Oran Park High School and Oran Park Public School

ESD Report

www.jhaservices.com Ph: (02) 9437 1000
Sydney | Brisbane
Level 23, 101 Miller St, North Sydney NSW 2060

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Title	ESD Report
Project	Oran Park High School and Oran Park Public School
Description	Ecologically Sustainable Development Report
Key Contact	Lawrence Yu

Prepared By

Company	JHA
Address	Level 23, 101 Miller Street, North Sydney NSW 2060
Phone	61-2-9437 1000
Email	Lawrence.yu@jhaengineers.com.au
Website	www.jhaservices.com
Author	L. Yu
Checked	M. Estimada
Authorised	

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1. INTRODUCTION

The Educational Facilities Standards and Guidelines (EFSG) documents highlight the areas for consideration for NSW Department of Education building projects, the materials and building practices detailed are not exhaustive.

Under section *DG02 Ecologically Sustainable Development* of the EFSG, it states that Ecologically Sustainable Development principles are to be applied in the design, development and operation of all state assets, and are an important contribution to developing a considered whole of life cost development approach.

Ecologically Sustainable Development (ESD) is defined as:
Using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased.

By applying ESD principles to the design, this will help ensure the project meets the aim of NSW Government Resource Efficiency Policy, which is to reduce Government's operating costs and lead by example in increasing resource productivity. This will drive resource efficiency by Government agencies in the areas of energy, water and waste, as well as a reduction in harmful air emissions from government operations.

This report describes the sustainability initiatives that are to be incorporated into the design of Oran Park High School and Oran Park Public School project in accordance with the EFSG.

2. OBJECTIVES

Section *2.03 Environmental Design Polices* of the EFSG states that:

- DoE requires that any new school buildings on an existing or new site will be able to achieve a minimum 4 Star Green Star rating.
- DoE also aims to ensure Ecologically Sustainable Development principles will be included in any new school, to a level that the building could be benchmarked to achieve a 5 Star Green Star rating.

The EFSG further states that it expects the policies set out within the guidelines will lead to a Green Star - Education v1 Design & As-Built 4 Star rating, which is considered to be best practice within the Australian building industry.

Thus, to meet the ESD requirements of DoE for new school buildings, the project team for Oran Park School project will follow the policies set out in the EFSG and in doing so deliver a building that is best practice within the Australian building industry. The project will not be obtaining formal Green Star certification but will use the principles of the Green Star tool as guidance for the project in accordance with EFSG.

Section *2.04 Environmental Design Features of Education Facilities* of the EFSG also states that a major objective in the design of Education Facilities is to achieve good indoor environmental quality and comfort conditions with minimum energy consumption. This project with employ Passive Design principles wherever possible to achieve this.

The development will meet all regulatory sustainability requirements including Section J Energy Efficiency of the National Construction Code (NCC).

3. SUSTAINABILITY INITIATIVES

This section describes the sustainability initiatives that are targeted by the Oran Park High School and Oran Park Public School project, in accordance with the EFSG.

