BAYFIT – REDEVELOPMENT OF A LEISURE CENTRE USING ESD PRINCIPLES

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Abstract
The purpose of this paper is to document how Environmentally Sustainable Design Principles were incorporated into the redevelopment of Altona Leisure Centre. Built in 1976 the Altona Leisure Centre had by 2004 grown old and tired and the community was demanding a better facility. In 2005 planning began in earnest and ESD principles were incorporated from the outset with the selection of Architects. By June 2008 the new $11,000,000 Bayfit Centre had been redeveloped and was fully functioning.

Key Words: Sustainable, leisure, Bayfit, energy, water, conservation, recycling

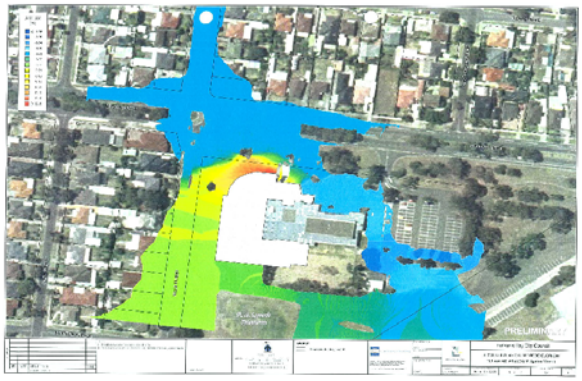
Introduction

This project, from the selection Architects to the final inspection has been overseen by the Project Control Group. This group included representatives of Hobsons Bay City Council, the owner of the facility and Leisure Management Services, the lessee of the centre. This allowed the final users of the facility to be part of the decision process. Once the Architect, ML Design Pty Ltd. was appointed, the project Architect also became a member of the Project Control Group. Decisions on all aspects of this $11 million project could therefore be considered with ESD principles in mind. From a 2,000 square metre 1976 building containing a narrow 25 metre pool, a small learn to swim pool and a small gym the centre has now been redeveloped into a 5000 square metre modern welcoming building containing four pools, a spa, a steam room, a large gym, a program room, a crèche and a wellbeing centre.

Embodied Energy – In the Building

The construction of the original building had involved the consumption of a large amount of energy in both the manufacture and transportation of components as well as the erection of the structure itself. The goal was to build a new facility but reuse as much of

the existing structure and components as possible.
The complication in this case was that the 1976 built facility was now in a flood plain and the designated floor level for the new building was 240mm above the existing floor. With the proposed facility being much larger than the existing, the 1 in 100 year flood event needed to be diverted around the facility by way of a large open swale drain.



Aerial of Predicted 1 in 100 Year Flood

Three major choices were available to the Project Control Group.
(1) Demolish the entire existing facility and rebuild a completely new facility with all floors at the designated level of 7.9m Australian Height Datum,
(2) Save some of the building with the existing floor level of 7.66m AHD and build a large extension with a higher floor level of 7.9m AHD with ramps between the two areas to comply with the Australian Code for Access and Mobility or
(3) Save some of the building with a floor level of 7.66m AHD and build a large extension at the same level.
As all options would still remain within the flood plain and required the construction of a permanent swale drain to divert any flood around the project. Option (2) and (3) both

required any swale to have a levee at least to RL 7.90 AHD between the building and the swale drain to protect the total building against the 1 in 100 year flood. The choice was made for option (3) as this allowed the project to comply with our aim of retaining as much embodied energy as possible and have all floors at the one level which was preferred to comply with the Australian Code for Access and Mobility.

Approximately 40% of the structure was eventually demolished with all salvaged concrete and steel being sent to recyclers by the builder ADCO Pty Ltd. The remaining 60% of the existing building was retained but reused for different purposes. The areas retained were the main pool hall with the 25m substandard pool, the plant room and the old male and female change rooms.

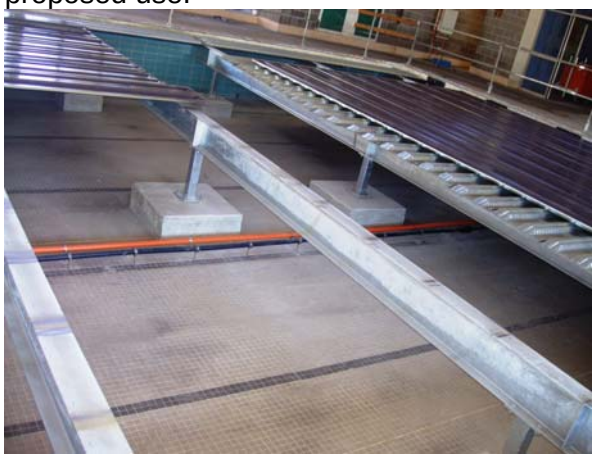
The end result involved the conversion of the old pool hall into a modern gym. This was achieved by flooring over the old pool with a concrete slab. The old tiled pool was physically sound and was converted into a 300,000 litre stormwater storage tank. The original change rooms were revamped and reused as gym change rooms with new change facilities for pool users being provided. What was once the pool plant room was converted into a children's crèche.

