Kennedy Associates explorations in sustainability

When I started my practice in the early 1990s the architectural world was finally and thankfully emerging from the constraints of postmodernism.

The end of the century and millennium was approaching and rather like at the end of the previous century, there was an open and vigorous debate not only about style but also what should underpin our thinking in the coming years.

The more I thought about it, the more I became convinced that the really interesting issues lay in the fundamentals of environmental design. While neither alone nor unique in this thought process, for me this recognition of the critical importance of sustainability gave meaning and strength to my own commitment to modernism, and offered a more robust basis around which to develop my work.

The real question became how to expand beyond the simple notion of 'eco' to an architecture driven by an exploration of sustainability, particularly in an urban setting (and how to develop an approach to environmental architecture not grounded in post-hippie romanticism).

This personal and theoretical journey has been slow and at times frustrating but it has also been fortunate. Our practice has developed a skill base in the technicalities of sustainability beyond the superficial and simplistic, and this has in turn enabled us, particularly in recent times, to attract a growing number of clients who are genuinely interested in achieving more than a well-insulated, north-facing house with a rainwater tank.

I have also been fortunate in having some very loyal, intelligent and committed staff who have led the R&D into the ever more complex intricacies of environmental design.

In terms of our knowledge and understanding of environmental issues and opportunities, we are in our late teens/early adulthood – that is, we have a growing clarity about what we need to do but the mechanisms for achieving it are still being developed and tested. There is a lot to learn.

Some time ago we decided that our research would focus on water management and thermal modelling of our houses. The two case studies below show different aspects of our work and our approach to markedly different conditions: one is a south-facing semi-detached house on a very tight site in an inner urban area, the other a freestanding house in a semi-rural bushland setting on a very steep hill with regular strong winds.

Both houses offer insights into how the exploration of environmental issues can lead to architectural outcomes which might otherwise have been missed. This not only makes both houses richer but also begins to offer us a way forward.

Steve Kennedy

The Coledale House — an exercise in thermal modelling

The Coledale House is a new house designed to replace an existing dilapidated miner's shack presently occupied by the owners on a site on the Illawarra escarpment.

The house has been designed to respond to a range of demanding site constraints including: no water and sewerage services; a steep slope with significant landslip potential; the constant threat of bushfire balanced against the need to retain significant vegetation; strong winds; and limited solar access because of the adjacent trees and escarpment.

The house is arranged around the geometry of a square, like many of our projects. Bedrooms, living and service areas and circulation are discretely segregated and organised around a north-facing sunken courtyard that serves as a focus for the house within an otherwise expansive site.

The geometric arrangement is also based on site-specific responses to wind movements, solar access and privacy. The service areas shield the courtyard from the persistent westerly winds; an on-site greywater treatment system is located in a planted roof over the bedrooms to prevent water discharge into the site; and the bedrooms and courtyard are sunk into the site to maximise solar access to the living areas.

The house builds on a large body of work we have done exploring ways in which design can maximise the thermal performance of the building fabric other than through the use of thermal mass. It is designed for solar access and features extensive shading devices, double glazing and cross ventilation.

There is a commonly held notion that architects systematically overglaze buildings. In the living areas, this house has variable glazing achieved by incorporating insulated shutters into the window design.

In summer, when conditions are generally comfortable, the house has been designed to be part of the outdoors with the shutters retracted into the adjacent wall. In contrast, on winter evenings when the escarpment shades the site early in the afternoon and cool air sinks down from the high country, the shutters close over the glazed areas to prevent heat loss.

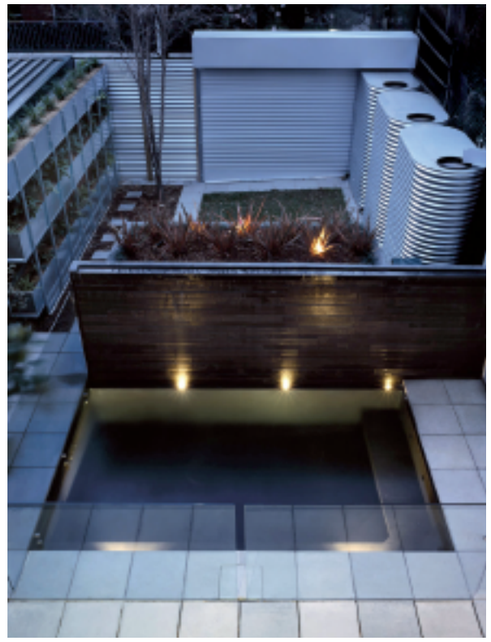
Because of its unique design the house was not able to be modelled adequately in NatHERS but it has recently been modelled in AccuRate. The findings of the AccuRate testing noted that:

