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the bowden centre
mt annan botanic garden

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The Bowden Centre is a new educational and multipurpose resource building at Mt Annan Botanic Garden, Sydney NSW.

The building's primary purpose is to provide a teaching facility for the numerous school groups who visit the garden every year - a place to learn about the garden and Australian flora. However, the facility has also been designed to accommodate a broad range of other activities, from seminars to weddings.

The building comprises a 345m^2 structure which houses one large 105m^2 space, with supporting facilities including staff offices and kitchen. Attached to the main space is a 50m^2 outdoor 'classroom'.

The brief for the project, the first permanent building at the Botanic Garden, was to set the benchmark for future buildings on the estate and to provide a unique multi-function facility that demonstrates high standards of ecological sustainability, within a very modest budget.

This was achieved through, amongst other things, siting the new building in the location of an existing structure, recycling the steel structure and aluminium windows from the earlier building, the use of low maintenance materials, the thermal management of the building via a ground coupled, water based air conditioning system and the inclusion of a series of plywood clad, vertical wall openings that act as alternatives to conventionally glazed windows.

The building, although relatively small, achieves a strong presence through its elongated form, the use of tripartite massing, soaring roofs and a 30m long verandah facing onto the adjoining open green.

In keeping with its setting and environmental agenda, the building uses a steel frame which is then clad in a combination of vertical and horizontal radially sawn Silvertop Ash plantation timber, constructed of overlapping solid timber slats that will be allowed to age to a soft grey, enhancing the bush setting as well as removing the need for the use of environmentally damaging finishes.

Internally, as with the outside, the building is lined in timber, being blackbutt veneer panels, a robust, low maintenance wall finish which gives the interior a rich spatial quality, strongly contrasting with the exterior environment and creates a unique, warm and inspiring space.

The rich, dark timber is highlighted by the continuous band of south facing clerestory windows and by the 13 plywood clad 'windoors' on the northern side of the building.

These 'windoors', which are casement type window openings utilising solid shutters rather than glass, achieve a higher insulation value, and provide less exposure to radiant heat gains, than a traditional window. When the windoors are shut the exterior of the building appears closed and solid, however when they are open the building has a strongly perforated appearance, which is further accentuated by the vertical timber cladding.

The thermal performance of the building presented a unique challenge due to both the high variation in seasonal temperatures at Mt Annan and the fact that the operation of the teaching space was not suited to a conventional passive solar design. The solution was to adopt a unique thermal management system that collects solar energy in the form of heat from the roof, stores that energy in a 40,000 litre below ground water tank, and then transfers that energy into the building by way of a heat pump to the polished concrete floors.

In summer the system works in reverse to cool the building by chilling the concrete slab.

The system, which has not been used before on a building of this scale, offers a viable and cost effective alternative to airconditioning for many building types.

The result is a building that can respond rapidly to a range of uses and conditions and is an essay in the creation of an environmentally intelligent building which transcends style to create a rich and inspiring educational environment.

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Australian Institute of Architects Awards citations

"The Bowden Centre provides an alternative approach to the sustainable utilisation of existing building stock through innovative re-use of an existing demountable structure as the basis for a multi-function permanent facility. Its simplicity of form enables the centre to have a 'loose fit' that accommodates a wide range of activities from its primary use as a teaching facility to a seminar area or a function centre.

Utilisation of the outdoor spaces is similarly successful with the outdoor room and verandah enabling great opportunity for response to varied conditions and uses. In terms of re-use, the new building has been carefully sited where the earlier demountable structure stood and the steel structure and aluminium windows have been reclaimed for use.

The seamless way in which sustainable strategies are holistically integrated into the design provides inspiration for a sustainable future.

This is a simple, elegant and intelligent building that demonstrates the important role architects can play in solving basic problems and elevating the response so that it is not only functional and sustainable, but delightful. It sits so calmly in its setting that it has a sense of inevitability."

Peter Mould, Chair of Jury
NSW Government Architect

The Bowden Centre

Winner of the
2008 Sir John Sulman Prize for Outstanding Architecture
2008 NSW Australian Institute of Architects Architecture Award
for Sustainable Architecture
2008 NSW Property Council Award (commendation)
2007 BPN Environ Sustainability Award
2007 Australian Timber Award (commendation)

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PROJECT TEAM

Project team

Client:	Botanic Gardens Trust of NSW
Architects:	Kennedy Associates Architects
Structural Engineers	Low & Hooke (Aust) Pty Ltd
Mechanical Engineers	Meinhardt Consulting Engineers
Lighting	Architectural Lighting Design Pty Ltd
Builder	Kinsley Constructions Pty Ltd
Mechanical Installation	Ecothermal Solutions Pty Ltd
Photography	Bart Maiorana, Steve Kennedy, Petra Kleegraefe

Kennedy Associates Project Team

Principal	Steve Kennedy
Project Director:	Anthony Nolan
Project Team:	Malay Dave
	Danny Le
	Marika Hahn
	Martin Tran

Suppliers

Timber cladding	Radial Timber Pty Ltd
Timber lining	Big River Timbers Pty Ltd
Cladding to windoors	Carter Harvey Holt Pty Ltd

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FREQUENTLY ASKED QUESTIONS

1. Where is the Bowden Centre

The Bowden Centre is located at Mt Annan Botanic Garden, a demonstration garden dedicated to native Australian species in Western Sydney.

