



# Designing for a comfortable, sustainable future.

John Jamison, Technical Manager at Winstone Wallboards, brings to light some of the key challenges and opportunities for future building performance in a recent webinar.

Comfort and sustainability have become much more important to New Zealanders in recent years. We no longer want to put up with cold, damp environments, and caring for our planet has become more of a focus as we strive to protect our quality of life for future generations to enjoy. At the heart of these issues sits building performance. In John's webinar, he delved into what makes a building "just right", and the roadblocks that can prevent projects from reaching their full potential.

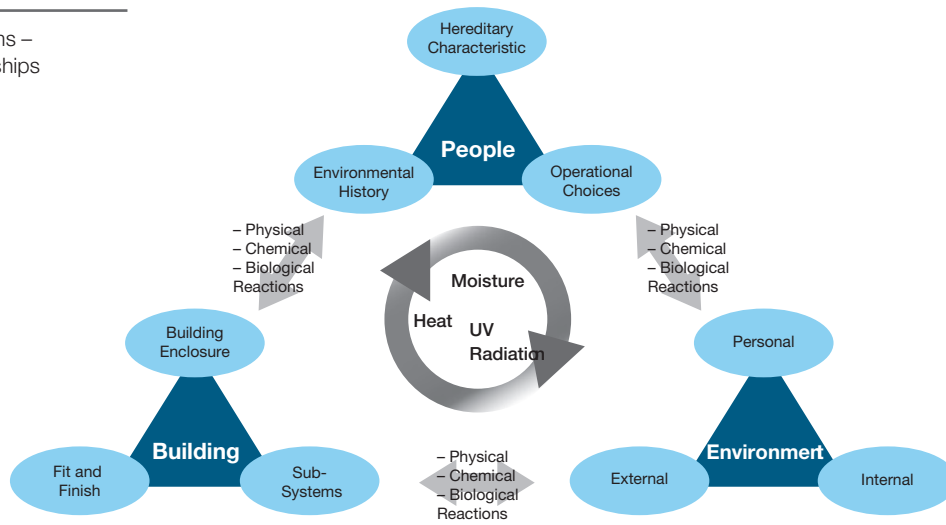
## Start with the outcome in mind, fabric first, then control the environment.

To ensure a building has a great internal environment, John recommends starting with the end in mind, by specifying the environment the building is expected to deliver. Next, consider the fabric of the building. What materials will be used, and how will these perform in the external environment surrounding the building? Lastly, to make sure the desired environment can be delivered reliably, environmental control systems can be added - lighting when the sun fades, heating in the depths of winter, or whatever is needed to deliver the desired internal environment. If this process is followed, with the environment properly specified and the fabric of the building optimised, then the scale of these environmental control systems can be minimised, delivering an efficient building.

Typically, people do not notice when they are feeling comfortable. They only notice their environment when they become uncomfortable. Thermal comfort has been shown to be related to the heat and moisture balance next to a person's skin. If this is in balance, then a person may experience this as comfort. If more heat is lost than generated then it could be described as cold, or if not enough heat is lost, too warm. Different spaces have different requirements – for example, the needs of a gym will be different to the needs of an office. For a space to be comfortable, there are six factors to be considered. Two can be controlled by the occupant – what they are wearing and what they are doing. The other four are environmental factors – humidity, air speed, air temperature, and radiant temperature. By considering these six factors as the first stage of the design process, the end result is guaranteed to be a more comfortable space. Naturally each individual person has a different perception of comfort, so a system has been developed to calculate the predicted percentage of dissatisfied people (PPD) within a population for a given set of conditions. If a high level of comfort is desired the design team will look to minimise this percentage.

Once we have arrived at the environment we wish to deliver, the next step is getting the fabric of the building right. We need to create an "ideal wall". A wall is an environmental separator that controls liquid water, air flow, heat flow, water vapour, and sound (while providing structural support and protection from the spread of fire). These five environmental elements can be controlled by the various layers that make up a wall system. The elements may be controlled separately

The Building Systems – Functional Relationships



Source: Building Science Corporation

or can be combined, but each one must be addressed to create an “ideal wall”. It is the structural aspect of a wall that provides shelter, so it makes sense to protect the structure as much as possible to ensure the durability of the building. These protective layers must all work together so one element doesn’t undermine another. For example, because uncontrolled airflow transfers a lot of heat, if we cannot control the airflow, we will be wasting our time with trying to deliver a heat flow control layer.

The concept of an “ideal wall” can equally be applied to create an ideal floor and an ideal roof, because we are considering the requirements of the building and how to best protect it from the elements. By engineering for building performance, the spaces we create are specifically designed to meet the needs of the users, resulting in buildings that will perform well for generations to come. This brings us to the environmental impact and sustainability.

When considering the environmental impact of a building, the impact over the whole lifetime of the building should be considered. This includes the longevity of the building, the internal environment created and the health impacts on the occupants. Simply minimising carbon use during the build does not necessarily mean the building will have a low carbon footprint over time. Poorly designed buildings may have health impacts and shorter lifespans than well designed ones. The operational carbon of the building must also be considered. A poor building design that costs a lot to heat or cool may well have a higher carbon impact over time.

Unfortunately, the typically used building element schedule method from H1/AS1, typically used for residential buildings, is not outcome focussed. Meeting the minimum prescribed construction R values does not guarantee that the internal environment will be optimal, or how much energy a building will use to deliver a ‘healthy’ internal environment. Operational efficiency and the comfort level of the space is often not considered. To understand how efficiently a design will deliver a desired set of internal conditions, the desired end outcome must be the start of the design process. Thinking about energy use in kilowatt hours per meter squared per annum encourages a design team to think about the internal environment and the operational energy it will require.

Winstone Wallboards are really pleased to see energy consumption being considered in design in the Building for Climate Change – Transforming Operational Efficiency document and are in full support of engineering for building performance. New systems are continually being developed to meet design needs, and the technical team is growing to support engineers and designers to deliver great internal spaces. A wall must meet our needs for comfort, style, safety, durability and for the environment. A building must perform well for its lifetime, reducing operational carbon use and providing a comfortable space for generations to come.