3.1 Energy Conservation

The following policies contributes to Green Star Credit ENE-1

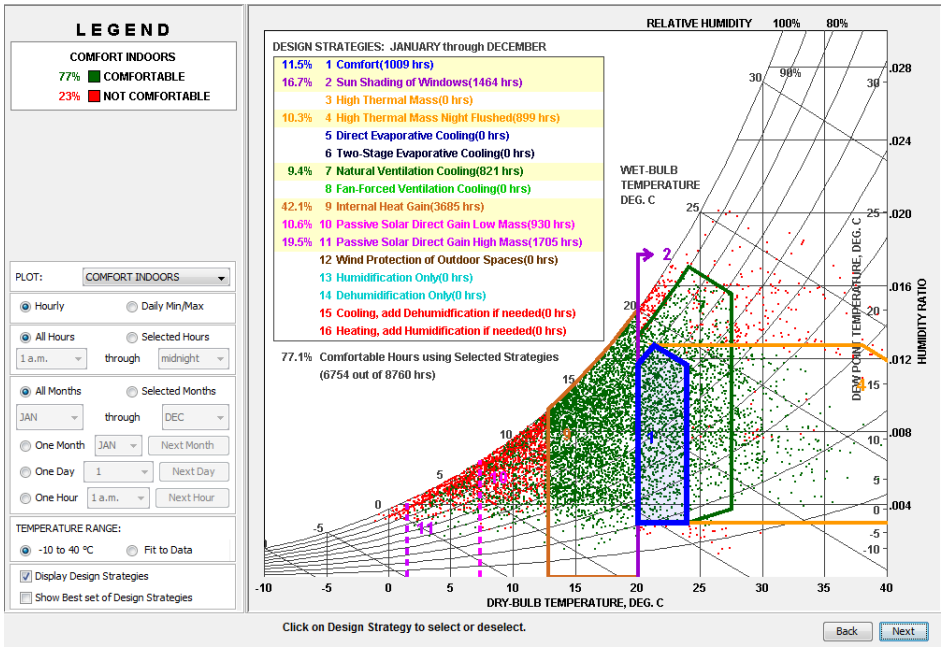
3.1.1 Heat Loss / Gain Policy

Controlling heat loss from the building during cooler winter months and heat gain during the warmer months is an important part of reducing the on-going cost associated with providing an efficient indoor environment. As part of the whole of life approach to the design an assessment is to be undertaken to determine the most appropriate heating and cooling systems that are to be included within the building suited to the local environment.

In following this approach, designers must consider:

- Climate/ micro-climate: This data shall come from the current AIRAH handbook and where a specific area is not referenced in the handbook, the Bureau of Meteorology statistics shall be utilised.
- Orientation: exposure to sun (solar) and wind
- Natural Ventilation and cross ventilation
- Insulation, thermal capacity and time lag of building fabric.
- Energy and Resources Cost: Initial and on-going, of heating and cooling. Reduced energy consumption provides future cost savings and a reduced carbon footprint.
- Activities / Equipment that may produce excess heat.

Energy modelling software is to be used to determine heating and cooling loads as part of the Whole of Life analysis that is to be undertaken (i.e. Camel or Carrier).



Psychrometric analysis predicts passive strategies have the potential to improve number of hours thermally comfortable by 66%

3.1.2 Insulation

The Building Code of Australia (BCA) sets out the insulation requirements for buildings based on the local conditions and insulation is to be applied to all school spaces.

The Key Purpose of insulation is to:

- In summer keep heat out to provide cooler, more comfortable classrooms.
- In winter keep warmth in to reduce heating energy consumption.

Roof and wall Insulation to achieve the required NCC Section J Part J1 Building Fabric insulation R-values as a minimum.

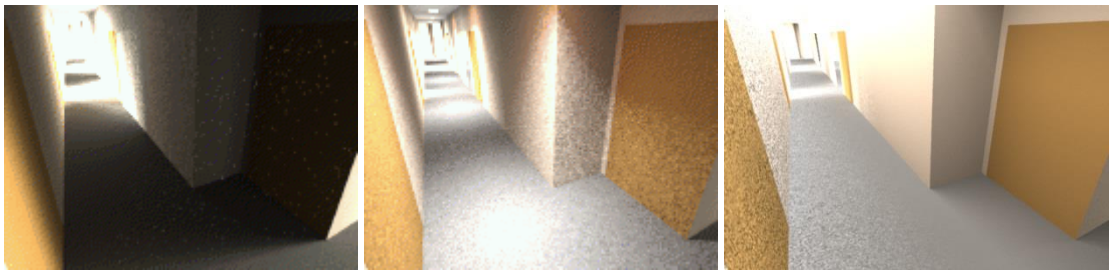
3.1.3 Natural Light

This policy contributes to Green Star Credit IEQ-4

- Maximise Natural Daylight in all habitable spaces, to reduce energy usage, improve the indoor amenity and create a pleasant environment.
- Natural daylight is to be provided to all teaching spaces unless identified otherwise.
- Natural daylight can be provided via windows, skylights, rooflights and the like. Where a room is required to have a brownout function, rooflights and skylights will need to include a method to sufficiently adjust light levels.
- When the space is large, it is recommended that perimeter lighting is adjacent to windows be on a separate zone to make maximum use of daylight.

