

## Case Study – Arena Child and Family Centre

Cardinia Shire Council’s Arena Child and Family Centre in Officer provides a case study on the benefits of sustainable building design and the significant operational cost savings that it can provide. The Arena centre was one of the first buildings that an early version of the BriefEzy requirements were applied to and it features a number of sustainable design features. These design features provide numerous benefits, including improvements in the comfort and well-being of occupants, while also reducing environmental impacts.



Image 2: Arena Family and Child Centre

### Passive Design Features

The building is orientated along an East West axis with major activity areas facing north. Northern winter sun provides warmth to the building when it is needed most. Additional high level windows also provide northern solar access to areas on the southern side of the building. Natural lighting and thermal conditioning achieved through passive and sustainable design promotes health, wellbeing and thermal comfort of occupants.



Image 3: Arena Children's Centre Northern facade

The building features high levels of insulation in the roof and walls, as well as the extensive use of double glazing. The concrete slab of the building is designed to absorb thermal energy, providing thermal mass and reducing the need for heating and cooling. A light coloured roof has been used, to reflect heat in summer and keep the building cooler. The light colour also lowers the roof surface temperature enabling the rooftop solar electricity system to perform more efficiently. The building also includes external shading to provide protection from the summer sun and reduce air conditioning requirements.

Image 3 is looking towards the north facing side of the building in mid-summer. The external shading can be seen to provide protection from the sun. The north facing glazing can be seen, the building's light coloured roof and the high level north facing windows that bring winter sun further into the building.

## **Heating , Cooling and Hot Water**

Air conditioning is only provided to the main activity areas. Areas that are not used for extensive periods are not air conditioned to reduce energy consumption. Efficient split systems and multi-split units are used so air conditioning can be easily controlled and limited to certain parts of the building. When outdoor conditions are appropriate, operable windows provide a passive design alternative to the use of air-conditioning. Temperature set points are limited to ensure over conditioning does not occur.

Ceiling fans are utilised in summer to assist with cooling, the velocity they generate allow room temperatures to be set at higher levels, reducing energy consumption. Hot water is provided from efficient instantaneous electric and small electric storage hot water units close to the point of use. Solar electricity from the building's rooftop array is able to supply all heating, cooling and hot water systems, as they are all powered by electricity.



## Water

Water efficient appliances are used throughout the facility. The toilets are supplied by a 5,000 litre rainwater tank that is connected to extensive areas of the building's roof. The use of rainwater for flushing of toilets significantly reduces the building's mains water use.



Image 4: Arena Family and Child Centre rainwater tank

## Solar Energy

The facility is powered by a 30kW solar electricity system. The system utilises micro-inverters, allowing each panel to operate independently. This means if one panel becomes dirty or shaded, the rest of the system will not be impacted, unlike conventional solar energy systems.



Image 5: Arena Family and Child Centre Solar Electricity System

## Lighting

In addition to the use of natural lighting, energy efficient LED lighting is used throughout the facility including the carpark. Occupancy sensing and daylight dimming is incorporated as part of the lighting control strategy.

## Summary of Savings

The simple and cost effective sustainable design features incorporated at Arena Children's centre have provided a significant cost and environmental savings. As can be seen in the table below, compared to an older children's centre without as strong a focus on sustainable design, the building is saving \$10,000 per year in energy costs, 64 tonnes of greenhouse gas emissions per year and 94,000 litres of water per year. The two centres are of comparable size.

	<b>12 months Water Use (kL) 2017-2018</b>	<b>12 months Greenhouse Gas Emissions (TCO<sub>2e</sub>) 2017 - 2018</b>	<b>12 months Energy and Water Costs 2017-2018</b>
<b>Arena Children's Centre (593m<sup>2</sup>)</b>	127	-23	-\$423
<b>14 year old children's centre (637m<sup>2</sup>)</b>	221	41	\$9741
<b>Savings</b>	<b>94</b>	<b>64</b>	<b>\$10,164</b>

Table 3: Energy consumption comparison Arena Family and Child Centre  
(Emissions factors from National Greenhouse account factors July 2018)