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5 Hercules Street, Hamilton

Superior ESD Design Report

for

Pamada

March 2014

project no. 6363

CONTENTS

Revision History

Rev	Date	Purpose/Status	Comments
-	9/12/13	Draft	
1	6/12/13	Revision 1	
2	24/01/14	Revision 2	
3	19/06/2014	Revision 3	Accommodating EDQs comments
4	22/03/2014	Revision 4	Incorporating Cardno Comments
5	31/03/2014	Revision 5	Updated to reflect reduced apartments

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EXECUTIVE SUMMARY

This project is located on 5 Hercules Street, Hamilton and includes 142 units over 19 levels with a rooftop terrace as well as basement and podium parking. The objective of the report is to present the key Superior ESD Design Features that have been incorporated in order to reduce environmental impact and provide enhanced occupant comfort. Also, *additional ESD initiatives* separate to 'formal' Superior Design Outcomes are included in the report for information purposes.

Water is a limited resource in Australia, with many cities having restrictions in place due to low supply. It is also an area that offers many opportunities for conservation measures. This development will facilitate reduced water use through the installation of efficient fixtures and fittings as a SDO, and also the harvesting and recycling of rainwater for landscape irrigation as an *additional ESD initiative*.

In Australia, most of our energy is generated from non-renewable sources such as coal and gas. The burning of these fossil fuels has serious negative impacts on future society and the environment. This development seeks to limit this impact by minimising energy use. The development will be powered by the purchase of 100% renewably sourced energy, as a SDO. All apartments will be fitted with 100% energy efficient light globes and occupancy sensors in common areas will further help reduce energy demand. Additional ESD initiatives will include installation of energy efficient appliances, ceiling fans, and achieving an average 5.5-Star NatHERS rating.

Urban cities have large amounts of area covered by roofs leading to problems with stormwater runoff. The roof garden on this development will help mitigate some of this water as well as providing opportunities for food production and enhanced insulation. A centralised hot water system is another initiative proposed in support of both energy and cost efficiencies.

Material choices will enable the life of products and materials used in the development to be prolonged. Waste facilities encourage recycling to reduce the amount of general waste going to landfill. The development has acknowledged the embodied energy and resource depletion caused by concrete and has proactively reduced these effects by not using natural aggregates for non-structural purposes.

The development is providing the opportunity for residents to reduce their greenhouse gas emissions by providing 2 dedicated 'Car Share' car parks – a scheme which offers an easy alternative to car ownership. Bike storage facilities support cyclists and provide tenants with another transport option.

Fundamental to the approach of the new development are the following targets:

- Reduced environmental impact - minimised energy use and resource conservation.
- Economic savings – reduced operational and maintenance costs due to environmental performance.
- Better and healthier living environments.

The above mentioned sustainability strategies plus additional ESD initiatives will deliver Superior ESD Design Outcomes when compared against a standard building of the same class.

1 INTRODUCTION

This report highlights the Superior ESD Design Outcomes for the multi-unit residential development at 5 Hercules St, Hamilton, in support of Development Application assessment by Economic Development Queensland.

There are several features of this building that have been designed to reduce its environmental impact – above and beyond that mandated by the Building Code of Australia. The innovative ESD technologies/features include climate-sensitive building design, energy and water efficient fixtures and fittings as well as rainwater harvesting and recycling. The inclusion of these features will result in a Superior Design Outcome that will benefit occupants whilst minimising the impact to the broader environment.

The main features that improve the environmental performance of this development are:

- Water efficient fittings and fixtures
- Rainwater collection, storage and reuse
- Energy efficiency initiatives
- Centralised hot water system
- Roof garden
- Materials
- Transport

These features are illustrated in the Concept Design drawings (Appendix – A) and further elaborated in the following sections to clearly demonstrate how they will deliver Superior Design Outcomes for the development.