2. Who was the client

The client was the Botanic Gardens Trust of NSW.

3. How big is it

The building comprises a 345m^2 structure which houses one large 105m^2 space, with supporting facilities including staff offices and kitchen.

Attached to the main space is a 50m^2 outdoor 'classroom'.

4. How are the spaces organised

The core spaces within the Centre are the 105m^2 multi purpose space and the adjoining 50m^2 external classroom, located at the western end of the building, which has expansive vistas across the Botanic Garden

These two spaces occupy approximately 50% of the building's footprint. The remaining spaces are occupied by staff offices, toilets, store-rooms, a kitchen and the 30m long south facing verandah / corridor linking the various volumes of the building.

The staff offices are located at the eastern end of the building giving staff overview of people coming to and from the centre.

5. What are its key architectural features

The building, although relatively small, achieves a strong presence through its elongated form, the use of tripartite massing, soaring roofs, and the 30m long south facing verandah connecting it to public pathways and the adjoining open green.

The building's massing and proportions are further articulated by the use of vertical and horizontal cladding differentiating the upper and lower portions of the structure, the manner with which the three key roof forms are oriented in different directions to reflect their purpose and location and the dynamic placement of large areas of highlight glazing, again reflecting the function of the spaces they serve.

The verandah roof sets up the line which divides the building's various volumes between lower and upper elements, with the lower portions having an apparently 'solid' and enclosed character and the upper portions an open and transparent character.

The apparently enclosed and solid character of the lower portions of the building are further perforated by a series of primarily vertical slots including a series of 13 'windoors', which are casement type window openings utilising solid shutters rather than glass. When the windoors are shut the exterior of the building appears closed and solid, however when they are open the building has a strongly perforated appearance, which is further accentuated by the vertical timber cladding constructed of overlapping solid timber slats.

The interior of the main space, as with the outside, is lined in timber, being blackbutt veneer panels, a robust, low maintenance wall finish which gives the interior a rich spatial quality, strongly contrasting with the exterior environment.

The space has a sloping ceiling reaching 5m at its highest point, that is divided at wall height by a series of 0.5m high muscular timber beams at 2.5m centres, created by overcladding the modular steel frame system recycled from the pre existing building. These beams, which also house the lighting for the room, repeat the external differentiation between upper and lower elements and give the space a strongly defined rhythm and sense of scale.

The use of an accentuated high ceiling and highlight glazing for the interior volumes is repeated in the public toilets and staff rooms. These rooms, in contrast to the main space, are each further defined and given individuality by the use of a different single strong colour on one wall of each space, such as the 4m high bright green wall in the staff room.

6. What was the environmental brief for the project

The project brief called for a building that:

"demonstrates the practicable incorporation of leading edge ecological sustainability features in building fabric and ongoing operation, and which can be utilized for a variety of educational, cultural and recreational purposes."

7. How was this achieved

This was achieved through a range of environmental innovations including:

- Locating the building over the footprint of the previous building thus minimising site disturbance and impact on vegetation
- the recycling of the steel structure and aluminium windows from the previous building on the site
- the use of environmentally appropriate materials, such as radially sawn plantation timber
- the minimal use of chemicals, paints and the like
- the use of low energy, indirect, fluorescent lighting throughout
- the harvesting of roof water for the operation of the toilets and basins
- the use of 'windoors', being plywood clad solid shutters, in place of traditional glazed windows
- the use of polished concrete floors to provide thermal mass and
- the thermal management of the spaces via a solar heated, ground coupled, water based air conditioning system which heats and cools the building through the polished concrete floors.

8. What is particularly innovative about this project in ESD terms

The key environmental initiative of the Bowden Centre is the thermal management system, which was developed in conjunction with Meinhhardt Consulting Engineers.

The thermal performance of the building presented a unique challenge since the operation of the teaching space was not suited to direct solar access due to concerns about glare and the operation of video teaching aids.

As a result, a conventional approach to passive solar design was not possible. Equally the client did not want to install a traditional air-conditioning system in the building.

