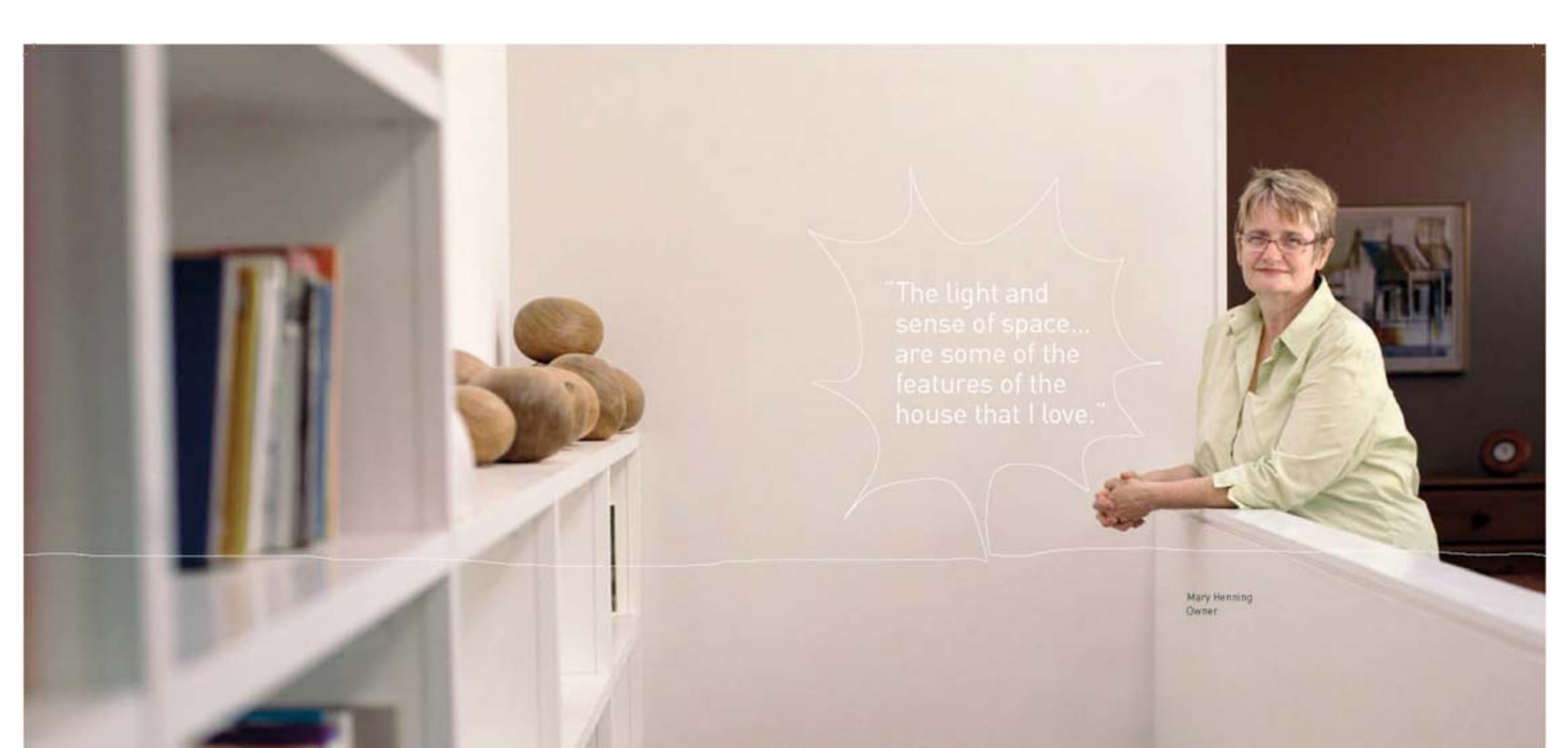


THE CLOVELLY HOUSE

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"The light and sense of space... are some of the features of the house that I love."

Mary Henning
Owner

Clovelly, NSW
Kennedy Associates Architects

A modern, open plan dwelling that meets the very specific needs of a client with mobility issues. A two storey addition at the rear contains living areas, home office, main bedroom and service areas. Bathrooms, stairs, kitchen and living spaces are all wheelchair accessible. The garden houses three rain water tanks and a grey water treatment system, delivering a 75 per cent reduction in town water usage.

"The light and sense of space along with the connection to outdoors are some of the features of the house that I love. Every day some aspect of the design delights me, this morning it was the clouds visible through the skylights. It could be shapes and intersection of planes, proportions, materials, anything - it's like a good art work with many layers of meaning."