2 WATER EFFICIENT FITTINGS AND FIXTURES

One of the smartest ways to reduce demand on potable water is through the installation of water efficient fixtures and fittings. This approach can provide both financial and environmental benefits without compromising a consumer's lifestyle. Installing water efficient fittings and fixtures not only reduces the consumption of potable water, but assists in reducing the energy required to heat water, and also the quantity of sewage. Water efficient fittings and fixtures provide a triple benefit – the rationing potable water demand; reduction of CO_2 emissions associated with water heating, and the reduction of infrastructure costs and energy used for waste water treatment.

The most straight-forward way to identify that a product meets an acceptable efficiency standard is to examine its WELS rating. The Australian Water Efficiency Labelling Scheme (WELS) rates fittings and fixtures according to water efficiency – the higher the star rating the more efficient the fixture.

Being superior to standard & mandated fittings, the development will utilise as a minimum:

- 3-Star WELS rated shower heads with lower than the mandated minimum flow
- 5-Star WELS rated faucets
- 5-Star WELS rated toilet systems

A comparison of the benefits achieved by installing fittings that have a higher WELS rating than the mandated minimum are identified in the following tables

	Standard Shower Head (WELS 3 star)	Premium WELS 3-Star Shower Head
Flow Rate	9 L/min	7.5 L/min
Average Daily Usage per Apartment	16 (min)	16 (min)
Number of Apartments	142	142
Daily Water Consumption	20,448 (L)	13,632 (L)
Annual Water Consumption	7.46 (ML)	4.98 (ML)
Annual Water Savings 2.49ML per year		

	Standard Faucets (WELS 3 star)	WELS 5-Star Faucets
Flow Rate	9.5 L/min	5.0 L/min
Average Daily Usage per Apartment	10 min	10 min
Number of Apartments	142	142
Daily Water Consumption	13,490 L	7100 L
Annual Water Consumption	4.92 ML	2.59 ML
Annual Water Savings 2.33 ML per year		

	Standard 9/4.5 Dual Flush Toilet	WELS 4-Star 4.5/3 Dual Flush Toilet
Average Flush	3.5 L	3.0 L
Flushes per apartment per day	10	10
Number of Apartments	142	142
Daily Water Consumption	4970 L	4260 L
Annual Water Consumption	1.81 ML	1.55 ML
Annual Water Savings 0.26ML per year		

By installing these water efficient fittings and fixtures, this development will reduce the consumption of portable water and emissions to the sewerage system by approximately 5.08 ML per year, a 35.8 % reduction in water use.

3 RAINWATER COLLECTION, STORAGE & REUSE

Water scarcity is a major issue for Australia, as the driest inhabited continent we must use our limited water resources wisely. Rainwater tanks connected to roofs provide a valuable source of water which will help to future proof the development from drought restrictions and rising water prices.

As an *additional ESD initiative* the development will retain and reticulate rainwater for:

- Watering landscape

The estimated additional reduction in potable water demand over and above that achieved by installation of water efficient fixtures and fittings is:

	Estimated Demand
Landscape irrigation	0.20 ML
Annual Water Savings 0.20 ML per year	

4 ENERGY EFFICIENCY INITIATIVES

4.1 INCREASED MINIMUM NATHERS STAR RATING

As referenced by the BCA 2013, new multi-unit residential developments built in Queensland must achieve an average 5-Star NatHERS rating for the entire building (with a minimum of 4 stars for individual units) [1]. This averaging method was introduced 1 March 2010 to account for the difficulties in achieving a 5-Star rating to all units due to orientation related thermal loading. An additional ESD initiative, supporting the stated SDOs, the development will obtain an average NatHERS rating of 5.5.

In Brisbane's climate a 5 –Star NatHERS rated apartment consumes a maximum of 55 MJ/m2 per annum. A 5.5-Star rating will result in an average consumption of 48 MJ/m2 per annum [2]. Adopting this initiative will save an average of 7 MJ/m2 per annum, per apartment, resulting in an energy saving of 994 MJ/m2 per annum, a 5.9% reduction for the development, and greenhouse gas emission reduction of 684 T CO_2-e/yr.