Benefits:

- Natural daylight improves the indoor environmental quality of spaces and encourages beneficial learning.
- Saving in energy consumption and ongoing running costs. Lights will seldom need to be turned on during the day.



Consider the use of skylights or clerestory to introduce daylight into enclosed space like corridors. Left: Corridor without skylights (only spill light from rooms with door open). Middle: Corridor with skylights. Right: Corridor with clerestory.

The corridors of the proposed development will achieve some natural light from borrowed light via glazed internal walls.

3.1.4 Sun Shading

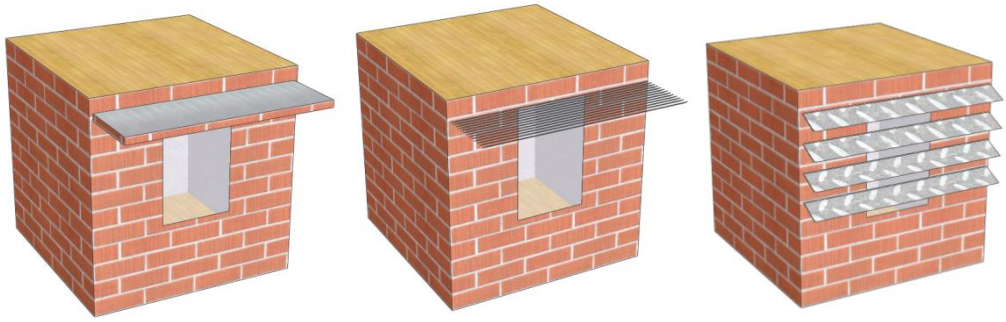
This policy contributes to Green Star credit IEQ-11

- On exposed facades subject to direct sunlight, external window shading should be considered as part of the building design to ensure energy efficiency and thermal comfort.
- If used, perforated sun shades must have small openings, with total perforation less than 20% to avoid dappled glare patterns within the building. Note perforated shades are more expensive and require more maintenance than solid sheet material.
- Aluminium is preferable as perforated steel sheeting is also susceptible to rusting and should not be used.

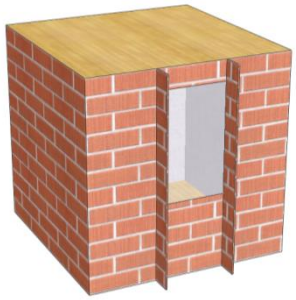
- Prepare sun diagrams in the design phase as a minimum requirement.

Benefit:

- Reduces heat gain due to the easterly rising sun and westerly setting sun. Shading will reduce need for cooling energy required for classroom.



Shading options for north facades include single projection, louvres awning or multiple blades.



For east/west facades, consider vertical fins shading options

3.1.5 Ventilation

Natural Ventilation is the preferred option to maintain good indoor environmental air quality through all school areas.

Air Movement through a space is a mandatory requirement to provide fresh air to areas so that they can be occupied by people for a prolonged time. In simple buildings this is achieved by the use of operable windows located on two opposite sides to enable natural cross ventilation.

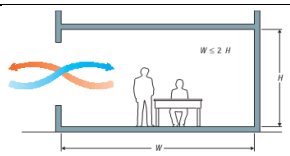
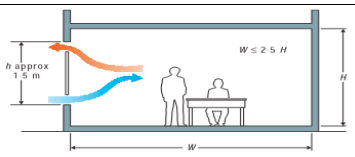
Where natural cross ventilation cannot be provided other forms of assisted ventilation will be required. The type of ventilation selected is to be determined based on a Whole of Life assessment of the individual situation. As per the EFSG, rooms will incorporate fans to assist ventilation.

The building regulations and AS1668 provide direction on air movement and ventilation requirements.

3.1.5.1 Natural Ventilation

- Natural ventilation is required to all classrooms for comfort in summer and to maintain a healthy indoor environment.
- Where cross ventilation may be restricted (i.e. where rooms are located on each side of a corridor), at least one whole wall of operable windows plus ceiling fans are required, to provide air movement.
- Some windows need to be operable in driving rain and so must be protected with appropriately designed weather hoods, eaves overhang or other method of protection.
- To be effective air movement must be directed at the body surface, i.e. at the occupant level. If only high level inlets are provided, the air flow occurs mainly along the ceiling and cooling benefits will be reduced.