It's not an ordinary house but it is a house for ordinary people. No large and spectacular site, engineering marvels or enormous budget, just the transformation of a 1920s south-sided semi-detached house into a beautiful liveable sustainable home."

THE CLOVELLY HOUSE

SUMMARY:

The Clovelly House is a three bedroom, south facing semi-detached residence, with in-ground pool and off-street car parking, in Clovelly, an inner city suburb of Sydney, Australia.

The house, designed by Kennedy Associates Architects and completed in 2004, was designed to meet the very specific spatial and accessibility needs of the client with ambulant disabilities.

The Clovelly House meets best practice in both urban design and environmental design within a complex and constrained site and brief and demonstrates a model for the integration and management of an open plan format with thermal and acoustic comfort.

The house incorporates a range of innovations beyond the normal approaches of passive solar and environmental design, including a vertical 'green wall' grey water treatment system, the first of its kind in Australia.

The house has won several prestigious awards for its achievements in integrating sustainable principles and innovations within a strong modernist architectural language and, in particular, for its outstanding performance in water management on a 234m² site.

The house has been widely published.



THE CLOVELLY HOUSE

ARCHITECTURE:

Apart from benchmarking environmental innovation in an urban context, the Clovelly House demonstrates the capacity to achieve architectural excellence, including significant spatial generosity within tight sites and difficult urban locations, whilst exemplifying methodologies for managing sites with poor solar access and methodologies for the integration and management of open plan formats with thermal and acoustic comfort.

The house is a modern, open plan dwelling focused on meeting the very specific needs of a client with mobility issues.

The house retains the front portion of the semi in its original format and adds a two storey addition at the rear which contains living areas, home office, main bedroom and service areas.

The house is organised around the staircase and central void, which is located at the rear of the house and acts as a pivot around which the house operates.

These spaces accommodate not only the living areas and home office but also the owners' extensive library and art collection. The office, located at the centre of the house on the upper level, enables the owner to work from home, enjoy the view and control activities within the house, without leaving the upper level.

Bathrooms, stairs, kitchen and living spaces are wheelchair accessible.

The rear garden which is divided into two equal courtyard spaces; with one courtyard and pool designed as a continuation of the sequence of living spaces and the second as a garden and service area which provides off the street parking and accommodates the water storage systems.

The side walls of the rear courtyard area are formed by the water storage systems, three rain water tanks providing 9000 litres of water storage and the 'green wall' grey water treatment system, whilst the intermediate wall between the courtyards houses the pumps and structures to support the pool and water treatment systems within a slate covered planter box and wall of water/ fountain, which fills the pool.

The massing and geometry of the house derives from the square and can be read as a series of solid and open intersecting cubes adopting the 6m site width as the governing dimension. The living area is 12 m long, the void 3m long by 6m high, the courtyards 6m long and 6 m wide and so on.

This adherence to a basic geometry gives the house a unity, clarity and consistency which result in its having a strong sense of place and in association with the spatial organisation of the house, the house demonstrates the ability to achieve significant spatial generosity on tight urban sites.

THE CLOVELLY HOUSE

SUSTAINABILITY:

The Clovelly House meets best practice in both urban design and environmental design within a complex and constrained site and brief. Initiatives include:

water

- the house benchmarks water management technology including a triple pipe reticulation system to accommodate rainwater harvesting and grey water reuse
- retains and reuses all water on site other than black water and is the first building in Australia to use a 'green wall' grey water treatment system
- achieves a minimum 75% reduction in town water usage,
- treated grey water used for the toilet and washing machine
- onsite rainwater storage for 9000 litres used for showers, baths and hand basins
- in-ground swimming pool exclusively maintained by on site storage of roof water
- onsite management of overflow stormwater to recharge aquifer

thermal

- thermal chimneys provide solar space heating and cooling to living areas
- skylights enhance passive solar performance of living areas
- full insulation of internal and external walls and ceilings
- adjustable external louvres to western sun

power / lighting

- provision for solar power generation
- low wattage lighting, including PL and LED
- solar space and water heating including the pool

ventilation

- thermal chimneys / solar space heating and cooling to living areas
- cross flow ventilation
- ceiling fans

materials

- zero voc / bio paints
- vegetable based oils to all timber floors
- sustainable timber and building products
- minimal use of off-gassing materials
- non use of copper in plumbing

landscape

- native and indigenous plantings
- green wall utilises bio systems and plantings to purify and polish grey water

appliances

- 5 star refrigeration
- induction heating to stove
- solar hot water and pool heating

spatial

- bathrooms, master bedroom office, stairs, kitchen and living spaces are all wheelchair accessible.