In response to this challenge the building adopts a unique thermal management system that collects solar energy in the form of heat from the roof of the building, stores that energy in a large below ground water tank, and then concentrates and transfers that energy into the building by way of a heat pump to the concrete floor slabs.

The system was designed around the notion that the critical place to ensure thermal comfort was at the floor level where the occupants sit/stand. The building has very high ceilings and the upper levels of the spaces form 'heat blankets' which help modify the temperature at lower levels.

The system operates as follows:

Winter Mode:
The 100m^2 of solar pool heating collectors located on the roof provide heat to a 40,000 litre water tank submerged into the ground (ground coupled), next to the building. The water within the tank is set to be at 20^{0}C all year.

The water is then transferred via a heat pump to a series of hydronic floor coils set into the polished concrete floor. The heat pump boosts the temperature in the coils to approximately 35^{0}C, resulting in a surface temperature of approximately 29^{0}C at the floor level, the maximum comfortable for people sitting on the floor.

Summer Mode:
In summer the system works in reverse to cool the building by chilling the concrete slab. Utilising the below ground water tank, which has discharged its heat into the adjoining ground, the solar panels operate, via the heat pump, to cool the tank overnight when the external air temperature falls well below daytime temperatures.

In summer the system supplies water to the floor coils at approximately 15^{0}C, resulting in a surface temperature of approximately 19^{0}C at the floor level, the minimum comfortable for people sitting on the floor. The system can maintain a temperature of approximately 20^{0}C at the floor level for up to two days of full occupancy during day time external air temperatures of in excess of 35^{0}C.

In effect, the system is a solar boosted geo thermal system, which has been designed to respond to the particular environmental and occupancy conditions of the site. The system always works with the natural temperature gradients, not against them, as is the case with a typical heating and cooling system.

The system cost approximately $40,000 to supply and install.

9. What other environmental strategies were incorporated in the design

Siting:
The building is sited in the location of the "demountable" building that it was to replace, in order to minimise the disturbance to the garden and its associated infrastructure. The building had minimal impact upon existing trees and vegetation.

Building form:
The orientation of the building, and roof forms have been designed to compliment the thermal management and daylight strategies adopted for the building.

Windows:
The building has two core window types:

- 1.8 m high highlight glazing made up primarily of recycled aluminium windows from the previous building
- a series of 13 'windoors', which are casement type window openings utilising solid shutters rather than glass. Each 'windoor' is a 1.8m high by 0.4m wide plywood screen fitted into a prefabricated steel frame and operated with heavy duty casement stays. 'Windoors' achieve a higher insulation value than traditional windows, have less exposure to radiant heat gains, and provide integral shading through the use of timber in lieu of glass.

Materials:
The core decisions with respect to materials were:

- The recycling of the structural steelwork and aluminium windows from the existing "demountable" building.
- The use of a polished concrete floor slab to provide thermal mass and to facilitate the hydronic heating and cooling system
- The use of a steel stud frame for infill walls.
- The use of Australian plantation hardwood both externally and internally to provide sustainably sourced, low toxic surfaces. Externally the timber was untreated and will be allowed to weather to a soft grey requiring minimal ongoing maintenance.

Paints:
The use of paints was minimised throughout the project, and in particular externally. Water based low VOC paints were used throughout the interior.

Water:
The building collects its roofwater for reuse in toilet flushing and garden irrigation, making the building virtually self sufficient in terms of water consumption.

Lighting:
The use of T5 fluorescent lighting for 95% of the lighting within the project.

Low Maintenance:
Materials were selected for the project on the basis of their longevity, low embodied energy, resistance to wear and tear and recyclability.

Recyclability:
The building has been designed to be almost entirely recyclable. The steel structure for the new building was bolted together on site, the exterior timber cladding has been screw fixed and the interior plywood lining has been designed to be removable.

10. What timber products were used in the project

The principal timber products used in the project were:

Vertical Cladding:
25mm unseasoned, fine sawn, plantation, Silvertop Ash, vertical boarding & battens were used as wall cladding throughout the lower portion of the building.

Horizontal Cladding:
19mm seasoned, dressed, plantation, Silvertop Ash Shiplap cladding laid horizontally were used as wall cladding at the upper portion of the building.

Internal wall lining:
25mm structural grade plywood panels, using plantation and regrowth Blackbutt hardwood veneers were used as internal wall lining to the main space of the building.

11. Did cost factors influence the ESD decisions

The construction cost, excluding site works, was approximately $800,000.00 AUS.

The tight budget in part drove the need to find unusual and innovative solutions to the project.

In this process, it was found that cost considerations aligned with the project's environmental agenda to minimise waste by supporting:

- the salvaging and recycling of the existing building
- the use of products with low embodied energy, such as the polished concrete slab
- the minimal use of toxic finishes such as external paint.

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