- Highest air velocity happens if the inlet is small and the outlet is large, and this will provide the greatest cooling effect. However, multiple inlets will be required to ensure even coverage of cooling breeze throughout the classroom.
- With larger inlet opening, the air velocity will be lower but the volume of air passing in unit time will be higher. Therefore, large inlet openings are desirable when the wind direction is not constant, or airflow through the whole space is required.

Natural Ventilation Strategies	**Effective Ventilation Depth (W)**	
Single sided ventilation, single opening	W ≤ 2*H (floor-to-ceiling height)	
Single sided ventilation, double opening	W ≤ 2.5*H	
Cross ventilation	W ≤ 5*H	

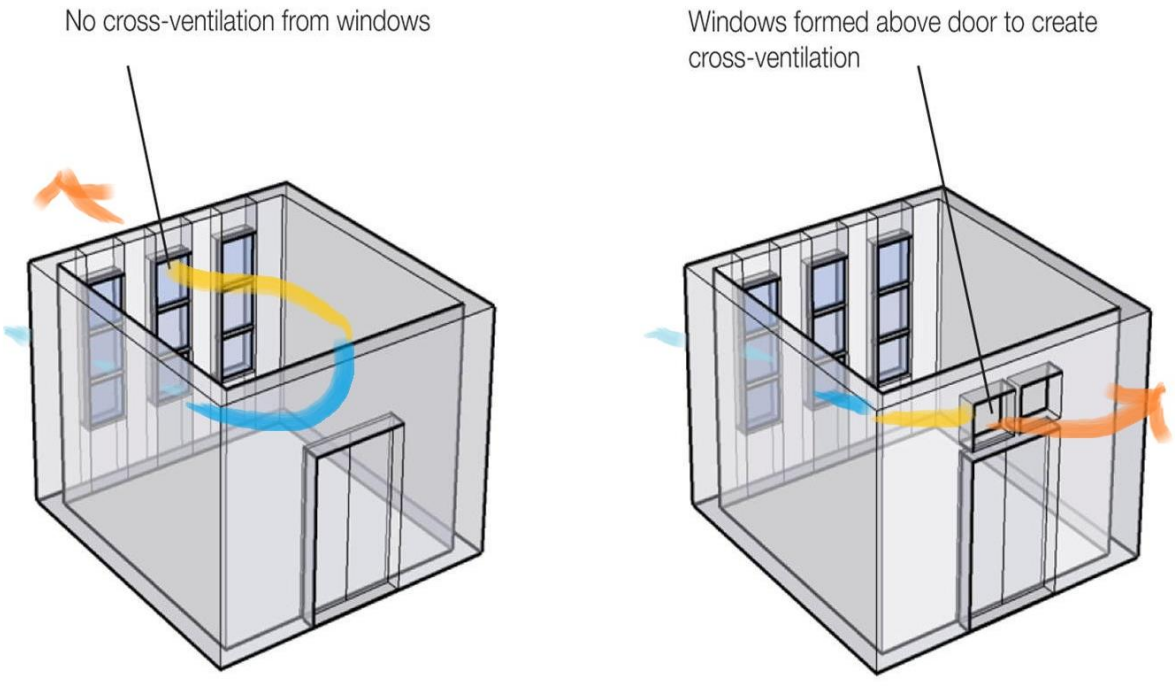
Effective ventilation depths of various natural ventilation strategies.