THE CLOVELLY HOUSE

WATER:

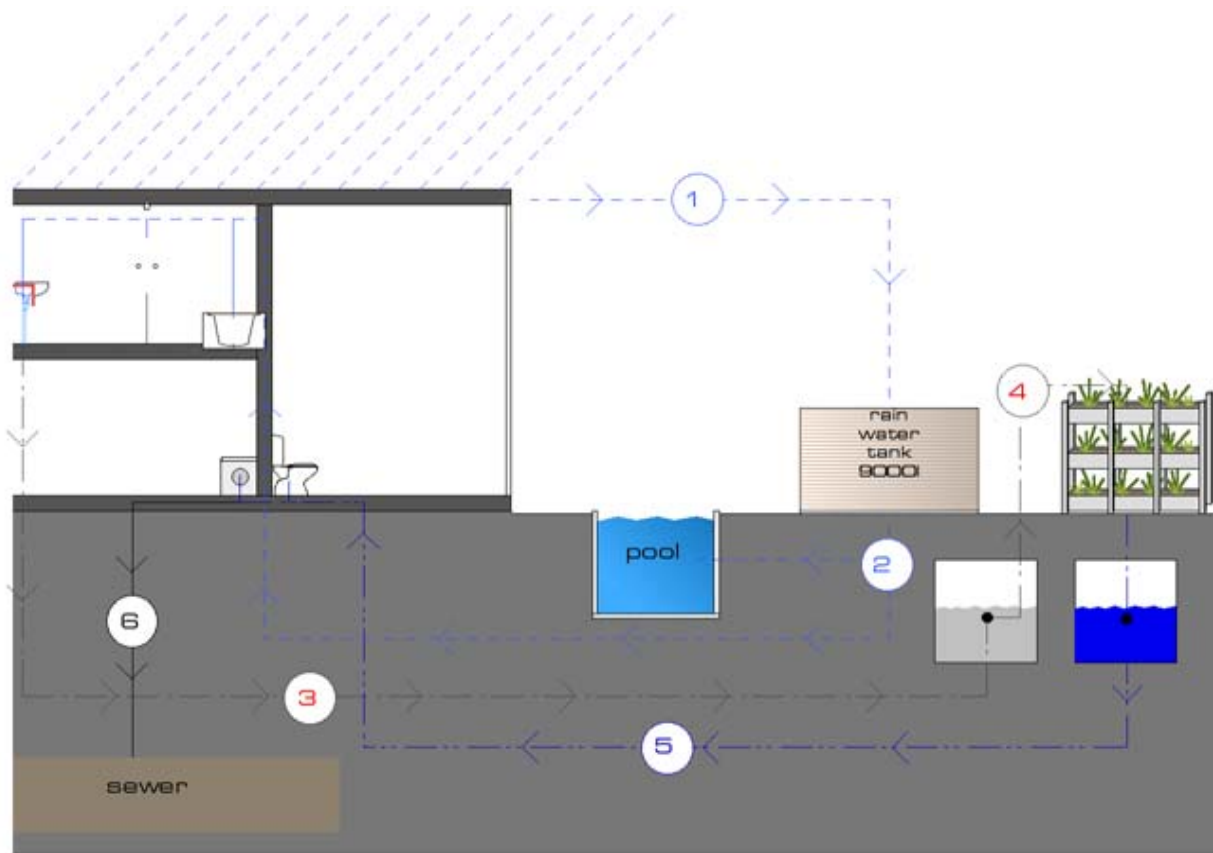
The Clovelly House benchmarks water management technology in residential domestic architecture, including a triple pipe reticulation system to accommodate rainwater harvesting and grey water reuse.

Rainwater harvested from 100sqm of roof area is stored in three 3000litre tanks. This water is used for the in-ground pool, showers, baths and hand basins. Overflow stormwater is directed to the stormwater pit to recharge the aquifer.

All water on site, excluding black water, is retained and reused on site. The Clovelly House is the first building in Australia to use a 'green wall' grey water treatment system, designed by Kennedy Associates and Environmental Design and Solutions. Grey water filtered and polished through the wall is diverted for use in the toilet and washing machine.

The Clovelly House achieves a minimum of 75% reduction in town water usage.

That is a saving of approximately, 115,000 litres of water per year in a two person household



1. rainwater collected from 100sqm roof area is directed to storage tanks.

2. water from tank supplies the pool, bath, showers and basins

3. greywater collected from shower, bath and basin is directed to holding tank 1.

4. Water from holding tank 1 pumped to top of 'greenwall treatment system'.

5. polished water supplies washing machines & toilets.

