CURRENT AUSTRALIAN BUILDING-ENVELOPE PERFORMANCE

As shown in Part 2, Section 6.3 the energy used for building space conditioning is often the largest component of overall building energy consumption. Building envelopes in Australia tend to have poor thermal resistance compared to world's best practice and international benchmarks. This is due to: poor building codes, limited post-build assessments, limited retrofit programs, and insufficient incentives for building owners and occupants to invest in energy saving measures.

Construction types. The Australian Bureau of Statistics (ABS) provides some evidence of the poor thermal performance of residential dwellings [2]. The most common construction format for residential dwellings is brick veneer, accounting for 41% of the Australian building stock (55% in Victoria and 67% in the ACT). Brick veneer has the poorest thermal performance of all construction types in most climates, especially in heating-dominated climates (eg Canberra, Melbourne). This is due to the fact that the main thermal mass (brick) is on the outside with the plasterboard on the inside. The thermal mass is uninsulated and therefore readily absorbs heat during warm weather and loses heat in cool weather.

Insulation extent. The ABS dataset also shows that while 69% of Australian dwellings have some form of insulation, wall insulation exists in only 18% of dwellings [2].

Uninsulated brick veneer and timber weatherboard homes provide minimal thermal resistance. The lack of insulation for these building types in all climate zones leads to uncomfortable internal environments. In addition, ceiling insulation is inadequate. Energy Efficient Strategies (EES) estimates[3] that the housing stock average R value for added ceiling insulation is only R2.5, which means there is substantial room for improvement even in homes with existing ceiling insulation.

Glazing and window coverings. The ABS also found that [2] only 47% had "window coverings designed to stop heat or cold", only 32% had outside awnings or shutters, and only 2.6% had double glazing. From an energy-efficiency standpoint, Australian windows have been described as the worst in the developed world [6].

Draughts. Air infiltration/leakage is an often overlooked aspect of building performance. Uncontrolled air leakage can account for 15% to 25% of winter heat loss in Australian homes[7]. Australian homes are reported as being two to four times as draughty as those in North America or Europe[7].

In a study by the Moreland Energy Foundation in 2010 the performance of 15 typical Victorian homes was evaluated. Fan pressurisation tests were conducted to measure the number of air changes per hour (ACH, a measure of air infiltration) [8].

This study measured an average of 29 ACH at 50 Pa (ACH50, the number of times the total volume of air in the house changes in one hour at 50 Pa pressure differential between inside and outside the house) [8]. Comparing these findings to the Passivhaus standard of 0.6 ACH50, and Australian best practice (7-10 ACH50), indicates that there is a major problem with draught-proofing in cool-climate homes [8].

Non-residential. There is less information available about the thermal performance of the non-residential building stock. What is known is that the majority of inner city office building stock constructed after 1950 has curtain wall facades. Curtain wall refers to glazed cladding that hangs on the outside of a building, with each storey having floor to ceiling glass. Such walls do not support the building. Instead, most buildings with curtain wall facades have a central lift core that holds the weight of the structure. Unfortunately, curtain wall facades incorporate single glazing, which has poor thermal properties and low solar reflectance, and aluminium, which is one of the best conductors of heat. Since the introduction of Section J (energy efficiency) in the National Construction Code in 2006 attention has turned to improving the thermal performance of glazing, with a focus on reducing the overall glazed area, reducing heat conductance (U value), and introducing external shading.

These provisions, however, only apply to new buildings and therefore the existing building stock with poor performing curtain wall facades needs to also be addressed. Various building industry experts who have provided advice for this report have indicated that most non-residential buildings are poorly insulated.

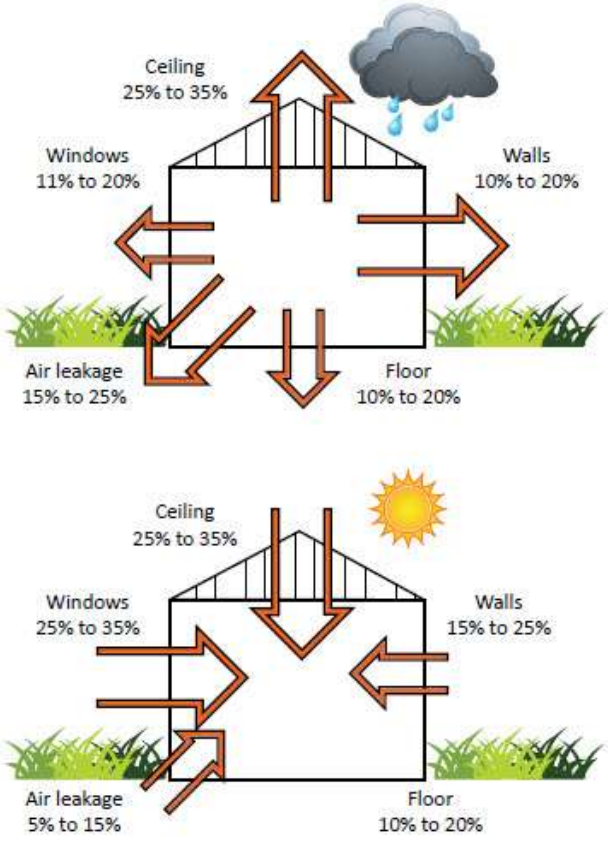

FIGURE 3.1 Heat flow in an uninsulated cool-climate house.

Source: http://decarboni.se/publications/zero-carbon-australia-buildings-plan/2-improving-thermal-performance-building-envelope