3.1.5.2 Cross Ventilation

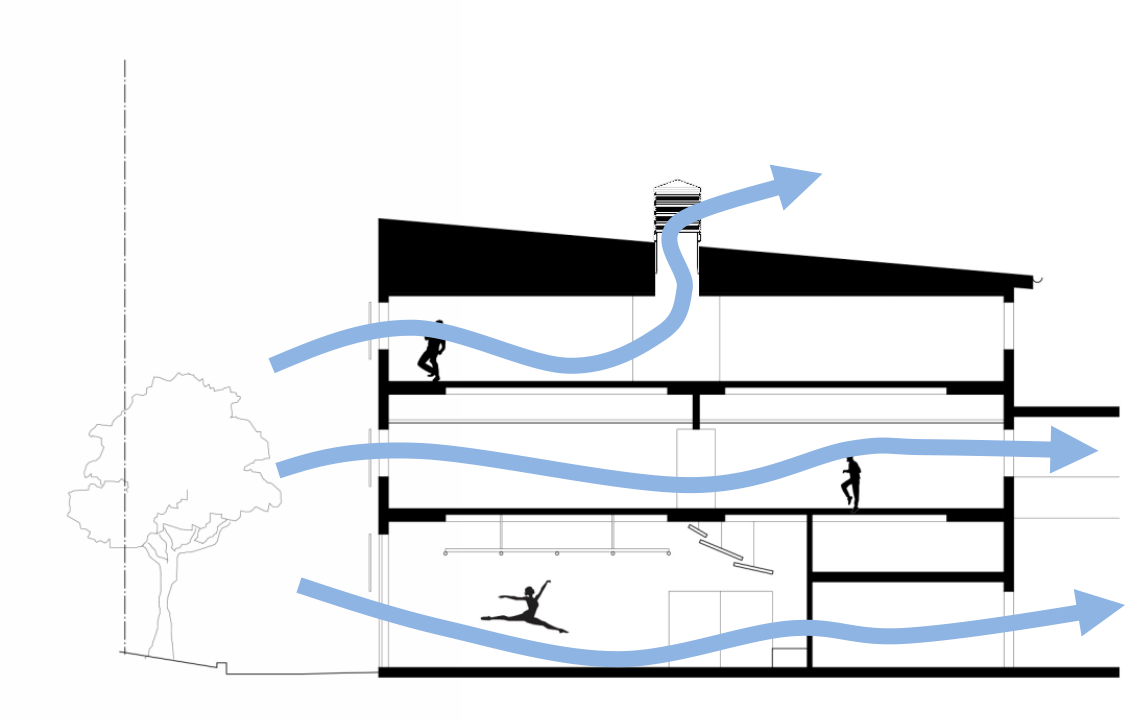
This policy contributes to Green Star credit IEQ-2

Cross Ventilation is the primary means of achieving good air movement and comfort conditions in all habitable rooms.

- Maximise cross ventilation wherever possible.
- Single loaded covered walkways are used to maximum cross ventilation.



Install ventilation openings on opposite sides of the classroom to achieve good cross ventilation.



Consider the use of windcatcher or whirlybirds along corridor to improve cross ventilation potential.

3.1.5.3 Mechanical Ventilation

This policy contributes to Green Star credit IEQ-1 & IEQ-2

- Generally used only in areas where natural ventilation cannot be achieved, such as School Performance Spaces, Duplicating Rooms, Dark Rooms and any internal toilets.

3.1.5.4 Ceiling Void Ventilation

- Provide ventilation so as to remove hot air build-up in large enclosed roof spaces. Roof mounted turbo ventilators are an approved method.
- Roof turbo ventilators are an effective way of enhancing the natural ventilation of a single or upper storey of a multi storey building. Size ventilators to provide a minimum of 7.5 air changes per hour using the local climatic data.

3.1.5.5 Louvres

- Louvres are good at allowing air in from the windward side of a building, but poor from the leeward side. They should not be used where there is poor cross ventilation.
- Louvres are to be used on mechanical intakes and discharges, in plant rooms and are to be operable where they serve a naturally ventilated habitable space.
- Louvres are to be weatherproof and be fitted with vermin mesh.

3.1.5.6 Sanitary Spaces

- Require greater air circulation than that required by building regulations, with sufficient natural ventilation or mechanical ventilation, to disperse odours and /or humidity.
- Cross ventilation is to be used where possible.

3.1.5.7 Storage Spaces

- Storage spaces are to have permanent air ventilation openings (without compromising security), to prevent concentration of odours.

3.1.6 Air Cooling and Heating Systems

No AC will be provided to classrooms, based on ESFG guidelines for schools in the east coast of NSW. Split AC to be provided to comms rooms and critical areas only.

Where HVAC is provided, include:

- Timed or sensor operation functionality for all Air Cooling systems
- Centralised control of HVAC plant with programmable schedules for the school year
- Consider one single infrastructure for heating and cooling where it demonstrates whole life cycle cost savings.