6. blackwater flows into sewer.



THE CLOVELLY HOUSE

FAQs:

1. Site area

234m², 39m x 6m

2. When was the house built?

Design commenced in 2001, construction was completed in late 2004.

3. How big is the house?

The Clovelly House is a three bedroom, two storey building with a gross floor area of 163m², excluding the void over the living area.

4. Where did the idea for the green wall come from?

The idea was a result of a collaboration between Kennedy Associates and our environmental engineer, Toby Gray of ENVDS (p: 0400 312 711).

The clients had asked us to provide a house that addressed key environmental issues including water management. We were looking at how to accommodate a grey water treatment system in a small inner urban lot and Toby showed us some images of some 'green walls' in Scandinavia which were not used for grey water but which offered an interesting idea.

From there the idea took off with Toby doing the science on it and Kennedy Associates, designing the system including the structure and reticulation system as well as coordinating its fabrication and installation.

There are a number of proprietary 'green walls' on the market elsewhere in the world but as far as we know none of them offer 'water polishing' of the type achieved in Clovelly

As far as we know, this is the only vertical grey water treatment system of its type in the world and the Clovelly House is, apart from Michael Mobb's house in Chippendale, the first house in an urban area of Sydney to achieve this type of water treatment.

5. How big is the Green Wall?

The Green Wall is, 6m long, 2.1m high and 350mm wide

6. How does it work?

It is basically a huge water filter.

It contains three 350mm high troughs, each with a different filtration medium, such as sand, which filter and polish the water.

Water is pumped to the top planter and then travels by gravity through each planter till it reaches the bottom holding tank.

7. Where does the grey water come from?

Water for the Green Wall is collected from, floor wastes, showers, bath and bathroom basins.

It is stored in a 300 litre holding tank under the courtyard before being pumped twice a day up to the top planter in the green wall.

8. What is the recycled water used for?

Treated water from the Green Wall is stored in a 600 litre holding tank under the wall and used in toilet flushing and the washing machine. It passes through a UV filter on its way into the house.

9. Is it potable?

No, the water is regularly tested and easily meets the requirements set down by NSW Health for its use but is not potable.

10. What is the cost for someone to install a 'green wall' grey water treatment system?

The system cost around \$20 000 but it should be noted that it is a prototype so future versions are likely to cost less and be smaller etc.

11. Can a green wall be used in other locations?

Definitely. We are currently looking at using it in several other projects. It is not however at this point in time an off the shelf product. It needs the input of the environmental scientist in the design process to both determine the size and particular composition of the filters and to sign off on the design in terms of its environmental performance.

12. What happens if the owners go away ?

A solar powered re-circulating pump connecting the holding tank to the top planter is used when the house is unoccupied to keep both the water fresh and the plants alive.

If, over an extended period of non use, the water in the holding tank runs out the tank is automatically topped up with rainwater from the rainwater tanks.

13. Are the plants part of the system ?

The plants assist in the process by absorbing the nutrients extracted from the grey water. The species found to be most suitable include, cannas and liriopes in the top planter, arum lillies in the middle planter, ferns in the bottom planter.

14. Are special soaps and chemicals required in the system?

There are no special controls regarding chemicals etc. The occupants use normal soaps and shampoos however, the fewer the chemicals put into the system will mean the longer the filter mediums will be effective before needing to be replenished.

15. How frequently will the filter materials need to be replaced.?

We don't know how often the filter materials will need to be replenished. We anticipate it will be between 5 and 10 years.

16. What are the other water management systems in place in the house?

9000 litres of rainwater storage in three specially designed tanks. Excess stormwater is directed to underground absorption pits that recharge the aquifer, as against running out into the street. Each rainwater tank is nominally 2.1m high X 1800long X 900wide & holds 3000 litres

17. What is the rainwater used for?

Swimming pool, showers, bath, hand basins, laundry tub, dishwasher, garden and to top up the grey water as needed.

18. Where is town water used?

The only direct town water connection in the house is to the kitchen sink and roof mounted hot water system plus a top-up valve should the rainwater tanks run low.

19. Is the rainwater potable?

Our analysis suggests it is but we don't use it as potable water as both Sydney Water and NSW Health do not support the use of rainwater as potable water.

The system is outperforming our expectations in terms of water quality.

20. The swimming pool holds how much rainwater?

The pool holds 7500L. It is supplied exclusively with rainwater.

21. How effective has the water management system in the Clovelly House been?

Our clients have kept continuous records of their water usage since occupying the house and at this stage are saying they are achieving at least an 80% reduction in town water usage (even with a pool).

