

ALTERNATE CONSTRUCTION SYSTEMS

Residential design for comfort and energy efficiency are influenced by climatic considerations. There can be considerable differences between maximum and minimum temperatures in summer and winter, the diurnal temperature range (day/night differences) and the length of the heating and cooling seasons across Australia. To achieve the best results, housing design and construction materials should be appropriate to the climate of a region. Where you live will determine what level of thermal insulation you need and the thermal performance you should achieve.

Heavyweight and lightweight materials used in construction differ in mass content. Heavyweight construction systems are usually masonry and include brick, concrete, concrete block, tiles, rammed earth, mud brick, etc. Lightweight construction uses timber or light gauge steel framing as the structural support system for non-structural cladding and linings (eg. fibre cement, plywood and colourbond steel).

Heavyweight and lightweight materials have differing thermal performance and environmental impact depending on:

- Where they are used (internally or externally).
- How they interact with or moderate the climate.
- How far they need to be transported.
- How much energy and water is used in their manufacturing process.
- Specific site requirements (eg. slope, aspect, noise control; fire resistance).
- Exposure to destructive forces of nature (fire, termites, rain, cyclonic activity, UV, humidity, etc.).

Material selection for a new home should be assessed in light of the above factors to reach the best possible solution. In most situations, a carefully designed combination of lightweight and heavyweight systems will produce the best overall outcome in economic and environmental terms.

Heavyweight Construction:

- Generally has higher embodied energy than lightweight construction.
- Improves thermal comfort and reduces operational (heating and cooling) energy use, when used in conjunction with passive design and good insulation.
- Is most appropriate in climates with large diurnal (day-night) temperature ranges, however, exceptions occur at more extreme climates.
- Is more beneficial in heating climates.
- Requires more substantial footing systems and causes greater site impact and disturbance.
- Should be avoided on remote sites where there is a high transport component (eg. Darwin).
- Is often quarried or processed with high impact.
- Typically requires less maintenance and is more durable than lightweight construction.

Lightweight Construction:

- Generally has lower embodied energy than heavyweight construction.
- Can yield lower total life cycle energy use, particularly where the diurnal range is low.
- Responds rapidly to temperature changes and can provide significant benefits in warmer climates by cooling rapidly at night.
- Is preferred on remote sites with high materials transportation component.
- Usually requires more heating and cooling energy in cold to warm climates (where solar access is achievable) when compared to heavyweight construction with similar levels of insulation and passive design.
- Can have low production impact (eg sustainably sourced timber) or high impact (unsustainably sourced timber or metal frame).
- Typically requires more maintenance and is less durable than heavyweight construction.

Australia boasts eight different climate zones, insulation and thermal mass needs and requirements are climate determined. It is important to understand that different types and combinations of insulation and thermal mass must be considered to create an energy efficient, comfortable and long-term lower cost home.

Source: Your Home Technical Manual