Benefits:

- ensure electric HVAC systems are turned off when a space is not occupied
- ensure whole of life costs and operation and maintenance costs are optimised through consideration of both heating and cooling infrastructure

3.1.7 Period Bells (or equivalent)

This policy contributes to Green Star credit ENE-7

- Period Bell Light switching systems or equivalent (such as occupancy sensors) to automatically switch lights off when room is unoccupied are to be in all new schools, major conversions and additions. As per the ESFG, this is to be installed in each classroom to automatically turn off luminaires after class.
- All luminaires in rooms are to automatically turn off five minutes after the period bell has rung and all students have left the room. Alternatively include systems to turn off lights when the room is not in use.
- A conscious decision is required to turn the lights on again.

Benefit:

- Significant savings on luminaire energy consumption and ongoing running costs in Schools.

3.1.8 Electrical Lighting

Lighting accounts for a significant amount of energy usage in a building. Good practice lighting design generally includes for energy efficient fluorescent and LED lighting.

- Motion sensors are to be in infrequently used rooms such as store rooms, plant rooms, staff toilets and the like.

Benefit:

- Significant savings on luminaire energy consumption and ongoing running costs in Schools.

3.1.9 Appliances and Equipment

The NSW Government Resource Efficiency Policy sets out the minimum standards for new appliances and equipment. All new electrical equipment purchased by DoE where relevant, available and fit for purpose, must have minimum Greenhouse and Energy Minimum Standards (GEMS) star ratings stipulated under target E3 of the Policy.

3.1.10 Electricity Meters

This policy contributes to Green Star Credit ENE-2

Suitably sized meter are to be installed with capability for monitoring. Contact Advisory Services (sustainability.enquiries@det.nsw.edu.au) to ascertain site specific metering requirements.

In recent years, the cost of installing real time consumption monitoring has decreased and the user interface has improved as the industry matures. In addition to main utilities being metered, benefits can be seen by metering major energy equipment (air conditioning, lighting, hot water etc). Monitoring allows spikes in energy use to be identified quickly and rectified if required.

There are a number of data logging service providers. Currently, the most common strategy is to connect meters to a gateway device that will upload usage data and other information to an online platform. Customers will be provided access to the data via logging in to their online account. There is an annual subscription fee to access the online portal.

Further, real time displays located within a prominent location (such as the main entrance) could be provided detailing the buildings sustainable measures/energy usage/CO2 savings/water consumption etc. Although the real time displays do not have a specific sustainable agenda, the displays can potentially be used as an 'advert' and as a learning tool on the sustainability of the development.

The set up and annual fees for monitoring varies between the providers and would range between $5-6k set up and an annual fee of $2-4k. The provision of a real time display is over and above the fees.

Benefits:

- Lower electricity meter maintenance costs through selecting a fit for purpose meter.
- Better access to energy consumption data at the school.

Real time displays showing real time consumption data of power and water usage to building users. Usage data can also be viewed using mobile devices with web enabled platforms.

3.1.11 Renewable Energy Generation

Assess viability of Solar PV systems for new school proposals. The area of roof could potentially accommodate a large amount of PV panels to satisfy a large proportion of the electrical usage of the school and potentially export electricity back onto the grid.

Currently proposing 50kW system for Oran Park High School and a 12kW system for Oran Park Primary School in accordance with EFSG guidelines. Consider using panels as shading devices to north facing windows so they can be visible and used as a learning tool. Schletter (www.schletter.com.au) is one provider of façade system for one-row module mounting with inclinations from 15 - 75° using facade supports. Reminder of panels to be installed on north facing roof areas.

Benefit:

- Onsite generation of electricity to supplement base load demand at the school

Example of a large 99.5kW solar system at Menai High School.

Examples of PV awnings.

Schletter façade mounting system.

3.2 Water Conservation

This policy contributes to Green Star credit WAT-1

Practical water conservation systems to be incorporated into schools include:

3.2.1 General

- Purchase products where relevant available and fit for purposes with minimum Water Efficiency Labelling and Standards Scheme (WELS) star ratings as stipulated under W3 of the NSW Government Resource Efficiency Policy.
- Where WELS rating is not available, use the alternative Smart Approved WaterMark rating scheme.
- Internal Flow Controllers can be used to minimise water usage and wastage for staff amenities.