Thermal comfort is a component of the NatHERS rating, the better the assessment the more comfortable the apartments will be for the residents. A few thermal comfort initiatives will be implemented to better the performance of the development.

Ceiling fans remain the cheapest and most energy efficient method of mechanical cooling. With good design and insulation fans can provide adequate cooling and offer both financial and environmental benefits when compared to air-conditioning.

All units in this development will be fitted with ceiling fans to living and bedroom areas. It is estimated that this initiative can reduce the use of air-conditioning for approximately 3 months of each year. As the HVAC load to these areas would ordinarily be 50 kWh/m^2/year, this will save approximately 12.5 MWh/year of electricity, a 25% reduction and reduce total development greenhouse gas emissions by 12.75 T CO_2-e/yr.

Air conditioners are to be installed for instances when thermal comfort cannot be achieved through fans alone. For air conditioners to be efficient they require the space to be well sealed and adequately insulated. All apartments will have blinds to the windows which will help provide shade from the summer sun, which it is expected to help with machines efficiency. The air conditioners that are to installed will have the highest energy star rating that is economically practical.

4.2 LIGHTING

Since 1 May 2010, sole occupancy units in multi-residential buildings must include energy efficient lighting. The Queensland Development Code (QDC) requires that energy efficient globes are installed to a minimum of 80 percent of the total light fittings [1]. This requirement applies to both the internal and external areas of the building (i.e. balconies). As a Superior ESD Design Outcome (SDO) each apartment in the development will be fitted with 100% energy efficient globes.

To further reduce peak demand on electricity supply infrastructure, occupancy sensors will be used in all common areas such as foyers, hallways and car parks for the control of lights. This is a SDO as research has shown that sensors can save up to 30% of the electrical energy used for lighting [4].

4.3 APPLIANCES

While NatHERS does not consider the energy efficiency of major appliances in its star rating scheme, these items often contribute to more than half of a household's energy bill and are therefore extremely important when considering the overall environmental impact of a multi-residential building. The Energy Rating Scheme is a mandatory scheme for a range of appliances including dishwashers. A dishwasher is considered energy efficient if it has an energy rating of 3.5 or more stars. As a SDO initiative 3.5-Star dishwashers will be installed in all apartments. The potential energy savings achieved by this is shown in the following table.

	Standard Dishwasher	**3.5 Star Dishwasher**
Annual Energy Consumption per apartment	400 kWh/yr	270 kWh/yr
Number of Apartments	142	142
Total Energy Consumption	56.80 MWh/yr	38.34 MWh/yr
	Annual Energy Savings 18.46 MWh	
	Annual CO_2 savings 12.72T CO_2-e/yr	

By installing energy efficient dishwashers in the apartments, this development will save approximately 18.46 MWh/yr of electricity. A 32.5% reduction when compared to a standard 2.5 star dishwasher and decrease greenhouse emissions by 12.72 T CO_2-e/yr. The price of the energy efficient product is not significantly more.

An additional feature to help reduce energy demand is gas cooking appliances which will be provided as part of the standard fit out.

4.4 RENEWABLE ENERGY

GreenPower is the only voluntary government accredited program that enables consumers to elect to purchase renewable energy through their energy provider [2]. Participating renewable energy generators produce electricity from sources like mini hydro, wind power, solar, biogas and biomass, which produce no net greenhouse gas emissions. An estimate of the cost of GreenPower is around 5 to8 cents per KWh more than the current electricity rate, if 100 per cent GreenPower is purchased. The development will seek to incorporate 100% renewable energy as a SDO. (Refer to Padma supplied information for further details).

As an additional initiative the building contract will include provisions to ensure a certain amount of renewable energy is used by the contractor during construction.