- In summer the living areas closely followed the outside air temperature. These findings were not surprising given the extensive glazing in the living areas when the shutters are open. However, as this is an area that does not experience extremes of summer heat, that relationship is not of concern.
- In winter the performance of the house was dramatically different, being considerably more stable than the outside conditions, with the house never cooler than 15°C. The winter performance reflected the effective reduction in the glazed area through the use of shutters.

The house demonstrates the way in which responses to site constraints, and concerns for energy efficiency can produce new and innovative building forms.

Anthony Nolan

Recycled greywater — the Clovelly House experience



The aim of the Clovelly House was to push forward the benchmark for urban residential sustainability, particularly with respect to water usage. The house includes many environmental design features but its most significant achievement is a greater than 75 per cent reduction in mains water consumption, after almost a year of occupation. This has been accomplished through the combination of a unique greywater treatment system and relatively small rainwater storage (9,000 litres). There is no reduction in lifestyle for the occupants and the house includes a swimming pool exclusively fed by rainwater.

The house collects greywater every day. Unlike rainwater, this has the benefit of significantly reducing total water storage requirements, which is especially critical on a tight urban site of only 234m^2. Washing machines and toilets use the most water in a house. In the Clovelly House these fixtures do not use mains water or rainwater, but clean treated greywater.

The house collects the cleanest sources of greywater from the showers, bath and hand basins in a separate plumbing system. The water is then temporarily held in a small tank under the courtyard. At this point, any large particles are filtered out and excess water overflows to the sewer. Twice a day, a pond pump transfers the contents of the tank to the main treatment system, the 'green wall'.

Designed in collaboration with environmental engineering firm ENVDS, the 'green wall' uses biological processes to filter the greywater and remove nutrients, polluting compounds and organic matter. The water arriving at the top of the wall is gravity fed from each planter box to the one below it.

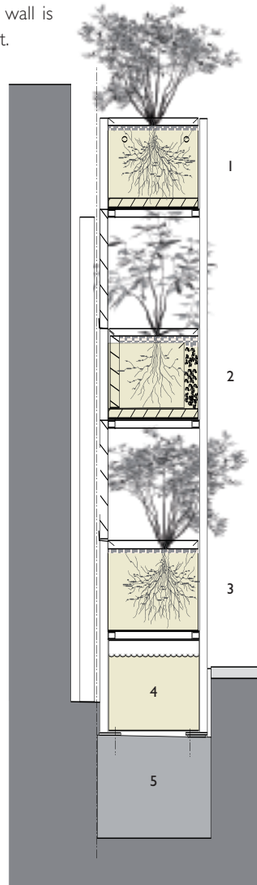
Key to this process is a variety of micro-organisms in the filter material that break down the polluting compounds, allowing them, along with the nutrients, to be used as food for the plants in the wall. Thus, the wall provides a contained and self-sufficient ecosystem of microbial life producing clean water that collects in a tank at the base of the wall. The water passes one last filter, a UV light, as a failsafe before being reused within the house.

The treatment quality of the water must be tested regularly to satisfy NSW Health and Randwick Council. The three key indicators of water quality – suspended solids, thermotolerant coliforms and BOD (biochemical oxygen demand) – have all been reduced to well below minimum acceptable levels.

The green wall is located adjacent to the southern boundary along the side of the parking space. It is 6m long, 2.1m high and 350mm wide. Framed in hot dip galvanised steel, the three horizontal trays of folded galvabond sheet are simple geometric containers designed to form a backdrop to the plants within.

The result is a living wall treating water through a combination of natural and man-made elements and processes, the first of its type in Australia and a prototype for future systems.

Simon Anderson



1 Planter 1
2 Planter 2
3 Planter 3
4 Treated water tank
5 Concrete footing