3.2.2 Taps

- Taps with timed flow can be used to minimise water usage and wastage in student amenities.

3.2.3 Toilets

- Dual Flushing Cisterns with a minimum WELS rating of 4, to be used to reduce water usage and minimise waste. Appropriate cisterns must be used with a suitably rated pan to ensure effective use.

3.2.4 Urinals

- Manual flushing urinals are preferred.
- Waterless urinals should only be considered in new facilities with appropriate drainage. Maintenance of waterless urinals should be strictly in line with the manufacturers recommendations to ensure effective use.

3.2.5 Rainwater Harvesting and Reuse

- Rainwater harvesting and tank storage for landscape irrigation and flushing of toilets. Rainwater tanks to be incorporated where there is a local identified end use such as irrigation or toilet flushing. Rainwater tank designed preferably with gravity flow. However, an electric pump should be installed with the rainwater tank where required and economically feasible.

3.2.6 Sprinkler system

- Where schools are required to install a sprinkler system for fire safety, it is recommended to install a closed loop system to capture and reuse fire systems testing and maintenance water, or by using an alternative non-potable water source.

3.3 Other Sustainability Initiatives

3.3.1 Environmental Management Plan (EMP)

This policy contributes to Green Star Credit MAN-7

- All projects will require the preparation of an appropriate site-specific Environmental Management Plan (EMP) prior to the commencement of the relevant site works.
- Contractors will be required to prepare an EMP as a condition of contract.
- All projects of $10m or more, and all projects under $10m if they are environmentally sensitive, contractors will need to have a corporate Environmental Management System (EMS) accredited by a NSW government construction agency.

3.3.2 Timber

This policy contributes to Green Star Credit MAT-7

- No Rainforest timbers to be used unless plantation grown
- No timbers from high conservation forests
- Use only recycled timber, engineered and glued timber composite products, timber from plantations or from sustainably managed regrowth forests.

3.3.3 Waste

This policy contributes to Green Star Credit MAT-7

- Eliminate unnecessary waste by better planning and more efficient use of natural and manufactured resources. This approach is often referred to as a Whole of Life approach to building.

3.3.4 Ecologically Sustainable Development

This policy contributes to Green Star Credit ECO-4

- Ensure the preservation, maintenance and sustainable use of the community's natural and material assets.
- Protect and support biological and ecological diversity
- Restrict the flow of pollutants into our natural environment.

3.3.5 Conservation of Biological Diversity

This policy contributes to Green Star Credit ECO-4, EMI-5 & EMI-6

- Conserve for future generations, the biological diversity of genetic materials, species and ecosystems.
- Assess project and purchasing impacts on the natural environment during all project phases and adopt a precautionary approach where risk is high.

3.3.6 Pesticide

- New Buildings: no chemical pesticides and termiticide to be used. Preventive treatments to be by physical means and careful design to minimise risk.
- Schools should be designed, constructed and maintained, without using chemicals for termite and other pest control.

3.3.7 Environmentally Friendly Materials / Products

This policy contributes to Green Star Credit IEQ-8

Encourage the use of materials and products which:

- Adequately and economically perform their intended functions, and also have lower adverse environmental impacts throughout their life cycle.
- Contain reduced or no hazardous substances (Low VOC)
- Reduce the demand for rare or non-renewable resources
- Are made from or contain recycled materials or can be recycled at the end of their useful life.

4. SUMMARY

This project has met the sustainability requirements of the EFSG by incorporating the above sustainability initiatives as set out in the guidelines. Together the above initiatives contribute to Green Star Credits ENE-1, ENE-2, ENE-7, WAT-1, IEQ-1, IEQ-2, IEQ-4, IEQ-8, IEQ-11, MAN-7, MAT-7, ECO-4, EMI-5 and EMI-6. In accordance with the EFSG, this is expected to be equivalent to a Green Star - Education v1 Design & As-Built 4 Star rating, which is considered to be best practice within the Australian building industry.