Embodied Energy – In the Plant

The original building contained plant some of which had been installed in more recent years. This included small sand filters and dosing plant and some air-conditioning plant. The sand filters and dosing plant were retained as spare parts or replacement plant for the other aquatic facility owned by Hobsons Bay City Council. The usable air-conditioning plant was reused for less onerous uses within the new Bayfit facility. Thus the embodied energy within this plant was retained.

Water Harvesting

The roof and surrounding area provides approximately 9000 square metres of stormwater catchment area. In the design stage of the project it was the desire of the Project Control Group to harvest the stormwater that falls upon this area for reuse in the project. The question was should we have an underground storage tank or an above ground tank. The answer was simple. Why not save the old pool and incorporate it into the design as the stormwater storage facility. Structurally the original pool shell was sound and water tight and ideal for the proposed use.



Pool Converted for Stormwater Storage

Now when it rains all stormwater from the project area is discharged into the old tiled swimming pool under the new gym. The stormwater captured in this way is then filtered and fed into the new pools via the purification plant. With average rainfall it is expected the harvested water will almost equal the topping up requirements of the new pools. This offsets the need to use potable water for topping up the pools. This saves potable water use and saves the embodied energy embedded in the original pool.

Water Recycling - During Construction

During the construction of the four new concrete pool shells, two backwash tanks and four balance tanks all were required to be hydraulically tested for leaks. This required filling each with clean water and testing them over a specified period. By arrangement with the builder this was accomplished by using bore water from a local bore. The amount trucked in was minimised by filling each tank in turn so that the same water was used more than once. This water was then totally reused again to assist in the irrigation of the nearby Altona Lakes Golf Course. This has helped conserve a resource by minimising the use of potable water.

Water Recycling - Ongoing

In aquatic centres, where sand filters are used, the filters are regularly cleaned by forcing water back through the sand in the opposite direction to wash the "waste"

collected into the sewer, hence the term “Backwashing”. This is regarded as a trade waste by the sewerage authority and attracts a charge. At Bayfit this waste water is cleaned to a standard that allows it to be used to flush all toilets, wash down the pool concourse and irrigate the gardens around the centre. Surplus water to these needs is pumped to adjacent Altona Lakes Golf Course for irrigation. This eliminates a need to use potable water for flushing purposes which conserves a resource and eliminates a discharge to sewer and the consequential trade waste charge. The harvested stormwater is not used for these purposes as the demand for topping up the pools exceeds our capacity to collect and store enough stormwater by harvesting.

Energy Conservation - Lighting

Bayfit operates throughout the year usually from 6 AM to 9 PM Monday to Thursday, 6 AM to 8 PM Friday and 8 AM to 6 PM weekends. Artificial lighting is therefore a major factor in such a facility.

At Bayfit the artificial lighting of the Aquatic and Gym areas within the building are automatically controlled depending on the natural light entering the particular part of the building. Light switches still operate in each area but the light intensity is controlled. If the day is sunny and bright some of the artificial lights are automatically turned off. If it is before daybreak, after dusk or the day is dull as it is throughout winter in Melbourne, any lights which have been “turned on” operate normally. This minimises electricity use and provides a constant light level for the patrons.

Origin Energy has now completed “Daylight Simulation Modelling” of the Aquatics and Gym areas which compares the system installed with a normal manual switch on switch off configuration. The bottom line reveals that in a 12 month period the installed system has provided a saving of 18.6% in energy use for lighting these areas. On the basis of this information the system has now been extended into the Program Room.

Energy Conservation – Pool Heating

In Aquatic Centres both the temperature of the pool water and the air above the pool need to be maintained to tight tolerances for energy efficiency and the benefit of the patrons. The air handling equipment also needs to bring fresh air into the system and exhaust stale air. The incoming fresh air needs to be brought to the required temperature by heating or cooling. At Bayfit the waste air is passed through a heat exchanger which removes the heat energy contained within it and transfers the heat to the incoming fresh air. This minimises the energy needed from external sources to heat or cool the incoming fresh air.

Similarly the backwash water that is being treated for reuse for toilet flushing, concourse wash down and irrigation is straight out of the warm pool environment. At Bayfit the heat within that backwash water is first removed via a heat exchanger and then reused to assist in the heating of the treated water going into the pool. This minimises the energy needed from external sources to heat the incoming pool water.

Energy Conservation - Solar

The supply of hot water to the centre including the public showers and hand basins in the various change rooms is supplied via the solar panels. The 24 roof mounted solar panels pre-heat the mains water prior to it entering the gas hot water services. In this way less gas energy is used in heating the hot water to the required temperature.