5 CENTRALISED HOT WATER

A system that supplies hot water to all dwellings from a central source offers both energy and cost efficiencies. This type of system would include one or more central hot water heaters supplying metered hot water through insulated pipework. Utility providers such as 'Origin' offer packages which include management of customer accounts. Centralised hot water plant can be located in one or more locations within or external to a building. While centralised hot water systems are becoming more common they are not a mandated necessity. A system will be installed in this apartment complex as a part of the developer's additional sustainability initiatives.

6 ROOF GARDEN

This development will include a rooftop terrace with landscaped areas and vegetable gardens. It will take advantage of otherwise wasted space for food production, green amenity and stormwater absorption. Roof gardens absorb about 76 litres of water per square meter of garden space [2]. The water that is absorbed by the garden would otherwise end up in creeks, rivers or oceans laden with urban pollutants or enter treatment plants, driving up the cost of water treatment.

Not only will the roof garden provide aesthetic value, it will offer residents with fresh, seasonal, chemical free produce that has been sustainably grown. Garden environments are places to learn and share sustainable living practices as well as creating a sense of community through shared participation.

The roof garden will contribute to a Superior ESD Design outcome by minimising stormwater runoff, providing increased insulation of the roof structure, and a reduction in the urban heat island effect (the increase in air temperature around built up areas). The garden will offer a wide range of environmental, social and educational benefits as well as being a valuable recreational activity that can contribute to the health and wellbeing of residents.

7 MATERIALS

7.1 RECYCLED CONTENT

The developer has committed to using construction products/materials with a post-consumer recycled content of at least 20%.

7.2 RECYCLING WASTE STORAGE

An area on the ground floor is to be provided for waste collection with a dedicated storage area for the separation, collection and recycling of waste. This area is easily assessable by all building residents and will enable recycling company logistics. The space will be sufficiently sized to accommodate storage for the following recyclables:

- Cardboard;
- Glass;
- Plastics;
- Metals; and
- Batteries

7.3 CONCRETE

To reduce the embodied energy and resource depletion caused by the use of concrete in the development no natural aggregates are to be used for non-structural purposes. This includes areas such as; the building base course, sub-grade to any car parks and footpaths, backfilling to service trenches, as well as kerb and gutters, and ground pavements.

As a Superior Design Outcome Portland cement in concretes will be substituted by supplementary cementitious materials at the following minimum percentages: insitu - 30% in situ; precast - 20%; pre-stressed/post-tensioned - 15%

8 TRANSPORT

Driving and transport are major contributors to greenhouse gas emissions, which can be easily reduced by using cars less. This development scheme incorporates multiple strategies to offer cycling support including secure bike storage facilities. Bike storage is provided in each apartment and also at ground, podium and basement levels based on a minimum of 1 per unit plus substantial visitor storage.

Another initiative that is increasing the viability of a car-free lifestyle is 'Car Share'. 'Car Share' is a service that offers members the option of renting cars by the hour or day. Rather than owning a vehicle members get access to a fleet of shared cars which are parked at convenient locations. This development will include two car spaces that are allocated to 'Car Share' as a Superior Design Outcome.

9 CONCLUSION

The design of 5 Hercules St embodies a range of Superior Sustainability Design features and also additional ESD initiatives to provide enhanced reduction in electricity and water use, as well as heightened comfort for occupants. Where possible the proposed development will incorporate passive solar design features such as suitable glazing treatments on windows, awnings for shading, blinds for glare control, light façade colours, roof gardens, natural ventilation through windows and doorways, as well as ceiling fans. These features will all contribute to water and energy savings and will help to future-proof the development.

The NatHERS rating achieved by an apartment is determined with reference to design of the building shell – its roof, walls, windows and floors. This report documents an overall Superior ESD Design Outcome through increased energy efficiency, reduced resource demand, and increased occupant comfort - and moves beyond the building shell to specify enhanced water efficiency fixtures and fittings as well as energy efficient appliances. This means that this development will be more energy efficient than other 'standard' developments of similar size, has a reduced impact on local infrastructure as well as the environment, natural resources and, reduced pollutants released into the atmosphere.

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