That is:

The occupants use less than 100 litres of town water per day

and

are saving approximately, 115,000 litres of water per year in a two person household

Despite the fact that we have been in almost constant drought since the house was occupied it has never run out of tank water and, as I said before, the grey water system is outperforming our expectations in terms of water quality.

22. Did it require special plumbing?

YES, the house has a three pipe reticulation system all in polypropylene pipe work (rainwater, grey water and town water supplies) with almost no copper (the lack of use of copper was a thing we specified as part of the overall sustainability agenda of the house).

The additional plumbing added a cost of approximately \$2000 to the project for both the supply and waste pipe work.

23. Was it easy to get the builders and plumbers interested in the project?

The builders were interested, if a bit daunted.

The plumbers had some difficulty with the ideas. During the project we changed plumbers to a plumber who was committed to sustainability principles (one of the few in Sydney).

24. What about Sydney Water and the local council?

After some initial difficulty Sydney Water were also supportive, if cautious. It was after all the first time some of what we were doing had ever been done.

Randwick Council were very enthusiastic and helpful. The Mayor has visited the house and written about it.

25. Is the house difficult to maintain?

No, the whole purpose of the project was to produce a house which made our clients lives easier not harder.

26. Does the house feel different?

The house was designed as a piece of modern architecture on a difficult infill site.

The environmental initiatives were not seen as being anything other than good design and the appropriate way to approach housing in the 21st Century.

As we said earlier, the whole approach for us is to make what we do a fundamental and integral part of living in the house – not an add on.

THE CLOVELLY HOUSE

AWARDS & PUBLICATIONS:

AWARDS / CITATIONS:

- 2004 Green Buildings Awards Gold Medal
- 2004 National YBE (Year of the Built Environment) 2004 Exemplars Publication. Clovelly House selected as a 'Best Practice House' for both Sustainable Communities and Excellence in Building
- 2004 Solar House Day – exemplar house
- 2005 Solar House Day – exemplar house
- 2005 RAI (Royal Australian Institute of Architects) Awards
- Environmentally Sustainable Architecture
- 2005 DIPNR (NSW Department of Planning and Natural Resources) Clovelly House selected as leading case study for BASIX
- 2006 Randwick City Council Urban Design Awards
- Award for Best Alterations and Additions
- Award for Sustainable Design

PUBLICATIONS:

The Clovelly House has been featured in numerous publications including:

RAIA Architecture Bulletin, RAIA 2006 Annual Review, SMH Domain, Australian Financial Review, Indesign Magazine, Contemporary Home Design Magazine, Sanctuary Magazine, Greensmart Magazine, Better Homes & Gardens Magazine, Baanlaesuan Magazine (Thailand). Sustain Magazine (UK), VIVE Magazine, Home Magazine (Czech), Sublime Magazine(UK), Dwell Magazine (USA)

The house is featured on the NSW Govt - BASIX website, the World Architecture Website (UK) and the Slowhome Website (Canada),

TOURS/ CONFERENCES / CPD:

The Clovelly House has been presented at numerous talks and conferences including the 2006 RAIA National Conference and has been the subject of a series of tours of leading contemporary housing in Sydney.

The house is the subject of the first online CPD program launched by the RAIA in June 2006.

TELEVISION / FILM:

The Clovelly House has been featured on the ABC 7.30 Report, several lifestyle programs and three films focussing on sustainability.

THE CLOVELLY HOUSE

PROJECT TEAM:

Architect: Kennedy Associates Architects
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THE CLOVELLY HOUSE

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Rain Water Tanks:	Slimline Rainwater Tanks 26 Beerwah Pde QLD p: 1800 804 901 p: 07 5494 6311	Pumps & 'Rain Bank':	Davey Products Pty Ltd p: 1300 367 866
Pool:	Architectural Pools 16 Bream Street Coogee NSW 2034 Contact: David Merry p: 9665 4602	Solar HWU:	Beasley Hot Water Solutions p: 1300 360 343
Sun Lizard Heater:	Alternative Fuels PO Box 276 Mt Evelyn Vic 3796 p: 03 9737 1566	Bio Paints / Floor Oils:	The Natural Paint Place 583a King Street Newtown NSW 2042 p: 9519 0433

Pavers: Besser Block Centre
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Dee Why NSW 2099
p: 9982 2536

Kitchen: Schmidt Kitchens
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Darlinghurst NSW 2010
Contact: Laurent Schurrle
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w: www.cuisines-schmidt.com

Joinery: AG Cabinetmaking
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f: 9725 2018

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