Energy Conservation – Transport

The more people that attend Bayfit via foot, bicycle or public transport rather than as a single occupant in a car, the better it is for energy conservation. Public transport is catered for now at Bayfit via a bus route and bus stop outside the centre. A shared bicycle and pedestrian path has now been constructed right past the front door with bicycle lockers and hoops provided for cyclists who use the centre. This encourages patrons to ride or walk to the centre.

School Learn-to-Swim programs are catered for by providing a separate exclusive drop off stop and entry-bridge to facilitate easy access for school groups in buses.

This integrated planning has enabled the best possible ESD outcomes at Bayfit.

Efficient New Plant & Equipment

Whilst the capital cost of any new plant in an Aquatic Centre is a major expense, it behoves the designers to specify the most energy efficient plant the budget will allow.

At Bayfit this took many forms, but direction to and innovation by the hydraulic, pool water treatment, mechanical, and electrical consultants and the Project Architect maximised the benefits that have been derived at this facility.
These included water efficient taps and fittings, dual flush cisterns and waterless urinals. The control of the shower temperature in the public showers was also pre-set to allow only one available temperature. This not only provided a safer situation for users but also limits energy use.
The choice of gas boilers for the heating of the pool water was taken on an energy efficiency basis. The high efficiency condensing boilers chosen increased the energy efficiency on this major item of plant by 10%.
The pool hall supply and exhaust fan motors are provided with variable speed drives. This reduces the energy use by the fan motors when demand is minimal such as overnight when the centre is not in use.
All air-conditioning plant have economisers fitted to maximum use of the outside air temperature for cooling (free cooling).
The pool hall air handling plant is provided with heat exchanger coils to recover heat from the exhaust air and transfer it to preheat the introduced outside air.
The pool hall air handling plant also has automatic controls which vary the intake of outside air to maintain pool hall humidity. This permits lower outside air volumes to be taken in and therefore reduced heating loads and energy consumption when the condition of the outside air is suitable

Architectural Features

North Facade of the Aquatics Area

The building has many features which go unnoticed to the passing public. The open see-through aspect of the facility is one feature that does not go unnoticed. The original building allowed little of the indoor activities to be seen from the outside. The current Bayfit activities in both the aquatic areas and the gym can now be seen by the passing traffic. This provides a very inviting welcome to potential patrons, which is a goal of the city and also a good commercial marketing tool.
The striking appearance of the wave roof also gets very favourable comments. What does go unnoticed includes the Comfort Plus laminated glass windows which allows light in but reduces heat transfer into and out of the building thereby saving energy. The large eaves over the north facing windows and the horizontal louvres at mid-height reduce direct sunlight onto the windows facing towards the sun thereby reducing energy use. The South facing roof windows which allow indirect light into the Aquatic areas but eliminate direct sunlight also minimise energy use. The ceiling lights within the Aquatic areas are shine up towards the white ceiling so that light above the water areas is indirect and therefore does not allow reflections off the pool surface for safety purposes.

Materials & Insulation

The extended building is of galvanised structural steel frame with concrete floors with steel deck rooves and cladding. The choices made here were to ensure, in such a harsh internal environment, the building would have a long life and be “Fit for Purpose”. Fit for purpose and whole of life considerations are an integral part of ESD considerations.
The roof and wall cladding is Colorbond Ultra which is highly resistance to marine corrosion, a particular concern at this location. The story however does not end there. The roof sandwich includes an insulating fibreglass building blanket, a woven polyethylene fabric moisture barrier, foil sarking and safety mesh. This roof sandwich is separated from the galvanised steel purlins by continuous dense polystyrene thermal packers, which reduces the transfer of heat through the roof. This in turn conserves energy.
The floor to the Program Room is a “sprung” timber floor which is extensively used for aerobics. The choice of timber for this application was recycled Tasmanian Oak. By

choosing recycled timber ESD and fit for purpose principles were maintained.
Whilst not a major line item in the construction of this $11,000,000 facility the benches in the change rooms and around the pool hall needed a durable surface which was suitable for the wet aquatics situation. In this case recycled plastic slats were chosen as they were certainly “fit for purpose” and ESD compliant.

Funding

The project was funded in the main by Hobsons Bay City Council, the owner $6.5 million
Leisure Management Services, the lessee $2.3 million,
Sport and Recreation Victoria $2.5 million
Assistance was also provided by smaller grants from the Department of Sustainability & Environment for water harvesting, backwash recycling and lighting controls initiatives.

Conclusion

Many of the decisions regarding the design and construction of Bayfit involved much discussion and consideration as to their merits. Some involved new technology but most involved simple principles which all related back to the initial goal of using Environmentally Sustainable Design Principles in the Bayfit Project.
The inclusion of the lessee representatives on the Project Control Group also was a key to the success as it involved the final users in all decisions.
The lessons learned with this project:

1. Involve the users of the building in all decisions from the outset.
2. Think ESD before your start the design and throughout the construction phase.

The result is very aesthetically pleasing building which has been well received by the public, exemplified by their attendance and their obvious enjoyment of the facility.

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