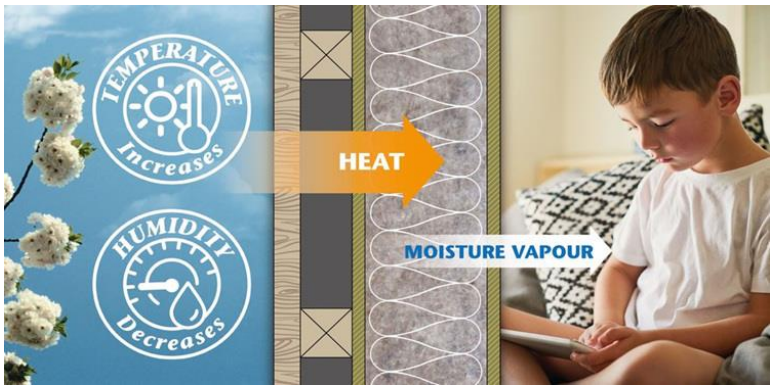
A breathing house allows air and moisture movement through its structure, in particular through the walls, this is by a process called diffusion.

Air diffusion is not inconsistent with high thermal performance. Thermal performance relies on reducing air infiltration (air leakage between separate pieces of material). Air diffusion through the pores of a material takes much longer and as it gradually warms or cools during that time it does not present a significant thermal loss.

A well designed structure will prevent liquid water leaking into a building, but creating a perfect seal is virtually impossible. The more you try to seal it, the higher the chance there is of there being small cracks or holes, which could wick moisture into the wall via capillary action. Choosing a material that has a proportion of larger pores (i.e. less dense) will ensure a capillary break and prevent wicking, otherwise (and in some cases as well) you need to build in a capillary break in the structure. Then the water can either drain away or evaporate, and move out of the wall again.

However moisture vapour can also enter a wall from the inside or outside, depending on the gradient of temperature and relative humidity between inside and outside. Also accidental flooding or pipe leaks can saturate the structure. So a wall needs to be capable of water vapour diffusion through the material itself. This will let any evaporated moisture out. If the wall is made from materials or a system that doesn't let moisture dry out within 24-48 hours, then mould, and potentially toxic mould, can develop.

Another benefit of a breathing structure is that exposure to EM radiation is reduced due to the materials keeping dry, as water is a conductor. Materials with mineral content also help block the radiation.



Are breathing walls more expensive? Well yes, but in a new home 90% of installed materials are in the building envelope (floors, walls, and roof, and excluding doors, windows and finishes). This 90% represents less than 20% of the total construction cost, and less than 10% for the material cost. So it doesn't add a lot to the overall cost, and the benefits are huge.

Creating a breathing wall structure using timber frame is very simple!

A standard timber frame structure uses plasterboard to line the inside, but the high nitrogen content of the paper on the board can grow mould. It also uses a rigid air barrier underneath the cavity cladding system, and most rigid air barriers do not breathe. Some insulations can trap moisture droplets in the air pockets and mould can form on dirt and mineral deposits left after the water evaporates. Acrylic paint slows the passage of water vapour, this is good to prevent vapour getting in, but not to let it out again.

So instead, a layer of breathing Magnesium Oxide board inside and out, with a wool/polyester insulating layer, and a paint layer on the inside with a natural, breathing paint creates the perfect breathing structure.

Foreverbreathe is one such wall system, the pictures are from their website.

Dragonboard can be used for timber floors or a concrete floor overlay.

However a word of warning: Magnesium Oxide boards work well provided they are of good quality, backed by industry accreditation. Quality boards have a higher MGO content and less organic matter, which absorbs moisture. They have fibreglass mesh for strengthening. Only stainless steel fixings and flashings should be used, as contact and drips can cause corrosion.

Cheap boards are a disaster in the same league as leaky buildings, the high organic matter content absorbs moisture and causes mould growth. This extra moisture, along with the lack of reinforcing, means the boards can disintegrate or crack.